

COUNTYWIDE RADIO COMMUNICATION SYSTEM

CONTRACT DOCUMENTATION



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SECTION 1

SYSTEM DESCRIPTION

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

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SYSTEM DESCRIPTION

1.1 TECHNICAL SYSTEM DESCRIPTION AND METHODOLOGY OVERVIEW

Motorola Solutions (Motorola) is pleased to propose a solution to Lake County, Illinois that will meet its existing and future Mission-Critical two-way radio communication needs. The solution is based on leveraging the existing STARCOM21 infrastructure that is already optimized and working within the County. As part of the Illinois Statewide STARCOM21 system, Lake County users will be able to experience seamless interoperable communications with users from other State and Local agencies.

The proposed Lake County Simulcast system will be offered as follows:

- GEO Redundant Prime sites.
- 11-site simulcast cell (including Gurnee Toll site).
- 10 TDMA/DDMA channels per site; capability of up to 18 talkpaths combined with the ability to adapt to existing FDMA users on the system.
- DAQ 3.4 coverage at 95% reliability to a portable, with remote speaker microphone, in a 12 dB loss building in the Lake County service area at 1% GOS with 16 dB in designated areas.
- 99.9999% microwave backhaul path reliability.
- ASTRO Express single-site backup trunking solution.
- IP-based MCC7500 Dispatch Console platform with IP and Analog loggers.
- APX P25 subscribers with GPS, advanced messaging and OTAP.
- BDAs at nine sites.
- Qty. four (4) 12 x 16 shelters.

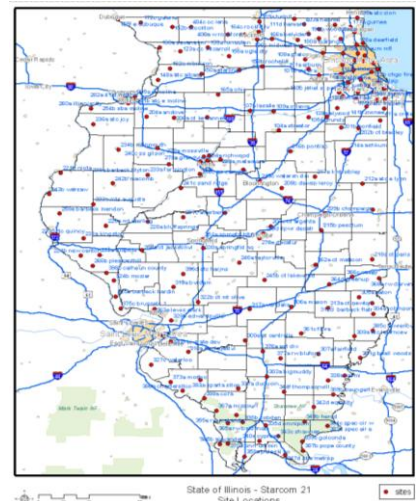
For the site-to-site communication needs and interconnectivity with STARCOM21 Motorola will provide a hi-tier Aviat microwave backhaul network for all Lake County sites. Motorola will be the prime integrator and Aviat will support the effort by handling design, site surveys, radio installation, and commissioning of the microwave network.

1.2 STARCOM21 TRUNKING SYSTEM OVERVIEW

The system is made up of a combination of simulcast cells and site repeater RF locations. The STARCOM21 system supports operation in 700MHz and 800MHz bands.

Voice over Packet

Motorola's ASTRO 25 Trunking System complies with a wide range of Project 25 standards. With public safety and industrial users moving toward countywide, statewide, and nationwide coverage, new systems are also expected to comply with rising industry expectations of increased communication capabilities. One of the benefits of voice over packet is improved performance. The use of leading edge transport network equipment provides for continued



improvements in a system's ability to process the high volume of calls found on Wide Area Public Safety Systems.

Centralized System Management

The STARCOM21 systems features centralized management. This helps keep the system healthy with alerts, diagnostics, and faults reported at a centralized location. The accuracy of a system-wide clock helps ensure that key devices on the system record events at the same time to help improve fault diagnostics and call activity tracking. The network management system also provides functionality to remotely distribute software upgrades to products on the network. As a partner in the STARCOM21 system, Motorola will manage and maintain the network management subsystem. This includes the addition and configuration of new user radios on the network, the configuration of the radio tower sub-sites, and the configuration of user's radio features on the system. Any applications that are present on Lake County's local NM client are shared with other users of the system.

Flexible System Design

The modular design of the technology provides scalability in handling the needs of a small or large system. In addition to scalability, the flexible system design includes narrowband simulcast in the 12.5 kHz range. Large and heavily populated areas will benefit from the narrowband simulcast feature due to its improved frequency efficiency.

1.2.1 STARCOM21 Trunking Call Services

The STARCOM21 trunking system offers a wide range of advanced call services to meet the demanding communications needs of a diverse, Mission-Critical workforce. The available calling features and benefits are described below:

Talkgroup Call

The Talkgroup Call is the primary communication level in an ASTRO 25 trunked system as the majority of conversations take place within a talkgroup. Radios assigned to a given talkgroup are provided with Talkgroup Call capability and can communicate with other members of the same talkgroup. Talkgroup Call provides the effect of a "dedicated channel" for each talkgroup.

Multigroup Call

A Multigroup Call is a call involving multiple talkgroups at the same time and can be initiated by a properly authorized console dispatcher or radio unit. The talkgroups that are addressed in the call are pre-programmed within the radio units and system.

The advantage of Multigroup Call is the ability to simultaneously communicate important information to multiple talkgroups quickly and efficiently. A single Multigroup Call transmission utilizes fewer channel resources and airtime than multiple, separate talkgroup calls.

AllStart Talkgroup Call

AllStart is a talkgroup setting that operates in the same manner as the default call setup mode. This call setup approach requires that all sites with affiliated talkgroup members and other required resources be available before the call begins. Otherwise, the system returns a busy response to the user who initiated the talkgroup call. Once the required resources become available, the call request is granted.



FastStart Talkgroup Call

FastStart is a talkgroup setting that requests a group call setup whether or not all affiliated Talkgroup members are available. This “Automatic Busy Override by Talkgroup” call setup method still requires the participation of all affiliated consoles and critical resources before the call can begin.

As channels at the affiliated talkgroup members’ sites become available, they are added to the call in progress. FastStart will simplify the setup of automatic busy override functionality. FastStart applies regardless of the number of zones involved in the call. Caution: It should be noted that some talkgroup members may not be included in a FastStart talkgroup call if they happen to be affiliated at a busied site.

Emergency Alarm / Call

Emergency Alarm/Call provides users the ability to inform dispatch personnel of a life-threatening situation. By pressing the radio’s Emergency Alarm button, an alarm is sent to the dispatcher. Upon activation of the emergency radio’s Push-To-Talk, a channel is assigned for a predetermined amount of time. In the event that all voice channels are occupied, the system is capable of functioning in one of the following two modes:

- **Emergency Top-of-Queue** - If all voice channels are occupied when an emergency call is made, then the unit initiating the emergency shall be placed at the top of the busy queue list and allowed access to the next available voice channel. The emergency unit is given the highest level of priority regardless of how many units are already in queue. As soon as any user of any of the busy channels de-key, the emergency caller is granted the channel. This virtually eliminates channel contention and assures the first available channel will be assigned.
- **Emergency Ruthless Preemption** - If all voice channels are occupied when an emergency call is made, then the unit initiating the emergency is allowed access to the voice channel that has the lowest priority user currently assigned. It must be noted that until now the low priority current user de-keys, there could be RF contention between the emergency user and the low priority unit. Once the non-emergency user de-keys, the channel belongs to the emergency user.

Call Alert

Call Alert allows a user to initiate a signal that notifies another user to call back the alerting party. Call Alert capability helps ensure that important messages get through, even if the called party is away from the radio. In addition, Call Alert signaling takes place over the system control channel. This helps to preserve valuable voice channels for other communications.

1.2.2 STARCOM21 User Features (Voice Only)

The following features are designed to make the system easier to use.

Busy Queuing and Callback

Although trunking systems are considerably more frequency efficient than conventional radio systems, there may still be times on STARCOM21 when all of the voice channels are busy. If a radio user attempts to initiate a call while all the system channels are in use, the requesting user will be put into a Busy Queue and then automatically notified when a channel becomes available. This feature eliminates the need for the radio user to continually re-key in an effort to gain channel access.

Multiple Priority Levels

STARCOM21 provides multiple levels of priority allowing system access to the most critical users during busy periods. Individual users and talkgroups can be assigned specific priority level(s), with

up to 10 levels available. This allows higher priority users to be placed higher in the busy queue for quicker system access.

Continuous Assignment Updating

This feature is designed to insure that a radio just coming into service during an active talkgroup conversation will be immediately assigned to the appropriate voice channel. A user is included in his or her active talkgroup call with no special action required. To achieve this, the system control channel continuously transmits the channel assignment for talkgroups involved in active calls.

1.2.3 STARCOM21 Voice Encryption

The STARCOM21 network offers the following secure features (these features can be quoted if Lake County desires):

- Secure (encrypted) voice communications to the Console Operator.
- Supported algorithms include: ADP, DES-OFB, and AES (Optional per subscriber unit).
- Single or dual encryption.
- Multi-key encryption within same encryption algorithm.
- Distribution of key material to subscribers will be conducted manual rekeying using the KVL 4000 Plus key loader.

Secure (Encrypted) Voice Communications

Motorola systems have the capability to protect their Land Mobile Radio (LMR) voice communications with sophisticated, digital encryption. The encryption used in STARCOM21 offers a great improvement in terms of audio quality over earlier encryption methods. Digital encryption does not impact audio quality. Encryption allows users the ability to send and receive sensitive information over the air with the confidence that only those for whom it was intended will receive it.

Supported Algorithms

ADP, DES-OFB and AES encryption algorithms are available on the STARCOM21 System.

Project 25 defines the DES-OFB encryption algorithm as the standard encryption algorithm that allows encrypted interoperability between Project 25 compliant radios from various manufacturers. OFB stands for Output Feedback, the encryption synchronization method adopted by Project 25.

The National Institute of Standard and Technology (NIST) defines AES encryption as the standard encryption algorithm defined under the Advanced Encryption Standard (AES) for use by U.S. Federal and Canadian National Government agencies and, on a voluntary basis, by organizations, institutions, and individuals domestically and internationally.

Single Algorithm

Single algorithm means that one encryption algorithm can be used in a two-way radio system. This allows users the ability to send and receive sensitive information over the air with the confidence that only those whom it was intended will receive it.

Multiple Algorithms

Multiple algorithm capability means that up to two or more different encryption algorithms can be used in a two-way radio system. Multiple algorithms provide additional flexibility for larger organizations requiring completely separate operations or for two or more completely autonomous groups, who only have to occasionally work and communicate together through an interoperable mode of operation. Multiple algorithms also provide backward compatibility to subscribers.



Subscribers with multiple algorithms can be shared with different infrastructures that happen to use different encryption algorithms.

Distribution of Encryption Keys

Delivering and updating encryption keys to a secure device is done manually using the KVL 4000 Plus key loader. A key loader is a hand held portable device that connects via a cable to a secure device. The key loader supplies the “encryption keys” needed to perform encryption and decryption operations properly.

Key Loader – KVL 4000 Plus

The KVL 4000 Key Loader is used to create, store and transfer encryption keys used by Motorola’s secure products. Once two or more devices have been given keys by the key loader, they can then communicate over a secure (encrypted) link.

1.2.4 STARCOM21 Wide Area Radio Roaming

Motorola’s STARCOM21 wide area trunking system offers a sophisticated set of radio roaming features and capabilities simplifying user operation of the radio while ensuring that the radio is operating on the optimum site. Motorola’s wide area roaming features and benefits are described below:

Automatic Site Registration

Automatic Site Registration is the automatic registration process that takes place whenever a radio is turned on or when the user roams from one trunking site to another. No operator intervention is required. This important feature enables continuous call processing for the user and effortless user roaming throughout the system.

De-Registration

There are three instances when a radio unit will de-register from a site. The first method is when a radio unit is turned off. The radio will perform a soft power down de-registering itself with the Zone Controller. The second way is when a user moves from one site to another. Automatic Site Registration occurs at the new site, and the Zone Controller automatically de-registers the radio at the old site. The third way a radio unit is de-registered is via a Time-Out Timer. De-registration occurs when a radio goes out of range for longer than a pre-selected amount of time. These de-registration processes help to ensure that precious frequency resources are not wasted.



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1.3 PROPOSED SOLUTION

Motorola has chosen to leverage the existing STARCOM21 P25 trunked digital wireless communication system to fulfill Lake County's communication needs. To meet Lake County's coverage requirements, existing STARCOM21 simulcast sites will be combined with existing Lake County sites to form a new simulcast cell.

STARCOM21 Managed:

- New IP IV&D Geo-Redundant Simulcast Prime Sites w/eleven (11) IP Simulcast Remote Sites.
- Four (4) New Motorola Standard Building (MSB), 12'X16' Shelters.
- 32-minute DC Backup (microwave infrastructure).
- 32-minute UPS Backup for the FNE equipment.
- Redundant Simulcast Voting Comparators.
- Ten (10) GTR8000 stations at each site.
- Redundant GGM Gateways at each RF site.
- TRAK9100 GPS clocking at each Prime/RF site.
- MOSCAD Alarm Monitoring.
- Aviat Hi-Tier 99.9999% Microwave Backhaul Ring.

Lake County Owned and Managed:

- MCC7500 Dispatch Site Solution:
 - Nine (9) MCC7500 Dispatch Consoles w/ Voice Processing Modules:
 - ◆ Per Console:
 - One (1) 19" Touch Screen Monitor
 - One (1) Z420 Operator position computer
 - Two (2) Speakers,
 - One (1) Gooseneck MIC
 - DES-OFB and AES encryptions capability
 - Two (2) Headset Jacks
 - One (1) Dual Foot Pedal
 - Dual IRR Logging Application
 - One (1) APX 7500 Backup Control Station
 - Two (2) Redundant AUX-IO servers
 - One (1) Conventional Site Controller
 - Two (2) redundant GGM Gateways
 - Three (3) LAN switches for resources' distribution
 - Ten (10) Conventional Channel Gateways for interconnecting up to 40 conventional resources
 - One (1) MKM 7000 Console Alias Manager.
 - NICE Logging (Analog and Digital).
 - GENWATCH3 OVER-THE-AIR BASE Solution.
 - ASTRO EXPRESS 5-Channel backup trunked system.
 - Short Message/Alphanumeric Text Service and MCC7500 Consoles.
 - Fourteen (14) APX6000 7/800 MHz Model 3.5 portables.
 - One-hundred thirty-eight (138) APX6000 700/800 MHz Model 2.5 Portables/w belt clips.
 - Five hundred seventy-five (575) APX6000 700/800 MHz Model 2.5 Portables/w belt loop.
 - Ninety-Two (92) APX6000 700/800 MHz Model 1.5 Portables.
 - Hundred-six (106) APX6500 7/800 MHz Mid Power Mobiles Remote Mount.
 - Thirteen (13) APX6500 7/800 MHz MID Power Control Station.



August 12, 2014
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1-8 System Description

Lake County, Illinois
Countywide Radio Communication System
PS-000042156

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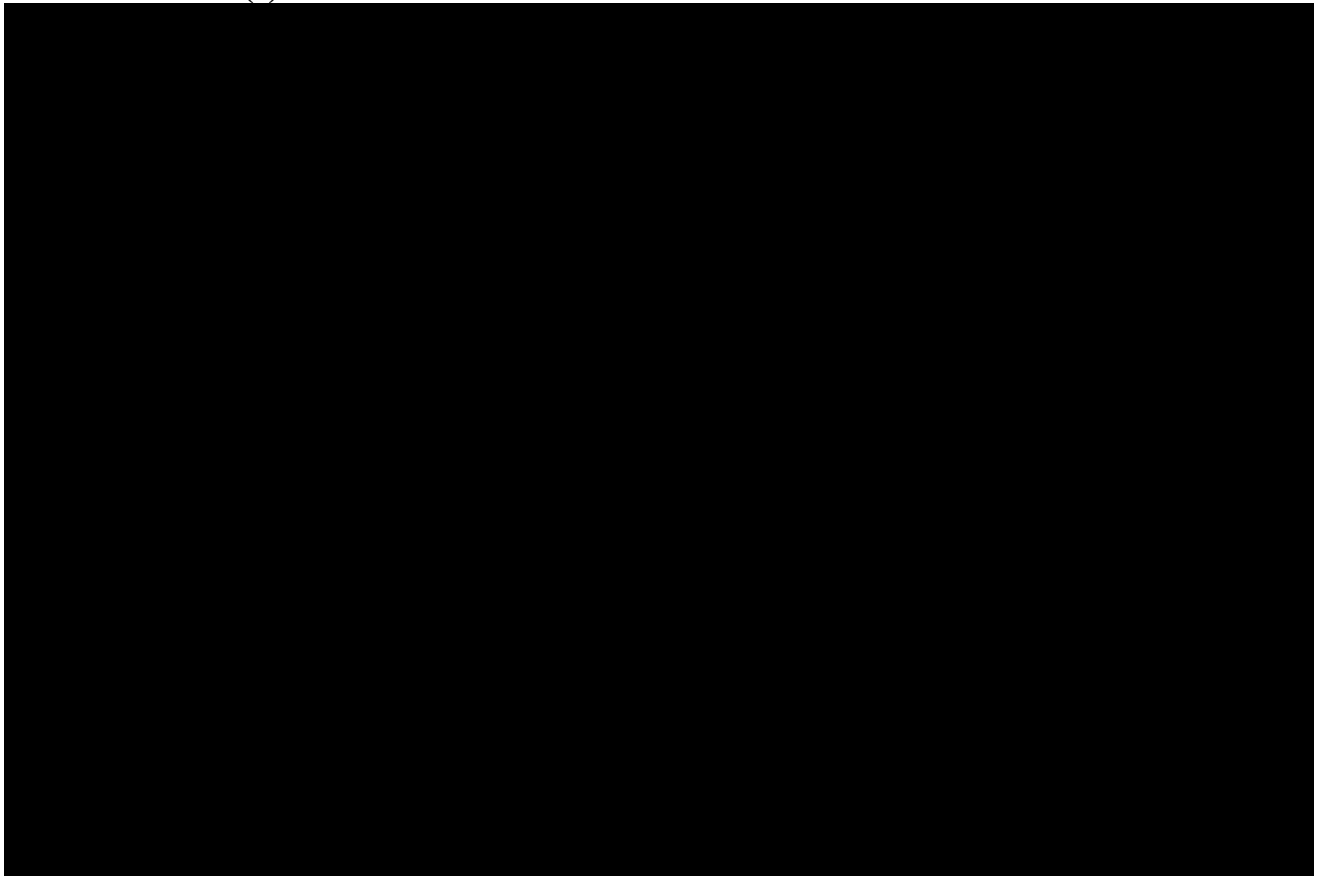
High Level Overview

Libertyville Control Room Primary Simulcast Prime Site

Motorola is proposing a Primary Geo-Redundant Prime Site solution.

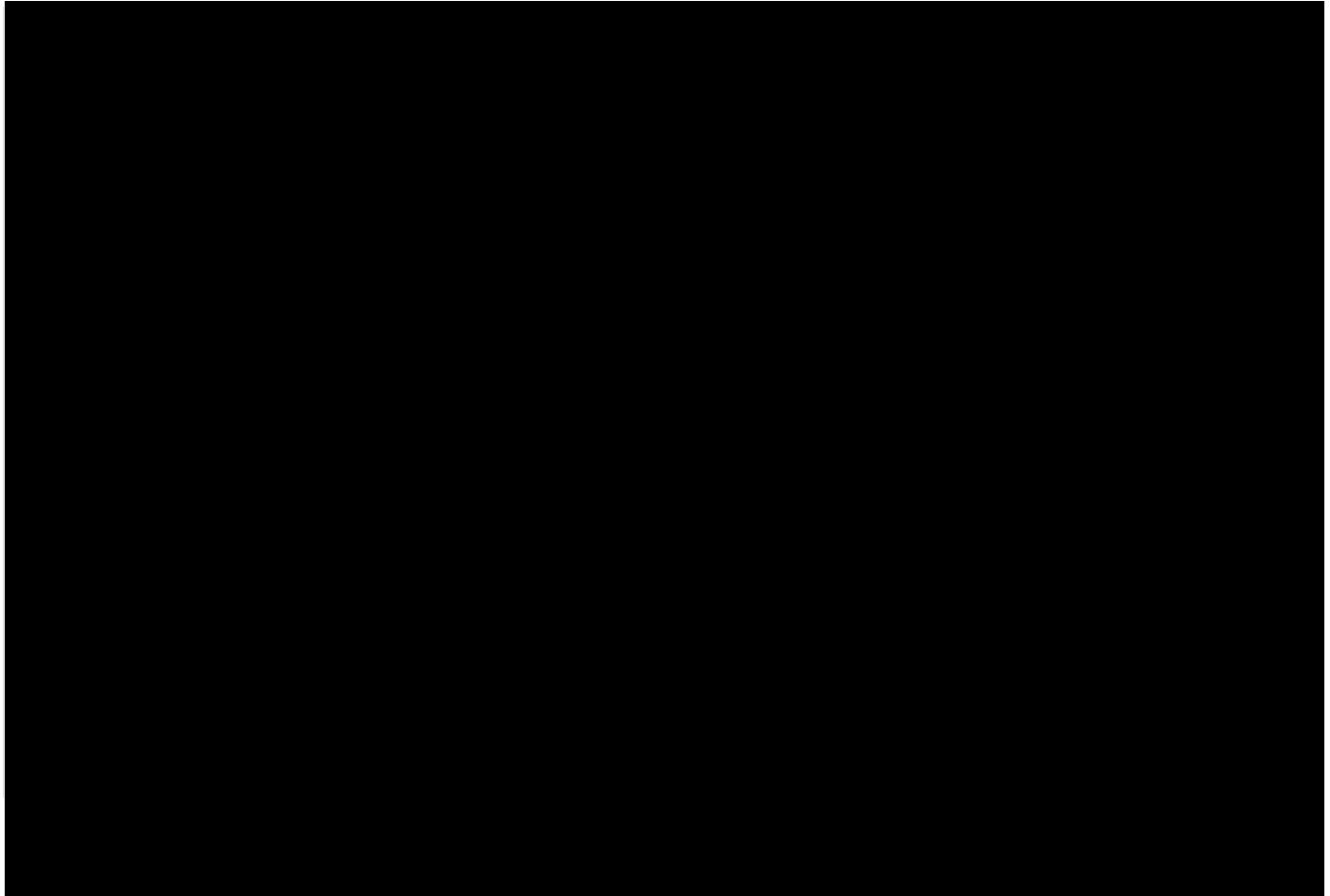
Site components include:

- Two (2) GCP 8000 Site Controllers.
- Ten (10) GCM 8000 Comparators.
- One (1) TRAK 9100 Simulcast Site Reference.
- One (1) Sub-site Access Gateway.
- One (1) Prime Site Ethernet Switch.
- One (1) Backhaul Ethernet Switch.
- One (1) SDM 3000 MOSCAD device.
- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) Co-located RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) Sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.



Waukegan Geo-Redundant Prime Site

- One (1) Redundant GCP 8000 Site Controller.
- Ten (10) Redundant GCM 8000 Comparators.
- One (1) Redundant TRAK 9100 Simulcast Site Reference.
- One (1) Redundant Sub-site Access Gateway.
- One (1) Redundant Prime Site Ethernet Switch.
- One (1) Redundant Backhaul Ethernet Switch.
- One (1) SDM 3000 MOSCAD device.
- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) Co-located RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) Sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.



Lake Zurich Site

- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Lake Villa Site

- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Highwood Water Tower Site

- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Lake Barrington Water Tower Site

- Aviat Microwave equipment.
- One (1) New 12'x28' Shelter.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.



Vernon Hills Site

- Aviat Microwave equipment.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Beach Park Water Tower Site

- Aviat Microwave equipment.
- One (1) New 12'x28' Shelter.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Antioch Water Tower

- Aviat Microwave equipment.
- One (1) New 12'x28' Shelter.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.

Antioch Northwest Water Tower

- Aviat Microwave equipment.
- One (1) New 12'x28' Shelter.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.



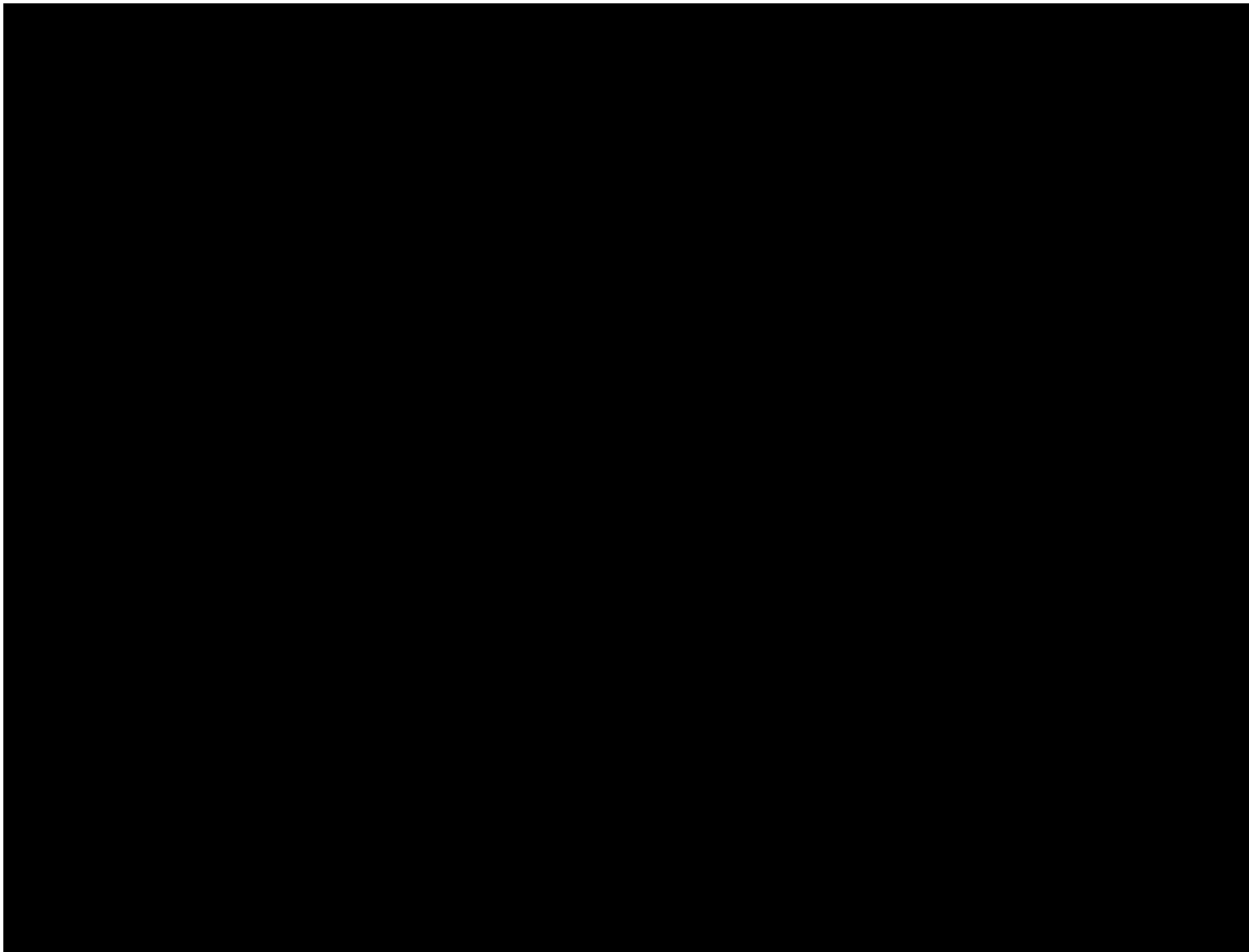
Gurnee Toll Site

- Aviat Microwave equipment.
- One (1) New 12'x28' Shelter.
- 32-minute Eltek DC Microwave backup rack.
- 32-minute UPS.
- One (1) RF sub-site:
 - Two (2) ESS GTR 8000 racks (10 base stations total).
 - One (1) sub-site switch.
 - One (1) GGM 8000 Site Gateway.
 - One (1) SDM 3000 MOSCAD device.
 - One (1) TRAK 9100 Simulcast Site Reference.



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1.4 RF COVERAGE PREDICTIONS AND ANALYSIS

The Lake County coverage design is based on Round Trip Delivered Audio Quality (DAQ) 3.4. The coverage testing will be a subjective talk-in and talk-out testing while measuring the outbound signal strength, making sure it meets the Minimum Received Signal Level (MRS�). Outbound BER measurements will be provided as information only. See coverage acceptance test procedure later in the proposal for detailed requirements for coverage testing.

The service area used for coverage analysis is the Lake County borders (for 12 dB coverage) plus three mile outside the Lake County borders (for on-street coverage). Motorola is guaranteeing 95% service reliability with a portable on hip (with a ¼ wave antenna) in a swivel case using Remote Speaker Microphone (RSM):

- Element 1 – 800 MHz (700 MHz capable) portable On-Hip On-Street Countywide service area plus 3-miles.
- Element 2 – 800 MHz (700 MHz capable) portable On-Hip 12 dB In- Building Countywide service areas.
- Element 3 – 800 MHz (700 MHz capable) portable On-Hip inside 12 County facilities per Addendum 2 of the RFP.
- Element 4 (Optional) – 800 MHz (700 MHz capable) portable inside 16 dB buildings as specified by the provided Shapefiles.

Motorola has designed a system that meets and exceeds the 95% service area reliabilities for talk in and talk out with the first three elements mentioned above.

Service Area Reliability is defined in TSB-88.1-C §5.3.2 as follows: “The Channel Performance Criterion (CPC) Service Area Reliability is the probability of achieving the desired DAQ over the defined Service Area.” Motorola will test coverage throughout the entire service area, whether or not the test locations are painted as covered by the predicted coverage maps. Service area is defined in the first two elements mentioned above.

Coverage design for Lake County:

1. Design of 11 sites for DAQ 3.4 with a portable on hip (with a ¼ wave antenna) in a swivel case using Remote Speaker Microphone (RSM).

1.4.1 Aviat Backhaul Microwave Network

Motorola has proposed a (45 Mbps) hybrid traffic ring solution. The proposed network consists of eleven (11) sites and eleven (11) microwave links in a ring/spur configuration. Each point-to-point microwave link is capable of 45 Mbps of capacity. Each path was designed to meet a reliability of 99.9999% at BER=10e⁻⁶ using the Vigants reliability model. The PAR6-65 Andrews antennas proposed are FCC Part 101 Category A antennas.

NOTE: STARCOM21 requires 30MBs to provide site connectivity on the current Lake County design with a reserve for up to a two site expansion if required. All additional capacity will be reserved for the County's discretionary usage.

PATH AVAILABILITY (PERCENTAGE)			
PATH	SITE A	SITE B	64 QAM, HT (45 MB)
1	SO Dispatch	Gurnee	100.00000%
2	Gurnee	Waukegan	100.00000%
3	Waukegan	Beach Park	100.00000%
4	Beach Park	Antioch	100.00000%
5	Antioch	Antioch NW	99.99995%
6	Antioch NW	Lake Villa	99.99999%
7	Lake Villa	Lake Zurich	99.99996%
8	Lake Zurich	Highwood	99.99996%
9	Highwood	SO Dispatch	99.99993%
SPURS			
10	Lake Barrington WT	Lake Zurich	99.99999%
11	Vernon Hills	SO Dispatch	99.99999%
PATH UNAVAILABILITY (SECONDS/YEAR)			
PATH	SITE A	SITE B	64 QAM, HT (45 MB)
1	SO Dispatch	Gurnee	1.4
2	Gurnee	Waukegan	0.9
3	Waukegan	Beach Park	1.2
4	Beach Park	Antioch	1.5
5	Antioch	Antioch NW	14.8
6	Antioch NW	Lake Villa	4.5
7	Lake Villa	Lake Zurich	14.1
8	Lake Zurich	Highwood	11.3
9	Highwood	SO Dispatch	22.4
SPURS			
10	Lake Barrington WT	Lake Zurich	1.7
11	Vernon Hills	SO Dispatch	2.7

Figure 1-5: Backhaul Path Availability

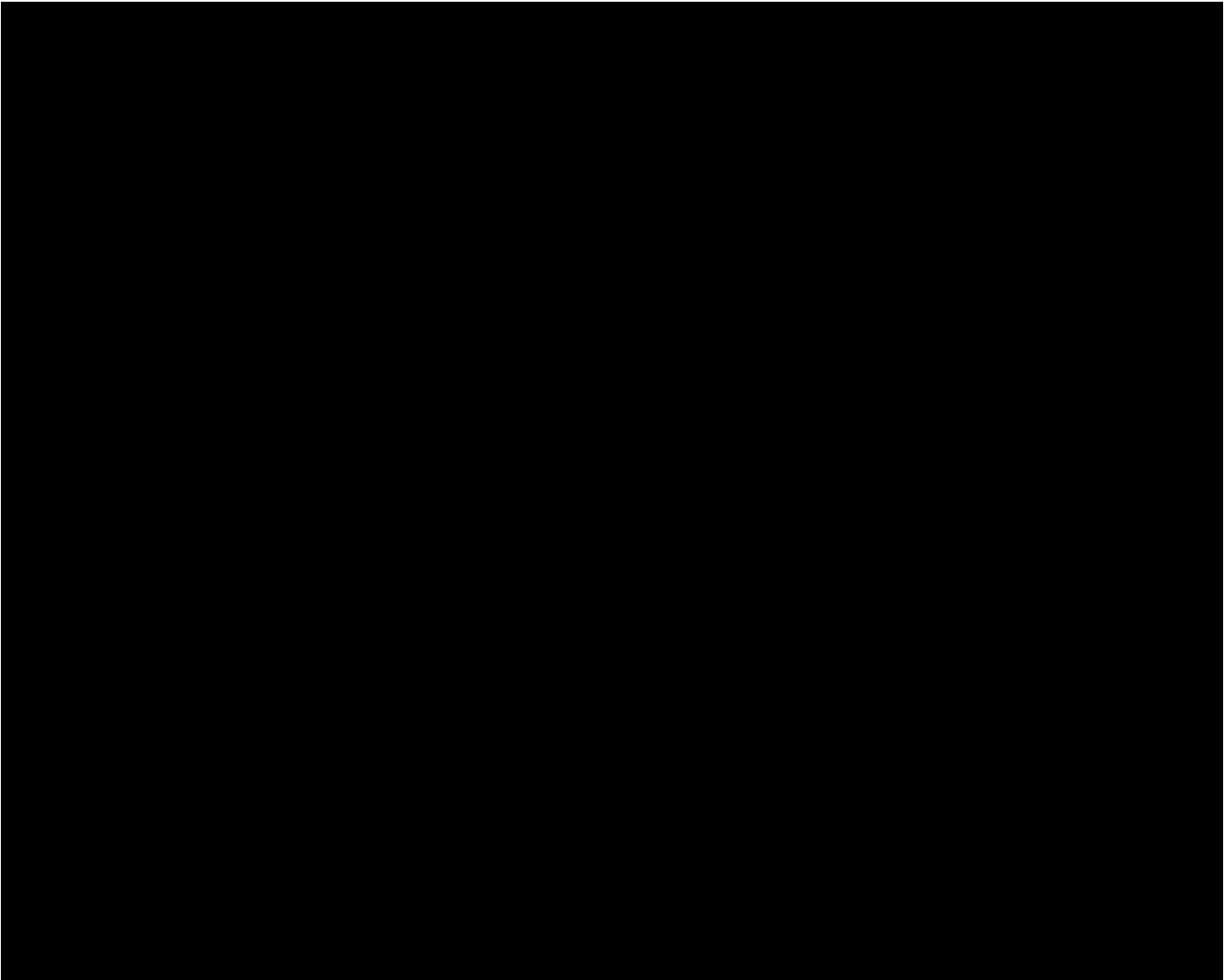
Motorola will be providing the microwave equipment, DS1 panel, antennas, waveguides, and dehydrators. The microwave equipment will be rack mounted in Motorola-provided racks. Breaker panels for the microwave equipment will be included at the top of each equipment rack.

The demarcation point will be:

- 10/100/1000 RJ45 on the DAC GE3 for all Ethernet traffic.
- RJ48 for T1 traffic.

Motorola is proposing a rack mounted server running the ProVision EMS solution for monitoring and provisioning of the microwave equipment.





Motorola will commit to maintaining the coverage as deployed (11 designated sites) as long as Lake County utilizes the STARCOM21 system. If changes should be required in the future that would affect the 11 deployed sites, then Motorola agrees to consult with, and gain approval from, the County in advance of making any required modifications.



1.5 ASTRO 25 OVERVIEW

ASTRO[®] 25 is the most widely used Project 25, Mission-Critical, Integrated Voice and Data (IV&D) communication network for public safety agencies. Installed worldwide, ASTRO 25 solutions meet and exceed IV&D requirements for day-to-day operations, as well as emergency response in the most demanding situations. ASTRO 25 is a wireless platform that combines uncompromising, real-world performance and the legendary reliability of Motorola.

A PLATFORM WITH UNPARALLELED FLEXIBILITY

From single-site to nationwide deployments, ASTRO 25 is a flexible, modular network with advanced call processing capabilities designed to meet the needs of public safety. ASTRO 25 can adapt to accommodate additional users, increased geographic coverage, enhanced data applications, and connectivity to other networks—all to ensure an efficient and cost-effective solution for decades to come.

ASTRO 25 is optimized for the rigorous demands of public safety, providing reliable communications. When an emergency involves multiple agencies, first responders can share voice and data communication among their teams. In addition, centralized command and control can deploy resources efficiently, maintain communication security, and track personnel effectively.

RELIABLE VOICE & DATA INTEGRATED AS ONE



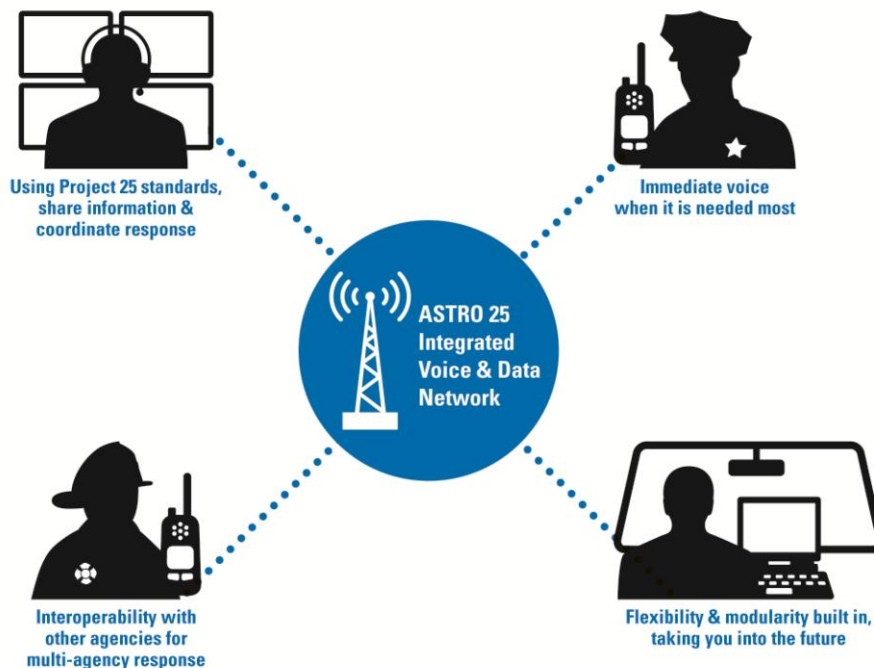
1.6 THE BENEFITS OF ASTRO 25 IP TECHNOLOGY

Motorola's proposed solution for County is our ASTRO 25 platform with IV&D, the foundation of the Mission-Critical portfolio. ASTRO offers a Project 25, standards-based Internet Protocol (IP) modular solution, providing your first responders with:

- **Cost savings** – ASTRO 25 reduces costs by integrating your voice and data needs into a single solution.
- **Interoperability** – ASTRO 25 is compliant with APCO Project 25 standards, offering seamless interoperability with other compliant systems and radios, putting the highest level of interoperability in the end-users' hands, without the need of gateways or console patches.
- **Reliability** – Pre-release software and upgrade testing, third-party hardware and software certification process, fault-tolerant architecture with multiple fallback modes, multiple levels of redundancy, and real-time network and security monitoring provide Mission-Critical reliability.
- **Increased security** – Information Assurance (IA) enhances the confidentiality, integrity, and availability of the Radio Network Infrastructure (RNI). Multiple encryption algorithms keep end-to-end voice and data transmissions confidential.
- **Enhanced productivity** – Easy and intuitive interfaces to critical, real-time information is delivered to users when and where they need it.
- **Flexibility** – Scalable, flexible design allows ASTRO 25 to dynamically adapt to the operational demands of any size organization. The IP-based design supports a unique mix of voice, data, and geographical requirements, permitting easy system enhancements as the users' needs evolve.

ASTRO 25
WHEN MISSION
CRITICAL
COMMUNICATIONS
DEMAND PROJECT 25
INTEROPERABILITY
& IP FLEXIBILITY

A description of the features, benefits, system architecture, and hardware components are provided in this document.



1.6.1 Dynamic Dual Mode Operation (DDMA)

Dynamic Dual Mode allows users to interoperate between P25 FDMA and P25 TDMA services. It is part of the call processing application and uses an advanced control channel that dynamically switches call assignments between FDMA and TDMA.

Dynamic Dual Mode is seamless to users and requires no intervention from users or network operators. For example, if a user in an active P25 TDMA talkgroup call roams onto a P25 FDMA-only site, the system automatically initiates P25 FDMA mode at the next Push-to-Talk (PTT). Or if an active P25 TDMA talkgroup call is underway at a site and a P25 FDMA-only member of the talkgroup joins (or “affiliates”) with the call, the system automatically switches the call to P25 FDMA mode at the next PTT. The FDMA-only user is now included in the call, and the call is switched without any user intervention or awareness. When a Dynamic Talkgroup has both FDMA users and TDMA users affiliated with the system, and FDMA channel resources are available, the talkgroup call proceeds in FDMA mode without requiring any user intervention. Should only TDMA users be affiliated on the system, the call takes place in TDMA mode.

As an added benefit in encrypted systems, the call setup automatically switches between FDMA and TDMA while maintaining end-to-end encryption. This provides a high level of assurance that the system remains secure from dispatcher to radio user.

Dynamic Dual Mode improves ease of use in ASTRO 25 systems with a mixed fleet of P25 FDMA and P25 TDMA radios. For example:

- Radio users have seamless interoperability, regardless of the operations mode.
- Dispatch operators can automatically coordinate between P25 TDMA radio users and P25 FDMA radio users, with no need to track or patch users together.
- System administrators do not need to pre-assign base stations as P25 TDMA or P25 FDMA; the system automatically assigns the appropriate station mode based on the needs of the user.

Dynamic Channel Assignment

Dynamic Channel Assignment provides efficient system operation by dynamically switching between P25 FDMA mode and P25 TDMA mode for a given station based on the needs for the call assigned to the station. Any station can potentially be configured as FDMA only, TDMA only or Dynamic (FDMA/TDMA). Dynamic Channel Assignment is available as a separate option, and if desired can be configured on as many channels as needed on the ASTRO 25 system for County.

Dynamic Talkgroup Assignment

Dynamic Talkgroup Assignment provides seamless communication for systems with mixed FDMA and TDMA fleets of radio users by automatically assigning talkgroups as FDMA or TDMA modes depending on the capabilities of the affiliated subscribers. When a Dynamic Talkgroup has both FDMA users and TDMA users affiliated with the system, and FDMA channel resources are available, the talkgroup call proceeds in FDMA mode without requiring any user intervention. Should only TDMA users be affiliated on the system, the call takes place in TDMA mode. Dynamic Talkgroup Assignment is available as a separate option, but if required can be enabled for any or all administrator-configured talkgroups.



1.7 ASTRO 25 IP SYSTEM FEATURES

An ASTRO 25 system is a feature-rich, modular platform that consists of a Core site, which may include ASTRO 25 RF sites and simulcast cells. This section discusses the various key features and equipment components that comprise the proposed system.

1.7.1 Master Site (Managed by STARCOM21)

The master site is the central point for all system traffic in each ASTRO 25 zone and is managed by STARCOM21. Call processing and system management occur at the master site. The Voice and Data call processing for each zone is performed by the Zone Controller. The Zone Controller(s) maintain constant communication between the RF Sites, Simulcast Sites and Network Management (NM) sub-systems via the Network Transport Subsystem.

1.7.1.1 Master Site Zone Controller

A zone has a master site that contains the computing backbone for that zone. The master site contains all the components necessary for controlling calls within a zone and for communicating with other zones to manage InterZone calls in a multi-zone system. In addition, the master sites provide the hardware and software components that are used for Network Management and system configuration.

All the components that communicate over Ethernet are connected through a central switch called the master site Ethernet LAN switch. This switch provides two separate internal LANs which are integrated to provide redundant links for critical network traffic.

The zone controller is used to process system-wide commands and handle call processing and mobility management functions for the system. In systems with two zone controllers, there is a connection from each zone controller to the LAN switch and a direct connection between the two zone controllers. The LAN switch connection allows each zone controller to communicate with the gateway routers/Core Gateways.

Zone Controller

The Zone Controller provides trunking call processing for ASTRO 25 system operation. The Zone Controller forms the heart of a wide-area radio system by providing the central processor for the zone, with the necessary hardware and software capabilities to provide call processing and mobility management.

The Zone Controller builds upon the strength and experience of Motorola wide-area trunking systems to deliver multiple layers of reliability for business-critical, Mission-Critical and life-critical applications.

**RELIABILITY THROUGH
REDUNDANCY**

The Zone Controller is supplied in a redundant controller configuration, and provides the following:

- **System Availability:** The Zone Controller allows software upgrades once loaded, providing enhanced system availability.
- **Intelligent Switchover:** The Redundant Configuration provides automatic switchover to the standby controller if a loss of wide-area communications is detected. Notification can be sent to the user if other components fail, allowing the user to manually switch to the standby controller if desired.
- **Cross Controller Compatibility:** Capable of running two different versions of software simultaneously, ensuring upgrades are fully functional with one controller before upgrading the second controller.
- **Redundant Configuration:** The Redundant Zone Controller is a computer platform with redundant processors that provide trunking call processing for ASTRO 25 wide-area radio communication systems. It is designed to detect failures by automatically switching operation to the standby controller, minimizing the interruption of call processing functionality.

1.7.1.2 Network Management System

The Network Management (NM) system can be viewed as a set of software applications or tools used to manage the ASTRO 25 wide-area trunked radio system and its constituent components.

The NMS supports the following services:

- **Network Monitoring** – Applications are included for monitoring the status of the transport network and the individual infrastructure components; displaying status information; forwarding alert information; and performing diagnostic procedures.
- **Configuration Management** – Facilities are provided for entering and maintaining the operational parameters of the infrastructure components and user devices (i.e., the mobile and portable radios).
- **Accounting Management** – NMS supports the tracking of radio usage of the system by providing an optional interface to third-party accounting and/or billing applications.
- **Performance Management** – Standard and optional applications are available for monitoring, reporting, controlling, and optimizing the use of system resources.
- **Security Management** – NMS includes features for setting user privileges and controlling their access to view and/or modify information contained in the configuration databases.

Network Management subsystem will include the following servers at the zone and system levels of the ASTRO 25 system.

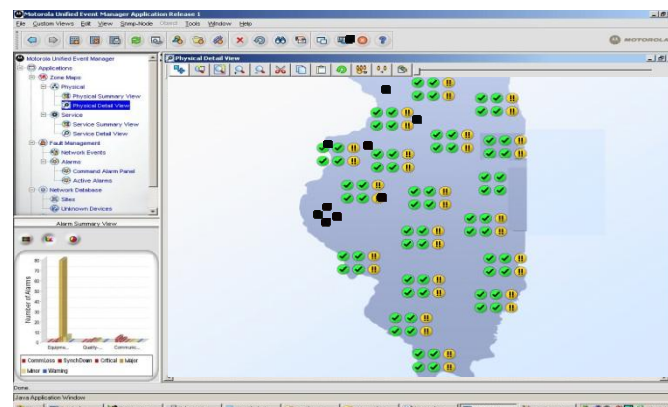
- **NMS Zone-level Servers (one each per zone)** – Air Traffic Router, Zone Database Server, Unified Event Manager (UEM), and Zone Statistics Server
- **NMS System-level Servers** – User Configuration Server (UCS) and System Statistics Server



1.7.1.3 Unified Event Manager

The Unified Event Manager (UEM) application allows system management personnel to manage LMR system devices from a single screen. Historical and real-time traffic screens give users access to radio events, radio status, and any device alarms. Other features include:

- Graphical views/maps
- Active alarms and summary views
- External notification flexibility
- Remote site control
- Fault reporting capabilities
- Device inventory
- External notification
- Customized views
- Role-based access



Sample UEM Screen

The UEM provides a customized discovery process for optimization and deep discovery of subcomponents

reported on by a device. The application also allows for automatic registration of the devices without pre-configuration. Interpreting and displaying events in an easy-to-understand and meaningful format—along with a topology of the network and devices tailored for the ASTRO 25 network—will ease navigation and present the network in a manner that is intuitive to a system operator.

Health of services is provided in addition to device-based alarms, including rules for determining the overall status of services in a separate service view (e.g., redundant controller is down – service is still up; we represent both views). Rules have been developed for calculating alarms based on interpreting incoming events. Security procedures are in place to roll SNMPv3 keys and maintain the ability to receive SNMP inform requests through the key role of an entire network. Device commands are presented in a manner specific to each device type. During discovery, a complete device inventory with specific rules to identify service and proxied components is accomplished for all individual devices. Table 1-1 outlines features and benefits of the UEM.

Table 1-1: Unified Event Manager (UEM) Features and Benefits

Feature	Benefit
Optimized Discovery Based on System Design	UEM supports subnet discovery of the IP addresses which are designated for radio system devices. This translates to an efficient device discovery process.
Discovery of Fault Managed Devices	Based on the device type the UEM has pre-determined rules for discovery of the custom entities supported on the device. Additional rules are used for event translation and alarm generation.
Fault Manager Registration	Procedures in place to register the manager's IP address as a trap/inform destination.
Centralized View of the Communications Network	System Managers can view the ASTRO 25 system status and quickly isolate problems to the board level.

Feature	Benefit
Intuitive Graphical User Interface (GUI)	System Managers are quickly notified of failures on the system and can diagnose device problems. Summary and Detail maps provide a graphical display of site status in their geographical location within the system.
Active Alarms View and Alarm Summary	Persistent single view of all failure conditions (“What’s Inoperable”) in the network and a quick reference summary of alarms by severity, allowing users to quickly pinpoint the highest priority failures.
Secure Device Access	SNMPv3 protocol with SHA and AES 128-bit encryption to prevent security breach attempts.
Role-Based Access Control	Assignment of user privileges for access to views and operational capabilities.
Email Notifications	User-specified event notifications are sent via secure email or forwarded to a portable mobile device, which allows System Managers to work away from the System Management Terminal but remain aware of system events.
Fault Reporting Capabilities	Event history data is auto-archived and exported for further analysis and reporting.
Remote Command Operation	Remote state change capability helps to service remote devices and avoid unnecessary trips to the sites for troubleshooting.
Network Inventory	Tabular view of the devices and their associated status.
Audit Trail and Job Status	Traceability and status for commands and actions executed.

The UEM is optimized to quickly discover the devices in our network; making installation and setup quick and error-free. The UEM has a built-in capability to identify the type of device it is discovering; it will activate the pre-determined rules for discovery of the devices, which results in faster event translation and alarm generation in the manager. Each device, via its various entities (i.e., fan, power supply, etc.), will quickly inform the manager what it needs to monitor. Procedures built into the UEM will configure the IP address in the device to give the correct path for sending its information during operation.

Quick and accurate interpretation of the system activity is crucial in effective management of the devices. The UEM translates the events into intuitive information, which will inform the user of either the severity of the failure or implication of the event.

UEM translates the events into active alarms, which make the user aware which events require immediate attention versus more minor events/alarms. The alarm view dynamically updates based on the condition of the reported device (i.e., the alarm will be cleared from the alarm view when a device sends a clear event to the UEM).

The Reliable Communication design in the UEM provides Supervision and Synchronization services:

- **Supervision** – Provides periodic SNMP Polling to ensure communication is established with each device on the network. The UEM generates communication failure alarms/events when communication between the agent and the manager fails.
- **Synchronization** – Used to ensure the accuracy of the state that the device is reporting. If the connection between the UEM and the device is lost, the device will queue up the missed fault events and re-send when the connection is re-established. These Motorola-defined procedures were put in place to enhance the reliability of basic SNMPv3 trap messaging. These procedures



manage the re-synchronization of missed failures. The UEM utilizes SNMPv3 informs to enable the device to detect whether the connection has been interrupted.

- **Northbound Interface (NBI)** – A real-time event stream using a standard industry protocol that can escalate events to a higher-level management application for added flexibility. NBI is provided for customers who prefer to manage their network with existing tools. The UEM handles the custom/proprietary interfaces to the network elements. The NBI provides a published fault event API to the customer's manager, which allows them to manage both Motorola and non-Motorola devices. The NBI agent supports SNMPv3 and uses a SNMPv3 User-based Security Model (USM) for secure communications with the UEM. The Fault Management Services provided with NBI are: Quick Synchronization – MOM requests more recent activity to update on health; File-Based Synchronization – Request to generate a file for missed information; and UEM-NMS Communication Link Supervision to notify of any interruption.

1.7.1.4 MOSCAD NFM System

The MOSCAD Network Fault Management (NFM) system is an end-to-end solution which collects alarms from devices and equipment at Motorola communication sites; then it sends the information to the Graphic Master Computer (GMC) server, which resides at the STARCOM21 Master site and UEM, where the information is stored so that it can be displayed and analyzed by system technologists and managers. Features and benefits of the MOSCAD NFM system are outlined in Table 1-2.

Table 1-2: MOSCAD NFM System Features and Benefits

Feature	Benefit
Collection of Environmental Alarms	A single SDM3000 supports data interfaces and digital alarm inputs to site equipment such as doors, tower lights, UPS, security, and third-party devices.
Data Interfaces to Site Equipment	The SDM3000 collects alarms and values from a wide range of Motorola stations, Microwave Radios, Channel Banks, Frequency Standards, and more via RS232, SNMP V1 & V3, and IP.
Collection of Analog Information	The SDM3000 interfaces to site equipment with analog outputs such as temperature sensors, fuel sensors, RF Power sensors, etc.
Initiation of Site Controls	The SDM3000 interfaces to site equipment which can be controlled, such as doors, generators, security, equipment switching, etc.
Local Web Server	The SDM3000 incorporates a built-in Web Server so that Service Technologists can view alarms of equipment and devices while on site or over the ASTRO network infrastructure.
Reliable Communications	The SDM3000 provides reliable communications to the GMC and UEM via encrypted SNMP V3.
Intuitive Drill Down Display of Alarms	The GMC incorporates an intuitive "Drill Down" display of alarms: Multi-Zone level, Zone level Map Screen, Site level, Device level, and Alarm level.
Intuitive Representation of Equipment	Chassis view graphics of the equipment are displayed on the GMC and GWS GUI, giving System Technologists an immediate understanding of the equipment and subcomponent which is in alarm.
Analog Display Screen	Graphical meters display the analog information of the site (i.e., Generator Fuel Level).
Equipment Control Screen	Equipment and devices can be controlled (turned On/Off, Open/Closed) from the control screen.

Feature	Benefit
Immediate Update of Alarm Status	A combination of polling from the GMC and event reporting from the SDM3000 ensure alarm information is displayed on the GMC/GWS as quickly as possible.
Auto Archive of Alarms	Alarm information is automatically archived on the GMC server for future access by the Historical Alarm Report tool.
User-Defined Historical Alarm Reports	Historical Alarm data in the SQL database on the GMC can be easily accessed to produce reports with the Report Generator function.
Multiple User Levels	Up to 8 user levels, ranging from Administrator to Guest, allow definition of operational capabilities from system configuration through system control to viewing and acknowledgment of alarms.
Alarm Summary Window	The Alarm Summary Window lists all time stamped alarms and can be sorted by Zone, Site, and Equipment, and by acknowledged/un-acknowledged alarms. This allows users to quickly identify any issues with their system.
Station Values Displayed	Station and Microwave values such as RSSI, BER, RF Power, and VSWR are displayed on the GMC/GWS, providing System Technologists with analytical information on the site they are troubleshooting.
Remote Configuration	A terminal window on the GMC/GWS allows remote configuration of analog QUANTARs and TeNSr Channel Banks.
Alphanumeric Paging of Alarms	The GMC/GWS can send specified descriptive alarm messages to alphanumeric-capable pagers over paging networks such as SkyPager or Skytel.
Client View of Multi-Zone System	Each GWS client can view alarms from each zone level GMC server, which minimizes the total number of clients needed in the system.

GMC Server and GWS Client

The MOSCAD NFM GMC server and GWS client is an NFM solution specific to Motorola communications systems. The NFM application graphic screens depict current system status; the user can easily navigate from a macroscopic system view down to the individual site details. RF site alarms are time stamped, stored in the alarm history database, and accessed by the Report Generator utility, which helps the user to filter alarms and events, then displaying, printing, and exporting them.

One GMC is required per Zone, and all the GWS clients (up to 16) view the real-time system alarms, status, and controls from all GMC servers.

GMC Server and GWS Client Graphics

The GMC/GWS NFM application has been developed to provide several layers of screens. The first layer is the System Overview Screen: a map showing the site locations with each site location icon selectable. The second screen layer is the individual site screen (Figure 1-7: Sample Individual Site Screen), graphically showing the exact equipment at each site with selectable equipment graphic icons. A third layer of screens is the individual site component hardware, such as GTR, Microwave, Rubidium standard, and other site support equipment, including environmental alarms. Alarm icons on the site equipment graphic show which module (i.e., Power Supply) is in alarm; selecting that icon provides a list of the alarms for that module. All alarms are also shown on the alarm summary screen.





Figure 1-7: Sample Individual Site Screen

SDM3000 Site RTU

The heart of the MOSCAD NFM solution is the SDM3000 site Remote Terminal Unit (RTU), where RF components and environmental equipment are alarmed and controlled. The SDM3000 interfaces to IP devices via SNMP and FSP, to monitor alarms and capture values such as RSSI, RF Power, and BER. The SDM3000 serially interfaces (RS232) to remote site devices by emulating the specific device protocol, allowing the SDM unit to control, collect alarms, configure, and change parameters of the device (Figure 1-8: Sample SDM3000 Screen). The SDM3000 collects alarms and initiates controls through the various inputs, outputs, and analog signals via the onboard Input and Output (I/O).



Figure 1-8: Sample SDM3000 Screen

The SDM3000 units take advantage of inherent communications capabilities to securely communicate via encrypted SNMP v3 from the remote sites to the UEM and GMC.

A built-in Web Server on the SDM3000 allows Service Technologists to use a browser to view alarms from all equipment and devices, while they are on site or remote over the ASTRO network infrastructure.

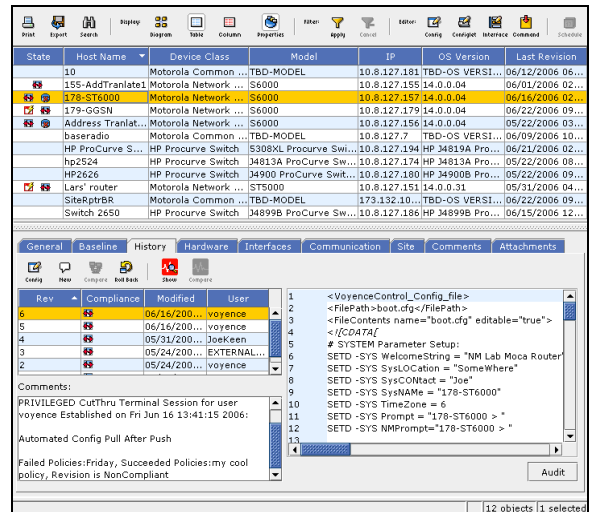
1.7.1.5 Configuration Management Applications

This section provides information about the applications that provide configuration management capability in ASTRO 25 systems. These devices are the Unified Network Configurator (UNC) and the Provisioning Manager (PM) and are located at the STARCOM21 NOC center.

Unified Network Configurator

The Unified Network Configurator (UNC) is a network change and configuration management tool that enables users to efficiently manage the configurations of networks and devices in an ASTRO 25 system. The UNC is built on VoyenceControl, which is an automated compliance, change, and configuration management system. The UNC provides a single application for the configuration of all radio system and transport devices. Some of the key features that the UNC provides include:

- Efficient, role-based user setup.
- Auto discovery of devices/configurations, reducing configuration errors and initial configuration time by providing minimal data entry.



Sample UNC Screen

Historical configuration information is easily accessible, along with forensic information and the ability to roll back to previous versions. A valuable tool that the application provides is the ability to create a configuration and not implement it immediately. The UNC allows another user to approve and implement changes, which can help distribute those changes during off hours when system loading is minimal.

The UNC application allows system management personnel to see planned and current configurations simultaneously for quick comparison. This application offers easy editing screens and configuration “wizards” to reduce data entry.

Benefits of the UNC are outlined in Table 1-3: UNC Benefits:



Table 1-3: UNC Benefits

Feature	Benefit
Built-in Network Tool kit to enable features	Tools provide a methodical process to enable features in the system with minimal labor and chance of error. Examples of these are: turning on authentication on a set of protocols within the Gateways; locking Ethernet switch ports; setting delay; and jitter alarm thresholds.
Auto Discovery of Devices	Components are automatically discovered, and their configurations are added to the database without the need for any manual entry of data.
Scheduled Distribution	Users can determine the time of day when they would like configurations to be sent to the devices, or delay the distribution of a configuration change until approved.
Distribution Monitoring	Allows users to view the status of configuration changes, such as whether the change is in progress, has successfully completed, or has failed.
Change Logging/Audit Trail	Maintains a log of various user interactions with the configuration system that can be used to help diagnose issues.
Configuration Versioning	Constantly tracks and logs versions that have changed and provides the ability to view or compare versions.
Management of Credentials	SSH and SNMP passwords can be managed. Automated mechanism allows seamless password and passphrase rolling, which can be performed automatically if desired.
Wizards for Common Operations	Radio system administrators can perform common operations using a simple web-based interface specifically developed for ASTRO 25 users. Provides an intuitive guide to assist in easy-to-follow setup procedures.
Rollback to Previous Version	Immediately reverts the device configuration to a previously created version.

1.7.1.6 Provisioning Manager

The Provisioning Manager (PM) is a centralized interface for all user and system configuration.

The PM provides the following:

- Configure system-level parameters for call capability.
- Configure system-level parameters for the master site, such as the parameters for home zone mapping and sub-band restricted ID mapping.
- Configure Console Users, Radios, Talkgroups, Multi-Groups, Agency Groups, and Broadcast Data Agencies.
- Configure access control for users in the PM.
- Configure ZoneWatch windows.
- Configure and manage the attributes relating to a zone such as MEG Application Platform, AUX I/O Configuration, and Consoles.
- Ability to export some configuration data from the PM.
- Ability to import some configuration data to the PM.
- Optional API available to interface to the PM.



Features and benefits for the PM are outlined in Table 1-4:

Table 1-4: Provisioning Manager Features and Benefits

Feature	Benefit
Central Point for All User Configuration Information	Minimizes configuration conflicts created by multiple entry points. Enables simplified control and consistency for subscriber provisioning.
Radio User Capabilities	Efficient configuration capabilities across multiple agencies and system.
Reuse Configuration information Using Profiles	Minimize configuration data re-entry through the creation of profiles that are shared across several radio users and talkgroups.
Intuitive Navigation	Provides a tree-based navigation with objects arranged logically, allowing users to navigate to their required tasks.
Fleet Management	Allows the user to easily create talkgroup and agency group mapping.
Agency Partitioning	Offers the ability to create security groups to partition system management resources among various agencies and users.
Concurrent User Access	Enables distributed configuration management from multiple users.
MCC7500 Console Information Synchronization	MCC 7500 consoles are automatically synchronized with radio user configuration information from the system, minimizing data entry and allowing for a cohesive view of configuration information.
Manage Configuration Data Distribution	Provides users with control over the distribution of configuration information to the various network devices in the system.

1.7.1.7 Performance Management Applications

The Motorola performance suite enables a customer to monitor, manage, and report on system performance in near real-time. The applications empower system managers to proactively plan for expansion. The performance suite is composed of both Motorola and third-party solutions that are all certified, sold, and supported by Motorola. Each application has a unique set of features and benefits to facilitate efficient and effective system management. Together, these applications complete the big picture: how the system is performing, operating, and being used, by providing insight into the activity of each zone, site, subscriber, or talkgroup.

Motorola offers performance management as a standard feature of ASTRO 25 systems. Other standard features include ZoneWatch, Historical Reports, and Dynamic Reports. These features enable customers to manage their communications system business more efficiently. ZoneWatch displays real-time communications activity, while Dynamic and Historical reports collect traffic statistics over predetermined intervals for report generation. These applications are used to monitor, collect, log, and evaluate network performance and resource utilization; they collect statistics about radio resource usage for radio units, talkgroups, channels, sites, zones, and system-wide activity report generation. Dynamic and Historical Reports have archival and export features for saving reports for offline data analysis. Statistics are aggregated into detailed and summarized reports on both an individual zone and system-wide basis.

Additionally, Motorola offers enhanced Performance Management features for ASTRO 25 systems, which are described below. Enhanced Performance Management features are available to provide further insight into system performance. Applications perform a variety of tasks, such as polling system resources, detailed reporting, long-term archiving and logging, and data stream collection.



Affiliation Display

Affiliation Display provides a dynamic view of the sites to which all operating units are currently affiliated; it suggests the area in which a unit may currently be operating based on its last affiliation and the site's radio coverage (Figure 1-9: Sample Affiliation Display Screen). The application enables system managers to monitor how radio users travel between different sites in a zone, and to monitor how they communicate with assigned talkgroup members and those outside of their talkgroup. Affiliation Display is used to trace a state/location of a single subscriber, and also to monitor location and affiliation information organized by site, console site, radio, channel, or talkgroup.

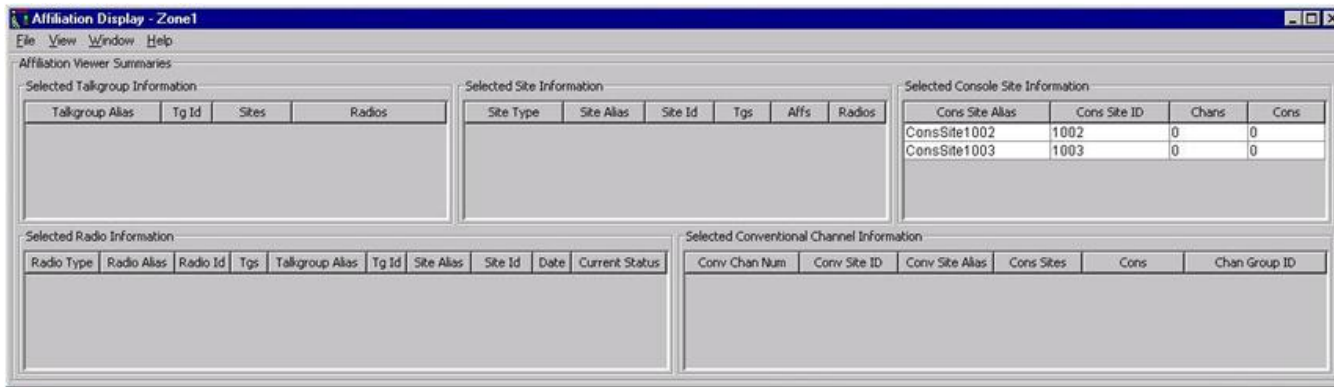


Figure 1-9: Sample Affiliation Display Screen

Table 1-5 outlines benefits of Affiliation Display.

Table 1-5: Affiliation Display Features and Benefits

Feature	Benefit
Real-Time Display	Monitor selected radios, sites, talkgroups, consoles, and conventional channels to track how radios are roaming between sites, and how traffic moves within sites in a zone. Display sites and console sites where each talkgroup is currently operating.
Graphing	Display graphs of the site, console site, and talkgroup data to see how radio usage is distributed across sites and talkgroups, to help determine if system resources are deployed to maximize system performance.

Air Traffic Information Access

The Flexible Air Traffic Information Access (ATIA) interface provides an access point for air traffic call information on the system. Whenever significant events occur in call processing, call information will be provided through ATIA. For non-call activity, the Flexible ATIA interface will provide call information in unique data packet formats. Benefits of ATIA are outlined in Table 1-6: Air Traffic Information Access Features and Benefits.

Table 1-6: Air Traffic Information Access Features and Benefits

Feature	Benefit
Integration Flexibility	ATIA stream data can be integrated with third-party applications to produce detailed reports custom built to a system manager's needs.
All Call Control Information	Information can be used to understand what is happening on the system, e.g., who called, where they called from, and type of call, to monitor the system's operation.

Computer Aided Dispatch Interface (CADI)

Computer Aided Dispatch Interface (CADI) is an Application Programming Interface (API) for use by third-party CAD applications, permitting customers to work with third-party vendors to create software that specifically meets their dispatch needs on Motorola ASTRO 25 systems. The API gives CADI direct access to the commands and events used by the radio system and its network management applications.

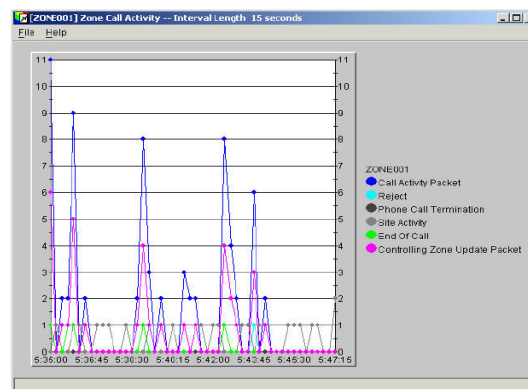
THIRD PARTY COMPANIES THAT HAVE INTERFACED WITH MOTOROLA'S CADI API

• ACIC client/server with Geocomm AVL server • Archonix message switch • Ather Biokey • Cisco • Customer-Created CAD: • Pinellas County, FL • Hanover County, VA • Prince Georges County, MD	• Fatpot CAD • The Genesis Group • Geo911 • INIT (Transit CAD Application) • Interact • Interact Field Based Reporting with CrimeAgent Client • Intergraph • New World	• Northrup-Grumman • Orbital (Transit CAD Application) • Ortivus AVL and CAD • OSSI • Premier MDC • Tiburon Mobile and Forecom • Trapeze • Tri-Tech

Dynamic Reports

Dynamic Reports monitor and report usage trends in order to improve radio and talkgroup system management. System managers can closely examine what happens during a shift or set period of time: for example, checking the busy count to see if calls are being missed. Dynamic Report recommendations can be made on system expansion and design to improve communication.

Table 1-7: Dynamic Reports Features and Benefits outlines features and benefits of Dynamic Reports.



Sample Dynamic Reports Screen



Table 1-7: Dynamic Reports Features and Benefits

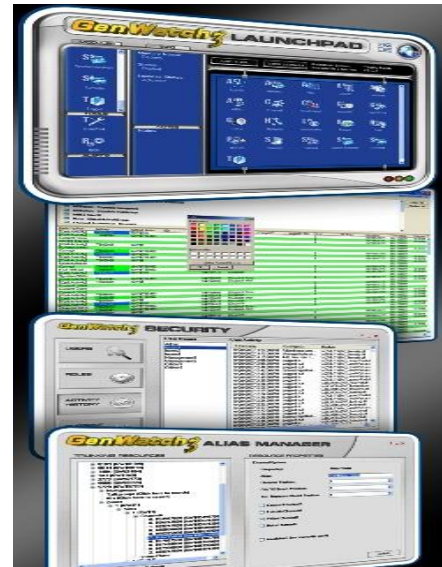
Feature	Benefit
Real-Time Display	This display provides zone-level, real-time line charts that illustrate channel utilization for all call types—group, private, interconnect, control channel, and dynamically blocked calls.
Graphing	Graphs can be run at the zone, site, and console site level to understand how often and why busy conditions occur on the system; this increases system efficiency and provides insight into how the system is being utilized.
Data Intervals	Dynamic statistical data objects are presented in time-based intervals. At the end of each interval, a new set of statistical values is added to the display. The timed intervals are defined as follows: 15 seconds (default), 1 minute, or 15 minutes for 1–100 intervals.
Accessing Data/Exporting Data	Reports can be output to the client PC workstation display, printer, or file for convenient access.
Data Storage	Statistics are aggregated into detailed and summarized reports on both an individual zone and system-wide basis. They are available on an hourly basis for 10 days, daily for 62 days, and monthly for 1 year.

1.7.2 GenWatch3 (Customer Owned)

GenWatch3 monitors the Air Traffic Interface Application (ATIA) or 3600/9600 baud Control Channel. It decodes it, stores it, reports on it, watches it, alarms on it, and more. GenWatch3 displays detailed information about subscriber, talkgroup, site, zone, and system activity in a way that makes sense—it is the dashboard showing the performance of the Motorola radio network.

Because of its unique modular design, GenWatch3 can be easily tailored to meet customer needs. Additional features can be added later: either as Genesis creates them, or as system requirements and/or budgets allow. Data can be imported into most accounting software and is archived for up to 12 months. Reports are produced in a Microsoft Excel Format.

Benefits of GenWatch3 are outlined in Table 1-8: GenWatch3 Features and Benefits.



GenWatch3

Table 1-9: Historical Reports Features and Benefits

Feature	Benefit
Real-Time Display	Monitor and analyze information about zones, sites, channels, talkgroups, and users to understand how the system is performing and utilized to more efficiently manage resources.
Reports	Create various types of reports at the zone or system level, organized by system resources to analyze activity and performance.
Data Intervals	Historical data is stored in time-based intervals. For each interval type, the oldest interval in storage is removed as a new interval is added to storage. The timed intervals are defined as follows: ▪ Every 15 minutes for 100 intervals (approximately one day; zone level only) ▪ Hourly for 241 intervals (approximately 10 days; system and zone level) ▪ Daily for 62 intervals (approximately 2 months; system and zone level) ▪ Monthly for 36 months (3 years; system and zone level)
Accessing Data/Data Exporting	Users can utilize the Report Scheduler window to schedule zone-wide and system-wide reports to occur at specified times, with an output to a printer or data file. Reports can be exported to one of the following formats: ▪ Comma Separated Values (CSV) ▪ HTML ▪ Adobe Portable Document Format (PDF) ▪ Extensible Markup Language (XML)
Data Storage	Statistics are aggregated into detailed and summarized reports on both an individual zone and system-wide basis; they are available on an hourly basis for 10 days, daily for 62 days, and monthly for 1 year.

1.7.2.1 Integrated Voice and Data

The Project 25–compliant Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly utilize your existing ASTRO 25 stations, improving in-field efficiency. Voice is prioritized, allowing Mission-Critical traffic to always take precedence over data transmissions. The IV&D service creates a data transport layer capable of supporting both industry-standard IP and customer-developed applications, including:

- Advanced Messaging
- Outdoor Location
- Over the Air Programming (POP25)

Users can achieve a number of important benefits, including:

- Conservation of valuable airtime.
- Increased communications accuracy.
- Allows users in the field to perform queries without dispatch.
- Better return on investment—same assets for multiple functions.
- Utilizes common radio units for both voice and data applications.
- Advanced Messaging Service—Similar to text messaging on a cell phone, the Advanced Messaging Service provides a convenient means of communication between all network users. A user can send a text message of up to 200 characters to another radio or dispatcher. Dispatchers and radio users may be a part of a named text-messaging group, allowing point-multipoint service. Advanced Messaging Service makes use of the IV&D transport layer, and provides a store and forward function, ensuring message delivery.

Advanced Messaging Service (Customer Owned)

Motorola's ASTRO 25 Advanced Messaging Service is an application that makes use of ASTRO 25 IV&D data services. Advanced Messaging Service provides the ability for users within the customer network to send and receive data messages of up to 200 displayable characters. These messages may be sent:

- From one text-messaging-capable subscriber to another text-messaging-capable subscriber.
- From a text-messaging-capable subscriber to a dispatcher equipped with a Fixed Text Messaging Client.
- From a dispatcher equipped with a Fixed Text Messaging Client to a text-messaging-capable subscriber.
- From a dispatcher equipped with a Fixed Text Messaging Client to other dispatchers equipped with a Fixed Text Messaging Client.
- From a text-messaging-capable subscriber to a third-party application having an e-mail address, where the third-party could be a messaging application such as CAD, Mass Notification System, database, etc.
- From a third-party application having an e-mail address to a text-messaging-capable subscriber.

All messages are routed through a central server in the Customer Enterprise Network (CEN). This server provides a store and forward service for the system, enabling storage of messages sent to an out-of-service user for subsequent delivery when the receiver becomes available.

Over-the-Air Programming

Motorola solutions will be providing the powerful Over-the-Air Programming (OTAP) tool called Programming over P25 (POP25), which allows simple, wireless updates of LMR radios. This is an alternative to the standard method of programming, which is to connect a PC with a cable to the radio in order to read/write the programming changes. POP25 allows end-users and radio users to stay in the field during the reconfiguration process, thus saving valuable time and resources.

POP25 can reduce the total amount of time spent per radio unit update by up to 85%, allowing users and equipment to remain operational in the field. Assuming one reprogramming event every other year over the average lifetime of a radio (10 years), the total coordination and programming time can be reduced from 3.5 hours to only 30 minutes.

One of the key features of POP25 is being able to make and receive calls during the process:

- Retain full use of the radio during the configuration data transfer without interrupting communication.
- Voice always takes priority over POP25 data transfers.
- When a voice call ends, POP25 starts where it paused programming; there's no need to restart.
- Users do not have to switch to a non-busy channel.
- Users do not have to stay in an area with high signal strength during the download.
- All radio functions and capabilities are accessible and enabled.

POP25 allows for scheduled batch programming and can make specific programming changes instead of requiring a full code plug rewrite. The system will automatically generate a report, showing which radios were successfully programmed. An overview of the OTAP process is shown in Figure 1-11.



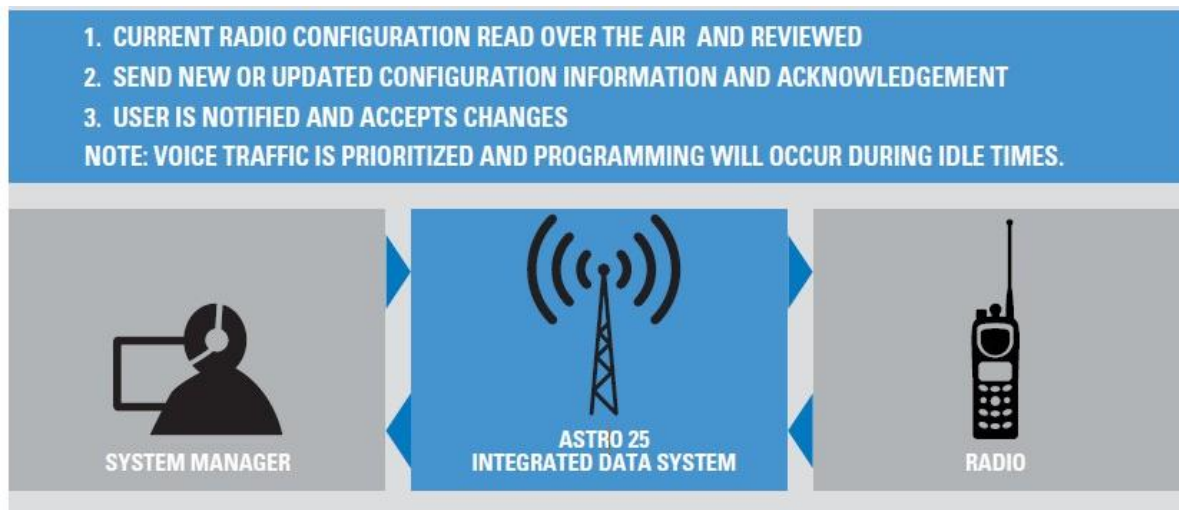


Figure 1-11: Over-the-Air Programming Steps

1.7.2.2 Encryption Capabilities

When it is absolutely critical that communications not be monitored by unauthorized parties, radio systems can be configured with encryption. Encryption ensures only authorized units in the system can listen to transmissions being made. Encrypted calls are protected end-to-end throughout the network.

Project 25 Encryption Algorithms

ASTRO systems can be equipped with current Project 25 algorithms and are fully compliant with all Federal Information Processing Standards (FIPS). The following encryption is available: DES-OFB, DVI-XL, DVP-XL, DES-XL, AES, and ADP.

Software-Based Encryption Algorithms

Advanced Digital Privacy (ADP) is an entry-level encryption algorithm, offered exclusively by Motorola. ADP allows users to protect any and all communications from eavesdroppers and scanners for less cost than the hardware-based encryption algorithms. With Health Insurance Portability and Accountability Act (HIPAA) compliance being more closely scrutinized, many users are implementing this cost-effective security option for all of their users.

KVL 4000 Key Variable Loader

The KVL 4000 is Motorola's encryption Key Variable Loader for secure enabled Motorola products. Equipped with the Motorola MC55 handheld, the key loader is outfitted with state-of-the-art features and user interface for increased efficiency and programming flexibility. A large LCD color display, paired with an easy-to-use alphanumeric keypad, enables simple viewing and data entry. Built with legendary Motorola quality and security, the KVL 4000 is built to withstand everyday use in federal and public safety environments.

KVL4000 Features and Benefits

The KVL4000 utilizes the Motorola MC55 handheld computer with large 3.5 inch color display, touch screen interface, and QWERTY



KVL 4000

keyboard. The device is built to withstand everyday use in federal and public safety environments.

Features of the KVL 4000 are outlined in Table 1-10:

Table 1-10: KVL 4000 Features

Feature	Description
Automatic key generation	Automatically generates random keys for any algorithm Can auto-generate a single key or a bulk set of keys
Enhanced security	▪ FIPS 140-2 Level 3 provides the highest level of security for your data ▪ User timeout automatically logs out the user after a specified period of inactivity ▪ User and administrator authentication allows users and administrators to perform and restrict firmware upgrades, changes, and key management
Dead battery operation	Ability to operate the KVL, including key management and key downloading while charging.
Key Management Facility support	With store and forward capability, the encryption keys are downloaded from the KMF, stored in the KVL, and delivered to the end units.



1.8 MCC 7500 SOLUTION OVERVIEW FOR THE SYSTEM DESCRIPTION (CUSTOMER OWNED)

Motorola's proposed dispatch solution for Lake County is our MCC 7500 Dispatch Console, offering IP-based seamless connectivity between County dispatch operators and field personnel.

The MCC 7500 Dispatch Console will provide Lake County with scalable, flexible system architecture, sophisticated network management and security, and an easy migration to future capabilities.

This section discusses the various components that make up the proposed MCC 7500 Dispatch Console system. These components are connected together and to the rest of the ASTRO 25 system on an IP network via console site routers and switches. The MCC 7500 Dispatch Console functions as an integrated component of the total radio system, fully participating in system level features such as end-to-end encryption and agency partitioning.

Since the network is IP-based, the system's interfaces and components can be distributed physically throughout the network. Logging components can be centrally located at the zone core or distributed at console sites. CCGWs can be located at conventional-only RF sites, at trunking RF sites, the master site, or at console sites with conventional stations. Aux I/O Servers can be placed anywhere in the zone, closest to where they are needed.

MCC 7500 Dispatch Console Component Description

The MCC 7500 Dispatch IP Site consists of the following elements:

- Nine (9) MCC7500 Dispatch Consoles w/ Voice Processing Modules:
 - Per Console:
 - ◆ One (1) 19" Touch Screen Monitor.
 - ◆ One (1) Z420 Operator position computer.
 - ◆ Two (2) Speakers.
 - ◆ One (1) Gooseneck MIC.
 - ◆ DES-OFB and AES encryptions capability.
 - ◆ Two (2) Headset Jacks.
 - ◆ One (1) Dual Foot Pedal.
 - ◆ Dual IRR Logging Application.
 - ◆ One (1) APX 7500 Backup Control Station.
 - Two (2) Redundant AUX-IO servers.
 - One (1) Conventional Site Controller.
 - Two (2) GGM Gateways.
 - Three (3) LAN switches for resources' distribution.
 - Ten (10) Conventional Channel Gateways for interconnecting up to 40 conventional resources.
- One (1) MKM 7000 Console Alias Manager.
- One (1) Radio Control Manager license.

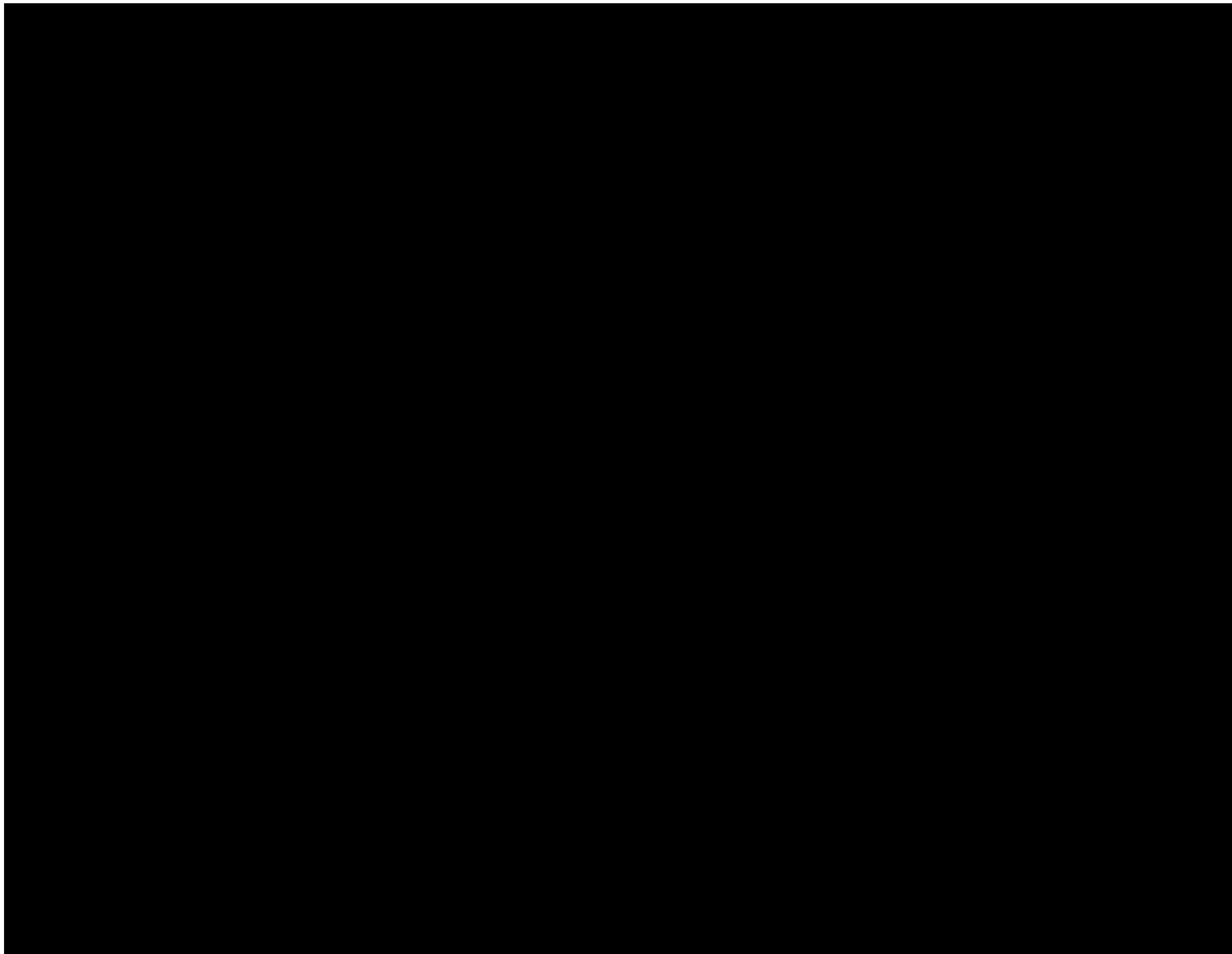
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1.8.1 Interoperability Features

ASTRO 25 is specifically designed around APCO P25 standards. All voice messages are digitized, all Land Mobile Radio (LMR) system features are compliant with P25 standards, and the system uses the P25-defined, 9600-bps control channel format for all control channel commands. As part of ongoing enhancements to this solution, Motorola has joined and actively participated in the P25 interoperability committee to ensure continuously improving interoperability with the radios of other P25 vendors. ASTRO 25 is also fully Common Air Interface (CAI) compliant.

MUTUAL AID INTEROPERABILITY OFFERS FLEXIBILITY AND FUTURE EXPANSION.

Motorola can use multiple customer-furnished interoperability radios to install, configure, and make operational the necessary hardware and software to provide two-way communications between the MCC 7000 series consoles and Mutual Aid channels.

As shown in Figure 1-14, interoperable communications can be provided through a dispatcher-initiated interface (patch) to the Mutual Aid radios. The Motorola Conventional

Channel Gateway (CCGW) forms the bridge between the MCC 7000 series dispatch console on the ASTRO 25 radio network and the Mutual Aid radios. This allows the dispatcher to patch together Mutual Aid radios and required subscribers on the ASTRO 25 system as situations dictate. Each GGM 8000-based CCGW can connect with up to four analog or V.24 ports, and 10 IP-based Mutual Aid channels. The high density GGM8000-based CCGW can connect with up to eight analog and eight V.24 ports, plus 10 IP-based Mutual Aid channels. Multiple CCGWs can be installed per site to support Mutual Aid radios for seamless communications with various agencies. CCGWs can be placed at any RF or console site allowing flexibility of connecting to the MCC 7000 series consoles. CCGW interfaces can be installed at any location as long as there is network connectivity back to the Zone Core. Additional CCGWs can easily be added anywhere on the LMR IP network as Mutual Aid requirements change.

As an incident occurs, local Mutual Aid agencies can initiate a radio conversation to an MCC 7000 series dispatch location via a programmed channel. By selecting an icon on the console monitor, the dispatcher can initiate a patch to an RF channel for first responders as necessary. Incident conversations will be seamless from the moment of the patch initiation, and can be recorded like any talk group conversation within the LMR network. The dispatcher will also be able to take part in and monitor conversations for the duration of the incident, as necessary.

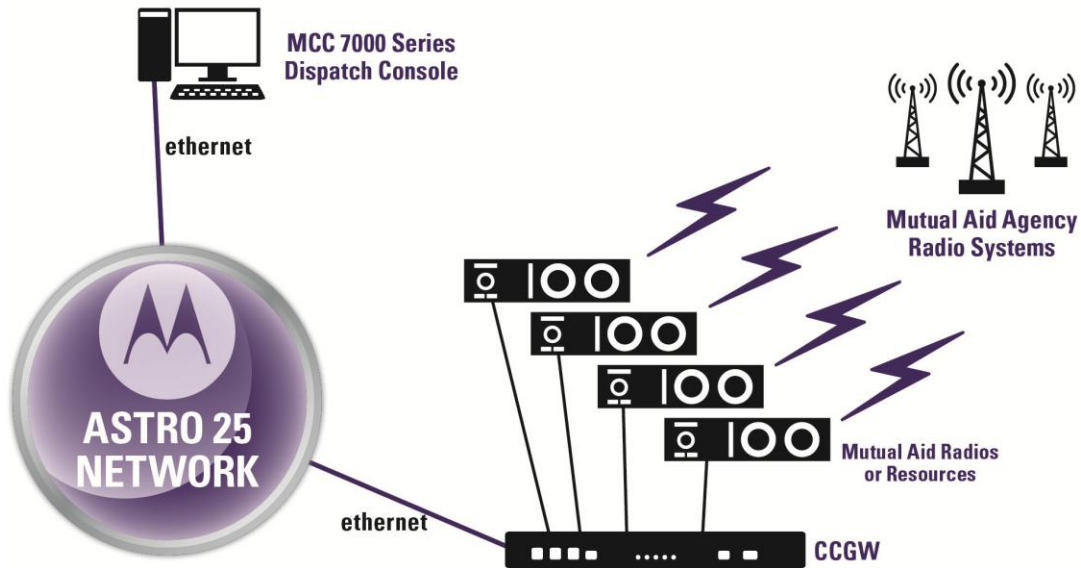


Figure 1-14: Mutual Aid Components

1.8.1.1 Integration with the ASTRO 25 Network

The MCC 7500 IP Dispatch Console will be seamlessly integrated into the Lake County ASTRO 25 system, without interface boxes, digital voice gateways or backroom electronics for an integrated mission critical network. This tight union between radio infrastructure and dispatch console equipment has several operational benefits to System Description.

This modular IP approach substantially reduces the amount of space needed for backroom electronics. All dispatch activity is performed over IP. The physical space needed to accommodate the MCC 7500 console position is comparable to that required for a personal computer.

Both trunked talkgroups and conventional radio channels can be accessed and controlled from one MCC 7500 IP Dispatch Console over the same network. This reduces overall transport costs and the need for duplicate fixed network equipment.

THE MCC 7000 SERIES CONSOLES' IMPROVED USE OF BANDWIDTH ENSURES THAT EMERGENCY CALLS WILL MAKE IT THROUGH TO THE DISPATCH OPERATOR, REGARDLESS OF SYSTEM TRAFFIC.

Table 1-11 outlines the benefits of the MCC 7500's seamless integration to the ASTRO 25 network.



Table 1-11: Benefits of Seamless Integration of the MCC 7500 IP Console with County ASTRO 25 Network

Feature	Benefit to Lake County
Tight coordination between the IP network and IP console eliminates the potential for audio degradation.	Subscribers and console operators will be able to communicate without loss of information.
Emergency calls are prioritized for successful delivery regardless of network traffic.	Console operators will always be able to hear emergency calls from users in the field.
Inherent access to all system resources within the network provides dispatch priority to reach any user when needed.	Console operators will always be able to reach out to users in the field.
Rapid call set up times and quality of service, regardless of the size of the system.	The ability to scale the system to handle future capacity, while maintaining efficient dispatch operations.
True end-to-end encryption capable from the subscriber to the console operator position, enhancing operational security	Assurance that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator.
Improved bandwidth efficiencies reduce transport costs.	Ongoing cost savings for Lake County.

1.8.1.2 Connection to ASTRO 25 System

Details on the connectivity between the MCC 7000 series dispatch console and the ASTRO 25 system are described below.

Dual Site Link

The MCC 7000 series console site for Lake County is remote from the core site and is provided with redundant site links to provide path diversity. The console site has two logical connections to the core site with each connection using a different core router. Each console site gateway provides an interface that handles all of the IP Network Management traffic between the MCC 7000 series console center and County ASTRO 25 system's core site. The site gateways fragment large IP packets according to industry standards, prioritize packets, and convert Ethernet data to the desired transport medium.

LAN Switch

The site LAN switches provide LAN interfaces for dispatch site equipment and a LAN port for the link to the core site. Through the switch, service technicians can access the system's configuration manager and service the equipment.

1.8.1.3 Voice Encryption

The MCC7500 provides true end-to-end encryption from the subscriber to the console operator position, enhancing operational security. This assures that sensitive, private communications will remain secure, from the user in the field to the console dispatch operator. The following encryption is available: DES-OFB, AES.



1.8.1.4 Conventional Base Station Interfaces

The MCC 7000 series consoles are capable of accessing and controlling Lake County's analog and digital conventional base stations through the use of conventional channel gateways (CCGW). This capability lowers Lake County's cost of ownership in two ways:

- It uses the same transport network, reducing the requirements for dedicated backhaul.
- It reduces the hardware requirements for interoperability, lowering fixed network equipment costs.

The dispatch console processes audio received from the station, and controls various features on the stations, such as frequency selection, private line selection, and repeater on/off.

1.8.2 Console Operations

The MCC 7000 series dispatch console is designed to provide Mission-Critical audio between the dispatch console and users in the field. It is optimized for real-time audio, prioritizing emergency calls over other traffic, minimizing voice queuing, and transmitting calls in 450 milliseconds or less.

Using robust error mitigation to maintain call quality even when the system is heavily loaded, the MCC 7000 series console reduces communication errors that may force dispatch console operators to repeat their transmissions.

1.8.2.1 Dispatch Interface

The MCC 7000 series console's graphical user interface (GUI) optimizes user efficiency. It is designed to display the maximum number of resources a dispatch operator is able to easily view and control. The System Description can customize the MCC 7000 series GUI by agency or by individual user to meet their dynamic needs and requirements.

Elite Dispatch Graphical User Interface

The MCC 7000 series Elite Dispatch GUI is an enhanced version of Motorola's Gold Elite Dispatch GUI. For existing Gold Elite users, the GUI allows a smooth transition and minimal training for radio dispatch operators. For new users, the graphical icons and customization options make the MCC 7000 series console GUI easy to learn and operate.

An example of the MCC 7000 series GUI is shown in Figure 1-15.



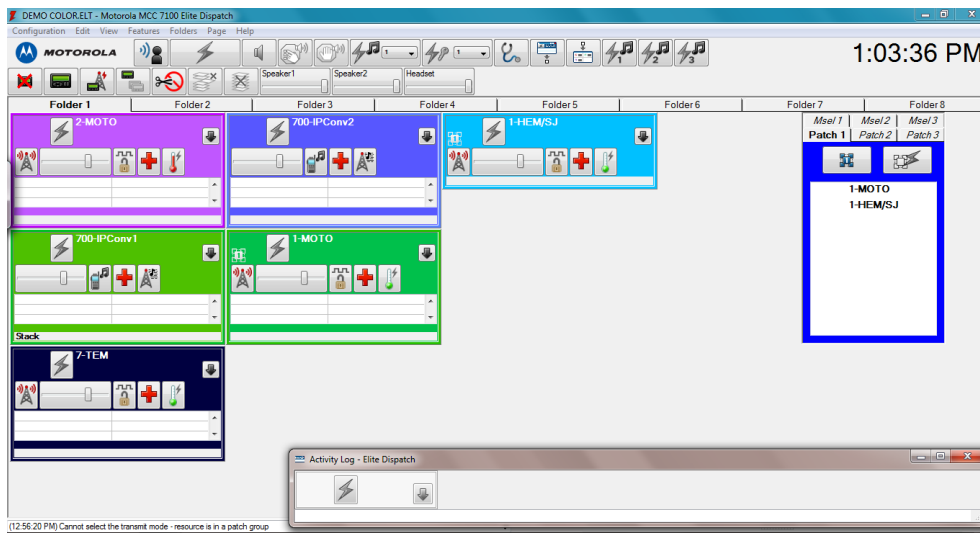


Figure 1-15: The MCC 7000 series GUI delivers critical real-time information is delivered to the console operator when and where they need it

Based on operator preference, the MCC 7000 series GUI can be customized to show details of trunked and conventional RF channels on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators can respond to a missed call by simply clicking on an entry in the Activity Log. The number of calls and call information displayed in the Activity Log is customizable to suit the needs of the user. The status of auxiliary inputs and outputs can be conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

Inbound Event Display

For those users who prefer a call-based GUI over a resource-based GUI, the MCC 7000 series dispatch console supports the Inbound Event Display (IED) GUI. The IED GUI displays incoming radio events in a queue format. The dispatch console user can manage and respond to these events directly from the queue. Filtering and sorting features are available to allow the information in the queue to be tailored to the needs of the dispatch console user.

The console can be configured to operate in “quiet mode” when using the IED GUI. This is well suited to customers who operate in a Request-To-Talk (RTT) environment.

The types of events that can be displayed in the IED window include:

- Emergency Alarm events.
- Radio Status events.
- Radio Message events.

These events can occur on trunked radio resources, ASTRO 25 conventional radio resources and MDC 1200 radio resources.

An example of an IED window is shown in Figure 1-16.

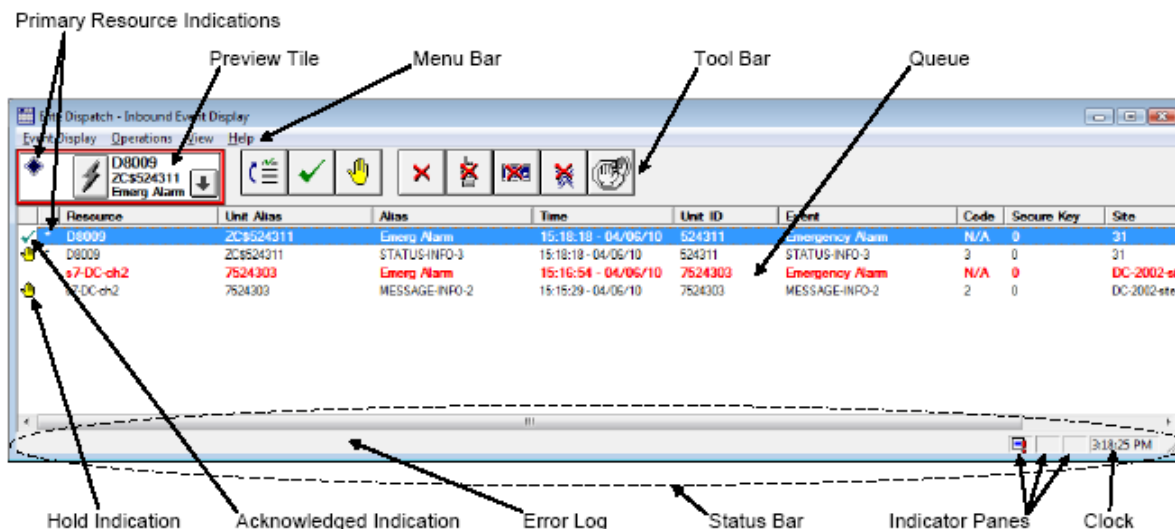


Figure 1-16: Example of an IED Window

Auxiliary Inputs/Outputs

Dispatch Consoles support Global Auxiliary Inputs/Outputs (Aux I/Os) for remote status indications or remote control through dispatch consoles. Global Aux I/Os are typically implemented by hardware that is independent of the dispatch console positions in a system and may be accessible to multiple dispatch consoles.

For dispatch consoles, Aux I/O functionality and support is provided by:

- Configuration of dispatch console Aux I/O parameters through network managers.
- Dispatch console display of status inputs/control outputs.

The Aux I/O Servers are used to provide the Aux I/O feature for the dispatch consoles. The consoles communicate to the Servers to perform the Aux I/O function.

1.8.2.2 Standard Radio Transmission and Reception

A typical MCC 7000 series console has two speakers, one for selected audio and the second for all remaining unselected audio. Additional speakers can be added to the console, allowing dispatch operators to configure a specific speaker for a set of designated audio sources. This simplifies multitasking between multiple audio sources, allowing flexibility in the way the audio is presented to the dispatch operator.

Receiving Calls from the Field and Other Dispatch Operators

Dispatch operators have great flexibility as to how to hear calls from field radio users and other dispatch operators. Each console dispatch operator can define his or her own audio reception profile. They can select a single audio source, whether conventional or talkgroup, to be heard on a selected speaker ("Single Select"). The dispatcher can also define groups of radio resources that can all be heard on a selected speaker ("Multi-Select").

Initiating Calls to the Field and Other Dispatch Operators

The dispatch operator has several different ways of initiating a call. In most circumstances, a "General Transmit" is appropriate. With the general transmit, the dispatch operator selects a resource on the console and activates the transmission through a footswitch, headset transmit button, or a microphone transmit button.

If the dispatch operator needs to quickly transmit on a resource, they use the “Instant Transmit” function, which activates the resource regardless of whether it is selected. To prevent accidental activation of “Instant Transmit,” it can be limited through an “Instant Transmit Safety Switch,” which must be pressed prior to activation of “Instant Transmit.”

Making Calls to the Field and Other Dispatch Operators

The dispatch operator can transmit audio in different ways, depending on who they need to speak with and how important that communication is. Most basically, they can make calls to all users listening to a specific conventional radio resource or a specific trunking talkgroup. When multiple resources are required, the operator can select additional talkgroups and/or conventional channels as needed for the call using the multi-select feature.

The MCC 7500 console enables dispatch operators to make private calls to individual field radio users or dispatch operators. Once this private call is established, it can be patched in with another resource at the dispatch operator’s discretion.

Controlling Console Audio

The MCC 7000 series consoles offer the operator several different ways of controlling or muting the audio on their console. The operator can change the audio volume of any specific resource routed to a selected speaker and, if they desire, can mute and un-mute all non-selected resources on the console (“All Mute”) for 30 seconds.

The console enables the dispatcher to transmit on a resource while receiving audio from other resources. It also can prevent acoustic feedback when a co-located operator position transmits by muting the transmitting operator position’s audio on a shared resource.

Controlling Network Audio

Dispatch operators can control the audio on the ASTRO 25 network. Using the console, the operator can enable or disable radio users in order to compartmentalize traffic, reduce interruptions, and maintain communications between dispatch and the field. When this function is enabled or disabled, all dispatch consoles with this resource assigned are updated with the current status of the feature. This feature can be controlled from any dispatch console.

Based on operator preference, the MCC 7000 series GUI can be customized to show details of RF resources on a per-channel basis. Various controls can be highlighted, such as patch status, frequency select, coded/clear select, and individual volume control. Per-channel controls can be fully or partially shown, or hidden to save space on the screen. Busy dispatch operators can respond to a missed call by simply clicking on an entry in the Activity Log. The number of calls and call information displayed in the Activity Log is customizable to suit the needs of the user. The status of auxiliary inputs and outputs can be conveniently interpreted from the GUI with the use of familiar graphical icons, such as a door shown open or closed.

1.8.2.3 Dispatch Audio Experience

Emergency Alarms

The MCC 7000 series dispatch console is capable of monitoring radio subscribers for user initiated emergency activations. On subscriber radios that are equipped and programmed to transmit an emergency alarm, the MCC 7000 series console detects that this emergency has occurred and displays the emergency on operator positions that are preprogrammed to receive the emergency notification.

Operator positions can be programmed to either receive the emergency or to completely ignore it. In the event of an emergency condition from a radio user, all programmed consoles will give both an

audible and visual indication of the event. The dispatch operator can then silence the emergency leaving the visual indication on the screen indicating information on the initiating radio allowing the call to be handled and dispatched appropriately.

Once an emergency is received all programmed operator positions will give the audible and visual indication of the event. Any one of these operator positions has the ability to silence the emergency at only their position or for all operator positions on the system.

In the event of a system that all channels are busy at the RF site that receives the emergency, that event is automatically given a Priority Level 1. This is the highest priority possible, putting the emergency call at the top of any busy queue. The emergency call will be given the next available voice channel at that site bumping all non-emergency calls in the queue.

Desktop Speakers

Each dispatch console is capable of supporting up to eight audio speakers. In this design, two speakers are included per position. These speakers supply audio for select/unselect, as well as pre-determined audio sources to specific monitor speakers, each of which transmits unique audio—that is, an audio source cannot appear in multiple speakers at a single dispatch console. Monitor speakers – can tie specific talkgroups to a certain speaker, such as all fire resources to speaker 3.

Each speaker has individual volume controls, and contains an amplifier that provides a maximum of 2 Watts of power output. Speakers are self-contained units, and can be placed on a desktop, mounted in a rack/furniture, mounted on a wall, or mounted on a computer monitor.

Headset Jack

Each dispatch console is capable of supporting up to two headset jacks. A headset jack allows a dispatch console user to use a headset while operating the dispatch console. Each headset can either be connected to the console for supervisory applications, or to a desk telephone. The equipment design proposed includes two headset jack(s) per operator.

The headset jack contains two volume controls: one for adjusting the level of received radio audio and one for adjusting the level of received telephone audio.

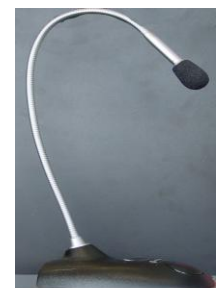
The headset jack supports headsets which use either PJ7 (6-wire) or PJ327 (4-wire) longframe connectors (6-wire headsets have a PTT button while 4-wire headsets do not have a PTT button).

Gooseneck Microphone

The VPM is capable of supporting a desktop microphone. The desktop microphone contains a microphone cartridge on a flexible shaft and two buttons in its base. One button controls the General Transmit feature. The other button controls the Monitor feature. Figure below shows Microphone.

The desk microphone is permanently fastened down, or it is left loose so the dispatch console user can pick it up while using it. The 18-inch long, flexible shaft allows the base to be placed behind a keyboard or writing area and still be able to position the microphone head within a few inches of the speaker's mouth.

If a desk microphone is connected to a dispatch console while no headsets are connected, the desk microphone is active whenever any transmit function is active. If a desk microphone is connected to a dispatch console while one or two headsets are connected, the desk microphone is only active during a transmit function if its transmit button is



**Gooseneck
Microphone**

pressed. This prevents the desk microphone from picking up unwanted background sound while the dispatch console user is using a headset to transmit.

The microphone head is compatible for use with CRT monitors.

Footswitch

Each dispatch console is capable of a dual pedal footswitch. The footswitch can be configured to control general transmit and monitor functions.

Instant Recall Recorder Port (for Radio)

Short-term, console-specific audio recording is a mechanism used to record a portion of the inbound audio present on a specific dispatch console and make it readily available to the dispatch console user. This recorded audio is retained by the recording system for a short period (typically about 60 minutes) and is easily played back by the dispatch console user. This allows the dispatch console user to replay received audio that the user may have missed.

The instant recall recorder port (for radio) allows an instant recall recorder to be connected to a dispatch console. The port provides an output containing the receive radio audio on the selected channels. Transmit audio of any type (from either this dispatch console or a parallel dispatch console) as well as tones generated by the dispatch console (emergency tones, callback tones, busy tones) are not included in the audio output.

Dispatch console generated tones (e.g., emergency alarm tones, trunking busy tones, error tones, etc.) are not included in the audio appearing at the analog audio output. This is done so that they do not interfere with the dispatch console user's ability to understand the voice audio that was recorded.

Headset Base

The Headset Base consists of an audio amplifier, a push-to-talk switch and a long cord with a PJ7 long frame connector at the end.

Headset Top

The Headset top consists of the earpiece(s), microphone and a short cable that connects to the Headset Base.

Telephone/Headset Port

The telephone/headset port allows an external telephone set to be connected to the dispatch console. The dispatch console's headset can then be used to communicate on both the radio system and a telephone system (i.e. a 911 system).

When a telephone call occurs at a dispatch position, radio audio is directed from the headset to the appropriate console speaker. The headset microphone audio is routed to the telephone, allowing the dispatch console user to communicate hands-free on the telephone set. When the dispatch operator ends their call, the headset reverts back to full radio operation.

When the dispatch operator transmits on a radio resource during a telephone call, the headset microphone is re-routed to the radio system for the duration of the transmission. Once the transmission is completed, the headset microphone is routed back to the telephone. During the transmission, the dispatch operator continues to hear the telephone audio through the headset.

1.8.2.4 Emergency Radio Transmission and Reception

As part of a Mission-Critical communications network, the MCC 7000 series console facilitates immediate prioritization and resolution of emergency communications between County dispatch and

first responders in the field. This enables dispatch operators and first responders to focus on their mission, not their equipment—especially during critical situations.

When a field user or another dispatch operator initiates an emergency call, the console emits both visual and audible indications (“Emergency Alarm”). The operator can then “recognize” the emergency call, which ends the audible emergency indication and notifies all console operators that the emergency is being addressed (“Emergency Recognize”). The audible emergency indication may also be muted by a console operator without recognizing the emergency alarm (“Mute Tones at a Single Op”). When an emergency is over, the dispatch console user can end the Emergency Alarm. The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

Receiving an Emergency Call

When a field user or another dispatch operator initiates an emergency call, the console emits both visual and audible indications (“Emergency Alarm”). The audible indication works to alert the dispatch operator that an emergency is underway; the visual indication directs the dispatch operator’s attention to the specific resource on which the emergency call is being made. The dispatch operator can immediately reserve a voice channel for the duration of the emergency.

The audible indication for an emergency is generated at the maximum level of the received audio, regardless of what volume the console has set that resource to. This is to ensure that the console operator does not miss the call. When the emergency call has been acknowledged, the volume for that resource is returned to its previous level.

Responding to an Emergency Call

When a console operator wishes to respond to an emergency call, they can bypass the standard console interface to auto-open a quick list, which contains specific controls for recognizing an emergency call, initiating an emergency call, and ending an emergency call (“Auto-Open of Quick List”). The operator can then “recognize” the emergency call, which ends the audible emergency indication and notifies all console operators that the emergency is being addressed (“Emergency Recognize”).

The audible emergency indication may also be muted by a console operator without recognizing the emergency alarm (“Mute Tones at a Single Op”). This would be used in a situation where one agency is monitoring a channel that belongs to another agency. If an emergency alarm comes in on the second agency’s channel, the first agency could mute the tones at their dispatch consoles without having to wait for the second agency to recognize it.

Ending an Emergency Call

When an emergency is over, the dispatch console user can end the Emergency Alarm. The visual indication on the console GUI is removed, and the console informs the other operator positions that the emergency is over (“Emergency End/Knockdown”).

The emergency mode remains active on the initiating radio unit until it is ended (reset) by the radio user.

1.8.2.5 Radio Patch Control

MCC 7500 console users can patch communication between trunked and/or conventional radios that are normally unable to communicate with each other due to different features, programming, or even different frequency bands. A patch group is a group of linked resources that can both receive messages from a console and transmit to all other members of the patch group. The MCC 7500 supports a maximum of 16 active patch groups.



Setting up a Standard Patch

A dispatch operator can set up a standard patch between trunked resources and/or conventional resources. After the patch is created, the dispatch console transmits all audio on one resource to all other resources in the patch group.

Patched radio users see the ID or alias of the other patched radio(s), as opposed to that of the console, provided that the radio subscriber is capable of displaying IDs. This minimizes confusion and the need for the dispatch operator to intervene in the call. Patches are automatically re-established if interrupted so the MCC 7500 user can concentrate on continuing operations.

Pre-Defined Patches

Patches can also be pre-defined, and be automatically re-initiated each time a dispatch console computer is restarted (“Patch Auto-Start”).

Using Multi-Select

The Multi-Select feature allows a dispatch console to define groups of selected radio resources. When a Multi-Select group is opened, all of the resources in the group are simultaneously selected. Resources can be added or removed from a Multi-Select group while it is open or while it is closed.

The Multi-Select feature:

- Selects multiple resources simultaneously.
- Defines and stores groups of resources so that multiple resources can be conveniently selected and deselected.

1.8.2.6 Call Management and Control

Automatic Prioritization of Calls

Calls on the MCC 7000 series console are prioritized through a transmission hierarchy. Calls from primary supervisors take priority over those from secondary supervisors, which in turn take priority over non-supervisors. Instant Transmit or All-Points Bulletin (APB) transmissions, regardless of whether they are from a supervisor, will take priority over general or patch transmissions.

Multiple dispatch console operators can be designated as primary supervisors on the same system, which is useful when multiple agencies share one system, each with their own primary supervisor.

Console supervisors have the capability to disable and enable operator console functionality as necessary.

Manual Prioritization of Calls

“System Access Priority Select” allows a dispatch operator to prioritize trunked resources on the system as either “normal” or “tactical.” A dispatch operator can change the priority of a trunked resource to tactical in order to give the resource a better chance of gaining communication access on a busy system. Only emergency calls have a higher priority than tactical. When the System Access Priority status of a resource is changed, it is updated at all dispatch consoles in the systems that are monitoring that trunked resource.

Standard Call Indications

The MCC 7000 series console indicates the availability of any given resource, whether or not it is being transmitted on at the moment. It will also give an inbound call indication that provides the console operator with a visual cue of audio activity on a radio resource. This functionality makes it easy for an operator to see at a glance what the status of a resource is at any moment.

Resource Identification

To identify a resource, the console reads its unit ID, a string of digits that uniquely represent that resource. The console makes it easy for operators to read unit IDs by replacing them with user-friendly 16-character aliases. These aliases, which are defined during the configuration of the console system, can replace the unit IDs of the following resources:

- Trunking Talkgroup Resource.
- Trunking Announcement Group Resource.
- Trunking Individual Call Resource.
- Conventional Channel Resource.
- Conventional Channel Frequency Selection Control.
- Conventional Channel PL Selection Control.
- Unit ID.
- Aux I/O Resource.

On large systems, unit IDs can be conserved by grouping all individual call resources on a specific trunking talkgroup together under a certain ID. This flexibility simplifies the daily work of County dispatch operators.

Call Alerting

When an operator needs to reach a radio user or dispatch operator and they are not near their radio or console, the dispatch operator can “page” the unattended radio or console through a series of beeps and an indication of the sender’s ID. When the radio user or dispatch operator becomes available, they will see the unit ID of the calling dispatch operator’s console or radio ID, and be able to return the call. Additionally, a Call Alert can be used to trigger an activity. For instance, a Call Alert may cause a vehicle’s horn to sound and its lights to flash.

The console operator can even send a call alert to a user who is involved in voice and data communications over the network.

1.8.3 Console System Security

The MCC 7000 series dispatch console enables end-to-end encryption from the operator position to the ASTRO 25 network, so that at no point will County communications be undermined by unencrypted transmissions. Each dispatch operator will be able to fully participate in secure communications while being confident that sensitive, vital information will not be heard by unauthorized individuals.

Secure Access to the Console

To use the dispatch console, an operator must enter a valid radio system user account name and password. The dispatch console validates that information with the radio system’s network manager and allows the user to access only the resources for which the user has access rights. This also applies to third-party applications that use the dispatch console’s API.

Secure Communications at the Console

The console itself encrypts and decrypts radio voice messages. Thus, radio voice messages are encrypted end-to-end, from the field radio user to the dispatch console. The console operator can choose whether or not to encrypt their transmissions on a particular trunked resource. Console operators can interface with agencies that have different encryption configurations without any manual intervention or delay. The MCC 7500 Console can support up to 60 calls simultaneously, using up to four different algorithms and multiple encryption keys.



To help reduce potential errors when managing encrypted communications, the MCC 7500 interface provides alerts when the console mode does not match that of a received call, and when a patch or multi-select group is being set up between a mix of clear and secure channels. The set of alerts available on the console are in Table 1-12, below.

Table 1-12: Security Indications

Indication/Alert	Indication/Alert Description
Receive Cross-Mode Indication	Indicates when an inbound call's secure mode does not match the console's outbound mode, so that the console operator can respond in the correct mode.
Clear Audio Alert	Provides visual and audible indication that a trunked radio transmission or reception is unencrypted.
Multi-Select Cross-Mode Alert	Indicates that different trunked resources in a multi-select group have different secure modes, preventing console operators from transmitting audio in both secure and non-secure modes.
Patch Cross-Mode Alert	Indicates that different trunked resources in a patch group have different secure modes, preventing console operators from transmitting audio that is intended to be secure in an unencrypted state.
Key Fail Indication	Indicates that a console cannot decrypt or encrypt a call due to a problem with an encryption key.
Panic Key Zeroizing	Erases all encryption keys at a specific console or AIS at the push of a button. The button is recessed in a panel to reduce the chance of accidentally pressing it.
Keyset/Indexset Selection via GUI	Enables the dispatch operator to manually select the keyset/indexset the dispatch console uses.
Key Management via KVL	Enables the operator to use the KVL to manage all keys for a dispatch console or archiving interface server.
Key Management via Store and Forward (Optional)	Enables the operator to use a KVL and KMF to manage all keys for a console or archiving interface server.

Securing Communications at the Logging Recorder

Not only are real-time communications encrypted, MCC 7500 encryption extends to call logging—ensuring that even recorded communications are not vulnerable to retrieval by unauthorized people.

Like the console itself, the Archiving Interface Server also requires a valid radio system user account name and password be entered and validated by the radio system's network manager before it allows access to recorded information. After gaining access, a user can view and listen to only the recordings for which the user has access rights. This enables agencies to keep their logs private from other agencies on the same system.

The AIS is capable of supporting up to four different encryption algorithms simultaneously.

1.8.4 Console Configuration and Management

The MCC 7000 series console system is configured and managed by the same configuration manager, fault manager, and performance reporting applications as the radio system. The user can define exactly which resources are available and how they are presented to the dispatch console user. This provides Lake County with a single point for configuring and managing the entire ASTRO 25 system. Changes are automatically distributed throughout the system. This centralized approach saves

valuable time and effort for system administrators and technicians, and reduces the errors that can occur when radio IDs and other data are entered at multiple locations.

In addition, call traffic and performance reports for each console can be generated from the system's network manager. This enables administrators to quickly and easily ensure optimal effectiveness and efficiency.

1.8.5 Interface with County Computer-Aided-Dispatch (CAD) System

The Motorola MCC 7000 series dispatch console could interface with the County CAD system through Application Programming Interfaces (APIs). These APIs are designed to support both the dispatch console user interface and the CAD application simultaneously, so that the dispatch/CAD operators for Lake County could be able to control all communications from the console at the same time.

Supported APIs

Three APIs (Table 1-13) are available for use by third parties who wish to integrate their application with the MCC 7000 series dispatch console. Each of these APIs performs a different function in the console/CAD interface, allowing for control of the console through the CAD system and information transfer between the console and the CAD system.

Table 1-13: APIs supported by the MCC 7000 Series Dispatch Console

API	Functionality
Console Dispatch Interface API	- Used for the overall management and maintenance of the connections between a software application and the dispatch system. - Authenticates the dispatch console user's login account and associates it with the security groups defined in the radio system's network manager. - Allows a CAD application to interface to the MCC 7000 series console system. - Delivers API messages either directly to the CAD application or enables retrieval of API messages upon request by the CAD application.
Resource Configuration API	- Retrieves configuration information such as lists of radio resources, capabilities/features available on each radio resource, and lists of accessible auxiliary input/output signals. - Retrieves aliasing information such as the end user radio unit IDs (e.g., Unit 4352 = "Division ABCD") and end user radio unit status (e.g., Status 7 = "En Route").
Console Features API	- Monitors and controls subscriber and console activity on the radio system. - Initiates voice and data radio communications with a subscriber unit; and controls access to external equipment.

Software Developer Kit for the APIs

To aid in the integration of the dispatch console system with the CAD system, Motorola can provide a Software Developer Kit (SDK) that contains all information necessary to be able to access and use the APIs described above.

The SDK's manuals document the supported Motorola MCC 7000 series dispatch APIs, including access to various dispatch features, configuration information, and aliasing information. The SDK



also includes various files needed by software developers as they create applications that use the APIs. These files include source code header/include (.h) files, library (.LIB) files, and dynamic link libraries (DLLs).

The SDK can be quoted to the System Description as an option. All software development costs associated with CAD integration with the MCC 7000 series dispatch console through APIs are the responsibility of Lake County and its selected CAD vendor.

1.8.6 Auxiliary Inputs and Outputs

An Auxiliary Input/Output server enables console operators to control and monitor external devices, such as doors and lights, from the console user interface. Multiple dispatch consoles anywhere in the network may monitor and control the same relay output and/or external inputs. Changes are indicated across all dispatch consoles simultaneously. Customizable graphic icons are also used to provide a visual indication of both the function and state of external inputs.

The contact closures and input buffers required to interface to these devices are housed in Remote Terminal Units (RTUs). These RTUs can be physically located close to where they are needed, at any console site or RF site. The dispatch consoles and RTUs communicate with each other across the radio system's IP transport network. Individual relay outputs can be configured so that they require a safety switch to be pressed before they respond to any commands from the dispatch console user.

Supported Aux I/O Configurations

The following Aux I/O configurations are supported.

Aux I/O Configuration	Description
Momentary Input	This is an input where the user interface always shows the true state of the input.
Latched Input	This is an input where the user interface does not necessarily show the true state of the input. When the input goes active, the user interface shows the state as active. The display will continue to show the state as active even if the input changes to the inactive state. A dispatch console user must manually reset the display to return it to the inactive state.
Momentary Output	This output relay is activated when the dispatch console user presses the button on the user interface and deactivated when the dispatch console user releases the button.
Latched Output	This output relay changes state only when the dispatch console user presses the button.
Interlocked Latched Output	This latched output relay is part of a group of latched output relays. Only one of the relays in the group may be active at a time. Interlocked relays work in a "break before make" fashion; that is, the previously active relay is deactivated before the new relay is activated.

1.8.7 Conventional Channel Gateway Equipment

Conventional Channel Gateways (CCGWs) are used to interface analog and ASTRO 25 conventional channels to the ASTRO 25 radio system infrastructure. CCGWs provide 4-wire analog interfaces for analog channels and V.24 and IP digital interfaces for ASTRO 25 conventional channels. The platform that is hosting a CCGW may be solely dedicated to that task or it may also be used as a console site router or an RF site router, provided the WAN link is not redundant.

Features Supported in Fallback Operation

While in fallback operation, the dispatch consoles continue to support the vast majority of their capabilities and features. The following general feature groups are supported:

- Station Control Features on Conventional Channels.
- Main/Alternate Conventional Channel Interfaces.
- Integrated Paging Encoder (analog channels only).
- Channel Marker.
- Alert Tones.
- RF Cross Mute.
- RF Cross Busy.
- Acoustic Cross Mute.
- Patch.
- Select and Multi-Select.
- Aux I/Os (that are located at the console site).
- Call Alert (ASTRO 25 Conventional channels only).
- Emergency Call (ASTRO 25 Conventional channels only).

Mutual Aid

In Public Safety or emergency services, “mutual aid” is an agreement among emergency responders to lend assistance across jurisdictional boundaries. This may be required due to an emergency response that exceeds local resources, such as a disaster or a multiple-alarm fire. Radio communications between these organizations may be shared on a Mutual Aid radio channel(s). Mutual Aid channels have been, and usually still are, Conventional Analog channels; however, all digital and mixed-mode channels are supported. These conventional Mutual Aid channels count against the overall station count in the overall system channel capacity.

Radio Control Manager

The Radio Control Manager (RCM) is used primarily by dispatchers to monitor and manage radio events, issue and monitor commands, and make informational queries of the system database. The RCM runs on a local PC client and, depending upon the configuration in the User Configuration Manager (UCM), can access multiple zones.

Table 1-14: Radio Control Manager Features and Benefits

Feature	Benefit
Radio Commands	▪ Regroup ▪ Cancel Regroup ▪ Selector Lock ▪ Cancel Lock ▪ Regroup and Lock ▪ Cancel Regroup and Lock ▪ Selective Inhibit ▪ Cancel Inhibit ▪ Storm Plan
Status Commands	▪ Radio check ▪ Snapshot ▪ Zone Status



Feature	Benefit
Events	▪ Emergency Alarms ▪ ChangeMe Requests ▪ Status Events
Reports	The RCM Reports tool is used to create, view, print, schedule, and export standard reports from RCM. These reports use a common format so the data can be used in spreadsheets. The report information reflects the actual RCM server database information, except the Emergency Alarms. RCM Reports enables you to present and analyze data showing RCM activity on the system.



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1.9 NICE LOGGING (CUSTOMER OWNED)

New logging equipment is required to record the trunked radio calls since the ASTRO 25 system is IP-based. Motorola is proposing logging equipment manufactured by NICE Systems, Inc. to meet this requirement; one 20-channel IP loggers will be included at the main dispatch site supporting logging of 20 simultaneous talkgroups.

In addition to new IP logging recorders, additional recorders to log telephony lines will be included as described below. A playback workstation is capable of retrieving audio from any recorder at any location, resulting in a high capacity and robust solution. The playback workstation supports playing back both types of calls, trunked IP and telephony from both types of recorders.

The logging equipment and capacities provided at main dispatch site include:

- MCC 7500 Archiving Interface Server with software license.
- NICE IP Logger with 20 simultaneous call capability and software license.
- NICE NRX Analog Logger with 96 channel capability.
- Two Playback Workstations with software licenses.

Playback Workstations at all locations can retrieve and replay recorded IP call audio and information with concurrently recorded telephony audio from any logging recorder.

1.9.1 NICE IP Logger

The NICE IP Digital Logging Recorder provides audio call recording and archiving for ASTRO 25 systems. It provides a reliable and robust solution for Lake County's audio recording requirements. It is an innovative recording solution that allows public safety organizations to record their radio system communications. The logging recorder currently utilizes a Quad-Core Intel Processor server with logical drives in a RAID 5 array configuration providing up to a maximum of 75,000 on-line channel hours of storage, dual DAT72 drives, hot plug redundant fan, redundant power supply, and Windows Server 2003, Standard Edition, SR2. The 20 simultaneous call recorder is scalable with the ability to add capacity with the purchase of additional call licenses.

The ASTRO 25 IP Digital Logging Recorder works in conjunction with an Archiving Interface Server (AIS) utilizing an API that allows the recording system to specify which talkgroups and conventional channels will be recorded. Because this API allows call control data to be passed to the recorder system, Motorola's recording solution provides unique capabilities. Lake County will have the ability to:

- See a call originator's unit ID and/or alias.
- See the type of call initiated; talkgroup, emergency, conventional.
- See when certain radio events occurred; emergency, acknowledgement/knockdown, changes in frequency or PL selection, etc.

1.9.1.1 NRX Logging Recorder

The NRX Logging Recorder provides an affordable, easy-to-use and easily maintained solution. It comes with a wide range of features and benefits, and is designed to meet the needs of organizations seeking a powerful and cost-effective recording system. The NICE NRX supports nearly every type of PBX, including D-Channel and CTI integrations. The Logger supports VoIP, TDM and screen recording in a single box.

For Lake County, the NRX Logger has the capacity to record up to 96 resources covering:

- Thirteen (13) Wireline Trunks.
- Four (4) Wireless Trunks.
- One (1) VoIP.
- Nine (9) Dispatch Consoles Select Audio.
- Nine (9) Backup Control Stations.
- Nineteen (19) Admin Phones.

1.9.1.2 NICE Inform Lite

NICE Inform Lite is a derivative of the NICE Inform multimedia and incident management solution which monitors, searches and manages different recorded audio content for the purpose of investigation and review.

NICE Inform Lite provides the core elements of the NICE Inform solution and delivers a powerful audio reconstruction and monitoring platform upon which the world of multimedia consolidation and management can be added as Control Centers become increasingly inundated with data and information which require organization and management.

Intelligent Incident and Event Management with NICE Inform Lite

NICE Inform Lite monitors, captures, manages and analyses audio transactions and information. Furthermore, it provides a complete, unified and chronological history of incidents in order to enable streamlining of investigations, information sharing and evidence delivery.

Utilizing NICE Inform Lite, the process of reconstruction, investigation and information-sharing is more complete and efficient. There is a single interface for users to manage the information of the incident including search, retrieval and saving investigative information.

Key Benefits of the NICE Inform Lite solution include:

- Consolidated information: There is a single interface for the user to retrieve information from multiple sources of audio data. The information is synchronized and organized in a chronological manner allowing a complete and authentic incident reconstruction.
- Traceability of actions: Every action taken with NICE Inform Lite system data is recorded and available for review in order to monitor the interactions with critical incident data.
- Providing a method of consistently reproducing, managing and consolidating audio and data information via a single, easy to use graphical user interface.
- Enables organizations to securely access recorded resources such as telephony channels and radio talk groups from other disparately located sites and between Inform Servers. Inform Lite Servers may be provided with secure access to an Inform Hub Server's resources within an Inform Server Matrix.
- Providing a path for a long term storage repository of consolidated incident information.
- Enabling users (with the appropriate access privileges) to locate and replay from interactions on a unified interface from multiple repositories across multiple organizational disciplines and departments.
- Maximizes efficiency of the incident reconstruction, investigation and information distribution processes by providing a highly intuitive method of organizing disparate audio data sources.
- Minimizing human error associated with manually attempting to coordinate and "match" data from multiple disparate information sources.
- Minimizing training and maintenance effort and costs by providing a single interface in lieu of individual interfaces for each source of audio information.



1.9.1.3 NICE Inform Lite Client Applications

The NICE Inform Lite suite of applications has been developed in support of Public Safety and Security users. NICE Inform Lite utilizes Microsoft's .NET Windows Forms technology in order to provide automatic updates from the NICE Inform Lite web server. This helps to combine low desktop support costs with feature-rich, high quality graphical user interfaces. Users also benefit – for example, user preferences and settings, including window sizes and locations, preferred search fields and many other options, are all stored centrally. Users can share workstations, or use different workstations from day to day, and their own personal preferences will be applied as soon as they log on to NICE Inform Lite.

Users can log in to NICE inform either manually or via their Windows/network log-in credentials utilizing the Active Directory function from within the Inform application.

Reconstruction Module

NICE Inform Lite is capable of searching and replaying analogue, digital and VoIP telephony along with radio audio, which can then be synchronized and replayed on one consolidated interface.

The Reconstruction module provides a combination of graphical and list displays of the recordings – giving a visualization of the recordings and the detail to investigate more closely. Reconstruction includes many powerful features, designed and developed with the user in mind in order to facilitate an easy, effective and logical workflow process. Refer to Figure 1-17: View of NICE Inform Lite Reconstruction Module for a view of the Reconstruction Module.

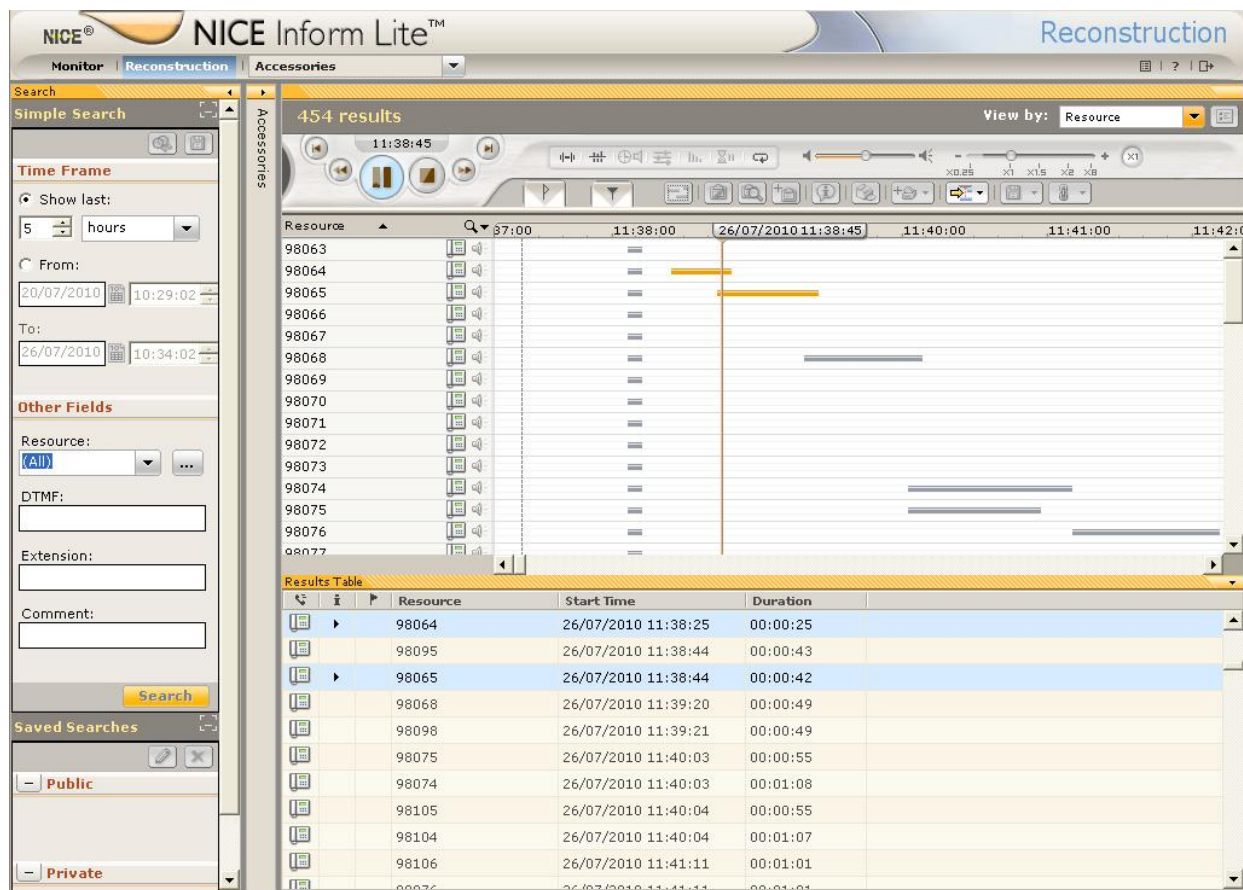


Figure 1-17: View of NICE Inform Lite Reconstruction Module

Search features

The Reconstruction module within the Inform Lite application provides the basis of the search and replay activities within the system. It is from here that the user is able to perform extensive searches for the recorded audio and associated data elements they wish to review, manage or distribute later.

The search function within the Reconstruction module includes several powerful features and enables the user to utilize all search parameters and criteria captured by the Inform application and associated recording platform. Users can search by items such as call duration, caller ID, specific recorded resources, annotations/bookmarks, user ID and extension to name but a few of the search criteria available.

Saved searches (private and public) – Once a search has been defined this can then be saved as a search that may be used again at a later date. Searches can be made available to other Inform Lite application users by making them public or specific to the user that created them by assigning them as private.

Filter and pinpointing incident information – A search may be further defined by the use of the filter tool which applies additional filter parameters against the search results displayed within the graphical and text results fields (Figure 1-18: View of NICE Inform Lite Reconstruction Filter Panel).



Figure 1-18: View of NICE Inform Lite Reconstruction Filter Panel

Graphical Representation of Audio Data – In addition to the standard tabular view of search results, the Reconstruction module provides a time-based graphical view of all audio segments. This graphical view provides rapid visual confirmation of a recordings existence, duration and sequence.

Playback features

There are a number of playback options provided for the user in order to enhance the review of the search results. These include – Skip silence, adding spoken date and time, volume, balance and Automatic Gain control.



Figure 1-19: Inform Lite Reconstruction Playback Bar

Playback Volume and Balance Control per Recorded Channel

When replaying multiple audio channels, mixed together and synchronized in real-time, users can dynamically control audio settings for each channel independently. Users can therefore quickly gain an understanding of both the incident communication as a whole and each audio recording individually.





Figure 1-20: Volume and Balance Control

Clipboard

The clipboard enables the user to keep a selection of search results on hand, while performing a new search or reviewing additional audio. The clipboard is particularly useful when the user finds that an incident involves a longer time frame or a wider number of channels than expected – all relevant audio from the first search can be placed on the clipboard, a new search performed with the new criteria and the combined results are now available for replay and further analysis.

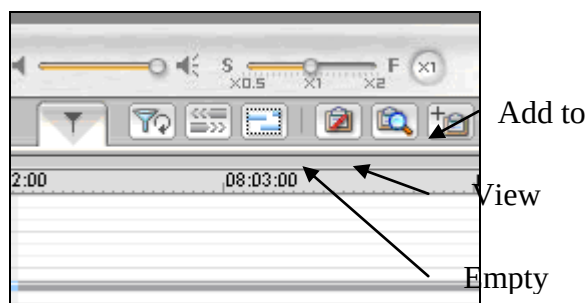


Figure 1-21: Clipboard

Annotations

During the review of the audio, users can add text and/or speech annotations to store further details or notes on the entire audio segment or on specific points in the recording. Annotations are marked as flags on the graphical view of recordings, so users can quickly refer to them. Bookmarks – annotations without text or speech – can also be added. Users can search for annotations at a later date, including annotations made with Last Message Replay.

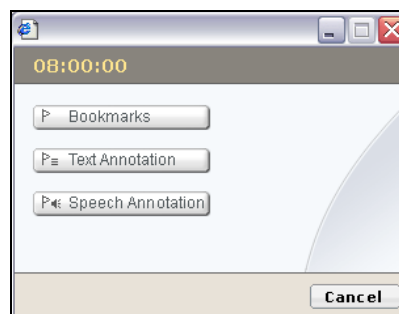


Figure 1-22: Annotations

Organizer

Organizer is an advanced incident management module. Authorized users can store, access and manage multiple collections of specified recordings digitally replicated from the recorder that captured them. Recordings can be placed into an incident individually, or a collection of recordings

can be given a name and managed collectively by that name. The incident storage area is independent from the normal recording storage area.

Audio that is within an incident can be replayed in just the same way as audio in the online store, with the same flexible user interface.

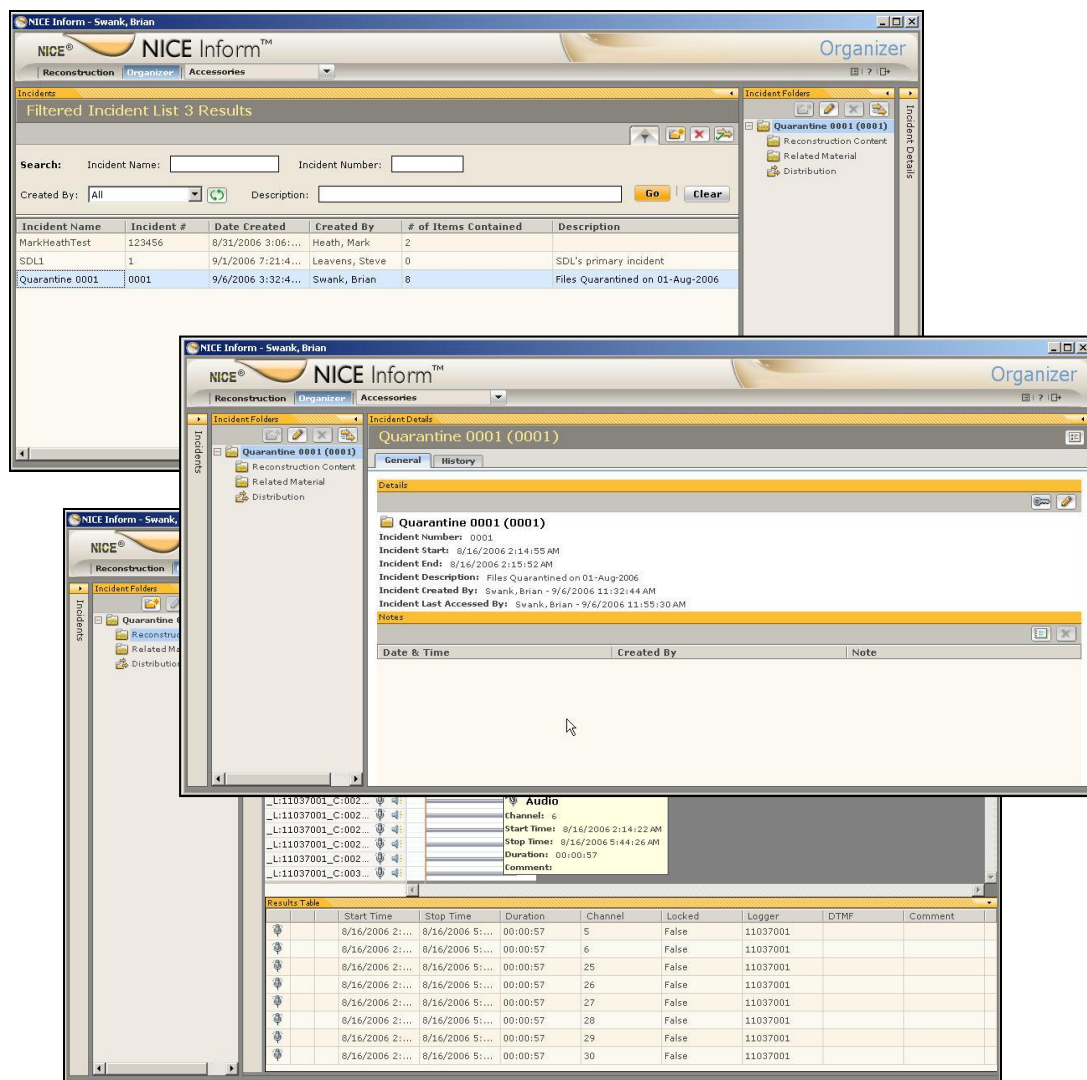


Figure 1-23: Incident List, Folders and Content Interfaces

The Organizer application includes further unique features:

- **Organization of Incident Information in Folders:** This provides a central location where all the incident recordings and related information are stored. This saves time and reduces errors, as users can refer to one location for all incident information rather than to multiple sources. Incidents can be accessed from any workstation. An authorized user, who has been granted the appropriate access privileges, can refer to the folder quickly and save time and effort in reconstructing the incident audio again. User privileges to access specific incidents may be independently defined for each incident.
- **Comment/Notes Functionality:** An authorized user has the ability to add notes to each incident folder and to individual recordings within the quarantine folder, providing an explanation or reason for the inclusion of that material in the incident.

- **Managing Additional Information:** Any other files or documents related to the incident can be imported to the incident folder to maintain, manage and secure all information about an incident in a single location. For example, the audio request that generated the creation of the incident folder could be saved alongside the incident recordings to provide a single location for all data concerning the incident.
- **Automated Distribution Process:** A wizard-guided distribution process simplifies the work for the user and wraps all incident material in one exported media file, including optional certification messages recorded by the user. Distribution profiles can be configured in advance to ensure consistency and repeatability when preparing audio for distribution. Profiles may be created for court purposes, where all audio is merged into a single file with certification messages added before and after the audio, or for investigative purposes, where all audio is kept separate and additional information is provided in an html page. Incidents may be distributed multiple times, in multiple formats, without the need to search the logging system each time.

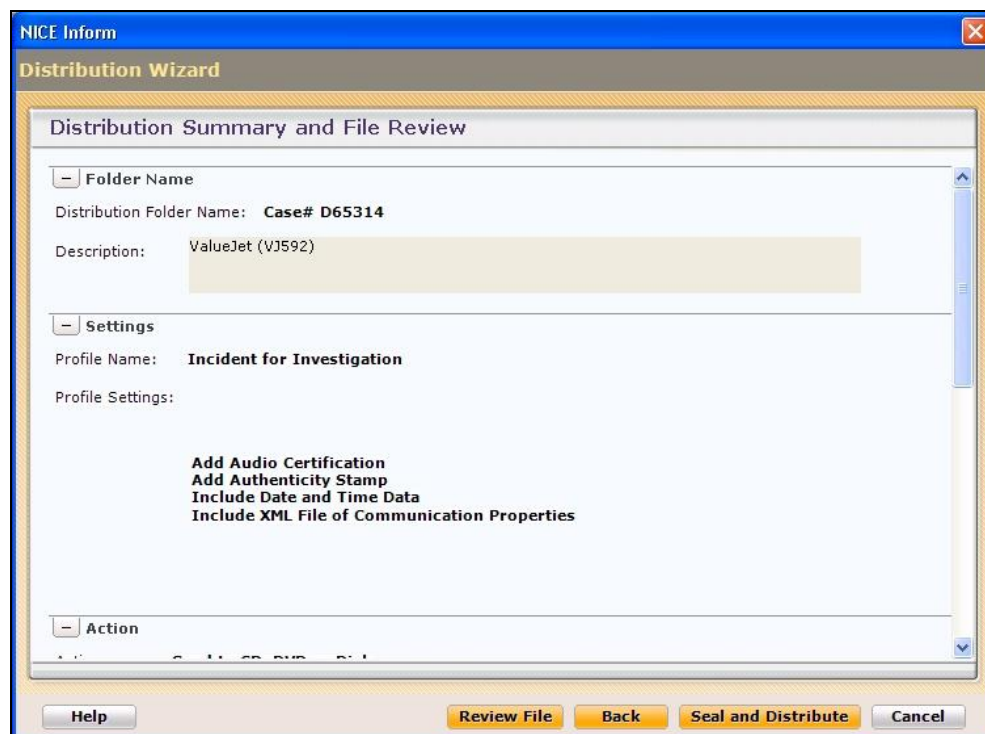


Figure 1-24: Distribution Wizard

- **Log of Distributed Material:** This further enhances traceability of distributed material. If the incident information is requested again, the user can quickly find the original recreation in the Organizer application rather than go through the reconstruction and reproduction process again. If the distributed audio is questioned, for example, as to whether it is complete, the original recordings that made up the distributed audio are still available for reference and verification.
- **Distribution Authentication:** When recordings are distributed they are saved as files in a folder that is given the name of the distribution. Also contained in this folder are other files that describe what the recordings contain. Each file that is saved has a hash code generated using the SHA-1 algorithm, which is stored in the NICE Inform server as part of the information kept about the distribution. To authenticate a distribution, the user opens the authentication dialogue and selects the relevant incident distribution folder. The distribution is then checked against the information stored on the server, including the quantity, names and recalculated hash codes of all the files in the distribution. The results of the verification, including any differences, are reported to the user.

- **Access Control to Evidence:** Privilege-based access to incident folders is supported, with the ability to define unique user security access lists for each incident.
- **History of Actions:** An audit trail is kept of every action taken on any of the recordings. This provides the ability to follow up and view actions taken by authorized users concerning the material of interest.

Monitor Module

The NICE Inform Lite Monitor module provides near real time, non intrusive access to ongoing calls and a way to view real time activity on a group of channels. Individual channels can be selected for monitoring and provide a local audio output on the workstation which is approximately a second behind the actual conversation. (The Monitor module has not been included but is available as an upgrade option.)

The Graphical User Interface (GUI) display will enable the user:

- To understand the resource name (e.g. channel name or position) and type (e.g. telephony).
- To understand whether there is activity on that particular channel.
- To monitor individual channels.

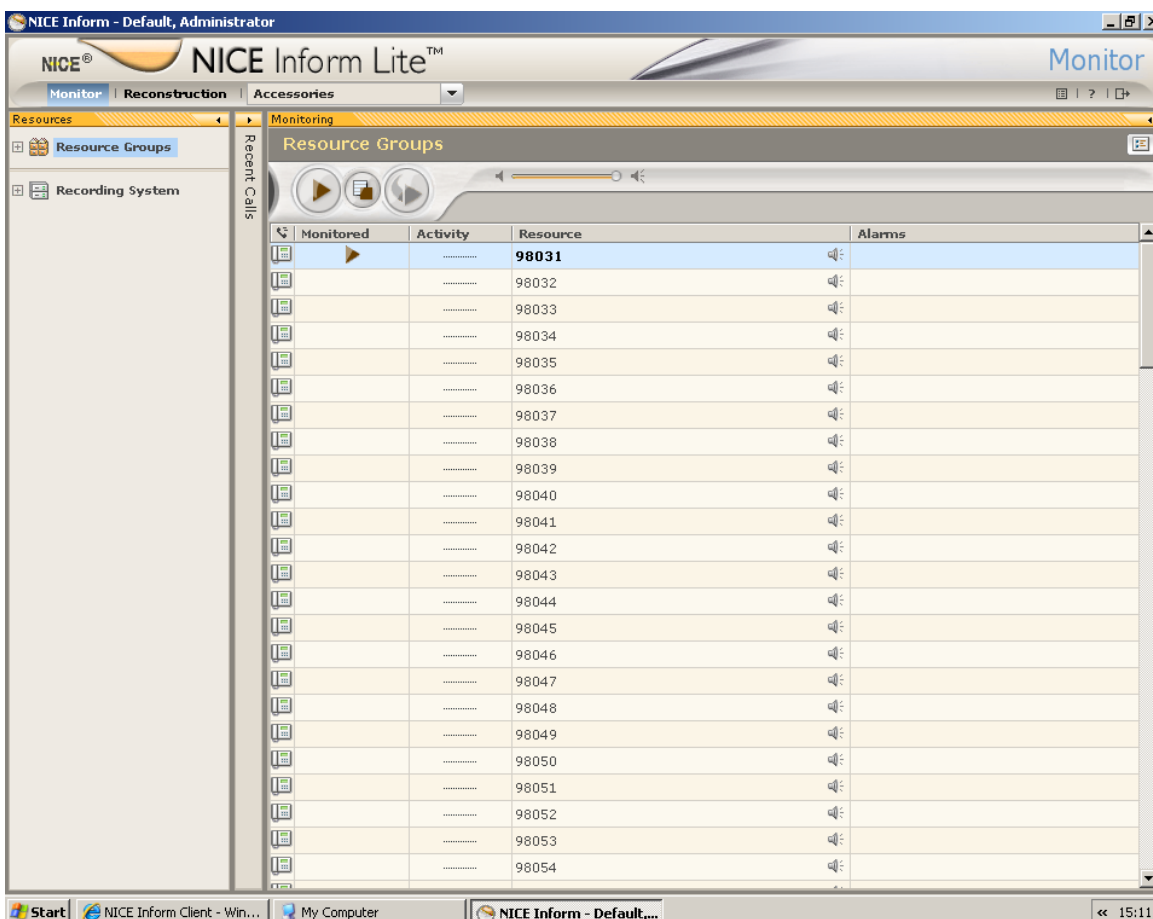


Figure 1-25: View of NICE Inform Lite Monitor



Monitor provides real time access to ongoing calls and a way to view real time activity on a group of channels. One or more channels can be optionally selected for monitoring and provides a local audio output on the workstation which is only a few seconds behind the actual conversation.

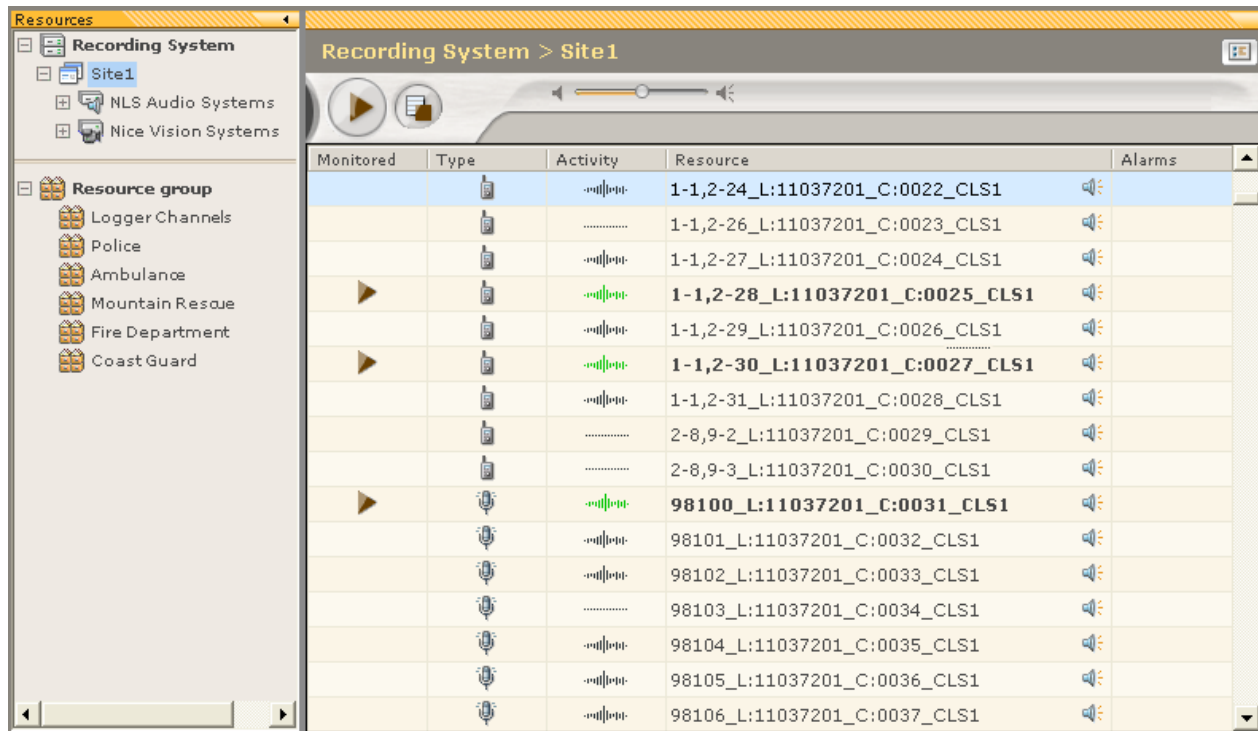


Figure 1-26: NICE Inform Monitor

NICE Inform Verify Application

NICE Inform Verify is an application designed to provide a verification tool for call takers within a Control Centre concerning recent telephone calls that they have just been engaged with.

The application will enable the user to search up to 5 resources at a time over a pre-defined period (usually 30 minutes). This will provide a list of calls and also associated call data such as start time, durations, stop time, caller ID etc. associated with the user at that specific position. The application also provides an option to associate a text annotation to a certain point within a call which can then be displayed within other modules of Inform. It also enables a user to save a call for onward review if deemed important.

In the same way as the Inform Lite application, the Inform Verify application is client server based and the software is provided by the main Inform Lite server. This will benefit the user and administrator in that any software updates are sent from the central server and the users are centrally administered and audited within the Inform administration functions.

The Graphical User Interface (GUI) (please see Figure 1-27: View of NICE Inform Verify Application) has been developed to be touch screen sensitive and also resizable so that it may fit in and around other applications utilized by call takers.



Figure 1-27: View of NICE Inform Verify Application

Audit Function

An audit trail of all actions taken on any of the recordings or within the system itself (modules, log-in, audio channel/resource replay etc.) is kept within a quarantined section within the application. This enables an administrator to follow up and review actions taken by authorized users concerning any particular areas of interest. Administrators also have the option to undertake a simple date and time search in order to pinpoint a specific system action. Additionally it is possible to print the audit listing and also save it to a CSV file.

NICE Inform - Default, Administrator

NICE Inform Lite™

Monitor | Reconstruction | Audit

Search

Simple Search

Time Frame

Show last: 5 Minutes

From: 06/08/2010 11:28:07

To: 06/08/2010 11:33:07

Search

9 results

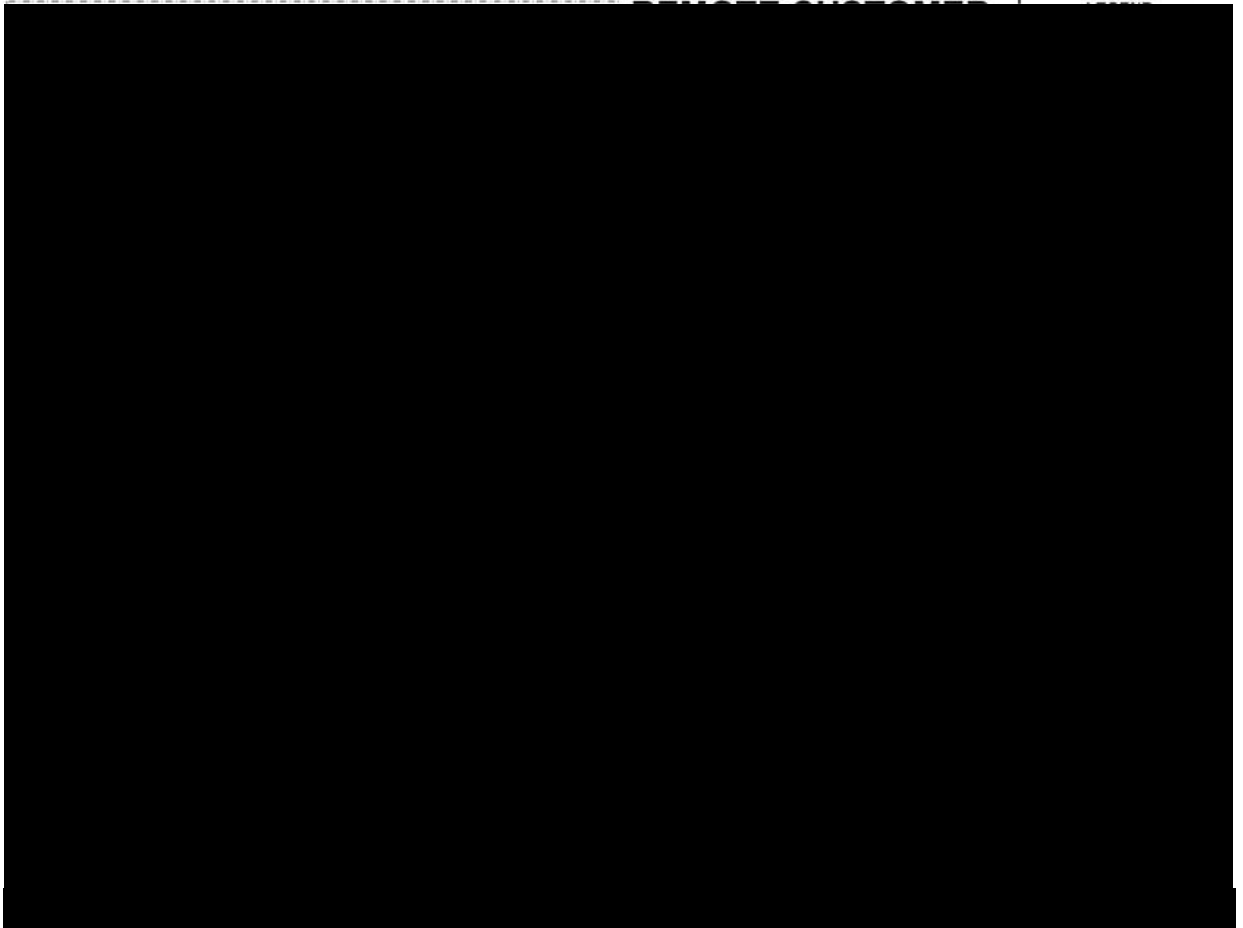
i	Date & Time	Name	Hostname	Group	Application	Message	D
+	06/08/2010 15:13:46	Default, Admin...	PHILSXPIE7VM	Management	User Administ...	Profile updated	D
+	06/08/2010 15:13:29	Default, Admin...	PHILSXPIE7VM	Management	User Administ...	User updated	D
+	06/08/2010 15:13:20	Default, Admin...	PHILSXPIE7VM	Management	User Administ...	User group updated	D
+	06/08/2010 15:12:25	Default, Admin...	PHILSXPIE7VM	Playback	Reconstruction	Playback started	D
+	06/08/2010 15:12:02	Default, Admin...	PHILSXPIE7VM	Live Monitor	Monitor	Live monitoring	D
	06/08/2010 15:11:35	Default, Admin...	PHILSXPIE7VM	Security	User Administ...	User logged in	D
	06/08/2010 15:11:31	Default, Admin...	PHILSXPIE7VM	Security	User Administ...	User logged out	D
+	06/08/2010 15:11:25	Default, Admin...	PHILSXPIE7VM	Management	System Admi...	Licensed resources updated	D
	06/08/2010 15:10:44	Default, Admin...	PHILSXPIE7VM	Security	User Administ...	User logged in	D

Figure 1-28: System Audit Trail View

1.10 REMOTED CUSTOMER ENTERPRISE NETWORK (CEN)

Motorola is proposing a CEN that will reside in the Libertyville Sheriff's Office Dispatch Equipment Room. The CEN is an extension of the STARCOM21 Master Site and will be used to interconnect the following items:

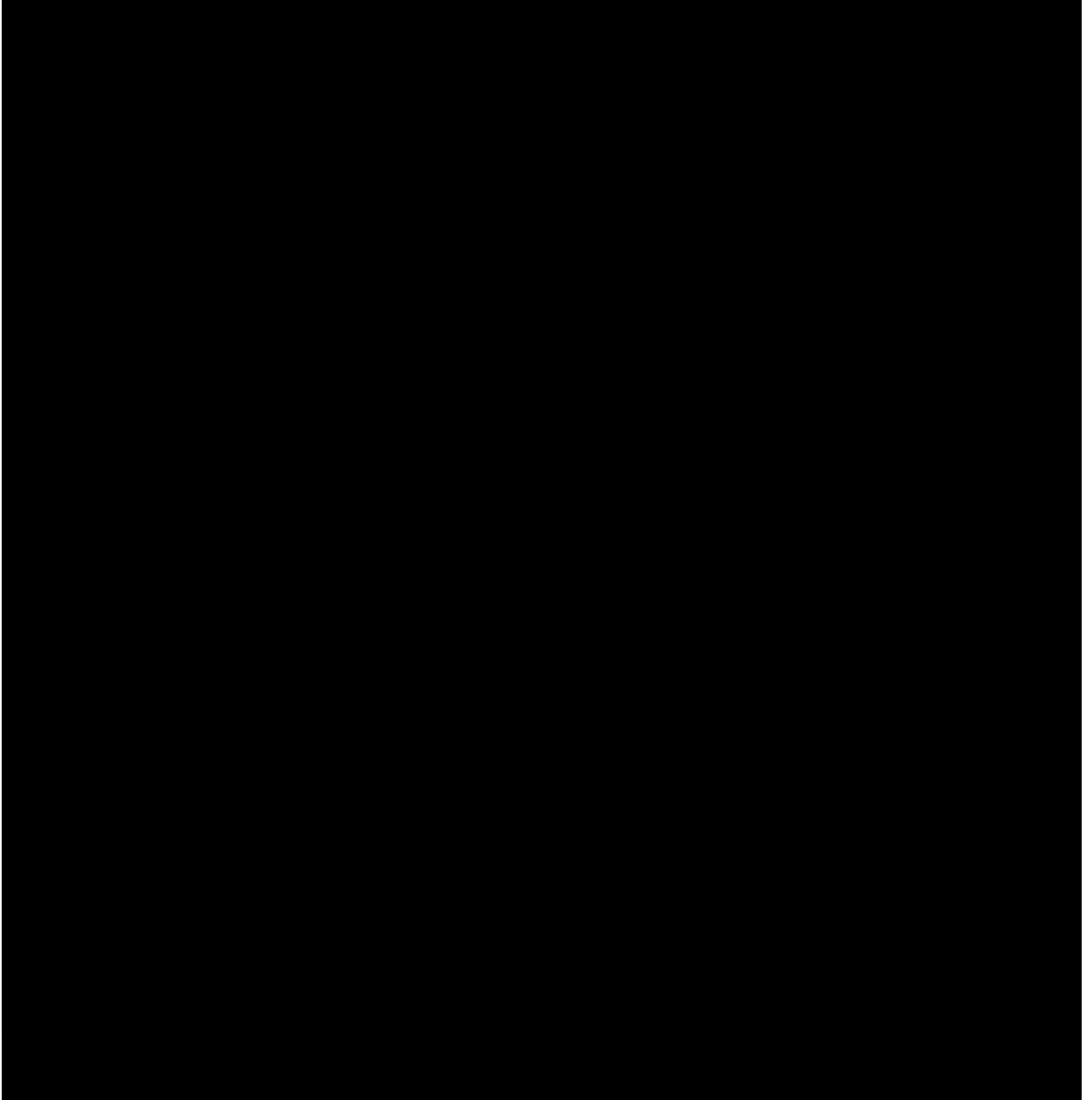
- NRX Logger with Inform LITE.
- CastleRock SNMP Server.
- Inform Verify Clients.
- Inform Reconstruction Clients.
- Short Message Text Server.
- Short Message Text Client.
- Over-the-Air Provisioning Application.



1.11 ASTRO EXPRESS SITE BACKUP SOLUTIONS (CUSTOMER OWNED)

Motorola is proposing ASTRO Express solution as a response to Lake County's Backup system requirement.

This proposal offers Lake County the ASTRO 25 Express System with a single-site, 5-channel, 800MHz, GTR 8000 Expandable Site Subsystem (ESS). During Primary Simulcast system failure, the backup ASTRO Express system will manually connect to the Transmit and Receive antenna assembly of the Primary Simulcast system.



1.12 ASTRO 25 SYSTEM FAILURE MODE ANALYSIS

Motorola's ASTRO 25 trunking networks have three modes of operation for increased reliability. The normal mode of operation is wide-area trunking. In the event of multiple component failures that lead to system disruption, the system is equipped to continue operation in two reduced feature operational modes: site trunking and failsoft.

The following pages include a detailed description of each of these operational modes, as well as a comprehensive analysis of the possible infrastructure failure scenarios and the system redundancy for mitigating each scenario.

Wide-Area Trunking

Wide-area trunking is the ASTRO 25 system's normal mode of operation. Wide-area trunking implies that the Fixed Network Equipment is operating properly. All simulcast cells and ASTRO 25 repeater sites are communicating with the Master Site. Subscriber units automatically roam between the various network RF cells. Talkgroup calls occur in the appropriate RF cells if users are distributed throughout multiple cells. Data applications are properly assigned channels for communication between the subscriber units and the host application.

Site Trunking

Site trunking is the first failover mode of operation. Site trunking impacts individual RF cells within a network. In multiple RF cell systems, one RF cell can be in site trunking, while the rest of the system remains in wide-area trunking. Site trunking implies that the simulcast prime site controller or the ASTRO 25 repeater site has lost connectivity with the Master Site. Talkgroup calls initiated in the RF cell that is in site trunking will only be broadcast in that RF Cell. Dispatch consoles use control stations, or the operators use portable radios to communicate on a site trunking RF cell. Console priority is not available in site trunking. Data applications are not available on a site in site trunking and will have to be reinitiated once the system reverts to wide-area trunking.

Radios detect if a site is in wide-area trunking or site trunking. Radio models with a display will indicate to the user when the site is operating in site trunking. The radio alternately displays the selected talkgroup and "Site Trunking." Depending on how the system and user equipment are programmed, subscriber units will try to roam to an RF cell that is in wide-area trunking.

Failsoft by Talkgroup

Subsystem/site failsoft is the final fallback means of communication if a site no longer maintains wide-area or site trunking operation. Multiple failures have to occur for the system to enter failsoft. Failsoft impacts individual RF cells within a network. In multiple RF cell systems, one RF cell can be in failsoft, while the rest of the system remains in wide-area trunking. The subsystem goes into failsoft mode in any of these scenarios:

- The site controllers are not functioning properly
- When all control channels are disabled or malfunctioned
- When only one channel is enabled

Failsoft operation provides communications in conventional mode via repeaters/base radios in order to maintain vital communications. In an IP multi-site simulcast subsystem, in subsystem-wide failsoft, received audio is routed to the comparator for voting and redistributed to all of the sites for simulcast transmission.

The subscriber's operation in failsoft mode is determined by the subscriber's programming. A subscriber can be programmed to behave in the following manner:



- ***Failsoft by control channel operation*** – The subscriber first scans for alternate control channels outside the multi-site subsystem, then scans the control channel frequencies for failsoft data.
- ***Failsoft by working group*** – The subscriber looks for Failsoft data on a pre-programmed frequency after a scan for alternate control channels outside the multi-site subsystem is unsuccessful. If the subscriber cannot decode failsoft data on the pre-programmed frequency, the subscriber then scans the control channels in the simulcast subsystem for failsoft data.

Subscriber units in an RF cell that is in failsoft will try to roam to an RF cell that is in either wide-area trunking or site trunking. Data applications are not available on a site in failsoft and will have to be reinitiated once the system reverts back to wide-area trunking.

Simulcast Local Failsoft

This feature addresses two simulcast subsystem failure scenarios, prime site to sub-site link failure and prime site failure:

- Upon loss of communication (11 seconds or more) with comparators due to a sub-site link failure, the GTR 8000 Base Radio, when programmed with local failsoft “on,” will automatically enter in-cabinet repeat mode and continuously transmit Failsoft signaling. Link failures of less than 11 seconds will not trigger a link failure condition.
- Provides continuity of operations within the coverage area of a simulcast sub-site, in case of loss of connectivity with Prime site, through local in-cabinet repeater mode operation.

Note: For a complete failure analysis feature description for STARCOM21, a separate technical document will be provided.

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1.13 ACCEPTANCE TEST PLANS

Motorola's sample Acceptance and Coverage Acceptance Test Plans follow:

1.13.1 Coverage Acceptance Test Plan

1.13.1.1 Overview

This Coverage Acceptance Test Plan (CATP) will verify that the voice radio system implemented for Lake County, Illinois, meets or exceeds the required coverage reliability. The CATP defines coverage testing methods and procedures, coverage acceptance criteria, test documentation, and responsibilities of both Motorola and Lake County.

The Lake County system is based on an audio quality level of DAQ 3.4 as defined later in this document. Coverage verification will consist of subjective round trip (talk-in and talk-out) voice testing along with measuring outbound signal strength levels. Additionally, outbound BER (bit error rate) will be measured for information only.

There are two service areas to be used for coverage analysis. The first, for testing portable radio coverage with 12 dB building penetration loss, is the area within the border of Lake County. The second, for testing portable radio coverage with no building penetration loss, includes Lake County plus the area three miles beyond the border of Lake County. Motorola is guaranteeing 95% service area reliability using a portable radio at hip level in a swivel case, equipped with a ¼ wave antenna and a Remote Speaker Microphone (RSM), performing at DAQ 3.4. This coverage guarantee applies to Elements 1, 2, and 3 as defined in the RFP:

- Element 1 – 800 MHz (700 MHz capable) portable on-hip, on-street, Lake County area plus 3-miles.
- Element 2 – 800 MHz (700 MHz capable) portable on-hip with 12 dB building loss within Lake County.
- Element 3 – 800 MHz (700 MHz capable) portable on-hip inside twelve County facilities per Addendum 2 of the RFP.
- Element 4 (Optional) – 800 MHz (700 MHz capable) portable inside 16 dB buildings as specified by the provided shape files.

1.13.1.2 CATP Definitions

Several definitions are needed to accurately describe coverage acceptance test methods and criteria. Where cited, these terms or methods are defined in TIA TSB-88.1-C¹ or TSB-88.3-C².

Defined Test Area

The service area is the geographical region in which communications will be provided that meets or exceeds the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configuration. **The service area per Element 1 of the RFP is the 3 miles beyond**

¹ *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 1: Recommended Methods for Technology Independent Performance Modeling* Technical Service Bulletin TSB-88.1-C, Telecommunications Industry Association (TIA), Arlington VA, 2008.

² *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 3: Performance Verification*, Technical Service Bulletin TSB-88.3-C, Telecommunications Industry Association (TIA), Arlington VA, 2008.

the border of Lake County, and the service area per Element 2 of the RFP is the area within the border of Lake County. Motorola’s coverage maps and accompanying coverage guarantees utilize the county limits as known at the time of Motorola’s proposal, and as depicted on the coverage maps included in the proposal. To test and verify coverage performance, Motorola will test all accessible tiles within the guaranteed service areas. ***To ensure enough tiles are tested in order to provide a high degree of confidence in the results, equally distributed tiles of approximately 0.5 mile by 0.5 mile will be used.***

For coverage testing, each defined test area will be divided into a grid pattern that produces at least the number of uniformly-sized test locations (or tiles) as required by the Estimate of Proportions formula. {TSB-88.3-C-1, §5.2.1, equation 2}

Channel Performance Criterion (CPC)

The CPC is the specified minimum performance level in a faded channel. {TSB-88.1-C, §5.2} For this system, the CPC is a Delivered Audio Quality 3.4. Definitions of various DAQ levels are shown below as they appear in TSB-88.1-C, §5.4.2, Table 2}.

DAQ	Subjective Performance Description
1	Unusable, speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

The CPC pass/fail criterion is the faded performance threshold, plus any adjustments for antenna performance, external noise, and in-building or in-vehicle losses. {TSB-88.1-C, §5.4.2, Figure 5} The faded performance threshold for the specified CPC is determined using the receiver’s static reference sensitivity adjusted by the projected CPC parameters for the applicable Modulation Type and DAQ as listed in the current version of TSB-88.1, Annex A, Table A-1

1.13.1.3 Required Number of Test Tiles in the Defined Test Area

The method used to test coverage is a statistical sampling of the defined test area to verify that the CPC is met or exceeded at the required reliability for each of the defined equipment configurations. It is impossible to verify every point within a defined test area because there are infinite points; therefore, coverage reliability will be verified by sampling a statistically-significant number of randomly selected locations, quasi-uniformly distributed throughout the defined test area. There is one test sample per test tile, with a sample consisting of multiple sub-samples.

Coverage acceptance testing will be performed in the defined test area as indicated on Motorola-provided maps. To verify that the reliability requirement is met, the defined test areas indicated on Motorola’s maps will be divided into uniformly sized tiles approximately 0.5 mile by 0.5 mile in size.

No acceptance testing will be performed in locations outside the defined test areas. However, Motorola and Lake County may agree to perform “information only” tests in locations outside the defined test area. Such “information only” test locations must be defined before starting the coverage test. If the added locations require significant additional time and resources, a change order will be required and Motorola may charge Lake County on a time-and-material basis.



1.13.1.4 Accessibility to Test Tiles

Prior to testing, Motorola and Lake County will plan the route for the test vehicle(s) through the defined test areas to ensure that at least the minimum required number of tiles is tested. While planning the route (if possible) or during the test, Motorola and Lake County will identify any test tiles that are inaccessible due to lack of roads, restricted land, etc. Inaccessible tiles will be eliminated from the acceptance test calculation. {TSB-88.3-C, §5.5.4}

If elimination of inaccessible test tiles results in less than a statistically significant number of test tiles or substantially alters the defined test area, Motorola reserves the right to adjust the committed reliability based on the reduced number of accessible test tiles within the altered test area and the Estimate of Proportions formula. {TSB-88.3-C-1, §5.2.1, equation 2}

1.13.1.5 Random Selection of a Test Location in Each Tile

This CATP provides an objective method of randomly selecting and tracking test locations using Motorola's VoyagerSM coverage testing tool. The method follows TIA TSB-88.3-C §5.0, "Performance Confirmation", and has direct correlation with Motorola's coverage prediction methodology.

Using Voyager, the actual test location within each test tile is selected randomly as the test vehicle crosses into the tile. If the selected test location is in a shielded area such as a tunnel or underground parking garage, data from that test location must be eliminated and a replacement test location must be used.

1.13.1.6 CPC Measurements in Each Tile

In each test tile, a voice test exchange will be initiated using text typical of a common voice exchange between the fixed location and the portable radio. The test vehicle will be moving at a speed that is proper for the surrounding conditions.

For outbound signal strength measurements, a series of sequential measurements (subsamples) will be made while the test vehicle is moving at a typical speed for the surrounding environment. This test tile measurement, containing a number of subsamples, constitutes the test sample for that location. The test sample will establish the median signal strength within the test tile.

SSI subsamples are typically measured over a distance of 40 wavelengths. A median of multiple signal strength subsamples is used rather than a single measurement in order to ensure that the measurement is not biased by taking a single sample that is at a peak or null point on the radio wave.

1.13.1.7 Required Equipment

Subjective DAQ 3.4 audio quality tests will be performed by the field test team using an APX series portable radio. An attenuator inserted in the antenna line will simulate a radio in a swivel case at hip level, equipped with remote speaker microphone and a ¼ wave antenna mounted on the radio. Element 1 tests will simulate operation with no building loss, while Element 2 tests will simulate operation with 12 dB of building loss. Optional Element 4 tests will simulate operation with 16 dB of building loss in the areas specified in Appendix B of the RFP.

When using an attenuated portable radio in a test vehicle, the antenna must be mounted in the center of the vehicle roof and be free of obstructions.

Tests inside of County facilities, listed in Addendum 2 of the RFP, will not use an attenuator since testing will be performed by personnel carrying portable radios as they walk through the various facilities.

A Motorola Voyager Test Kit (including a separate portable radio, roof mounted antenna and GPS receiver), will be utilized in the test team's transport vehicle to collect outbound (base station to radio) signal strength measurement data and assist the test team in determining that they are testing in the proper tile.

A laptop computer will be loaded with a geographical database that will display the area in and around Lake County. In conjunction with this GPS receiver, the laptop computer will track the transport vehicle's location on the map display. Field test teams will perform testing while on public roads or waterways.

Test Team Configuration

Each field and dispatch team will consist of at least one Motorola representative and two County representatives. A County representative will drive the vehicle while the Motorola representative assists with navigation. In order to comfortably accommodate test team members and all required testing equipment, Lake County will provide full sized sedans or SUVs.

At the beginning of each test day, individual test teams will be assigned an area or block of tiles to be tested for the day. The exact number of field and dispatch test teams will be mutually agreed to by Lake County and Motorola. Each test team will be expected to conduct coverage testing eight hours a day excluding weekends and holidays.

1.13.1.8 CATP Procedures

Test teams will perform DAQ 3.4 audio voice tests for evaluating coverage. The overall results of Elements 1, 2, and 3 voice tests and outbound signal strength measurements will determine if Motorola's coverage guarantees have been met. Optional Element 4 voice tests and outbound signal strength measurements will be provided for Information purposes only.

In conjunction with the audio quality voice tests, field test teams will also collect outbound bit error rate (BER) measurements for informational purposes only.

A large group of people is required in order to perform a statistically valid subjective audio quality test. However, having a large group of people in a vehicle during a subjective listening test is impractical; therefore three people in a car or van will be used for this test.

It is very important that the personnel participating in the subjective voice testing be familiar with the sound of radio conversations. Before testing, all personnel who will evaluate audio quality will be "calibrated" by listening to examples of audio that passes a DAQ 3.4 test.

Prior to the start of coverage testing, all test team members will attend a briefing where procedures that will be used to perform the test will be explained. Each team will be provided a copy of this test procedure and the forms that will be used to record test results for each test tile. At the beginning of each day's coverage testing, the following information will be recorded on the form for each test team including field and dispatch:

- Team Identification
- Team member names and contact information
- Name of the member that will be recording data
- Date of test
- Start time and end time



The CATP will be comprised of an audio quality test and outbound signal strength measurement in each tile. In order to ensure the random selection of all test locations, tests will be performed immediately after entering a test tile. All tests will be performed with the vehicle in motion. If the initial audio quality test fails, the test team will move the vehicle at least 3 feet and perform a second test. If the audio quality retest passes, then the tile is considered a pass. If this retest fails, then the test tile is considered to have failed. Retries will be limited to a maximum of 10% of the total number of tested tiles.

Once a test team in the field is ready to perform a test in a given test tile, a field test team member will make contact with the test team located at the dispatch console location and transmit a test message. The team based at the dispatch console will determine if the test message was received at DAQ 3.4 as defined in this document. The dispatch console test team will then transmit a test message to the field team, who will in turn determine the pass/fail status of the outbound voice test. The following defines the detailed procedure for audio quality testing:

1. One or more test teams will be positioned at a dispatch console while field test teams will drive the test area. All testing will be performed on roads utilizing a portable radio that is attenuated per Elements 1, 2 and 4. Test teams will ensure that there is no excessive background noise that could affect their ability to clearly hear and transmit test messages.
2. Field team members will notify the console team that they are in a given test tile and they are ready to perform testing. The field team will then transmit a standard test count, no longer than 10 seconds in duration. An example of a valid test count would be "Portable Team to Dispatcher. Grid Number # [Random Test Language]. Grid number #, How do you copy grid number #?"
3. The console team will judge if the message was delivered successfully, using the definition of DAQ 3.4 as the pass/fail criteria, then respond with "Field Team xx message understood" or "Field Team xx message unreadable".
4. The console team will then transmit a test message, no longer than 10 seconds in duration. An example of a valid test count would be "Dispatcher to Portable Team. Grid Number # [Random Test Language]. Grid number #, How do you copy grid number #?"
5. The field team will judge if the message was delivered successfully, using the definition of DAQ 3.4 as the pass/fail criteria and respond with "Field Team xx message understood" or "Field Team xx message unreadable".
6. The pass/fail status of each voice test will be determined by a consensus of the receiving team at the time of the actual test. The test teams will record the pass/fail results of each test tile using the supplied test forms.

TSB-88 allows for repetition in the definition of DAQ 3.4 "Speech understandable with repetition rarely needed. Some noise/distortion". Should any voice test initially fail, the field test team will ensure the vehicle has moved at least three feet and perform a second test in the same manner as discussed above. A passing retest will render that test tile a pass. If the retest also fails, the individual test point will be declared as failed. Retries will be limited to a maximum of 10% of the total number of tested tiles.

1.13.1.9 Critical Buildings Coverage Testing

Motorola also guarantees coverage inside the twelve critical buildings listed in Addendum 2 of the RFP. Audio quality tests will be performed using test procedures as previously described.

Before starting testing in a building and based on each building's accessible floor space and size, the number of test points on each floor of tested buildings will be agreed to by Lake County and Motorola to validate the 95% coverage criteria. At a minimum, the four corners of each floor plus the center of each floor will be tested. Elevators and enclosed stairwells will be excluded from the



in-building coverage requirements per Addendum 2 of the RFP. The required floors of each critical building will be covered per Addendum 2 of the RFP.

1.13.1.10 Evaluation of Test Results

After testing is performed in all test tiles and the CATP is completed, Motorola will evaluate the test results by compiling the audio quality voice testing and signal strength measurement data gathered for each test tile. For proposed service areas and operational characteristic/attenuation settings of Elements 1-3 of the RFP, both audio quality and outbound signal strength tests must pass for each test to be considered a "Pass."

CATP Pass/Fail Criterion

Each of the following guaranteed service area coverage commitments must be met.

- Minimum service area reliability of 95% for Element 1 - Portable on-hip, on-street, Lake County area plus three miles.
- Minimum service area reliability of 95% for Element 2 - Portable on-hip with 12 dB building penetration loss within Lake County.
- Minimum service area reliability of 95% for Element 3 - Portable on-hip inside the twelve Lake County facilities listed in Addendum 2 of the RFP.

1.13.1.11 Additional Test Provisions

1. Lake County will need to provide personnel required to participate in the field coverage tests and assist the test teams as they drive throughout the test area. The test will be conducted between 8:30 am and 5:00 pm Monday through Friday until all required tiles have been tested.
2. Motorola's coverage commitment is based on the proposed site locations, antenna heights, and licensed Effective Radiated Power (ERP). In the event there are changes in site locations or limitations resulting in reduced antenna height or Effective Radiated Power (ERP), Motorola will run new coverage maps taking these factors into account and the guaranteed coverage commitments will be adjusted accordingly.
3. It will be the responsibility of Lake County to provide access to all test tiles. All possible means will be utilized to gain access to each test tile.
4. If a test team realizes that a particular voice test was unsuccessful due to operator error such as volume set too low or on the wrong talkgroup, the test team will correct the error and perform the test again. Such an occurrence will not count as a failure or a retest.
5. Should modifications of antenna azimuths, changes in ERP, or changes in antenna heights be made to correct coverage deficiencies that resulted in an initial failure of the CATP, Motorola will retest tiles in affected areas at no additional cost to the Lake County.

1.13.2 CATP Documentation and Coverage Acceptance

During the coverage acceptance test, Voyager generates computer files that include raw test data. A copy of this data will be provided to Lake County at the conclusion of the coverage test. Motorola will process the data to produce a map detailing the coverage test results and to determine whether the coverage test was passed for each equipment configuration.

Motorola reserves the right to review any test tiles that fail. If a coverage test, or a portion thereof, is suspected by Motorola to have failed due to external interference, those tiles suspected of being affected by an interferer may be re-tested. If test tiles that are re-tested are confirmed to have failed due to interference or external noise, those test tiles will be excluded from all acceptance calculations, and Motorola will work with Lake County to identify solutions to the interference issues.



Motorola will conduct this Coverage Acceptance Test only once. If any portion of the test is determined to be affected by equipment malfunctions or failures, Motorola will repeat the portion of the test affected by the equipment malfunction or failure. Lake County will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

Motorola will submit a report to Lake County detailing the coverage test results. This report will include a document, to be signed by both Lake County and Motorola, indicating that the test was performed in accordance with the CATP and that the results of the test indicate the acceptance or non-acceptance of coverage provided by the radio system.



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1.13.3 Acceptance Test Plan

An Acceptance Test Plan follows:



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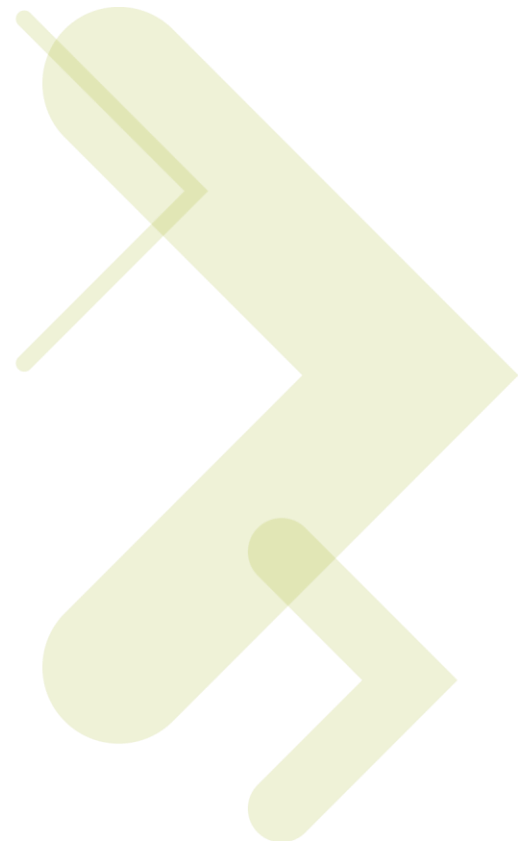


Lake County RFP

ASTRO 25



In-Plant Draft





www.motorolasolutions.com/services/government

October 24, 2013



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MCC 7100/7500 Trunked Resources



MCC 7100/7500 Trunked Resources

Instant Transmit

1. DESCRIPTION

The instant transmit switch provides immediate operator access to a channel, independent of its select status (selected or unselected). It provides priority over other dispatcher transmit bars or optional footswitches.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 – TALKGROUP 1 (Selected),
TALKGROUP 2 (Unselect mode)

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1, press the Instant Transmit button on TALKGROUP 1.
- Step 2. Verify that the Transmit indicator is lit.
- Step 3. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 1.
- Step 4. On RADIO-1 change to TALKGROUP 2.
- Step 5. Using CONSOLE-1, press the Instant Transmit button on the TALKGROUP 2 radio resource.
- Step 6. Verify RADIO-1 can monitor and respond to the call on TALKGROUP 2.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Talkgroup Selection and Call

1. DESCRIPTION

The Talkgroup Call is the primary level of organization for communications on a trunked radio system. Dispatchers with Talkgroup Call capability will be able to communicate with other members of the same talkgroup. This provides the effect of an assigned channel down to the talkgroup level. When a Talkgroup Call is initiated from a subscriber unit, the call is indicated on each dispatch operator position that has a channel control resource associated with the unit's channel/talkgroup.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 2

VERSION #1.010

2. TEST

- Step 1. Initiate a wide area call from CONSOLE-1 on TALKGROUP 1.
- Step 2. Observe that RADIO-1 and RADIO-3 will be able to monitor the call. Dekey the console and have either radio respond to the call.
- Step 3. Observe that all consoles with TALKGROUP 1 can monitor both sides of the conversation.
- Step 4. Initiate a wide area call from CONSOLE-2 on TALKGROUP 2.
- Step 5. Observe that RADIO-2 and RADIO-4 will be able to monitor the call. Dekey the console and have either radio respond to the call.
- Step 6. Observe that all consoles with TALKGROUP 2 can monitor both sides of the conversation.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Talkgroup Selection and Call - Secure

1. DESCRIPTION

The Talkgroup Call is the primary level of organization for communications on a trunked radio system. Dispatchers with Talkgroup Call capability will be able to communicate with other members of the same talkgroup. This provides the effect of an assigned channel down to the talkgroup level. When a Talkgroup Call is initiated from a subscriber unit, the call is indicated on each dispatch operator position that has a channel control resource associated with the unit's channel/talkgroup.

Digital encryption is used so only properly equipped and configured subscribers can monitor the conversation. A "Key" is used to encrypt the transmit audio. Only radios and Consoles with the same "Key" can decrypt the audio and listen to it.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 2 (No Keys)
RADIO-4 - TALKGROUP 1 (Clear TX Mode with Keys loaded)
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2 (Secure TX Mode)

VERSION #1.040

2. TEST

- Step 1. Initiate a wide area secure call from CONSOLE-1 on TALKGROUP 1.
- Step 2. Verify RADIO-1 can monitor and respond to the secure call.
- Step 3. Verify RADIO-4 can monitor and respond to the secure call because even though it is in clear mode the correct encryption keys are loaded for the secure call.
- Step 4. Initiate a wide area secure call from CONSOLE-1 on TALKGROUP 2.
- Step 5. Verify that RADIO-2 can monitor and respond to the secure call. Note that RADIO-3 cannot monitor the call.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Emergency Alarm and Call Display Description

1. DESCRIPTION

Users in life threatening situations can use the emergency button on the radio to send an audible alarm and a visual alarm signal to a console operator in order to request immediate system access to a voice channel for an emergency call.

An emergency alarm begins after the radio user presses the radio's emergency button. Pressing the emergency button places the radio in "emergency mode". To begin an emergency call, the radio user must press the radio's PTT button while in "emergency mode." The assigned voice channel will be dedicated to the emergency caller's talkgroup for an extended period of time, equal to the Message Hang Time plus the Emergency Hang Time. As with other call types, emergency calls can operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Initiate an Emergency Alarm from RADIO-1.
- Step 2. Observe the Emergency from RADIO-1 is received at CONSOLE-1 for TALKGROUP 1.
- Step 3. Acknowledge the Emergency at the operator position. Verify CONSOLE-2 receives notification that the call has been acknowledged.
- Step 4. Initiate a call with RADIO-1 to initiate an Emergency call.
- Step 5. Observe CONSOLE-1 and CONSOLE-2 can monitor RADIO-1
- Step 6. Clear the Emergency from CONSOLE-1 on TALKGROUP 1.
- Step 7. End the Emergency Alarm from RADIO-1.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

PTT Unit ID/Alias Display

1. DESCRIPTION

Console operator positions contain various resources such as talkgroup, multigroup, Private Call which enables the dispatcher to communicate with the subscriber units. If activity occurs on one of these operator position resources, the unit ID or associated alias of the initiating radio appears at the console resource.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Select the resource for TALKGROUP 1 on CONSOLE-1.
- Step 2. Initiate a call on TALKGROUP 1 from RADIO-2 and observe that the alias is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.
- Step 3. Initiate a call from RADIO-1 and observe that the alias of RADIO-1 is seen at CONSOLE-1 in the resource window as well as in the Activity Log window.
- Step 4. Modify RADIO-2's alias. Make sure to give enough time for the alias change to propagate to the Zone Controller.
- Step 5. Initiate a call from RADIO-2 and observe the new alias of RADIO-2 is seen at CONSOLE-1 in the list in the resource window as well as in the Activity Log window.
- Step 6. Return RADIO-2's alias to its original state.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Multigroup Call

1. DESCRIPTION

This trunking feature allows an equipped console operator position to transmit an announcement to several different talkgroups simultaneously. As with Talkgroup Calls, multigroup calls operate across sites as well as within the same site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - RANDOM
CONSOLE-1 - ATG 1

Note: TALKGROUP 1 and TALKGROUP 2 are members of ATG 1. RANDOM is any talkgroup not a member of ATG 1.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1, select the ATG 1 resource.
- Step 2. Initiate the Multigroup Call from CONSOLE-1.
- Step 3. Observe that RADIO-1 and RADIO-2 receive the Multigroup Call.
- Step 4. Verify that RADIO-3 does not receive the Multigroup Call because it is not a member of ATG 1.
- Step 5. Answer the Multigroup Call using RADIO-1 and observe CONSOLE-1 receives the response.
- Step 6. Verify that if the call is answered within the repeater hang time, the console will receive the call on the ATG 1 resource tile, otherwise the console will receive the call on the TALKGROUP 1 tile.
- Step 7. Verify that if the call is answered within the repeater hang time, RADIO-2 will monitor the call.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Multi-Select Operation

1. DESCRIPTION

Multi-Select (Msel) allows the console operator to group a number of channels/talkgroups together such that when the general transmit bar is depressed, all of the multi-selected channels/talkgroups will transmit at the same time with the same information. Multi-Select is one way communication call. If a radio user responds to a Multi-Select call the talkgroup the user is affiliated to will be the only one to hear the call. There is no super-group formed, so radio communication is still at the single talkgroup level. Multi-Select is utilized to send an APB to several channels/talkgroups. A Multi-Select has a limit of twenty (20) trunking/conventional resources

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2

VERSION #1.010

2. TEST

- Step 1. From CONSOLE-1, create an Msel group with TALKGROUP 1 and TALKGROUP 2.
- Step 2. Transmit on the Msel using the Msel instant transmit button.
- Step 3. Verify that RADIO-1 and RADIO-2 hear the call.
- Step 4. Initiate a call with RADIO-1.
- Step 5. Verify the call is heard on CONSOLE-1 but not on RADIO-2.
- Step 6. Initiate a call with RADIO-2.
- Step 7. Verify the call is heard on CONSOLE-1 but not on RADIO-1.
- Step 8. On CONSOLE-1 dissolve the Msel.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Talkgroup Patch

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other.

Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

NOTE : If "secure" and "clear" resources are patched together, one repeater for each mode may be assigned per site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 1
RADIO-4 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1 and
TALKGROUP 2

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1 create a patch between TALKGROUP 1 and TALKGROUP 2.
- Step 2. Initiate a patch call from CONSOLE-1.
- Step 3. Verify RADIO-1, RADIO-2, RADIO-3, and RADIO-4 can monitor the call.
- Step 4. Initiate several calls between the radios and verify successful communication.
- Step 5. Dissolve the patch created in step 1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Talkgroup Patch - Secure

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more talkgroups that need to communicate with each other. Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual talkgroups can also talk or listen to members of other talkgroups. Patched talkgroups can communicate with the console dispatcher and other members of different talkgroups because of the "supergroup" nature of the Patch feature.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 1 (No secure keys loaded)
RADIO-4 - TALKGROUP 2 (Clear TX Mode with keys loaded)
CONSOLE-1 - TALKGROUP 1 and TALKGROUP 2 (Secure TX Mode)

Note: All 4 Radios must have the same home zone.

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1 create a secure patch between TALKGROUP 1 and TALKGROUP 2.
- Step 2. Initiate a patch call from CONSOLE-1.
- Step 3. Verify RADIO-1, RADIO-2 and RADIO-4 can monitor the call.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from RADIO-1.
- Step 5. Observe that all radios are able to hear RADIO-1 except RADIO-3.
- Step 6. Dissolve the patch.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Talkgroup Patch with Conventional

1. DESCRIPTION

Talkgroup Patch allows a dispatcher to merge several talkgroups together on one voice channel to participate in a single conversation. This can be used for situations involving two or more channels or talkgroups that need to communicate with each other. Using the Patch feature, the console operator can talk and listen to all of the selected talkgroups grouped; in addition, the members of the individual channels/talkgroups can also talk or listen to members of other channels/talkgroups. Patched resources can communicate with the console dispatcher and other members of different channels/talkgroups because of the "supergroup" nature of the Patch feature.

NOTE : If "secure" and "clear" resources are patched together, one repeater for each mode may be assigned per site.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - CONVENTIONAL CHANNEL 1
RADIO-3 - TALKGROUP 1
RADIO-4 - CONVENTIONAL CHANNEL 1
CONSOLE-1 - TALKGROUP 1 and
CONVENTIONAL CHANNEL 1

VERSION #1.010

2. TEST

- Step 1. Using CONSOLE-1 create a patch between TALKGROUP 1 and CONVENTIONAL CHANNEL 1.
- Step 2. Initiate a patch call from CONSOLE-1.
- Step 3. Verify RADIO-1, RADIO-2, RADIO-3, and RADIO-4 can monitor the call
- Step 4. Initiate several calls between the radios and verify successful communication
- Step 5. Dissolve the patch created in step 1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Multi-Select Operation in Secure Mode

1. DESCRIPTION

Multi-Select (Msel) allows the console operator to group a number of channels/talkgroups together such that when the general transmit bar is depressed, all of the multi-selected channels/talkgroups will transmit at the same time with the same information.

Multi-Select is one way communication call. If a radio user responds to a Multi-Select call the talkgroup the user is affiliated to will be the only one to hear the call.

There is no super-group formed, so radio communication is still at the single talkgroup level. Multi-Select is utilized to send an APB to several channels/talkgroups. A Multi-Select has a limit of twenty (20) trunking/conventional resources.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX Mode)
RADIO-2 - TALKGROUP 2 (Secure TX Mode)
RADIO-3 - TALKGROUP 1 (No Key)
RADIO-4 - TALKGROUP 2 (Secure Key
Loaded, but in Clear TX mode)
CONSOLE-1 - TALKGROUP 1, TALKGROUP 2
(Secure TX Mode)

VERSION #1.010

2. TEST

- Step 1. From CONSOLE-1, create an Msel group with TALKGROUP 1 and TALKGROUP 2.
- Step 2. Transmit on the Msel using the Msel instant transmit button.
- Step 3. Verify that RADIO-1, RADIO-2 and RADIO-4 hear the call and RADIO-3 cannot hear the call.
- Step 4. Initiate a call with RADIO-1.
- Step 5. Verify the call is heard on CONSOLE-1 but not on RADIO-2.
- Step 6. Initiate a call with RADIO-2.
- Step 7. Verify the call is heard on CONSOLE-1 but not on RADIO-1.
- Step 8. On CONSOLE-1 dissolve the Msel.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Alert Tones - Talkgroup

1. DESCRIPTION

Pre-defined alert tones can be transmitted on the selected Radio Resource to subscribers which can alert members of a channel / talkgroup to a particular event or signify to radio users special instructions are to follow. The Console has the ability to send an Alert-Tone signal on selected conventional or talkgroup resources.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.040

2. TEST

- Step 1. Select TALKGROUP 1 on CONSOLE-1.
- Step 2. Select Alert Tone 1 and depress the Alert Tone button.
- Step 3. Verify that RADIO-1 and RADIO-2 hear Alert Tone 1.
- Step 4. Repeat Steps 2-3 for Alert Tone 2 and 3.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Call Alert

1. DESCRIPTION

Call Alert Page allows a subscriber/dispatcher to selectively alert another radio unit. The initiating subscriber/console will receive notification as to whether or not the call alert was received. Units receiving a Call Alert will sound an alert tone and show a visual alert indication. The display will also show the individual ID of the initiating subscriber/console unit.

SETUP

RADIO-1 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.030

2. TEST

- Step 1. Using CONSOLE-1, select the call alert button in the "Private Call" resource window.
- Step 2. Enter the ID of RADIO-1 and send the call alert to RADIO-1.
- Step 3. Verify that RADIO-1 receives the alert and that the ID or alias of the console is shown.
- Step 4. Turn off RADIO-1.
- Step 5. Using CONSOLE-1, send the call alert to RADIO-1 again.
- Step 6. Verify that after trying to page RADIO-1, the console displays "Can not send call alert - target not found" in the summary/status list.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Secure / Clear Cross-Mode Indication

1. DESCRIPTION

This test validates the ability of the console to show a visual indication of a Secure and Clear mode mismatch during the following conditions:

1. Talkgroup on the Console is in secure transmit mode but receiving clear audio.
2. Talkgroup on the Console is in clear transmit mode but receiving secure audio.

SETUP

RADIO-1 - TALKGROUP 1 (Secure TX mode)
CONSOLE-1 - TALKGROUP 1 (Secure TX mode)

VERSION #1.010

2. TEST

- Step 1. Initiate a secure call on RADIO-1.
- Step 2. Verify CONSOLE-1 is able to receive audio from RADIO-1.
- Step 3. Place RADIO-1 in clear TX mode.
- Step 4. Initiate a call on RADIO-1.
- Step 5. Verify CONSOLE-1 is able to receive audio from RADIO-1 and displays a secure mode mismatch indication.
- Step 6. Place RADIO-1 in secure transmit mode and place CONSOLE-1 in clear transmit mode.
- Step 7. Initiate a secure call on RADIO-1.
- Step 8. Verify CONSOLE-1 is able to receive audio from RADIO-1 and displays a secure Cross-Mode Indication.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Console Priority

1. DESCRIPTION

Console Operator Positions have ultimate control of transmitted audio on an assigned voice channel resource. The Console Position has the capability to take control of an assigned voice channel for a talkgroup call so that the operator's audio overrides any subscriber audio. Console priority is a feature that enables dispatchers to gain immediate access to an assigned voice channel so that a central point of audio control exists.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Initiate a Talkgroup call from RADIO-1 on TALKGROUP 1. Keep this call in progress until the test has completed.
- Step 2. Observe that RADIO-2 receives the call.
- Step 3. While the call is in progress, key up CONSOLE-1 on TALKGROUP 1.
- Step 4. Observe that RADIO-2 is now receiving audio from CONSOLE-1 on TALKGROUP 1.
- Step 5. De-key CONSOLE-1.
- Step 6. Verify RADIO-2 now receives RADIO-1 audio.
- Step 7. End the TALKGROUP 1 call from RADIO-1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Alarm Input / Outputs - Aux I/O Option

1. DESCRIPTION

A dispatch console user can simultaneously view the status of all Aux I/O instances pertaining to the AUX I/O object. Change to one AUX I/O instance is simultaneously viewable by all other instances.

SETUP

CONSOLE-1 - TALKGROUP 1
CONSOLE-1 - SITE - CONSITE-1
CONSOLE-2 - TALKGROUP 1
CONSOLE-2 - SITE - CONSITE-1
For this test-

An instance of AUXIO_1 has been created and is assigned as a standalone tile on CONSOLE-1 and CONSOLE-2.

VERSION #1.020

2. TEST

- Step 1. Assign an instance of AUXIO_1 to CONSOLE-1 to a talk resource tile on TALKGROUP 1
- Step 2. Assign instance of AUXIO_1 to CONSOLE-2 to a talk resource tile on TALKGROUP 1.
- Step 3. Change the status of AUXIO_1 on CONSOLE-1.
- Step 4. Verify the standalone tile as well as the talk resource instance on CONSOLE-1 and CONSOLE-2 change and display the same state for AUXIO_1.
- Step 5. Change the status of AUXIO_1 on CONSOLE-2.
- Step 6. Verify the standalone tile as well as the talk resource instance on CONSOLE-1 and CONSOLE-2 change and display the same state for AUXIO_1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Alert Tone with Talk Extend

1. DESCRIPTION

This test will demonstrate that the dispatch console is able to transmit Alt-Tone on a trunking resource during the tone generation period.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

SITE-1 - ZONE 1

CONSOLE-1 -TALKGROUP 1
CONSOLE-1 - SITE - CONSITE 1

VERSION #1.010

2. TEST

- Step 1. Send an Alert tone from CONSOLE-1.
- Step 2. Verify that RADIO-1 hears the Alert tone from CONSOLE-1
- Step 3. Key up general transmit by using CONSOLE-1's mike or foot switch
- Step 4. Verify that RADIO-1 hears audio from CONSOLE-1 during the Alert Tone Talk Extend period.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

Channel Marker

1. DESCRIPTION

A Channel Marker is a distinct, short duration, audible tone over radio and Console speakers. The tone is initiated and cancelled by a console operator.

The tone can be initiated only for the talkgroups or conventional channels. On initiation, it is generated periodically when there is no voice activity. The tone can be used for various purposes. The primary purpose of the tone is to inform radio users that the conventional channel or the trunked talkgroup is currently involved in a high priority situation and they should stay off the channel unless they are involved in the high priority situation. The tone also informs the users that a console operator is actively monitoring the talkgroup.

Note that the Channel Marker tone will only start when there is no voice activity for the selected Talkgroup or conventional channel. The channel Marker tone is sent in a current transmission mode of the Console user.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
CONSOLE-1 - TALKGROUP 1
CONSOLE-2 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Initiate a Channel Marker tone on TALKGROUP 1 from CONSOLE-1.
- Step 2. Verify RADIO-1 and RADIO-2 can monitor the Channel Marker tone on TALKGROUP 1.
- Step 3. Verify CONSOLE-1 and CONSOLE-2 also monitor the Channel Marker tone on TALKGROUP 1.
- Step 4. Initiate a call from RADIO-1 and continue to key longer than the preset Channel Marker tone period for TALKGROUP 1.
- Step 5. Verify while RADIO-1 is keyed, the Channel Marker tone is suppressed.
- Step 6. Verify after RADIO-1 de-keys, the periodic Channel Marker tone continues to be transmitted on TALKGROUP 1.
- Step 7. Cancel the Channel Marker on TALKGROUP 1 from CONSOLE-1.
- Step 8. Verify the Channel Marker is no longer monitored on TALKGROUP 1.

Pass____ Fail____



MCC 7100/7500 Trunked Resources

MOSCAD AUX I/O Status Indications

1. DESCRIPTION

This feature allows configuration of the Console's Momentary Aux IOs into pairs to provide positive feedback of successful remote activation of a MOSCAD Aux IO. The feature allows an operator to see when an Aux IO output is in transition from one state to another. The test can be run on MCC7100 or MCC7500 consoles.

SETUP

AUX IO-1 – Momentary Input -
CONVENTIONAL CHANNEL 1
AUX IO-2 – Momentary Output -
CONVENTIONAL CHANNEL 1
CONSOLE-1 – CONVENTIONAL CHANNEL 1,
AUX IO-1, AUXIO-2

VERSION #1.050

2. TEST

- Step 1. Pair AUX IO-1 and AUX IO-2 on CONSOLE-1
- Step 2. On CONSOLE-1 quickly depress and release AUX IO-1.
- Step 3. Verify that AUX IO-1 changes to the active state indicating that the request is being processed
- Step 4. Verify that AUX IO-2 changes state (either from active to inactive or inactive to active) and at the same time the AuxIO-1 indicator changes from the active to inactive state, showing that the processing of the request has completed and that the monitored device has changed stated.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Alarm Input / Outputs (Aux I/O Option)

1. DESCRIPTION

The alarm inputs of the Aux I/O can be connected to almost any device that requires or can detect a relay closure. These signals can be simulated and monitored in the factory.

SETUP

Connect a multi-meter capable of monitoring closures to the proper pins of the punch block cabled to the Aux I/O. One momentary input and one momentary output should be configured on at least one MCC 7100/7500 console.

CONSOLE-1 - TALKGROUP 1
CONSOLE-1 - SITE - CONSITE 1
Aux I/O punch block pinout:

Aux I/O 1 - pins 26,1
Aux I/O 2 - pins 27,2
Aux I/O 3 - pins 28,3
Aux I/O 4 - pins 29,4

VERSION #1.010

2. TEST

- Step 1. Using a shorting wire, simulate a relay closure on an input via the punch block.
- Step 2. Verify that CONSOLE-1 momentary input displays the icon designated for an ON_STATE.
- Step 3. Remove the shorting wire and verify that CONSOLE-1 displays the icon designated for an OFF_STATE.
- Step 4. Connect the meter to the pins to monitor a relay output.
- Step 5. Verify that the meter reads an open circuit.
- Step 6. Press the output button on the console to initiate a relay closure.
- Step 7. Verify that the meter displays a closed circuit.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Activity Log

1. DESCRIPTION

The Console activity log will show all traffic for the resource assigned to that console to include the time, radio alias, TG, PTT ID and Emergency Call.

The dispatcher has the capability of selecting a logged call within in the "Activity Log Window" for instant transmit on the corresponding logged resource.

This activity log can be logged to a text file for archival purposes.

Note: The log file in the ops will only be seen if you first check Log Activity in Elite Admin application then in folder options uncheck hide hidden system files. The location will be c:\Program Data\MCC7500\MessageMonitorLogs.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-2 – TALKGROUP 2
RADIO-3 – TALKGROUP 3
RADIO-4 – TALKGROUP 4
CONSOLE-1 – TALKGROUP 1, TALKGROUP 2, TALKGROUP 3, TALKGROUP 4

VERSION #1.020

2. TEST

- Step 1. On CONSOLE-1 select the "Show Activity Log" button on the tool bar to open the Activity Log Window.
- Step 2. Initiate calls on RADIO-1, RADIO-2, RADIO-3 and RADIO-4 to log call information and verify calls are displayed in the activity log window.
- Step 3. Select a logged call in the Activity Log Window and verify that the Channel Control Window (CCW) at the top of the Activity log window changes to the corresponding resource. Verify the dispatcher is capable of responding via the instant transmit button.
- Step 4. Open the text file created by the Activity Log and verify call traffic has been archived to the document file.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Remote Monitor

1. DESCRIPTION

Remote Monitor from Console is a call type in which the console operator can select and remotely key a subscriber unit. This allows the dispatcher to monitor the transmit audio remotely and without detection. This feature is useful in situations where the subscriber unit has been stolen, or there is a need to determine if the radio user is incapacitated and cannot activate a PTT (i.e. an officer has been injured or is under duress). The radio being monitored will not show any sign of being keyed up. This test can be run in secure or clear mode on a trunked 9600 or 3600 site.

SETUP

RADIO-1 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Put RADIO-1 into Remote Monitor via the Remote Monitor tile on the CONSOLE-1.
- Step 2. Verify that RADIO-1 keys up without any transmit indication.
- Step 3. Verify any audio is heard by RADIO-2 and CONSOLE-1.
- Step 4. Wait 30 seconds and verify that RADIO-1 dekeys.

Pass_____ Fail_____



MCC 7100/7500 Trunked Resources

Instant Recall Recorder (IRR) Operation

1. DESCRIPTION

The Instant Recall Recorder (IRR) allows for audio from a phone call or a radio call to be played back at the MCC 7500 or MCC 7100 Console position. Thirty minutes of audio is saved for radio and an additional thirty minutes for telephone. The audio is saved on the positions hard disk in the form of a .wav file.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1 running IRR application.

VERSION #1.020

2. TEST

- Step 1. Select a radio channel on the CONSOLE-1 application window.
- Step 2. Select IRR from the CONSOLE-1 toolbar.
- Step 3. Initiate radio communication between RADIO-1 and RADIO-2.
- Step 4. Verify a new entry appears in the IRR log window.
- Step 5. Select the new entry from the list.
- Step 6. Press play and verify conversation replay.

Pass____ Fail____





MKM 7000 Console Alias Manager (CAM)



MKM 7000 Console Alias Manager (CAM)

Alias Display When Using the MKM 7000

1. DESCRIPTION

This test will demonstrate that a Provisioning Manager (PM) defined alias still works on incoming calls when MKM 7000 solution is installed, although the locally defined ones take precedence, i.e. centrally defined ones will only be used if there is no locally defined alias for the radio that is making an incoming call.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1

A standalone or cohab'ed MKM 7000 server is connected and communicating normally with an MCC 7100/7500 Console.

CONSOLE-1 user is configured to use local alias service.

VERSION #1.030

2. TEST

- Step 1. Log into MKM 7000 GUI and configure an alias for RADIO-1.
- Step 2. Verify that RADIO-2 does not have any alias defined in MKM 7000.
- Step 3. Verify both RADIO-1 and RADIO-2 have their own PM defined aliases. Also verify the PM defined alias for RADIO-1 is different from the one defined by MKM 7000.
- Step 4. Key up RADIO-1 and verify that its locally defined alias shows up on CONSOLE-1, not the PM defined alias.
- Step 5. Key up RADIO-2 and verify that its PM defined alias shows up.

Pass_____ Fail_____



MKM 7000 Console Alias Manager (CAM)

Create a new Subscriber Unit ID to Subscriber Unit Alias Mapping - Conventional

1. DESCRIPTION

This test will demonstrate the capability to create a Subscriber Unit (SU) alias for an SU ID via the MKM 7000 GUI and have it show up on MCC 7100/7500 Console automatically.

The test will work on either a trunked or conventional system. This test will also demonstrate the capability to monitor connection status between MKM 7000 and MCC 7100/7500 Console.

SETUP

A standalone (not cohab) MKM 7000 server is connected and communicating normally with CONSOLE-1.

RADIO-1 - CONVENTIONAL CHANNEL 1

CONSOLE-1 - CONVENTIONAL CHANNEL 1
CONSOLE-1 user is configured to use the local alias service.

VERSION #1.010

2. TEST

- Step 1. CONSOLE-1 user logs into the MCC 7100/7500 console and verifies that the consoles synchronization status with Localized Aliasing is OK, as indicated by a green check mark on the "status screen".
- Step 2. Local Alias Admin logs into MKM 7000 GUI, verify under the Connected Consoles tab that MCC 7100/7500 console is connected to MKM7000.
- Step 3. Create a new SU ID that matches RADIO-1 to be used for this test.
- Step 4. Create a new SU Alias for the SU ID (new mapping between SU ID and SU Alias).
- Step 5. Submit the change.
- Step 6. Wait (up to) 30 seconds, initiate a call using RADIO-1 ON CONVENTIONAL CHANNEL 1, verify the defined SU Alias shows up on CONSOLE-1's CONVENTIONAL CHANNEL 1 resource.

Pass____ Fail____



MKM 7000 Console Alias Manager (CAM)

Create a new Subscriber Unit ID to Subscriber Unit Alias Mapping - Trunking

1. DESCRIPTION

This test will demonstrate the capability to create a Subscriber Unit (SU) alias for an SU ID via the MKM 7000 GUI and have it show up on MCC 7100/7500 Console automatically.

The test will work on either a trunked or conventional system. This test will also demonstrate the capability to monitor connection status between MKM 7000 and MCC 7100/7500 Console.

SETUP

A standalone (not cohab) MKM 7000 server is connected and communicating normally with CONSOLE-1.
RADIO-1 - TALKGROUP 1

CONSOLE-1 - TALKGROUP 1
CONSOLE-1 user is configured to use the local alias service.

VERSION #1.040

2. TEST

- Step 1. CONSOLE-1 user logs into the MCC 7100/7500 console and verifies that the consoles synchronization status with Localized Aliasing is OK, as indicated by a green check mark on the "status screen".
- Step 2. Local Alias Admin logs into MKM 7000 GUI, verify under Connected Consoles tab that the MCC 7100/7500 console is connected to MKM7000.
- Step 3. Create a new SU ID that matches RADIO-1 to be used for this test.
- Step 4. Create a new SU Alias for the SU ID (new mapping between SU ID and SU Alias).
- Step 5. Submit the change.
- Step 6. Wait (up to) 30 seconds, initiate a call using RADIO-1 ON TALKGROUP 1, verify the defined SU Alias shows up on CONSOLE-1's TALKGROUP 1 resource.

Pass_____ Fail_____



MKM 7000 Console Alias Manager (CAM)

Fault Management of MKM 7000 and MCC 7100/7500 Link

1. DESCRIPTION

This test will demonstrate that the link status between MKM 7000 and MCC 7100/7500 is monitored and fault managed by the Unified Event Manager (UEM).

This test will also demonstrate that the MKM 7000 and MCC 7100/7500 both monitor the link status between them.

SETUP

A standalone (not cohabed) MKM 7000 server is connected and communicating normally with an MCC 7100/7500 Console.

The console user is configured to use local alias service.

VERSION #1.030

2. TEST

- Step 1. The console user logs into CONSOLE-1 and verifies that MCC 7100/7500's synchronization status with MKM 7000 server is OK, as indicated by a green check mark on the "system status" screen.
- Step 2. Log into the MKM 7000 GUI and verify the connection to MCC 7100/7500 is up and running under Console Users tab.
- Step 3. Unplug the connection cable between MKM 7000 and MCC 7100/7500 and verify that the UEM shows link failure between MKM 7000 and MCC 7100/7500. Also verify the change of link status shows up on MKM 7000 GUI's Connected Consoles tab and MCC 7100/7500's "system status" screen.
- Step 4. Restore the connection cable between MKM 7000 and MCC 7100/7500 and verify that the UEM shows link failure between MKM 7000 and MCC 7100/7500 has recovered. Also verify the change of link status shows up on MKM 7000 GUI's Console Users tab and MCC 7100/7500's "system status" screen.
- Step 5. Log the console user out of CONSOLE-1 and verify that UEM shows link status is now "unconfigured user logout".

Pass____ Fail____



MKM 7000 Console Alias Manager (CAM)

MKM 7000 Fault Management

1. DESCRIPTION

This test will demonstrate that the MKM 7000's operational state is monitored and reported by the Unified Event Manager (UEM).

SETUP

A standalone (not cohabed) MKM 7000 server is connected and communicating normally with an MCC 7100/7500 Console.

VERSION #1.030

2. TEST

- Step 1. Verify the MKM 7000 is up and running.
- Step 2. Verify on UEM that the state of the MKM 7000 is "enabled".
- Step 3. In "Configuration Manager" of the MKM 7000, disable MKM 7000 (under Server Control tab) and verify on UEM that this is reported accordingly.
- Step 4. In "Configuration Manager" of MKM 7000, re-enable MKM 7000 (under Server Control tab) and verify on UEM that this is reported accordingly.

Pass_____ Fail_____





Radio Control Manager (RCM) Features



Radio Control Manager (RCM) Features

Radio Check

1. DESCRIPTION

Radio Check is a Radio Control Manager (RCM) command used to verify that a radio is active in the trunking system. The Radio Check command causes the Zone Controller to poll for the radio requesting that the radio re-affiliate. When the radio re-affiliates, the RCM then has the knowledge that the radio is powered on and within system range. If the radio is involved in a conversation, whether group or interconnect, the RCM application displays a message to that effect.

The information displayed by the RCM in response to the Radio Check command is: current talkgroup affiliation, the multigroup that the talkgroup is attached to (assuming the talkgroup belongs to a multigroup), and the site where the radio is affiliated. If the radio does not respond to the Radio Check command, a message to that effect displays.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2

VERSION #1.020

2. TEST

- Step 1. Select the Command menu and then select the Radio Check item to open the Radio Check window.
- Step 2. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button.
- Step 3. Observe the radio is polled and the current radio information is displayed on the RCM.
- Step 4. Turn off RADIO-1.
- Step 5. Enter the ID or alias of the RADIO-1 into the entry box and click the Apply button.
- Step 6. Observe that the RCM displays "Radio Not Found."
- Step 7. Depress and hold the PTT button of RADIO-2 until instructed to release.
- Step 8. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button. Observe that a busy for the radio is displayed on the RCM.
- Step 9. Release the PTT button on RADIO-2.
- Step 10. Observe the radio is polled and the current radio information is displayed on the RCM.

Pass____ Fail____



Radio Control Manager (RCM) Features

Radio Check (Single Site)

1. DESCRIPTION

Radio Check is a Radio Control Manager (RCM) command used to verify that a radio is active in the trunking system. The Radio Check command causes the Zone Controller to poll for the radio requesting that the radio re-affiliate. When the radio re-affiliates, the RCM then has the knowledge that the radio is powered on and within system range. If the radio is involved in a conversation, whether group or interconnect, the RCM application displays a message to that effect.

The information displayed by the RCM in response to the Radio Check command is: current talkgroup affiliation, the multigroup that the talkgroup is attached to (assuming the talkgroup belongs to a multigroup), and the site where the radio is affiliated. If the radio does not respond to the Radio Check command, a message to that effect displays.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

VERSION #1.020

2. TEST

- Step 1. Select the Command menu and then select the Radio Check item to open the Radio Check window.
- Step 2. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button.
- Step 3. Observe the radio is polled and the current radio information is displayed on the RCM.
- Step 4. Turn off RADIO-1.
- Step 5. Enter the ID or alias of the RADIO-1 into the entry box and click the Apply button.
- Step 6. Observe that the RCM displays "Radio Not Found."
- Step 7. Depress and hold the PTT button of RADIO-2 until instructed to release.
- Step 8. Enter the ID or alias of RADIO-2 into the entry box and click the Apply button. Observe that a busy for the radio is displayed on the RCM.
- Step 9. Release the PTT button on RADIO-2.
- Step 10. Observe the radio is polled and the current radio information is displayed on the RCM.

Pass____ Fail____



Radio Control Manager (RCM) Features

Radio Snapshot

1. DESCRIPTION

Snapshot is a Radio Control Manager (RCM) command used to retrieve information about an individual radio. Information provided by the RCM application in response to the Snapshot command includes: the serial number of the radio, current talkgroup/multigroup and site affiliations; the Regroup, Inhibit, and Selector Lock state of the radio. Snapshot information is taken from the system databases. The Snapshot command does not initiate any communication with the target radio.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 3

* RADIO-1 and RADIO-3 must be programmed with Dynamic Regrouping capability.

*Make sure Radio Users are configured with a "Radio Primary Talkgroup Assignment" in the UCM.

VERSION #1.020

2. TEST

- Step 1. Submit a Dynamic Regroup command for RADIO-1 and RADIO-3 to be regrouped to TALKGROUP 3.
- Step 2. At the RCM, initiate the Snapshot command for RADIO-1.
- Step 3. Verify that the RCM shows RADIO-1 affiliated to SITE 1 and that its current Regroup state is "Regroup."
- Step 4. At the RCM, revert the dynamic regrouping on RADIO-1 and RADIO-3.
- Step 5. Initiate the Snapshot command for RADIO-1.
- Step 6. Verify RADIO-1 shows an affiliation to SITE 1 and that its current Regroup state is "Cancel Regroup."
- Step 7. At the RCM, inhibit RADIO-2 and then initiate the Snapshot command for RADIO-2.
- Step 8. Verify RADIO-2 shows an affiliation to SITE 2 and that its current Inhibit state is "Selective Inhibit."
- Step 9. At the RCM, revert RADIO-2 and then initiate the Snapshot command for RADIO-2.
- Step 10. Verify RADIO-2 shows an affiliation to SITE 2 and that its current Inhibit state is "Cancel Inhibit."

Pass____ Fail____



Radio Control Manager (RCM) Features

Radio Status

1. DESCRIPTION

This optional feature allows the Radio Control Manager (RCM) to view status information sent in by subscribers. Statuses are used to indicate the Radio operator's operational state (e.g. off duty). The information that will be displayed includes the radio alias, talkgroup alias, hour and minute time stamp, status number or message number, and the customer entered translation for the specific status. Status input is displayed in chronological order, independent of the type of status number.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

Pass_____ Fail_____

* Configure RADIO-1 in the manager to use a particular status set.

* Configure the assigned status set (via the status set manager configuration objects) to include text translations for a few different statuses.

* The RCM user needs to be assigned the dispatch attachment group that matches the radio user's assigned dispatch attachment group.

VERSION #1.020

2. TEST

Step 1. Initiate a Status transmission from RADIO-1.

Step 2. Verify the RCM displays the proper Status text.



Radio Control Manager (RCM) Features

Dynamic Regrouping

RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 3
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 4

1. DESCRIPTION

VERSION #1.020

Dynamic Regrouping allows the Radio Control Manager (RCM) to assign individual radios operating in different talkgroups to a temporary talkgroup via the Regroup command. Network managers or supervisors can override individual radio talkgroup selections by steering regrouped subscribers to a new talkgroup containing users which need to communicate on a temporary basis. After receiving a Regroup command, a radio will ignore the current setting of the talkgroup selector and move to the target talkgroup specified in the Regroup command. Unless the supervisor issues a LOCK command, the radio user can deselect the target talkgroup by selecting another talkgroup using the radio selector. A unique location on the radio selector is reserved for the target talkgroup following a Regroup command.

Dynamic Regrouping assignments can be initiated rapidly, but not instantaneously. Regrouping is best suited for planned activities or occasional changes from normal routines. It is not intended for immediate responses such as high speed chases or for a rapid deployment on a per incident basis.

Regrouped radios receiving a second Regroup command will move to the new target talkgroup specified in the second command. When a regrouped radio receives a Regroup command, all information pertaining to the previous Regroup command is lost. A Cancel Regroup command or a Revert returns an individual radio to its normal operation.

Note - RCM user must be attached to primary and target talkgroup.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

Lake County, Illinois
Countywide Radio Communications System RFP \$13231
PS-000042156

August 12, 2014
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2. TEST

- Step 1. With the RCM open from the Commands menu item select the Radio Commands item to open the command window. Choose Regroup.
- Step 2. Enter TALKGROUP 3 in the target field.
- Step 3. Enter the IDs or aliases of RADIO-1, RADIO-2, RADIO-3 and RADIO-4.
- Step 4. Once all desired radio information is entered and appears in the command window click the Regroup button to initiate the command.
- Step 5. Observe all radios are regrouped and are able to communicate on TALKGROUP 3.
- Step 6. Switch the Subscriber to the Dynamic Regroup channel to acknowledge the group request.
- Step 7. Observe that the radios are able to select different talkgroups and are not locked onto the regrouped mode. Note- The Talkgroup selector knob has to be set to the dynamic regroup position before switching to any other talkgroup.
- Step 8. Observe that the Regroup task appears in the Command Monitor window.
- Step 9. Issue a Selector Lock command all four radios and verify their selectors have been locked.
- Step 10. Revert both commands and verify the radios have returned to normal operation.

Pass_____ Fail_____



Radio Control Manager (RCM) Features

Selective Radio Inhibit

1. DESCRIPTION

The INHIBIT command issued by the Radio Control Manager (RCM) disables a radio, preventing it from transmitting or receiving any audio. All of the radio's functionality ceases while a radio is inhibited by the RCM. Once inhibited, the radio cannot be used to monitor voice channels or for any other radio user initiated activity. Note that an inhibited radio still monitors the control channel so that it can be re-enabled with the Cancel Inhibit command. Upon receiving the Cancel Inhibit command from the RCM, the radio returns to its normal operation.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1

VERSION #1.020

2. TEST

- Step 1. From the Radio Control Manager select the Commands menu and then select the Radio Commands item in the menu to open the Command Window.
- Step 2. Enter the IDs or aliases of RADIO-1.
- Step 3. Select "Selective Inhibit" from the command pull down menu.
- Step 4. Once all desired radio information is entered and appears in the command window click the submit button to initiate the command.
- Step 5. Observe RADIO-1 is inhibited and appears to be dead.
- Step 6. Observe that the Inhibit task appears in the Command Monitor window.
- Step 7. Cancel the Inhibit by selecting the task in the Command Monitor window and clicking the Revert button to submit the task.
- Step 8. Observe that the Cancel Inhibit task appears in the Command Monitor window and that RADIO-1 is returned to normal operation.

Pass_____ Fail_____



Radio Control Manager (RCM) Features

Emergency Alarm Display (Single Site)

1. DESCRIPTION

The emergency call information that is displayed on the Radio Control Manager (RCM) includes the radio alias of the radio that initiated the Emergency Alarm, the talkgroup that the radio was affiliated to at the time the alarm was sent, and the time the alarm was received.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

One RCM, which has TALKGROUP 1 attached is required.

VERSION #1.020

2. TEST

- Step 1. Open the Radio Control Manager (RCM) window(s) and verify that the Emergency Alarm window is visible. If it is not, go to the View menu and select it bringing it into the RCM viewable area.
- Step 2. Initiate an Emergency Alarm from RADIO-1.
- Step 3. Observe that the RCM receives the Emergency Alarm.
- Step 4. Acknowledge the Emergency by selecting the Emergency in the window and clicking on the Respond button.
- Step 5. Verify the window displays the radio alias, the talkgroup, and the time the alarm was received.
- Step 6. Again, select the displayed Emergency and click the Delete button to clear the emergency.
- Step 7. Reset the radio by holding the Emergency button until the radio clears.
- Step 8. Repeat Steps 1-7 using RADIO-2.

Pass____ Fail____



Radio Control Manager (RCM) Features

Storm Plans

1. DESCRIPTION

Storm Plans represent any number of preprogrammed Dynamic Regrouping combinations constructed in advance to anticipate a unique need, such as a disaster, or to make a needed adjustment for an infrequent yet repeated event, like a parade or election. When implemented, a Storm Plan will automatically assign individual radios operating in different talkgroups to a temporary talkgroup, containing the radios specified by the stored Dynamic Regrouping command. Storm Plans are deactivated by selecting the revert option in the Command window.

Note - Radios are not required to be locked to a specific site for this test.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 3
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 4

Create a storm plan in the Provisioning Manager (PM) that regroups RADIO-1 and RADIO-2 to TALKGROUP 2.

VERSION #1.030

2. TEST

- Step 1. With the Radio Control Manager (RCM) open from the Commands menu item select the Storm Plan item to open the Storm Plan Window.
- Step 2. Select the Storm Plan.
- Step 3. Click on OK or Apply to invoke the Storm Plan.
- Step 4. Observe that the Storm Plan appears in the Command Monitor window.
- Step 5. Observe RADIO-1 and RADIO-2 are regrouped.
- Step 6. Initiate a call from RADIO-1.
- Step 7. Observe that RADIO-2, RADIO-3 and RADIO-4 are able to communicate with one another.
- Step 8. Un-regroup the radios by selecting the task in the Command Monitor window and clicking on the Revert button to submit the task.
- Step 9. Observe that the regrouping of the radios is now dissolved.

Pass_____ Fail_____





Wide Area Trunking FDMA/TDMA Mixed Sites



Wide Area Trunking FDMA/TDMA Mixed Sites

Auto Site Affiliation

1. DESCRIPTION

A Radio affiliation is a function that links a unique radio ID and unique talkgroup to a specific site. This information is stored in a affiliation table in the zone database. Before resources are assigned, the affiliation table is accessed to know which sites need to be assigned to support the call. Only the sites that need to be assigned that have associated talkgroups will be assigned. If the site does not have that talkgroup affiliated to it will not be assigned. This allows for more calls to be processed with fewer resources.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 2
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 2

This test requires the ZoneWatch feature.

Note: There are system settings which could affect the assignment of resources, such as required site.

VERSION #1.030

2. TEST

- Step 1. Turn RADIO-1 off and on.
- Step 2. Verify via ZoneWatch that RADIO-1 sends in its affiliation.
- Step 3. Initiate a call using RADIO-1 on TALKGROUP 1.
- Step 4. Verify RADIO-2 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at SITE 2 as there are no subscribers affiliated to TALKGROUP 1 at SITE 2.
- Step 5. Initiate a call on TALKGROUP 2 using RADIO-3.
- Step 6. Verify that RADIO-4 can receive and respond to the call. Using ZoneWatch verify that no resources are assigned at SITE 1 as there are no subscribers affiliated to TALKGROUP 2 at SITE 1.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Talkgroup Call

1. DESCRIPTION

The Talkgroup is the primary level of organization for communications on a trunked radio system. Radios with Talkgroup call capability will be able to communicate with other members of the same Talkgroup. This provides the effect of a private channel down to the Talkgroup level.

This test will demonstrate that a Talkgroup transmission initiated by a radio user will only be heard by system users, which have, the same Talkgroup selected. As with other types of calls, Talkgroup calls can take place from anywhere in the system.

SETUP

RADIO-1 - SITE 1 - TALKGROUP 1
RADIO-2 - SITE 2 - TALKGROUP 1
RADIO-3 - SITE 1 - TALKGROUP 2
RADIO-4 - SITE 2 - TALKGROUP 2

VERSION #1.040

2. TEST

- Step 1. Initiate a Wide Area Call with RADIO-1 in TALKGROUP 1.
- Step 2. Observe that only RADIO-2 will be able to monitor and respond to the call.
- Step 3. Initiate a Wide Area Call with RADIO-3 in TALKGROUP 2.
- Step 4. Observe that only RADIO-4 will be able to monitor and respond the call.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Secure Operation

1. DESCRIPTION

Digital encryption is used to scramble a transmission so only properly equipped and configured radios can monitor the conversation. A "Key" is used to encrypt the transmit audio. Only radios with the same "Key" can decrypt the audio and listen to it.

SETUP

RADIO-1 - TALKGROUP 1 (SECURE TX MODE)
RADIO-2 - TALKGROUP 1 (SECURE TX MODE)
RADIO-3 - TALKGROUP 1 (SECURE MODE and no, or incorrect key)
RADIO-4 - TALKGROUP 1 (Clear TX Mode)

Note: The identical secure mode must be programmed into RADIO-1, RADIO-2, RADIO-4 and that RADIO-3 has no secure code loaded or has a unique secure code from the other testing radios.

VERSION #1.020

2. TEST

- Step 1. Initiate a secure wide area call with RADIO-1 on TALKGROUP 1. Keep this call in progress until instructed to end the call.
- Step 2. Observe that RADIO-2 will be able to monitor the call.
- Step 3. Observe that RADIO-3 does not receive the call.
- Step 4. Observe that RADIO-4 will also receive the call even with the secure switch set to the non-secure mode of operation.
- Step 5. End the call from RADIO-1.
- Step 6. Respond with RADIO-2 and verify that RADIO-1 receives the response audio but RADIO-3 cannot.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Continuous Assignment Updating

1. DESCRIPTION

When a talkgroup is assigned a voice channel, the site controller continues to transmit the channel assignment on the control channel for the duration of the talkgroup call. Radios coming into use on the system are automatically sent to voice channels with conversations in progress involving their selected talkgroups.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Turn OFF RADIO-1.
- Step 2. Initiate a Talkgroup Call using RADIO-2 and verify RADIO-3 hears the audio.
- Step 3. While the Talkgroup Call is in progress, turn ON RADIO-1.
- Step 4. Observe RADIO-1, which was just brought back into service, joins the Talkgroup Call already in progress.
- Step 5. End the talkgroup call.
- Step 6. Switch RADIO-1 to another talkgroup.
- Step 7. Initiate a Talkgroup Call from RADIO-2 to RADIO-3.
- Step 8. While the Talkgroup Call is in progress, set RADIO-1 back to TALKGROUP 1.
- Step 9. Observe that RADIO-1 joins the Talkgroup Call already in progress.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Talkgroup Call Mode Change

1. DESCRIPTION

The Talkgroup is the primary level of organization for communications on a trunked radio system. Radios with Talkgroup Call capability will be able to communicate with other members of the same Talkgroup. This provides the effect of a private channel down to the Talkgroup level. The FDMA/TDMA mode of the call depends on Talkgroup programming, the capabilities of radios registered to the talkgroup and the capabilities of the sites at which they are registered. The FDMA/TDMA mode of a "Dynamic" Talkgroup call depends on the capabilities of the radios registered to the Talkgroup. A TDMA to FDMA mode change is preceded by transmission trunking. A call in the FDMA mode remains in that mode until the call drops. An FDMA call will not be transmission trunked and changed to a TDMA call.

Note: The FDMA/TDMA mode of a call can not change during a PTT. TALKGROUP 1 and TALKGROUP 2 are programmed for "Dynamic". SITE 1 and SITE 2 must be TDMA capable.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 (TDMA) - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Turn off RADIO-8.
- Step 2. Initiate a wide area call with RADIO-1 on TALKGROUP 1. Keep the call in progress until instructed to end it.
- Step 3. Observe that only RADIO-2 will be able to monitor and respond to the call. Observe that the channel is assigned in the TDMA mode since there are no FDMA-only radios in the call.
- Step 4. Turn on RADIO-8. Note that RADIO-8 cannot hear the call which is still in the TDMA mode.
- Step 5. Dekey RADIO-1. Observe that the channel dequeys immediately.
- Step 6. Initiate a wide area call with RADIO-1 on TALKGROUP 1. Keep the call in progress until instructed to end it.
- Step 7. Observe that both RADIO-2 and RADIO-8 will now be able to monitor and respond to the call. Observe that the channel is now assigned in the FDMA mode.
- Step 8. Turn off RADIO-8.
- Step 9. Dekey RADIO-1 and have RADIO-2 initiate the call during the hangtime. Observe that the channel is still assigned in the FDMA mode.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Call Alert

1. DESCRIPTION

Call Alert is a tone page that allows a user to selectively alert another radio unit. The initiating radio will receive notification from the trunked system as to whether or not the page was received by the target radio. Units receiving a Call Alert will sound an alert tone. As with other types of calls, Call Alerts can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - TALKGROUP 3

VERSION #1.010

2. TEST

- Step 1. Using RADIO-1, press the page button.
- Step 2. Enter the unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored
- Step 3. Press the PTT to initiate the call alert. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.
- Step 4. Verify that RADIO-2 user receives an audible indication of an incoming Call Alert was sent but RADIO-3 does not.
- Step 5. Verify RADIO-1 gets an audible indication that the Call Alert was successfully received at the target radio.
- Step 6. Turn off RADIO-2. Send a Call Alert from RADIO-1 to RADIO-2.
- Step 7. Verify that the RADIO-1 user receives audible indication that the Call Alert was sent.
- Step 8. Verify RADIO-1 receives a "No Acknowledgement" indication that the Call Alert was not received at the target radio.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

In Call User Alert (Enabled)

1. DESCRIPTION

In-Call User Alert enhances the Call Alert feature to allow Call Alerts to be received by radios that are currently involved in voice and data services. As part of this feature, the radio supports Talkgroup Muting where the radio user can mute all talkgroup voice received by the radio. The Console Dispatcher or another radio user can unmute the radio by sending the radio a Call Alert.

Note: Talkgroup Muting is a programmable option in the radio. There are also sub-options which will affect the time and operation of the Talkgroup muting.

SETUP

RADIO-1 - TALKGROUP 1

RADIO-2 - TALKGROUP 2

CONSOLE-1 - TALKGROUP 1

Verify that In-Call User Alert is enabled in the Unified Network Configurator Wizard.

VERSION #1.020

2. TEST

- Step 1. Verify that RADIO-1 and RADIO-2 have Talkgroup Muting (VMUT) disabled in the radios.
- Step 2. Enable Talkgroup Muting (VMUT) on RADIO-1.
- Step 3. Verify that there is a visual indication on RADIO-1 that Talkgroup Muting is enabled.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 5. Verify that no audio is heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 6. Send a Call Alert to RADIO-1 from RADIO-2. Verify that RADIO-1 receives a Call Alert and that RADIO-2 indicates success of Call Alert. Verify that CONSOLE-1 audio is now heard by RADIO-1
- Step 7. End Console talkgroup call.
- Step 8. Acknowledge Call Alert by hitting home key on RADIO-1.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

In Call User Alert (Disabled)

1. DESCRIPTION

In-Call User Alert enhances the Call Alert feature to allow Call Alerts to be received by radios that are currently involved in voice and data services. As part of this feature, the radio supports Talkgroup Muting where the radio user can mute all talkgroup voice received by the radio. The Console Dispatcher or another radio user can unmute the radio by sending the radio a Call Alert.

Note: Talkgroup Muting is a programmable option in the radio. There are also sub-options which will affect the time and operation of the Talkgroup muting.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
CONSOLE-1 - TALKGROUP 1

VERSION #1.010

2. TEST

- Step 1. Verify that In-Call User Alert is disabled. Verify that RADIO-1 and RADIO-2 have Talkgroup Muting (VMUT) disabled (Off) in the radios.
- Step 2. Enable Talkgroup Muting (VMUT) (Turn on) on RADIO-1.
- Step 3. Verify that there is a visual indication on RADIO-1 that Talkgroup Muting is enabled.
- Step 4. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 5. Verify that no audio is heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 6. Send a Call Alert to RADIO-1 from RADIO-2. Verify that RADIO-1 does not receive a Call Alert and that RADIO-2 indicates failure of Call Alert. End Console talkgroup call.
- Step 7. Send a Call Alert to RADIO-1 from CONSOLE-1. Accept the Call Alert at RADIO-1 by pressing the Home key.
- Step 8. Initiate a talkgroup call on TALKGROUP 1 from CONSOLE-1.
- Step 9. Verify that audio is now heard by RADIO-1 and that RADIO-1 displays the ID of CONSOLE-1.
- Step 10. End Console talkgroup call.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Multigroup Call in Wait Mode

1. DESCRIPTION

This trunking feature allows an equipped radio user to transmit an announcement to several different talkgroups simultaneously. The multigroup (ATG) call can be flagged for Wait Mode in the Provisioning Manager (PM) database forcing all attached talkgroups to finish calls in progress before the trunked system will process the multigroup call. The system does not permit inactive, attached talkgroups to initiate Talkgroup Calls during the "wait" timeframe. As with other types of calls, multigroup calls can take place from anywhere in the system.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 2
RADIO-3 - RANDOM (Not part of MG)
RADIO-4 - ATG 1

* TALKGROUP 1 and TALKGROUP 2 are members of ATG 1.

* RANDOM is any talkgroup not a member of ATG 1.

* Multigroups are set up through both the Provisioning Manager (PM) and the Subscriber Programming software.

VERSION #1.020

2. TEST

- Step 1. Verify ATG 1 is set for the Wait mode.
- Step 2. Using RADIO-1, initiate a call on TALKGROUP 1.
- Step 3. While RADIO-1 is keyed, attempt to initiate a multigroup call using RADIO-4 on ATG 1. Verify RADIO-4 receives a busy tone because one of the talkgroups attached to ATG 1 is involved in a Talkgroup Call.
- Step 4. Key RADIO-2 and verify that a busy tone is received because the ATG 1 call is in queue.
- Step 5. Dekey RADIO-1 and verify RADIO-4 receives a callback.
- Step 6. Key RADIO-4 and verify both RADIO-1 and RADIO-2 hear the multigroup call while RADIO-3 does not unmute.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Multigroup Call in Interrupt Mode

1. DESCRIPTION

This trunking feature allows an equipped radio user to transmit an announcement to several different talkgroups simultaneously. When the multigroup (MG) is flagged for Interrupt Mode the trunked system does not wait for attached talkgroups to finish calls in progress. Upon dekeying, the interrupted radios will join the multigroup call in progress. As with other types of calls, multigroup calls can take place from anywhere in the system.

NOTE: A receiver interference failure may appear if RADIO-1 is not immediately dekeyed. This test is not recommended for single site systems as RF contention will occur.

SETUP

RADIO-1 - TALKGROUP 3
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 4
RADIO-2 - SITE - SITE 1
RADIO-3 - RANDOM (Not part of MG)
RADIO-3 - SITE - SITE 2
RADIO-4 - ATG 2
RADIO-4 - SITE - SITE 2

* TALKGROUP 3 and TALKGROUP 4 are members of ATG 2.

* RANDOM is any talkgroup not a member of ATG 2.

VERSION #1.010

2. TEST

- Step 1. Verify ATG 2 is set for the Interrupt mode.
- Step 2. Using RADIO-1, initiate a call on TALKGROUP 3.
- Step 3. While RADIO-1 is keyed, initiate a multigroup call using RADIO-4 on ATG 2. Verify RADIO-2 receives the call but RADIO-3 does not unmute.
- Step 4. Dekey RADIO-1 and verify RADIO-1 unmutes and joins the multigroup call in progress.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Multigroup Call - TDMA Only Group

1. DESCRIPTION

This trunking feature allows an equipped radio user to transmit an announcement to several different talkgroups simultaneously. As with other types of calls, multigroup calls can take place from anywhere in the system. If the multigroup is flagged as TDMA-only, then the system requires that all talkgroups that are part of the multigroup must be flagged as TDMA-only or dynamic. If a dynamic talkgroup currently operated in FDMA mode is part of a TDMA only multigroup, then all the TDMA users of the dynamic talkgroup can get the audio but FDMA users of the dynamic talkgroup can not get the audio from the multigroup call.

Note: TALKGROUP 5, TALKGROUP 6 are programmed as "Dynamic" and members of ATG 3. SITE 1 and SITE 2 are TDMA capable. ATG 3 is programmed as "TDMA-only".

SETUP

RADIO-1 (TDMA) - TALKGROUP 5
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 6
RADIO-2 - SITE - SITE 1
RADIO-4 (TDMA) - ATG 3
RADIO-4 - SITE - SITE 2
RADIO-8 (FDMA-only) - TALKGROUP 6
RADIO-8 - SITE - SITE 2

VERSION #1.020

2. TEST

- Step 1. Using RADIO-4, initiate a call on ATG 3.
- Step 2. Verify that RADIO-1 and RADIO-2 can monitor the call. Observe that the channel is assigned in the TDMA mode.
- Step 3. Observe that RADIO-8 cannot monitor the call because it is not TDMA capable.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Audio Interrupt / Interrupt Never Mode

1. DESCRIPTION

A radio PTT request may be received for a group already active and currently being sourced by another radio unit. The talkgroup can be flagged to either allow or disallow the new PTT. If allowed, the latest PTT request will be granted and become the source of the call.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-2 - TALKGROUP 1
RADIO-3 - TALKGROUP 1

VERSION #1.020

2. TEST

- Step 1. Verify TALKGROUP 1's template is set up as Audio Interrupt Never.
- Step 2. Using RADIO-1, initiate a call on TALKGROUP 1.
- Step 3. Verify both RADIO-2 and RADIO-3 monitor the audio.
- Step 4. Using RADIO-3, initiate a call on TALKGROUP 1.
- Step 5. Verify that RADIO-3 receives a reject and that RADIO-2 continues to listen to RADIO-1.
- Step 6. Dekey both Radios.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Audio Interrupt / Interrupt Always Mode

1. DESCRIPTION

A radio PTT request may be received for a group already active and currently being sourced by another radio unit. The talkgroup can be flagged to either allow or disallow the new PTT. If allowed, the latest PTT request will be granted and become the source of the call.

Note: This test is not recommended for single site systems as RF contention will occur.

SETUP

RADIO-1 - TALKGROUP 4
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 4
RADIO-2 - SITE - SITE 2
RADIO-3 - TALKGROUP 4
RADIO-3 - SITE - SITE 2

VERSION #1.020

2. TEST

- Step 1. Verify TALKGROUP 4's template to be Audio Interrupt Always.
- Step 2. Using RADIO-1, initiate a call on TALKGROUP 4.
- Step 3. Verify both RADIO-2 and RADIO-3 monitor the audio.
- Step 4. Using RADIO-3, initiate a call on TALKGROUP 4.
- Step 5. Verify that RADIO-2 now listens to RADIO-3.
- Step 6. Dekey both Radios.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Audio Interrupt On Priority

1. DESCRIPTION

The system manager has the ability to allow users to interrupt calls in progress. There are 3 different settings, "Never" prevents all audio interrupt requests, "Always" allows the system to automatically grant audio interrupt requests on the same talkgroup and "On Priority" allows the system to use Subscriber ID priority in order to interrupt other radios. A radio with higher individual priority will interrupt another radio with lower individual priority.

SETUP

RADIO-1 – TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 – TALKGROUP 1
RADIO-2 - SITE - SITE 2
RADIO-3 – TALKGROUP 1
RADIO-3 - SITE - SITE 1

Note:
TALKGROUP 1 has been configured to
Audio_Interrupt = On_Priority

VERSION #1.030

2. TEST

- Step 1. Verify the radio user record for RADIO-2 has been configured for a higher priority level than RADIO-1.
- Step 2. Initiate a call using RADIO-1. Keep this call in progress until the completion of step 4. Verify RADIO-2 and RADIO-3 hear RADIO-1 audio.
- Step 3. Initiate a call using RADIO-2. Verify RADIO-3 hears RADIO-2 audio.
- Step 4. End the call on RADIO-2. Verify RADIO-2 and RADIO-3 hear RADIO-1 audio.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Multigroup Call

1. DESCRIPTION

This trunking feature allows an equipped radio user to transmit an announcement to several different talkgroups simultaneously. As with other types of calls, multigroup calls can take place from anywhere in the system. A Dynamic multigroup can contain FDMA-only, TDMA-only and Dynamic talkgroups. The FDMA/TDMA mode of a "Dynamic" multigroup will be determined by the capabilities of the radios affiliated to the talkgroups and multigroup and the capabilities of the sites where the radios are affiliated.

Note: TALKGROUP 1, TALKGROUP 2 are members of ATG 1 and programmed as "Dynamic". SITE 1 and SITE 2 must be TDMA capable. ATG 1 is programmed as Dynamic.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-4 (TDMA) - ATG 1
RADIO-4 - SITE - SITE 2
RADIO-8 (FDMA-only) - TALKGROUP 2
RADIO-8 - SITE - SITE 2

VERSION #1.010

2. TEST

- Step 1. Turn off RADIO-8.
- Step 2. Using RADIO-4, initiate a call on ATG 1.
- Step 3. Observe that RADIO-1 and RADIO-2 can monitor the call. Observe that the channel is assigned in the TDMA mode since there are no FDMA radios affiliated to either talkgroup.
- Step 4. Dekey RADIO-4 and turn on RADIO-8.
- Step 5. Using RADIO-4, initiate a call on ATG 1.
- Step 6. Observe that RADIO-1, RADIO-2 and RADIO-8 can monitor the call. Observe that the channel is now assigned in the FDMA mode.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Busy Queue Conversion

1. DESCRIPTION

If no voice channel resources are available, radios requesting channels for new conversations are placed in a queue. Users of the same priority will move through the queue in a FIFO (first in, first out) sequence. When a voice channel becomes available, the radio at the top of the busy queue gets a channel assignment and generates a callback tone if the FDMA/TDMA mode of the call can be supported by the available resource. While the call is waiting in the busy queue, the FDMA/TDMA mode of a talkgroup at a site in site trunking can be change as radios join or leave the talkgroup.

NOTE: All radios and talkgroups should start with default priorities. The Default is 10.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 2
RADIO-8 - SITE - SITE 1
RADIO-9 (FDMA-only) - TALKGROUP 2
RADIO-9 - SITE - SITE 1

VERSION #1.010

2. TEST

- Step 1. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 2. Initiate a TALKGROUP 2 call using RADIO-9. Verify RADIO-8 receives the call. Keep the call in progress until instructed to end it. Observe that the channel is assigned in the FDMA mode.
- Step 3. Initiate a TALKGROUP 1 call using RADIO-1 and observe that the radio receives a busy.
- Step 4. Dekey RADIO-9 and observe that RADIO-1 receives a callback and can make the call. Observe that the channel is assigned in the TDMA mode since there are no FDMA-only radios in the call.
- Step 5. Initiate a TALKGROUP 2 call using RADIO-9 and observe that the radio receives a busy.
- Step 6. Dekey RADIO-1 and observe that RADIO-9 receives a callback and can make the call. Observe that the channel is assigned in the FDMA mode.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Emergency Alarm and Call with Ruthless Preemption - FDMA call over-rides

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. To accomplish this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber affiliated at any site of any zone in the system. In this test case, the emergency call will cause 2 TDMA calls to be pre-empted.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed. This test is not recommended for single site systems as RF contention will occur. SITE 1 must be TDMA capable.

SETUP

RADIO-1 (TDMA) - TALKGROUP 5
RADIO-1 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 (TDMA) - TALKGROUP 3
RADIO-4 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 5
RADIO-8 - SITE - SITE 1
Note: TALKGROUP 5, TALKGROUP 2 and
TALKGROUP 3 are programmed for "Dynamic".

VERSION #1.020

2. TEST

- Step 1. The emergency type for TALKGROUP 5's template must be configured as Ruthless Preemption.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Initiate a call with both RADIO-3 and RADIO-4 and hold the PTT switches until instructed to release. Both calls are assigned in the TDMA mode to the single voice channel.
- Step 4. Key RADIO-1 and verify the radio receives a busy tone.
- Step 5. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch.
- Step 6. Observe that RADIO-1 is granted the channel immediately and the Talkgroup Calls are dropped for RADIO-3 and for RADIO-4.
- Step 7. Observe that the display on RADIO-8 denotes an emergency and the unit ID of RADIO-1. Also observe that the channel is assigned in the FDMA mode.
- Step 8. Dekey RADIO-3 and RADIO-4.
- Step 9. Exit the Emergency mode by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation.

Pass_____ Fail_____



**Dynamic FDMA/TDMA Busy Queuing and
Callback with Ten Talkgroup Priority
Levels**

1. DESCRIPTION

If no voice channel resources are available, radios requesting channels for new conversations are placed in a queue. Users of the same priority will move through the queue in a first in, first out sequence; however, users of higher priority will be inserted ahead of lower priority users in queue.

When a voice channel becomes available, the radio at the top of the busy queue gets a channel assignment and generates a callback tone if the FDMA/TDMA mode of the call can be supported by the available resource. Otherwise, the first call in the queue that can use the available resource gets assigned. The callback tone alerts the user that a channel assignment was made and transmitting is now possible on the selected talkgroup. In this test case, the available resource can NOT support the FDMA call mode.

NOTE: An Emergency Call has the highest priority at level 1. The highest assignable priority is 2 and 10 is the lowest. All radios and talkgroups should start with default priorities. The default is 10. SITE 1 must be TDMA capable.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-4 (TDMA) - TALKGROUP 4
RADIO-4 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 6
RADIO-8 - SITE - SITE 1
Note: TALKGROUP 1, TALKGROUP 2 and TALKGROUP 6 are programmed for "Dynamic".



2. TEST

- Step 1. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 2. Verify the priority level for TALKGROUP 6's template is configured as priority 9.
- Step 3. Initiate Talkgroup Calls with RADIO-1 and with RADIO-2. Keep these calls in progress until instructed to end them. Both calls are assigned in the TDMA mode to the single voice channel.
- Step 4. Key RADIO-8 and observe that the radio receives a busy.
- Step 5. Key RADIO-4 and observe that the radio receives a busy.
- Step 6. End the call on RADIO-1.
- Step 7. Observe RADIO-4 receives the first callback and can now make a call because the available resource can not support an FDMA call.
- Step 8. End the calls on RADIO-2 and RADIO-4.
- Step 9. Observe RADIO-8 now receives a callback and can make a call upon receipt of the callback indication since there is now a FDMA channel available.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Emergency Alarm and Call mode change

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel if the FDMA/TDMA mode of the call can be supported by the available resource.

For talkgroups programmed as dynamic, the FDMA/TDMA mode may change from TDMA to FDMA. In that case, the current TDMA call is transmission trunked and started in the FDMA mode on the next PTT. However, the emergency mode is not re-activated until the subscriber with the emergency does a PTT.

NOTE: If the subscriber does not have the PTT Display option, the Emergency ID will not be displayed. All radios and talkgroups should start with default priorities. The default is 10.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 2

Note: TALKGROUP 1 is programmed for "Dynamic". SITE 1 and SITE 2 must be TDMA capable.

VERSION #1.010

2. TEST

- Step 1. Power off RADIO-8.
- Step 2. Using RADIO-1 send an Emergency Call by depressing the emergency switch and then the PTT switch. Observe that the channel is assigned in the TDMA mode since there are no FDMA-only radios in the call.
- Step 3. Verify the display on RADIO-2 denotes an emergency and the unit ID or alias of RADIO-1.
- Step 4. Power on RADIO-8. Note that RADIO-8 cannot hear the call which is in progress in the TDMA mode.
- Step 5. End the call on RADIO-1. Observe that the channel dekeys immediately.
- Step 6. Initiate a call on TALKGROUP 1 with RADIO-1. Keep this call in progress until instructed to end the call.
- Step 7. Verify the displays on RADIO-8 and RADIO-2 both denote an emergency and the unit ID or alias of RADIO-1.
- Step 8. Observe that both RADIO-2 and RADIO-8 will be able to monitor and respond to the call. Observe that the channel is now assigned in the FDMA mode.
- Step 9. Dekey RADIO-1 and end the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds.

Pass____ Fail____



Wide Area Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Emergency Alarm and Call with Top of Queue - FDMA call in queue

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel if the FDMA/TDMA mode of the call can be supported by the available resource. Otherwise, the first call in the queue that can use the available resource gets assigned. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. To accomplish this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber affiliated at any site of any zone in the system. In this case, the first available resource CANNOT support the emergency call mode.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed. All radios and talkgroups should start with default priorities. Default is 10. SITE 1 must be TDMA capable.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 3
RADIO-3 - SITE - SITE 1
RADIO-4 (TDMA) - TALKGROUP 4
RADIO-4 SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 1
Note: TALKGROUP 1, TALKGROUP 2,
TALKGROUP 3 and TALKGROUP 4 are
programmed for "Dynamic".

VERSION #1.010

Lake County, Illinois
Countywide Radio Communications System RFP \$13231
PS-000042156

August 12, 2014

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2. TEST

- Step 1. Verify the emergency type for TALKGROUP 1's template must be set up as Top of Queue.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Initiate a call with both RADIO-2 and RADIO-4 and hold the PTT switches until instructed to release.
- Step 4. Key RADIO-3 and verify the radio receives a busy tone. Release the PTT switch on RADIO-3.
- Step 5. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch. Observe that RADIO-1 cannot transmit due to the voice channel being busy.
- Step 6. Release the PTT switch on RADIO-2. Observe that RADIO-3 receives the call back before RADIO-1 and is able to proceed with the call because the available channel resource is already busy with one TDMA call and can only support another TDMA call.
- Step 7. Dekey RADIO-4 and RADIO-3.
- Step 8. Observe that RADIO-1 receives the callback and is able to proceed with the call.
- Step 9. Observe that the display on RADIO-8 denotes an emergency and the unit ID of RADIO-1.
- Step 10. Dekey RADIO-1 and exit the Emergency mode by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation.

Pass_____ Fail_____



Wide Area Trunking FDMA/TDMA Mixed Sites

Emergency Alarm and Call with Talkgroup Revert

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel. An Emergency Call can be set to either Top of Queue or Ruthless Preemption operation. During an emergency call the Emergency ID will appear on the display of the subscribers. To demonstrate this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber affiliated at any site of any zone in the system.

This test will demonstrate a subscriber has the ability to revert to a specific talkgroup when an emergency is initiated. This is useful when the users have a designated talkgroup for handling emergencies.

The revert talkgroup must be set in the subscriber via software.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed.

SETUP

RADIO-1 - TALKGROUP 4
RADIO-2 - TALKGROUP 4
RADIO-3 - EMERGENCY TG

* EMERGENCY TG is the talkgroup programmed for emergency reverts.

VERSION #1.020

2. TEST

- Step 1. Initiate a call on TALKGROUP 4 from RADIO-1 and verify RADIO-2 can hear the audio. Verify RADIO-3 does not hear the audio.
- Step 2. Dekey RADIO-1.
- Step 3. Using RADIO-1, send an Emergency Call by depressing the emergency switch and then the PTT switch.
- Step 4. Observe the display on RADIO-3 denotes an emergency and the unit ID or alias of the unit sending the emergency and that RADIO-3 can hear RADIO-1's audio.
- Step 5. In addition observe that RADIO-2 cannot hear RADIO-1's audio.
- Step 6. Release the PTT switch on RADIO-1 and end the Emergency Call by holding down the Emergency button.

Pass____ Fail____





Site Trunking FDMA/TDMA Mixed Sites



Site Trunking FDMA/TDMA Mixed Sites

Site Trunking Indication

1. DESCRIPTION

When a remote site loses its link or does not have a link to the Zone Controller, the affected site will enter "Site Trunking" mode of operation. Radios locked onto this site will be serviced locally within this site's coverage area.

NOTE: If the subscriber does not have the Display option, the "Site Trunking" indication will not be displayed.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1
Lock the subscribers to SITE 1 if more than one site exists on the system.

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Verify that RADIO-1 and RADIO-2 are displaying the "Site Trunking" indication.
- Step 3. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass_____ Fail_____



Site Trunking FDMA/TDMA Mixed Sites

Talkgroup Call

1. DESCRIPTION

When a site goes into Site Trunking, radios with Talkgroup Call capability will be able to communicate with other members of the same talkgroup at that same site. Members of the same talkgroup at other sites will not be able to monitor those conversations.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 2
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - SITE 2

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1 at SITE 1.
- Step 3. Observe that only RADIO-2 will be able to monitor and respond to the call. Note that RADIO-3 and RADIO-4 are not able to monitor the call since the site is not in wide area operation.
- Step 4. Initiate a Talkgroup Call with RADIO-3 on TALKGROUP 1 at SITE 2.
- Step 5. Observe that only RADIO-4 will be able to monitor and respond to the call.

Pass_____ Fail_____



Site Trunking FDMA/TDMA Mixed Sites

Talkgroup Call (Single Site)

1. DESCRIPTION

When a site goes into Site Trunking, radios with Talkgroup Call capability will be able to communicate with other members of the same talkgroup at that same site. (Members of the same talkgroup at other sites will not be able to monitor those conversations.)

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 - TALKGROUP 2
RADIO-4 - SITE - SITE 1

* All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1 at SITE 1.
- Step 3. Observe that only RADIO-2 will be able to monitor and respond to the call. Note that RADIO-3 AND RADIO-4 are not able to monitor the call since they are on another Talkgroup.
- Step 4. Initiate a Talkgroup Call with RADIO-3 on TALKGROUP 2 at SITE 1.
- Step 5. Observe that only RADIO-4 will be able to monitor and respond to the call.
- Step 6. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Talkgroup Call

1. DESCRIPTION

When a Site goes into Site Trunking, radios with Talkgroup Call capability will be able to communicate with other members of the same talkgroup at that same site. Members of the same talkgroup at other sites will not be able to monitor those conversations. The Site Controller determines the FDMA/TDMA mode of a Talkgroup call depending on the capabilities of the radios registered at the site to the talkgroup.

Note: The FDMA/TDMA mode of a call cannot change during a PTT.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 1
RADIO-3 - SITE - SITE 2
RADIO-8 - TALKGROUP 1
RADIO-8 (FDMA-only) - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into Site Trunking. Turn RADIO-5 off.
- Step 2. Initiate a Talkgroup Call with RADIO-1 on TALKGROUP 1 at SITE 1.
- Step 3. Observe that only RADIO-2 will be able to monitor and respond to the call. Note that RADIO-3 is not able to monitor the call since SITE 1 is not in wide area operation. Observe that the channel is assigned in the TDMA mode.
- Step 4. With the RADIO-1 talkgroup call in progress, turn on RADIO-8.
- Step 5. Observe that RADIO-2 continues to monitor and is still able to respond to the call. Observe that the channel is still assigned in the TDMA mode.
- Step 6. Dekey RADIO-1. Observe that the call is transmission trunked.
- Step 7. Initiate a talkgroup call with RADIO-1 on TALKGROUP 1.
- Step 8. Observe that now RADIO-2 and RADIO-8 will be able to monitor and respond to the call. Observe that the channel is assigned in the FDMA mode.
- Step 9. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Call Alert

1. DESCRIPTION

Call Alert is a tone page that allows a user to selectively alert another radio unit. When a site is in Site Trunking, Radios at the site will only be able to Call Alert other radios at the same site. The initiating radio will receive notification from the trunked system as to whether or not the page was received by the target radio.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 2
RADIO-2 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Using RADIO-1, press the page button.
- Step 3. Enter the Unit ID of RADIO-2 with the keypad, or scroll to the location where this ID is stored.
- Step 4. Press the PTT to initiate the Call Alert.
- Step 5. Verify that RADIO-2 received the Call Alert.
- Step 6. Exit the Call Alert mode and return to normal talkgroup mode.
- Step 7. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Continuous Assignment Updating

1. DESCRIPTION

When a talkgroup is assigned a voice channel, the site controller continues to transmit the channel assignment on the control channel for the duration of the Talkgroup Call. Radios coming into use on the system are automatically sent to voice channels with conversations in progress involving their selected talkgroups.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Turn OFF RADIO-1.
- Step 3. Initiate a Talkgroup Call using RADIO-2.
- Step 4. While the Talkgroup Call is in progress, turn on RADIO-1.
- Step 5. Observe that RADIO-1, which was just brought back into service, joins the Talkgroup Call already in progress.
- Step 6. Release the PTT of RADIO-2. Switch RADIO-1 to TALKGROUP 2.
- Step 7. Initiate a Talkgroup Call using RADIO-2.
- Step 8. While the Talkgroup Call is in progress, turn RADIO-1 back to TALKGROUP 1.
- Step 9. Observe that RADIO-1, which was just set back to TALKGROUP 1, joins the Talkgroup Call already in progress.
- Step 10. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass_____ Fail_____



Site Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Busy Queue Conversion

1. DESCRIPTION

If no voice channel resources are available, radios requesting channels for new conversations are placed in a queue. Users of the same priority will move through the queue in a first in, first out sequence.

When a voice channel becomes available, the radio at the top of the busy queue gets a channel assignment and generates a callback tone if the FDMA/TDMA mode of the call can be supported by the available resource. While the call is waiting in the busy queue, the FDMA/TDMA mode of a talkgroup at a site in site trunking can be change as radios join or leave the talkgroup.

NOTE: All radios and talkgroups should start with default priorities. The Default is 10.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 1
RADIO-9 (FDMA-only) - TALKGROUP 2
RADIO-9 - SITE - SITE 1

VERSION #1.020

2. TEST

- Step 1. Place SITE 1 into Site Trunking and simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel. Turn off RADIO-8
- Step 2. Initiate a Talkgroup Call with RADIO-9 and keep the call in progress until instructed to end it.
- Step 3. Key RADIO-1 and observe that the radio receives a busy.
- Step 4. Dekey RADIO-9 and observe that RADIO-1 receives a callback and can make the call. Observe that the channel is assigned through CSS in the TDMA mode since there are no FDMA-only radios in the call
- Step 5. Dekey RADIO-1.
- Step 6. Initiate a Talkgroup Call with RADIO-9 and keep the call in progress until instructed to end it.
- Step 7. Turn on RADIO-8.
- Step 8. Key RADIO-1 and observe that the radio receives a busy.
- Step 9. Dekey RADIO-9 and observe that RADIO-1 receives a callback and can make the call. Observe that the channel is now assigned in the FDMA mode.
- Step 10. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Busy Queuing and Callback with FDMA call in queue

1. DESCRIPTION

If no voice channel resources are available, radios requesting channels for new conversations are placed in a queue. Users of the same priority will move through the queue in a first in, first out sequence; however, users of higher priority will be inserted ahead of lower priority users in queue.

When a voice channel becomes available, the radio at the top of the busy queue gets a channel assignment and generates a callback tone if the FDMA/TDMA mode of the call can be supported by the available resource. Otherwise, the first call in the queue that can be supported by the available resource is assigned. The callback tone alerts the user that a channel assignment was made and transmitting is now possible on the selected talkgroup. In this test case, the first available resource cannot support the call mode of the first call in the busy queue.

Note: In site trunking, the mode of all calls is dynamically determined by the Site Controller

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 (TDMA) - TALKGROUP 2
RADIO-2 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 4
RADIO-3 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 3
RADIO-8 - SITE - SITE 1

Note: SITE 1 must be TDMA capable. All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode.
- Step 2. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 3. Initiate Talkgroup Calls with RADIO-1 and RADIO-2. Keep these calls in progress until instructed to end them.
- Step 4. Key RADIO-8 and observe that the radio receives a busy.
- Step 5. Key RADIO-3 and observe that the radio receives a busy.
- Step 6. End the call with RADIO-1.
- Step 7. Observe RADIO-3 receives the first callback and can now make a call because the available resource can not support an FDMA call.
- Step 8. End the calls with RADIO-2 and RADIO-3.
- Step 9. Observe RADIO-8 now receives a callback and can make a call upon receipt of the callback indication since there is now a full channel available.
- Step 10. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Emergency Alarm and Call

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel if the FDMA/TDMA mode of the call can be supported by the available resource. Otherwise, the first call in the queue that can be supported by the available resources is assigned. To demonstrate this, an Emergency Alarm and Call will be initiated from a subscriber which will be received by a subscriber affiliated at any site of any zone in the system. In this case, the first available resource CANNOT support the FDMA call mode.

Note: In Site Trunking, the mode of all calls is dynamically determined by the Site Controller and Emergency Call operation is always Top of Queue. If the subscriber does not have the Display option, the Emergency ID will not be displayed.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 2
RADIO-3 - SITE - SITE 1
RADIO-4 (TDMA) - TALKGROUP 3
RADIO-4 - SITE - SITE 1
RADIO-5 (TDMA) - TALKGROUP 4
RADIO-5 SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 1

Note: All Radios should be "Site Locked"

VERSION #1.010

Lake County, Illinois
Countywide Radio Communications System RFP \$13231
PS-000042156



Motorola Solutions Confidential Restricted

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 2. Initiate calls with both RADIO-3 and RADIO-5 and keep these calls in progress until instructed to release.
- Step 3. Key RADIO-4 and verify the radio receives a busy tone.
- Step 4. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch.
- Step 5. Observe that RADIO-1 cannot transmit due to the voice channel being busy. End the call on RADIO-3.
- Step 6. Observe that RADIO-4 receives the call back before RADIO-1 and is able to proceed with the call because the available channel resource can only support a TDMA call.
- Step 7. Dekey RADIO-5 and RADIO-4. Observe that RADIO-1 receives the callback and is able to proceed with the call.
- Step 8. Observe that the display on RADIO-8 denotes an emergency and the unit ID or alias of RADIO-1.
- Step 9. Dekey RADIO-1 and end the Emergency Call by holding down the Emergency button on RADIO-1 until an alert tone sounds. Verify RADIO-1 returns to normal operation.
- Step 10. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____

August 12, 2014
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Site Trunking FDMA/TDMA Mixed Sites

Dynamic FDMA/TDMA Emergency Alarm and Call mode change

1. DESCRIPTION

Users in life threatening situations can use the Emergency button on the radio to immediately send a signal to the dispatcher and be assigned the next available voice channel if the FDMA/TDMA mode of the call can be supported by the available resource.

For talkgroups programmed as dynamic, the FDMA/TDMA mode may change from TDMA to FDMA during the call. In this case, the current TDMA call is transmission trunked and started in the FDMA mode on the next PTT. However, the emergency mode is not re-activated until the subscriber with the emergency does a PTT.

NOTE: If the subscriber does not have the Display option, the Emergency ID will not be displayed. All radios and talkgroups should start with default priorities. The default is 10.

SETUP

RADIO-1 (TDMA) - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-3 (TDMA) - TALKGROUP 1
RADIO-3 - SITE - SITE 1
RADIO-8 (FDMA-only) - TALKGROUP 1
RADIO-8 - SITE - SITE 1

Note: TALKGROUP 1 is programmed for "Dynamic". SITE 1 must be TDMA capable. All Radios should be "Site Locked"

VERSION #1.010

2. TEST

- Step 1. Place SITE 1 into the Site Trunking mode. Turn off RADIO-8. Simulate a busy system by disabling all channels at SITE 1 with the exception of the control channel and one voice channel.
- Step 2. Using RADIO-1 send an Emergency Call by pressing the emergency switch and then the PTT switch. Observe that the channel is assigned in the TDMA mode.
- Step 3. Observe that the display on RADIO-3 denotes an emergency and the unit ID or alias of RADIO-1. End the call on RADIO-1 and turn on RADIO-8.
- Step 4. Initiate a call on TALKGROUP 1 with RADIO-3. Observe that the channel is now assigned in the FDMA mode.
- Step 5. Observe that the display on RADIO-1 and RADIO-8 denote the unit ID or alias of RADIO-3 but do not show an emergency.
- Step 6. End the call on RADIO-3.
- Step 7. Initiate a call on TALKGROUP 1 using RADIO-1.
- Step 8. Observe that the displays on RADIO-8 and RADIO-3 both denote an emergency and the unit ID or alias of RADIO-1.
- Step 9. End the TALKGROUP 1 call on RADIO-1 and exit the Emergency mode by holding down the Emergency button until an alert tone sounds.
- Step 10. Return the site to Wide Area Trunking unless the next test requires Site Trunking.

Pass____ Fail____



Site Trunking FDMA/TDMA Mixed Sites

Wide Area Recovery

1. DESCRIPTION

A site in Site Trunking will transition to Wide Area Trunking when all failures have been cleared. All subscribers should transition from Site Trunking to Wide Area Trunking and continue to process calls.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1
RADIO-3 - TALKGROUP 1
RADIO-3 - SITE - SITE 2
RADIO-4 - TALKGROUP 1
RADIO-4 - SITE - SITE 2
CONSOLE-1 - TALKGROUP 1

Note: All Radios should be "Site Locked"

VERSION #1.020

2. TEST

- Step 1. Set the status of SITE 1 to Wide Area and clear any system errors that may have placed SITE 1 into Site Trunking.
- Step 2. Verify that the status of SITE 1 has transitioned into Wide Area Trunking.
- Step 3. Verify that RADIO-1 and RADIO-2 no longer display Site Trunking.
- Step 4. Verify Wide Area communications between RADIO-1, RADIO-2, RADIO-3, RADIO-4 and CONSOLE-1.

Pass____ Fail____





Advanced Messaging Solution (AMS)



Advanced Messaging Solution (AMS)

SMART CLIENT Logon Name Validation

1. DESCRIPTION

Logging onto an Advanced Messaging Solution (AMS) Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). The AMS Server Application will validate an SC user name with the provided password. The system administrator can create user accounts for only valid combinations of a user name and password. This feature provides a method to restrict access to the SC. This test will verify the logon to SC with valid user name and password.

SETUP

PremierOne Server
Windows User Accounts-
LoneDispatcher1 with password Password1

VERSION #1.020

2. TEST

- Step 1. Logon "LoneDispatcher1" onto Smart Client SC-1 using password "Password2"
- Step 2. Verify logon failed (access to Smart Client is not allowed), login failure notice on screen.
- Step 3. Logon "LoneDispatcher1" onto Smart Client SC-1 using password "Password1"
- Step 4. Verify logon is successful (access to Smart Client is allowed)

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Smart Client to Radio - Manual)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message from an Smart Client to a radio with a manually logged on name.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111

Equipment setup
Smart Client SC-1 Logged on as
"LoneDispatcher1"
Radio-1 Powered on
RADIO-1 Logged on as "name1"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "name1" from the address book as the address
- Step 2. Send the text message from Smart Client SC-1 to "name1"
- Step 3. Verify RADIO-1 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-1 message shows from "LoneDispatcher1"

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Smart Client to Radio - Provisioned)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message from a Smart Client to a radio with a provisioned name.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name3 is provisioned with password Moto3333

PremierOne Server Address Book
name3 is provisioned as name.

Equipment setup
Smart Client SC-1 Logged on as
"LoneDispatcher1"
RADIO-3 Powered on
(RADIO-3 is provisioned with "name3")

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "name3" from the address book as the address
- Step 2. Send the text message from Smart Client SC-1 to "name3"
- Step 3. Verify RADIO-3 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-3 message shows from "LoneDispatcher1"

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Radio to Smart Client)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message from a Radio to an SC logon name.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111

Equipment setup
Smart Client SC-1 Logged on as
"LoneDispatcher1"
RADIO-1 Logged on as "name1"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "LoneDispatcher1" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address]
- Step 2. Send the text message from RADIO-1 to "LoneDispatcher1" [PTT]
- Step 3. Verify Smart Client SC-1 receives the message
- Step 4. Verify SC message shows from "name1"

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Radio to Radio Manual logon)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message from a radio to another radio with a manually logged on name.

SETUP

PremierOne User Accounts-
Name1 is provisioned with password Moto1111
Name2 is provisioned with password Moto2222

Equipment setup
RADIO-1 Logged on as "name1"
RADIO-2 Logged on as "name2"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "name2" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address]
- Step 2. Send the text message from RADIO-1 to "name2" [PTT]
- Step 3. Verify RADIO-2 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-2 message shows from "name1"

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Radio to Radio Provisioned)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message from a radio to another radio with a provisioned logon name.

SETUP

PremierOne User Accounts-
Name1 is provisioned with password Moto1111
Name3 is provisioned with password Moto3333

Equipment setup
RADIO-1 Logged on as "name1"
RADIO-3 Powered on (no user logged in)

VERSION #1.020

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "radio3" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address]
- Step 2. Send the text message from RADIO-1 to "radio3" [PTT]
- Step 3. Verify RADIO-3 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-3 message shows from "name1"

Pass____ Fail____



Advanced Messaging Solution (AMS)

Logon Name Messaging (Using Reply Function)

1. DESCRIPTION

Logging onto a subscriber unit and AMS Smart Client (SC) allows addressing of text messages to a name rather than to a device identifier (ID). Using log on names, the sender of the message is identified by name rather than by device ID. This test will verify the message to a radio logon name using the reply function.

SETUP

PremierOne User Accounts-
Name1 is provisioned with password Moto1111

Equipment setup
RADIO-1 Logged on as "name1"
RADIO-3 Powered on

VERSION #1.020

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "radio3" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address]
- Step 2. Send the text message from RADIO-1 to "radio3" [PTT]
- Step 3. Verify RADIO-3 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-3 message shows from "name1"
- Step 5. On Radio-3 select "reply" to the message just received from RADIO-1 [HOME > TMS > INBX > view message > RPLY]
- Step 6. Compose a reply text message on RADIO-3 [type message]
- Step 7. Send the reply text message from RADIO-3 [PTT]
- Step 8. Verify RADIO-1 receives the reply message [HOME > TMS > INBX]
- Step 9. Verify RADIO-1 message shows from "name3"

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Subscriber Logon Name Transfer

1. DESCRIPTION

The logon name transfer feature allows a radio user to logon to a second radio without logging off the first radio, even when the first radio is powered off. The Common Presence Server will automatically remove the logon name association with the first radio.

This test will verify the proper message routing to logon name on a radio.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111

Equipment setup
Smart Client SC-1 Logged on as
"LoneDispatcher1"

RADIO-1 powered off
RADIO-2 powered off

VERSION #1.020

2. TEST

- Step 1. Power on and Logon "name1" onto RADIO-1 using password "Moto1111" [HOME > USER > ID > name1 > Password > 1111 > LOGN] and verify logon is successful [LOGGED IN on display]
- Step 2. Compose a text message on AMS Smart Client SC-1 selecting "name1" from the address book as the address
- Step 3. Send the text message from Smart Client SC-1 to "name1" and verify RADIO-1 receives the message [HOME > TMS > INBX]
- Step 4. Power on and Logon "name1" onto RADIO-2 using password "Moto1111" and verify logon is successful [LOGGED IN on display]
- Step 5. Verify RADIO-1 is not logged on any longer [HOME > USER > blank ID and password, does not say LOGGED IN]
- Step 6. Compose a text message on Smart Client SC-1 selecting "name1" from the address book as the address
- Step 7. Send the text message from Smart Client SC-1 to "name1"
- Step 8. Verify RADIO-2 receives the message [HOME > TMS > INBX]
- Step 9. Verify RADIO-1 does not receive the message [HOME > TMS > INBX]

Pass____ Fail____



Advanced Messaging Solution (AMS)

Radio Name Logoff Message (Messages Not Deleted)

1. DESCRIPTION

When the radio user logs off of a radio, the user is given the option to delete all message or leave all messages. This allows a radio user to clear all messages out before the next radio user takes possession of the radio but also allows the messages to remain if desired, when the radio will be used again by the same radio user. This test will verify the Radio user can choose to logoff and not delete messages

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111
Name3 is provisioned with password Moto3333

Equipment setup
Logon "LoneDispatcher1 on AMS Smart Client
SC-1 with password "Password1"
RADIO-1 = "name1" using password
"Moto1111"
RADIO-2 = "name2" using Password
"Moto2222"

VERSION #1.020

2. TEST

- Step 1. Compose and send 3 different text messages on Smart Client SC-1 selecting "name1" from the address book as the address for each message
- Step 2. Verify RADIO-1 receives the 3 messages [HOME > TMS > INBX]
- Step 3. Compose and send 3 different text messages from RADIO-1 selecting "LoneDispatcher1" from the Data Users List as the address for each message [HOME > TMS > COMP > NEW > type message > ADDR > LIST > select address > PTT]
- Step 4. Verify RADIO-1 has the 3 messages in the sent items folder [HOME > TMS, > SENT]
- Step 5. Compose and save a draft text message on RADIO-1 [TMS > COMP > NEW > type message > SAVE]
- Step 6. Verify RADIO-1 has the draft message in the drafts items folder [HOME > TMS > DRFT]
- Step 7. Logoff RADIO-1 and select NO for "CLR PRIVATE DATA?" [HOME > USER > LOGT > NO]
- Step 8. Verify that the 3 messages remain in the RADIO-1 inbox, the 3 messages remain in the radio sent items, and the draft message remains in the drafts folder. [HOME > TMS > INBX > BACK > DRFT > BACK > SENT]

Pass____ Fail____



Advanced Messaging Solution (AMS)

Radio Name Logoff Message (Message Deletion)

1. DESCRIPTION

When the radio user logs off of a radio, the user is given the option to delete all messages or leave all messages. This allows a radio user to clear all messages out before the next radio user takes possession of the radio but also allows the messages to remain if desired. This test will verify the Radio user can choose to logoff and delete messages.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111
Name2 is provisioned with password Moto2222

Equipment setup
Logon "LoneDispatcher1 on AMS Smart Client
SC-1 with password "Password1"
RADIO-1 = "name1" using password
"Moto1111"
RADIO-2 = "name2" using Password
"Moto2222"

VERSION #1.020

2. TEST

- Step 1. Compose and send 3 different text messages from Smart Client SC-1 selecting "name2" from the address book as the address for each message
- Step 2. Verify RADIO-2 receives the 3 messages [HOME > TMS > INBX]
- Step 3. Compose and send 3 different text messages from RADIO-2 selecting "LoneDispatcher1" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address > PTT]
- Step 4. Verify RADIO-2 has the 3 messages in the sent items folder [HOME > TMS > SENT]
- Step 5. Compose and save a draft text message on RADIO-2 [TMS > COMP > NEW > type message > SAVE]
- Step 6. Verify RADIO-2 has the draft message in the drafts items folder [HOME > TMS > DRFT]
- Step 7. Logoff RADIO-2 and clear private data. [HOME > USER > LOGT > YES]
- Step 8. Logon to RADIO-2 with user name2 and password Moto2222.
- Step 9. Verify that all messages are deleted from the RADIO-2 inbox, sent items, and drafts. [HOME > TMS > INBX > BACK > DRFT > BACK > SENT]

Pass____ Fail____



Advanced Messaging Solution (AMS)

Device ID Messaging (Radio to Smart Client)

1. DESCRIPTION

Messaging to a radio Device ID allows the sender of a message to address a message to a radio regardless of the user of the radio. When no user name is logged on a radio, the message is identified by the sending Device ID. This test will demonstrate sending a message from a radio with no user name logged on to an AMS Smart Client (SC).

SETUP

PremierOne User Accounts
LoneDispatcher1 with Password 1

Logon "LoneDispatcher1 on AMS Smart Client
SC-1 with password "Password1"

RADIO-1 Logged off but powered on

VERSION #1.040

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "LoneDispatcher1" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address].
- Step 2. Send the text message from RADIO-1 to "LoneDispatcher1" [PTT].
- Step 3. Verify Smart Client SC-1 receives the message.
- Step 4. Verify that the message shows from RADIO-1's Device ID.

Pass____ Fail____



Advanced Messaging Solution (AMS)

Device ID Messaging (Smart Client to Radio Device ID)

1. DESCRIPTION

Messaging to a radio Device ID allows the sender of a message to address a message to a radio regardless of the user of the radio. When no user name is logged on a radio, the message is identified by the sending Device ID. This test will demonstrate sending a message from a SMART CLIENT to a radio Device ID.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password "Password1"

Logon "LoneDispatcher1" on AMS Smart Client
SC-1 with password "Password1"

RADIO-1 Logged off but powered on

VERSION #1.040

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting RADIO-1's Device ID from the address book as the address.
- Step 2. Send the text message from Smart Client SC-1 to RADIO-1's Device ID.
- Step 3. Verify RADIO-1 receives the message [HOME > TMS > INBX].

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Device ID Messaging (Logged off Radio to Radio Device ID)

1. DESCRIPTION

Messaging to a radio Device ID allows the sender of a message to address a message to a radio regardless of the user of the radio. When no user name is logged on a radio, the message is identified by the sending Device ID. This test will demonstrate sending a message from a radio with no user name logged on to a radio Device ID.

SETUP

RADIO-1 Logged off but powered on
RADIO-2 Logged off but powered on

VERSION #1.030

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting RADIO-2's Device ID from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address].
- Step 2. Send the text message from RADIO-1 to RADIO-2's Device ID [PTT].
- Step 3. Verify RADIO-2 receives the message [HOME > TMS > INBX].
- Step 4. Verify the RADIO-2 message shows from RADIO-1's Device ID.

Pass____ Fail____



Advanced Messaging Solution (AMS)

Group Messaging (Smart Client to Text Messaging Group)

1. DESCRIPTION

Group messaging allows the sender of a text message to address the message to multiple destinations using a single text message group address. The text messaging group address must be previously defined and its address members selected. This test will verify sending a message from an AMS Smart Client (SC) to a text messaging group address.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1

Equipment setup
Logon "LoneDispatcher1 on AMS Smart Client
SC-1 with password "Password1"

Power on RADIO-1, RADIO-2, and RADIO-3

"RadioGroup1" group address must be
previously defined with RADIO-1, RADIO-2 and
RADIO-3 defined as members of the group.

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "RadioGroup1" from the address book as the address
- Step 2. Send the text message from Smart Client SC-1 to "RadioGroup1"
- Step 3. Verify RADIO-1, RADIO-2 and RADIO-3 receive the message [HOME > TMS > INBX]

Pass____ Fail____



Advanced Messaging Solution (AMS)

Group Messaging (Radio to Text Messaging Group)

1. DESCRIPTION

Group messaging allows the sender of a text message to address the message to multiple destinations using a single text message group address. The text messaging group address must be previously defined and its address members selected. This test will verify sending a message from a radio to a text messaging group address

SETUP

Equipment setup
RADIO-1, RADIO-2 and RADIO-3 are powered on.

"RadioGroup2" group address must be previously defined with RADIO-1, RADIO-2 and RADIO-3 defined as members of the group.

VERSION #1.020

2. TEST

- Step 1. Compose a text message on RADIO-1 selecting "RadioGroup2" from the Data Users List as the address [TMS > COMP > NEW > type message > ADDR > LIST > select address]
- Step 2. Send the text message from RADIO-1 to "RadioGroup2" [PTT]
- Step 3. Verify RADIO-1, RADIO-2 and RADIO-3 receive the message [HOME > TMS > INBX]

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Radio Message Store and Forward

1. DESCRIPTION

Store and forward allows a radio text message user to receive messages that were sent to the radio while the radio is powered off or to the radio user's logon name when the user name was not logged on. The radio receives the messages after powering on or after the user name is logged on. This test will verify messages sent to a user name for a radio that is powered off or a user name that is logged off will be sent when the user/subscriber become available.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111
Name2 is provisioned with password Moto2222

Equipment Setup
Login Smart Client SC -1 = "LoneDispatcher1"
password "Password1"

RADIO-1 = powered off
RADIO-2 = powered on, not logged in
RADIO-3 = powered off
(RADIO-3 must be provisioned for "name3")

VERSION #1.020

2. TEST

- Step 1. Compose and send a unique text message from Smart Client SC-1 to each of the following addresses; "name1", "name2" and "name3"
- Step 2. Verify that RADIO-2 does not receive the message sent to "name2" [HOME > TMS > INBX]
- Step 3. Compose and send a unique text message from Smart Client SC-1 to RADIO-1's Device ID
- Step 4. Power on RADIO-1 and verify that RADIO-1 receives only the message addressed to RADIO-1's Device ID. [HOME > TMS > INBX]
- Step 5. Logon "name1" on RADIO-1 using password "Moto1111" [HOME > USER > ID > name1 > Password > Moto1111 > LOGN]
- Step 6. Verify that RADIO-1 receives the message addressed to "name1". [HOME > TMS > INBX]
- Step 7. Logon "name2" on RADIO-2 using password "Moto2222" [HOME > USER > ID > name2 > Password > Moto2222 > LOGN] and verify that RADIO-2 receives only the message addressed to "name2". [HOME > TMS > INBX]
- Step 8. Power on RADIO-3. Verify that RADIO-3 receives the message addressed to "name3". [HOME > TMS > INBX]

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Smart Client Message Store and Forward

1. DESCRIPTION

Store and forward allows an AMS Smart Client (SC) text message user to receive messages that were sent to the dispatcher's logon name while the name was not logged on. The dispatcher receives the messages after the name is logged on to an SC. This test will verify messages sent to a dispatcher logon name while the dispatcher was not logged on are received when the dispatcher logs on.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111
Name2 is provisioned with password Moto2222

Equipment Setup
Smart Client SC-1 not logged in

RADIO-1 = powered on, logged in as Name1

VERSION #1.020

2. TEST

- Step 1. Compose and send 3 unique text messages from RADIO-1 to "LoneDispatcher1" [TMS > COMP > NEW > type message > ADDR > LIST > select address > PTT]
- Step 2. Logon "LoneDispatcher1" on Smart Client SC-1 with password "Password1"
- Step 3. Verify that Smart Client SC-1 receives all 3 messages

Pass____ Fail____



Advanced Messaging Solution (AMS)

Radio requests reply for message

1. DESCRIPTION

The sender of a message from a radio may request a reply of the addressee. When the message arrives at a Smart Client addressee a reply request is treated as a request for a read receipt (meaning the user opened the message). The originator of the message will then receive a message which indicates that the recipient read the message.

Note: The behavioral difference between radios and smart clients is due to historically different uses of the messaging protocol field used to indicate "reply request" and "read receipt".

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111

Equipment Setup
Smart Client SC-1 not logged in

RADIO-1 = powered on, logged in as Name1
with password Moto1111

VERSION #1.020

2. TEST

- Step 1. Compose and send a unique text messages from RADIO-1 to "LoneDispatcher1" [TMS > COMP > NEW > type message > ADDR > LIST > select address > PTT]
Note: select reply request field in message.
- Step 2. Logon "LoneDispatcher1" on Smart Client SC-1 with password "Password1"
- Step 3. Verify that Smart client SC-1 receives the message.
- Step 4. Verify that Radio-1 receives a message indicating Smart Client SC-1 user LoneDispatcher1 opened the message.

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Smart Client Message marked read receipt sent to radio

1. DESCRIPTION

A user logged into a Smart Client originates a message to a user on a Radio with the message marked as "read receipt" by the originator.

Note: The behavioral difference between radios and smart clients is due to historically different uses of the messaging protocol field used to indicate "reply request" and "read receipt"

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111

Equipment Setup
Smart Client SC-1 logged in as LoneDispatcher1
with password Password1

RADIO-1 powered on, logged in as Name1 with
password Moto1111

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "name1" from the address book as the address. Mark the message as "Read Receipt Requested" on the Smart Client form.
- Step 2. Send the text message from Smart Client SC-1 to "name1"
- Step 3. Verify RADIO-1 receives the message [HOME > TMS > INBX]
- Step 4. Verify RADIO-1 message shows from "LoneDispatcher1"
- Step 5. Verify message shows that the message sender requested a reply. (Reply requested icon)

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Send messages from Smart Client to Smart Client

1. DESCRIPTION

Advanced Messaging Solution (AMS) supports messaging between dispatchers using an AMS Smart Client (SC). Messages may be sent using the "Read Receipt" feature.

This test will verify a dispatcher using one SC sends a message to a dispatcher using another SC.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
LoneDispatcher2 with password Password2

Equipment Setup
Smart Client SC-1 = "LoneDispatcher1"
password "Password1"
Smart Client SC-2 = "LoneDispatcher2"
password "Password2"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "LoneDispatcher2" as the address.
- Step 2. Send the text message to "LoneDispatcher2"
- Step 3. Verify that the text message is received on Smart Client SC-2

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Send messages from Smart Client to Smart Client (Reply)

1. DESCRIPTION

Advanced Messaging Solution (AMS) supports messaging between dispatchers using an AMS Smart Client (SC). Messages may be sent using the "Read Receipt" feature.

This test will verify a dispatcher using one SC sends a message to a dispatcher using another SC.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
LoneDispatcher2 with password Password2

Equipment Setup
Smart Client SC-1 = "LoneDispatcher1"
password "Password1"
Smart Client SC-2 = "LoneDispatcher2"
password "Password2"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "LoneDispatcher2" as the address.
- Step 2. Send the text message to "LoneDispatcher2"
- Step 3. Verify that the text message is received on Smart Client SC-2
- Step 4. Select "Reply" to the message just received on Smart Client SC-2
- Step 5. Compose a reply text message on Smart client SC-2
- Step 6. Send the reply text message
- Step 7. Verify that the reply text message is received on Smart Client SC-1

Pass____ Fail____



Advanced Messaging Solution (AMS)

Send messages from Smart Client to Smart Client (with Read Receipt)

1. DESCRIPTION

Advanced Messaging Solution (AMS) supports messaging between dispatchers using an AMS Smart Client (SC). Messages may be sent using the "Read Receipt" feature.

This test will verify a dispatcher using one SC sends a message to a dispatcher using another SC

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
LoneDispatcher2 with password Password2

Equipment Setup
Smart Client SC-1 = "LoneDispatcher1"
password "Password1"
Smart Client SC-2 = "LoneDispatcher2"
password "Password2"

VERSION #1.020

2. TEST

- Step 1. Compose a text message on Smart Client SC-1 selecting "LoneDispatcher2" as the address.
- Step 2. Select the "Read Receipt" checkbox
- Step 3. Send the text message to "LoneDispatcher2"
- Step 4. Verify that the text message is received on Smart Client SC-2 by selecting the message
- Step 5. Verify that a "Read Receipt" message is received on Smart Client SC-1 for the message

Pass_____ Fail_____



Advanced Messaging Solution (AMS)

Send Quick Text Messages

1. DESCRIPTION

Quick Text messaging allows a radio user to pick from a list of predefined messages to send. This test will verify that Radio Quick Text messages can be selected and sent.

SETUP

PremierOne User Accounts-
LoneDispatcher1 with password Password1
Name1 is provisioned with password Moto1111
Name2 is provisioned with password Moto2222

Equipment Setup
Smart Client SC-1 user LoneDispatcher1 is
logged in.
Radio1 user name1 is logged in.
Radio2 user name2 is logged in.

VERSION #1.020

2. TEST

- Step 1. Compose and send a Quick Text message from RADIO-1 to "LoneDispatcher1" [TMS > COMP > LIST > select message 1 > ADDR > LIST > select address > PTT]
- Step 2. Verify that the Quick Text message is received on AMS Smart Client SC-1
- Step 3. Compose and send a Quick Text message from RADIO-1 to RADIO-2's device ID [TMS > COMP > LIST > select message 2 > ADDR > LIST > select address > PTT]
- Step 4. Verify that the Quick Text message is received on RADIO-2. [HOME > TMS > INBX]

Pass_____ Fail_____





Signoff Certificate

By their signatures below, the following witnesses certify they have observed the system Acceptance Test Procedures.

Signatures

WITNESS:

Date: _____

Please Print Name: _____

Please Print Title: _____

WITNESS:

Date: _____

Please Print Name: _____

Please Print Title: _____

WITNESS:

Date: _____

Please Print Name: _____

Please Print Title: _____



1.14 DISPATCH POWER DRAW

Dispatch power draw information for the proposed solution follow:

Main Dispatch Site Power Draw						
AC-Only Equipment						
Qty	CKT	Description	AC-Only	Power Draw (W)	Total Draw(W)	Total HVAC (BTU)
2		MCC7500 Dispatch Site Gateway	AC	50	100	341
10		CCGW GGM Gateway	AC	50	500	1705
3		MCC7500 Dispatch Site HP Switch	AC	50	150	511.5
1		Conventional Site Controller	AC	180	180	613.8
9		APX 7500 Consolettes	AC	65	585	1994.85
1		Triplite KVM	AC	25	25	85.25
1		CEN LAN Switch	AC	50	50	170.5
2		AUX Server	AC	20	40	136.4
1		Border Router	AC	50	50	170.5
1		AIS VPM	AC	50	50	170.5
1		AIS Server	AC	186	186	634.26
1		Advanced Messaging Server	AC	852	852	2905.32
1		Advanced Messaging Client	AC	186	186	634.26
1		Convex Combiner	AC	25	25	85.25
1		MCC7500 IP Logging Recorder	AC	920	920	3137.2
2		DAT Drives	AC	140	280	954.8
1		Raven	AC	100	100	341
1		Analog Logging Recorder	AC	852	852	2905.32
9		Dispatch Operating Positions	AC	186	1674	5708.34
9		Voice Processing Module	AC	50	450	1534.5
2		NM Client	AC	186	372	1268.52
1		Genwatch Client	AC	186	186	634.26
1		Castle Rock	AC	186	186	634.26
1		Playback Station	AC	186	186	634.26
63		Total System			8185	27910.85
		Total Equipment Draw with 100% Growth Margin			16,370.00	55,821.70

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1.15 LINKPATH PLANNER

A sample LinkPath Planner follows:



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Path Calculation

Customer/Project:
OPTION: Standard Power
Radio Model: IRU600 v3
Operation Mode: Fixed modulation (priority for throughput)
Protection Type: 1+0 NP

Date: 04 September 2013
Rev. Date: 12 September 2013
Engineer: M Del Fierro
Capacity: 29xDS1 (45 Mbps)
Frequency: 6GHz (High)
Bandwidth: 10 MHz
Modulation: 64QAM

Site Name: **SO Dispatch Center (SS)**

NAD83 Latitude : 42°17'47.67"N
Longitude: 87°57'26.15"W
Elevation : [705.2] ft
Azimuth: 4.7 °

Gurnee Toll (SS)

Latitude : 42°22'57.47"N
Longitude: 87°56'51.52"W
Elevation : [728.16] ft
Azimuth: 184.72 °

Path Length: 5.962 mi

Free Space Loss: 128.7 dB

Atmospheric Absorption: 0.1 dB

Diffraction Loss: 0.0 dB

Transmission Line Types: Elliptic/Other

Transmission Line Lengths: 205/3 ft

Transmission Line Losses: 2.9/0.3 dB

Transmit-Only Pads: 0.0 dB

Jumper / Flex Loss: 0.0 dB

Main Antenna Radome Loss: 0.5 dB

ACU Tx Loss: 0 dB

ACU Rx Loss: 0 dB

Misc/Common Line Pads: -0.0 dB

TOTAL LOSSES: 136.0 dB

Antenna Size: 6 ft

Antenna Centerline: 155.0 ft

Antenna Gain: 38.8 dBi

Antenna Type: PAR6-65-PXA/B [6GHz (I

Effective Radiated Power(EIRP): 63.7 dBm

Transmitter Power, GUARANTEED Low(28.5 dBm)

TOTAL GAINS (Incl. TRX Power): 106.1 dBm

Unfaded Received Signal Level: -29.9 dBm (+/- 2dB)

Required Level for: 10-6 BER: -78.5 dBm

Flat Fade Margin: 48.6 dB

Dispersive Fade Margin: 64.9 dB

Composite Fade Margin: 48.5 dB

Multipath Outage Probability(SESr): 0.000000148

Multipath Outage in (Sec/Yr): 1.4

Annual Multipath Reliability in %: 100.00000 %

Rain Outage in (Sec/Yr): 0.0 (Horizontal)

Annual Rain Availability in %: 100.00000 %

Vigants 1975

Crane

D2:Temperate Continental (Moderate)

Temperature = 59 °F

c = 2.88

w = 28.6 ft

x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -26.3 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
OPTION: Standard Power
Radio Model: IRU600 v3
Operation Mode: Fixed modulation (priority for throughput)
Protection Type: 1+0 NP

Date: 04 September 2013
Rev. Date: 12 September 2013
Engineer: M Del Fierro
Capacity: 29xDS1 (45 Mbps)
Frequency: 6GHz (High)
Bandwidth: 10 MHz
Modulation: 64QAM

Site Name:	Waukegan (Bldg)	Gurnee Toll (SS)
NAD83 Latitude :	42°21'38.89"N	42°22'57.47"N
Longitude:	87°49'59.32"W	87°56'51.52"W
Elevation :	[665.84] ft	[728.16] ft
Azimuth:	284.5 °	104.43 °

Path Length:	6.052 mi
Free Space Loss:	128.8 dB
Atmospheric Absorption:	0.1 dB
Diffraction Loss:	0.0 dB
Transmission Line Types:	Elliptic/Other
Transmission Line Lengths:	50/3 ft
Transmission Line Losses:	0.7/0.3 dB
Transmit-Only Pads:	0.0 dB
Jumper / Flex Loss:	0.0 dB
Main Antenna Radome Loss:	0.5 dB
ACU Tx Loss:	0 dB
ACU Rx Loss:	0 dB
Misc/Common Line Pads:	-0.0 dB
TOTAL LOSSES:	133.9 dB

Antenna Size:	6 ft	6 ft
Antenna Centerline:	173.0 ft	149.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	65.8 dBm	63.7 dBm
Transmitter Power, GUARANTEED	Low(28.5 dBm)	
TOTAL GAINS (Incl. TRX Power):	106.1 dBm	

Unfaded Received Signal Level:	-27.8 dBm (+/- 2dB)
Required Level for: 10-6 BER:	-78.5 dBm
Flat Fade Margin:	50.7 dB
Dispersive Fade Margin:	64.9 dB
Composite Fade Margin:	50.5 dB
Multipath Outage Probability(SESr):	0.000000092
Multipath Outage in (Sec/Yr):	0.9
Annual Multipath Reliability in %:	100.00000 %
Rain Outage in (Sec/Yr):	0.0 (Horizontal)
Annual Rain Availability in %:	100.00000 %

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
c = 2.75 w = 29.6 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -24.3 dBm (+/- 2dB) / -26.4 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name:	Beach Park (WT)	Waukegan (Bldg)
NAD83 Latitude :	42°27'12.86"N	42°21'38.89"N
Longitude:	87°52'33.88"W	87°49'59.32"W
Elevation :	[738] ft	[665.84] ft
Azimuth:	161.1 °	341.15 °

	Beach Park (WT)	Waukegan (Bldg)
Path Length:	6.771 mi	
Free Space Loss:	129.8 dB	
Atmospheric Absorption:	0.1 dB	
Diffraction Loss:	0.0 dB	
Transmission Line Types:	Elliptic/Other	Elliptic/Other
Transmission Line Lengths:	191/3 ft	50/3 ft
Transmission Line Losses:	2.7/0.3 dB	0.7/0.3 dB
Transmit-Only Pads:	0.0 dB	0.0 dB
Jumper / Flex Loss:	0.0 dB	0.0 dB
Main Antenna Radome Loss:	0.5 dB	0.5 dB
ACU Tx Loss:	0 dB	
ACU Rx Loss:	0 dB	
Misc/Common Line Pads:	-0.0 dB	
TOTAL LOSSES:	134.8 dB	

	Beach Park (WT)	Waukegan (Bldg)
Antenna Size:	6 ft	6 ft
Antenna Centerline:	141.0 ft	173.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	63.9 dBm	65.8 dBm
Transmitter Power, GUARANTEED		Low(28.5 dBm)
TOTAL GAINS (Incl. TRX Power):		106.1 dBm

	Beach Park (WT)	Waukegan (Bldg)
Unfaded Received Signal Level:	-28.7 dBm (+/- 2dB)	
Required Level for: 10-6 BER:	-78.5 dBm	
Flat Fade Margin:	49.8 dB	
Dispersive Fade Margin:	64.9 dB	
Composite Fade Margin:	49.7 dB	
Multipath Outage Probability(SESr):	0.000000131	
Multipath Outage in (Sec/Yr):	1.2	
Annual Multipath Reliability in %:	100.00000 %	
Rain Outage in (Sec/Yr):	0.0 (Horizontal)	
Annual Rain Availability in %:	100.00000 %	

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
 c = 2.31 w = 33.9 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -27.2 dBm (+/- 2dB) / -25.3 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name:	Antioch (WT)	Beach Park (WT)
NAD83 Latitude :	42°28'3.04"N	42°27'12.86"N
Longitude:	87°59'49.03"W	87°52'33.88"W
Elevation :	[777.36] ft	[738] ft
Azimuth:	98.8 °	278.92 °

	Antioch (WT)	Beach Park (WT)
Path Length:	6.254 mi	
Free Space Loss:	129.1 dB	
Atmospheric Absorption:	0.1 dB	
Diffraction Loss:	0.0 dB	
Transmission Line Types:	Elliptic/Other	Elliptic/Other
Transmission Line Lengths:	246/3 ft	191/3 ft
Transmission Line Losses:	3.4/0.3 dB	2.7/0.3 dB
Transmit-Only Pads:	0.0 dB	0.0 dB
Jumper / Flex Loss:	0.0 dB	0.0 dB
Main Antenna Radome Loss:	0.5 dB	0.5 dB
ACU Tx Loss:	0 dB	
ACU Rx Loss:	0 dB	
Misc/Common Line Pads:	-0.0 dB	
TOTAL LOSSES:	136.8 dB	

	Antioch (WT)	Beach Park (WT)
Antenna Size:	6 ft	6 ft
Antenna Centerline:	196.0 ft	141.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	63.1 dBm	63.9 dBm
Transmitter Power, GUARANTEED		Low(28.5 dBm)
TOTAL GAINS (Incl. TRX Power):		106.1 dBm

	Antioch (WT)
Unfaded Received Signal Level:	-30.7 dBm (+/- 2dB)
Required Level for: 10-6 BER:	-78.5 dBm
Flat Fade Margin:	47.8 dB
Dispersive Fade Margin:	64.9 dB
Composite Fade Margin:	47.7 dB
Multipath Outage Probability(SESr):	0.000000159
Multipath Outage in (Sec/Yr):	1.5
Annual Multipath Reliability in %:	100.00000 %
Rain Outage in (Sec/Yr):	0.0 (Horizontal)
Annual Rain Availability in %:	100.00000 %

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
 c = 2.25 w = 34.6 ft x = 1.4: Great Lakes Areas
 Unfaded Received Signal Level (at radio/transmission line interface): -27.3 dBm (+/- 2dB) / -26.5 dBm (+/- 2dB)
 Confidential and Proprietary Information



Path Calculation

Customer/Project:
OPTION: Standard Power

Radio Model: IRU600 v3
Operation Mode: Fixed modulation (priority for throughput)
Protection Type: 1+0 NP

Date: 04 September 2013
Rev. Date: 12 September 2013
Engineer: M Del Fierro
Capacity: 29xDS1 (45 Mbps)
Frequency: 6GHz (High)
Bandwidth: 10 MHz
Modulation: 64QAM

Site Name:	Antioch NW (SS)	Antioch (WT)
NAD83 Latitude :	42°29'28.11"N	42°28'3.04"N
Longitude:	88°10'6.14"W	87°59'49.03"W
Elevation :	[744.56] ft	[777.36] ft
Azimuth:	100.5 °	280.65 °

	Antioch NW (SS)	Antioch (WT)
Path Length:	8.911 mi	
Free Space Loss:	132.1 dB	
Atmospheric Absorption:	0.2 dB	
Diffraction Loss:	0.0 dB	
Transmission Line Types:	Elliptic/Other	Elliptic/Other
Transmission Line Lengths:	206/3 ft	246/3 ft
Transmission Line Losses:	2.9/0.3 dB	3.4/0.3 dB
Transmit-Only Pads:	0.0 dB	0.0 dB
Jumper / Flex Loss:	0.0 dB	0.0 dB
Main Antenna Radome Loss:	0.5 dB	0.5 dB
ACU Tx Loss:	0 dB	
ACU Rx Loss:	0 dB	
Misc/Common Line Pads:	-0.0 dB	
TOTAL LOSSES:	140.2 dB	

	Antioch NW (SS)	Antioch (WT)
Antenna Size:	6 ft	6 ft
Antenna Centerline:	156.0 ft	196.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	63.6 dBm	63.1 dBm
Transmitter Power, GUARANTEED		Low(28.5 dBm)
TOTAL GAINS (Incl. TRX Power):		106.1 dBm

	Antioch NW (SS)	Antioch (WT)
Unfaded Received Signal Level:	-34.1 dBm (+/- 2dB)	
Required Level for: 10-6 BER:	-78.5 dBm	
Flat Fade Margin:	44.4 dB	
Dispersive Fade Margin:	64.9 dB	
Composite Fade Margin:	44.4 dB	
Multipath Outage Probability(SESr):	0.000001577	0.000001578
Multipath Outage in (Sec/Yr):	14.7	
Annual Multipath Reliability in %:	99.99995 %	
Rain Outage in (Sec/Yr):	0.1 (Horizontal)	
Annual Rain Availability in %:	100.00000 %	

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
c = 3.62 w = 24.0 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -29.9 dBm (+/- 2dB) / -30.4 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name:	Antioch NW (SS)	Lake Villa
NAD83 Latitude :	42°29'28.11"N	42°23'17.08"N
Longitude:	88°10'6.14"W	88°5'40.52"W
Elevation :	[744.56] ft	[810.16] ft
Azimuth:	152.1 °	332.18 °

Path Length:	8.054 mi
Free Space Loss:	131.3 dB
Atmospheric Absorption:	0.1 dB
Diffraction Loss:	0.0 dB
Transmission Line Types:	Elliptic/Other
Transmission Line Lengths:	155/3 ft
Transmission Line Losses:	2.2/0.3 dB
Transmit-Only Pads:	0.0 dB
Jumper / Flex Loss:	0.0 dB
Main Antenna Radome Loss:	-
ACU Tx Loss:	0 dB
ACU Rx Loss:	0 dB
Misc/Common Line Pads:	-0.0 dB
TOTAL LOSSES:	137.8 dB

Antenna Size:	6 ft	6 ft
Antenna Centerline:	105.0 ft	210.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	64.9 dBm	63.4 dBm
Transmitter Power, GUARANTEED	Low(28.5 dBm)	
TOTAL GAINS (Incl. TRX Power):	106.1 dBm	

Unfaded Received Signal Level:	-31.7 dBm (+/- 2dB)
Required Level for: 10-6 BER:	-78.5 dBm
Flat Fade Margin:	46.8 dB
Dispersive Fade Margin:	64.9 dB
Composite Fade Margin:	46.8 dB
Multipath Outage Probability(SESr):	0.000000480
Multipath Outage in (Sec/Yr):	4.5
Annual Multipath Reliability in %:	99.99999 %
Rain Outage in (Sec/Yr):	0.0 (Horizontal)
Annual Rain Availability in %:	100.00000 %

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
 c = 2.58 w = 31.1 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -27.8 dBm (+/- 2dB) / -29.2 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name:	Lake Villa	Lake Zurich (Guyed)
NAD83 Latitude :	42°23'17.08"N	42°14'11.89"N
Longitude:	88°5'40.52"W	88°4'17.4"W
Elevation :	[810.16] ft	[879.04] ft
Azimuth:	173.6 °	353.57 °

	Lake Villa	Lake Zurich (Guyed)
Path Length:	10.522 mi	
Free Space Loss:	133.6 dB	
Atmospheric Absorption:	0.2 dB	
Diffraction Loss:	0.0 dB	
Transmission Line Types:	Elliptic/Other	Elliptic/Other
Transmission Line Lengths:	160/3 ft	200/3 ft
Transmission Line Losses:	2.2/0.3 dB	2.8/0.3 dB
Transmit-Only Pads:	0.0 dB	0.0 dB
Jumper / Flex Loss:	0.0 dB	0.0 dB
Main Antenna Radome Loss:	-	-
ACU Tx Loss:	0 dB	
ACU Rx Loss:	0 dB	
Misc/Common Line Pads:	-0.0 dB	
TOTAL LOSSES:	139.4 dB	

	Lake Villa	Lake Zurich (Guyed)
Antenna Size:	6 ft	6 ft
Antenna Centerline:	110.0 ft	150.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	64.8 dBm	64.2 dBm
Transmitter Power, GUARANTEED		Low(28.5 dBm)
TOTAL GAINS (Incl. TRX Power):		106.1 dBm

	Lake Villa	Lake Zurich (Guyed)
Unfaded Received Signal Level:	-33.3 dBm (+/- 2dB)	
Required Level for: 10-6 BER:	-78.5 dBm	
Flat Fade Margin:	45.2 dB	
Dispersive Fade Margin:	64.9 dB	
Composite Fade Margin:	45.2 dB	
Multipath Outage Probability(SESr):	0.000001505	0.000001502
Multipath Outage in (Sec/Yr):	14.0	
Annual Multipath Reliability in %:	99.99996 %	
Rain Outage in (Sec/Yr):	0.1 (Horizontal)	
Annual Rain Availability in %:	100.00000 %	

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
 c = 2.52 w = 31.8 ft x = 1.4: Great Lakes Areas
 Unfaded Received Signal Level (at radio/transmission line interface): -30.2 dBm (+/- 2dB) / -30.8 dBm (+/- 2dB)
 Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name: **Lake Zurich (Guyed)**

NAD83 Latitude : 42°14'11.89"N
 Longitude: 88°4'17.4"W
 Elevation : [879.04] ft
 Azimuth: 97.8 °

Highwood (WT)

Latitude : 42°12'37.67"N
 Longitude: 87°48'55.52"W
 Elevation : [692.08] ft
 Azimuth: 277.94 °

Path Length: 13.264 mi

Free Space Loss: 135.6 dB

Atmospheric Absorption: 0.2 dB

Diffraction Loss: 0.0 dB

Transmission Line Types: Elliptic/Other

Transmission Line Lengths: 160/3 ft

Transmission Line Losses: 2.2/0.3 dB

Transmit-Only Pads: 0.0 dB

Jumper / Flex Loss: 0.0 dB

Main Antenna Radome Loss: -

ACU Tx Loss: 0 dB

ACU Rx Loss: 0 dB

Misc/Common Line Pads: -0.0 dB

TOTAL LOSSES: 141.6 dB

Antenna Size: 6 ft

Antenna Centerline: 110.0 ft

Antenna Gain: 38.8 dBi

Antenna Type: PAR6-65-PXA/B [6GHz (I

Effective Radiated Power(EIRP): 67.8 dBm

Transmitter Power, GUARANTEED High(31.5 dBm)

TOTAL GAINS (Incl. TRX Power): 109.1 dBm

Unfaded Received Signal Level: -32.5 dBm (+/- 2dB)

Required Level for: 10-6 BER: -78.5 dBm

Flat Fade Margin: 46.0 dB

Dispersive Fade Margin: 64.9 dB

Composite Fade Margin: 45.9 dB

Multipath Outage Probability(SESr): 0.000001202

Multipath Outage in (Sec/Yr): 11.2

Annual Multipath Reliability in %: 99.99996 %

Rain Outage in (Sec/Yr): 0.1 (Horizontal)

Annual Rain Availability in %: 100.00000 %

Vigants 1975

Crane

D2:Temperate Continental (Moderate)

Temperature = 59 °F

c = 1.19

w = 56.4 ft

x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -29.3 dBm (+/- 2dB) / -30.0 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
 OPTION: Standard Power
 Radio Model: IRU600 v3
 Operation Mode: Fixed modulation (priority for throughput)
 Protection Type: 1+0 NP

Date: 04 September 2013
 Rev. Date: 12 September 2013
 Engineer: M Del Fierro
 Capacity: 29xDS1 (45 Mbps)
 Frequency: 6GHz (High)
 Bandwidth: 10 MHz
 Modulation: 64QAM

Site Name:	Highwood (WT)	SO Dispatch Center (SS)
NAD83 Latitude :	42°12'37.67"N	42°17'47.67"N
Longitude:	87°48'55.52"W	87°57'26.15"W
Elevation :	[692.08] ft	[705.2] ft
Azimuth:	309.4 °	129.31 °

Path Length:	9.395 mi
Free Space Loss:	132.6 dB
Atmospheric Absorption:	0.2 dB
Diffraction Loss:	0.0 dB
Transmission Line Types:	Elliptic/Other
Transmission Line Lengths:	214/3 ft
Transmission Line Losses:	3.0/0.3 dB
Transmit-Only Pads:	0.0 dB
Jumper / Flex Loss:	0.0 dB
Main Antenna Radome Loss:	0.5 dB
ACU Tx Loss:	0 dB
ACU Rx Loss:	0 dB
Misc/Common Line Pads:	-0.0 dB
TOTAL LOSSES:	140.2 dB

Antenna Size:	6 ft	6 ft
Antenna Centerline:	164.0 ft	155.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	63.5 dBm	63.7 dBm
Transmitter Power, GUARANTEED	Low(28.5 dBm)	
TOTAL GAINS (Incl. TRX Power):	106.1 dBm	

Unfaded Received Signal Level:	-34.1 dBm (+/- 2dB)
Required Level for: 10-6 BER:	-78.5 dBm
Flat Fade Margin:	44.4 dB
Dispersive Fade Margin:	64.9 dB
Composite Fade Margin:	44.4 dB
Multipath Outage Probability(SESr):	0.000002399
Multipath Outage in (Sec/Yr):	22.3
Annual Multipath Reliability in %:	99.99993 %
Rain Outage in (Sec/Yr):	0.1 (Horizontal)
Annual Rain Availability in %:	100.00000 %

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
 c = 4.69 w = 19.7 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -30.4 dBm (+/- 2dB) / -30.3 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
OPTION: Standard Power

Radio Model: IRU600 v3
Operation Mode: Fixed modulation (priority for throughput)
Protection Type: 1+1 HSB or HSB Ready Equal Tx / Equal Rx A Path

Date: 04 September 2013
Rev. Date: 12 September 2013
Engineer: M Del Fierro
Capacity: 29xDS1 (45 Mbps)
Frequency: 6GHz (High)
Bandwidth: 10 MHz
Modulation: 64QAM

Site Name:	Barrington (WT)	Lake Zurich (Guyed)
NAD83 Latitude :	42°11'10.51"N	42°14'11.89"N
Longitude:	88°11'15.11"W	88°4'17.4"W
Elevation :	[787.2] ft	[879.04] ft
Azimuth:	59.6 °	239.66 °

Path Length:	6.897 mi
Free Space Loss:	129.9 dB
Atmospheric Absorption:	0.1 dB
Diffraction Loss:	0.0 dB
Transmission Line Types:	Elliptic/Other
Transmission Line Lengths:	200/3 ft
Transmission Line Losses:	2.8/0.3 dB
Transmit-Only Pads:	0.0 dB
Jumper / Flex Loss:	0.0 dB
Main Antenna Radome Loss:	0.5 dB
ACU Tx Loss:	0 dB
ACU Rx Loss:	0 dB
Misc/Common Line Pads:	-0.0 dB
TOTAL LOSSES:	137.6 dB

Antenna Size:	6 ft	6 ft
Antenna Centerline:	150.0 ft	180.0 ft
Antenna Gain:	38.8 dBi	38.8 dBi
Antenna Type:	PAR6-65-PXA/B [6GHz (I	PAR6-65-PXA/B [6GHz (I
Effective Radiated Power(EIRP):	63.7 dBm	63.3 dBm
Transmitter Power, GUARANTEED	Low(28.5 dBm)	
TOTAL GAINS (Incl. TRX Power):	106.1 dBm	

Unfaded Received Signal Level:	-31.5 dBm (+/- 2dB)
Required Level for: 10-6 BER:	-78.5 dBm
Flat Fade Margin:	47.0 dB
Dispersive Fade Margin:	64.9 dB
Composite Fade Margin:	46.9 dB
Multipath Outage Probability(SESr):	0.000000187
Multipath Outage in (Sec/Yr):	1.7
Annual Multipath Reliability in %:	99.99999 %
Rain Outage in (Sec/Yr):	0.0 (Horizontal)
Annual Rain Availability in %:	100.00000 %

Vigants 1975 Crane D2:Temperate Continental (Moderate) Temperature = 59 °F
c = 1.66 w = 43.7 ft x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -27.5 dBm (+/- 2dB) / -27.9 dBm (+/- 2dB)

Confidential and Proprietary Information



Path Calculation

Customer/Project:
OPTION: Standard Power

Radio Model: IRU600 v3
Operation Mode: Fixed modulation (priority for throughput)
Protection Type: 1+1 HSB or HSB Ready Equal Tx / Equal Rx A Path

Date: 04 September 2013
Rev. Date: 12 September 2013
Engineer: M Del Fierro
Capacity: 29xDS1 (45 Mbps)
Frequency: 6GHz (High)
Bandwidth: 10 MHz
Modulation: 64QAM

Site Name: **SO Dispatch Center (SS)**

NAD83 Latitude : 42°17'47.67"N
Longitude: 87°57'26.15"W
Elevation : [705.2] ft
Azimuth: 181.1 °

Vernon Hills (SS)

Latitude : 42°12'6.02"N
Longitude: 87°57'35.17"W
Elevation : [688.8] ft
Azimuth: 1.12 °

Path Length: 6.553 mi

Free Space Loss: 129.5 dB

Atmospheric Absorption: 0.1 dB

Diffraction Loss: 0.0 dB

Transmission Line Types: Elliptic/Other

Transmission Line Lengths: 250/3 ft

Transmission Line Losses: 3.5/0.3 dB

Transmit-Only Pads: 0.0 dB

Jumper / Flex Loss: 0.0 dB

Main Antenna Radome Loss: -

ACU Tx Loss: 0 dB

ACU Rx Loss: 0 dB

Misc/Common Line Pads: -0.0 dB

TOTAL LOSSES: 135.7 dB

Antenna Size: 6 ft

Antenna Centerline: 200.0 ft

Antenna Gain: 38.8 dBi

Antenna Type: PAR6-65-PXA/B [6GHz (I

Effective Radiated Power(EIRP): 63.5 dBm

Transmitter Power, GUARANTEED

TOTAL GAINS (Incl. TRX Power):

Low(28.5 dBm)

106.1 dBm

Unfaded Received Signal Level: -29.6 dBm (+/- 2dB)

Required Level for: 10-6 BER: -78.5 dBm

Flat Fade Margin: 48.9 dB

Dispersive Fade Margin: 64.9 dB

Composite Fade Margin: 48.8 dB

Multipath Outage Probability(SESr): 0.000000292

Multipath Outage in (Sec/Yr): 2.7

Annual Multipath Reliability in %: 99.99999 %

Rain Outage in (Sec/Yr): 0.0 (Horizontal)

Annual Rain Availability in %: 100.00000 %

Vigants 1975

Crane

D2:Temperate Continental (Moderate)

Temperature = 59 °F

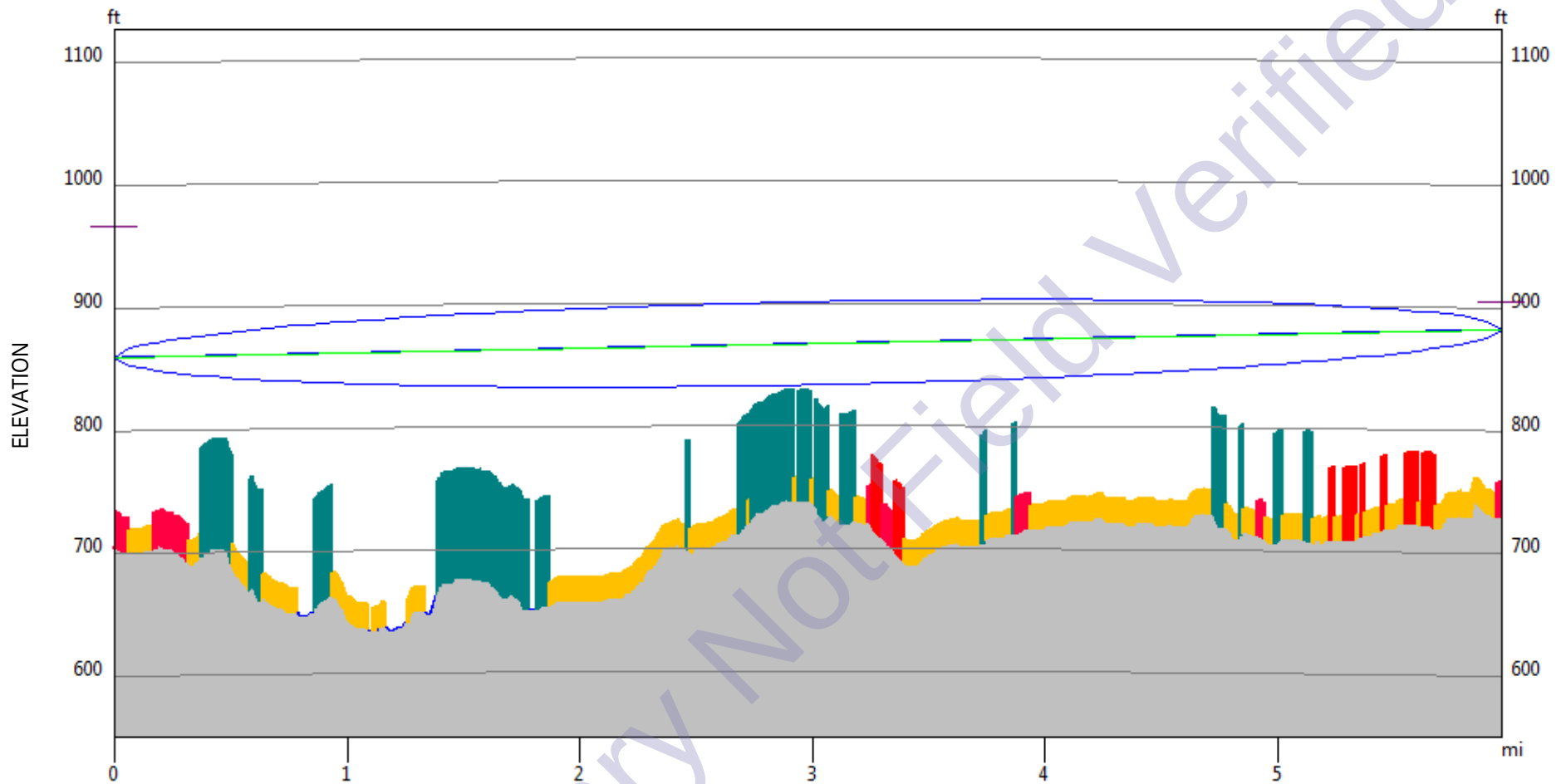
c = 4.69

w = 19.7 ft

x = 1.4: Great Lakes Areas

Unfaded Received Signal Level (at radio/transmission line interface): -27.3 dBm (+/- 2dB) / -25.8 dBm (+/- 2dB)

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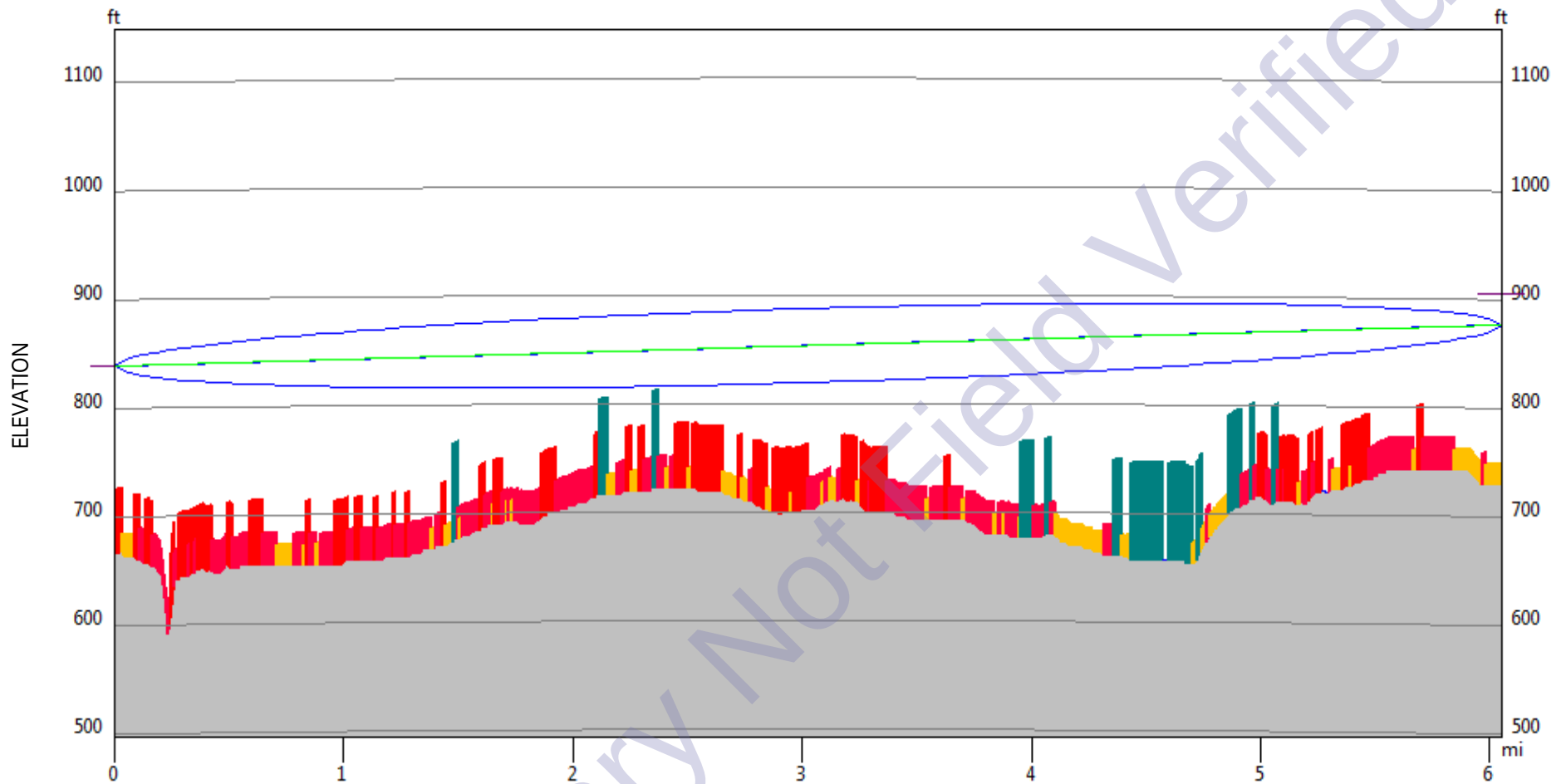


Terrain Roughness:		28.6 ft		DISTANCE		Path Length:		5.962 mi	
Site Name:		SO Dispatch Center (S)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°17'47.67"N		Lake County IL					
	Longitude:	87°57'26.15"W							
	Elevation AMSL:	[705.2] ft							
	Centerlines AGL:	155.0 ft							
Reference Map:				k1: 1.33					
Field Verified:	k2: 0.88								
Reference Map:						Reference Map:			
Field Verified:						Engineer:		M Del Fierro	

Confidential and Proprietary Information

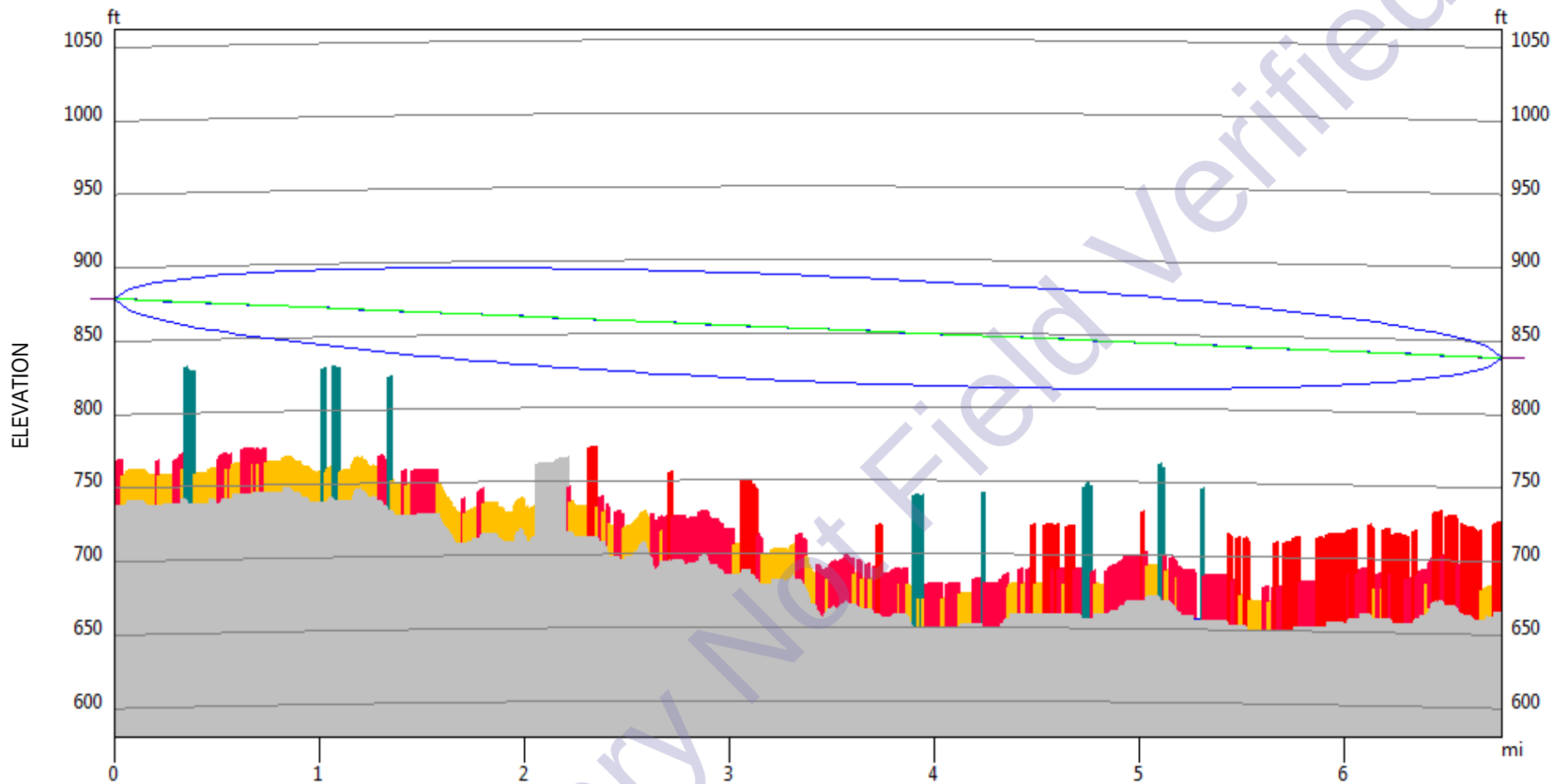
Site Name:		Gurnee Toll (SS)	
NAD83	Latitude:	42°22'57.47"N	
	Longitude:	87°56'51.52"W	
	Elevation AMSL:	[728.16] ft	
	Centerlines AGL:	155.0 ft	

Reference Map:
Engineer: M Del Fierro

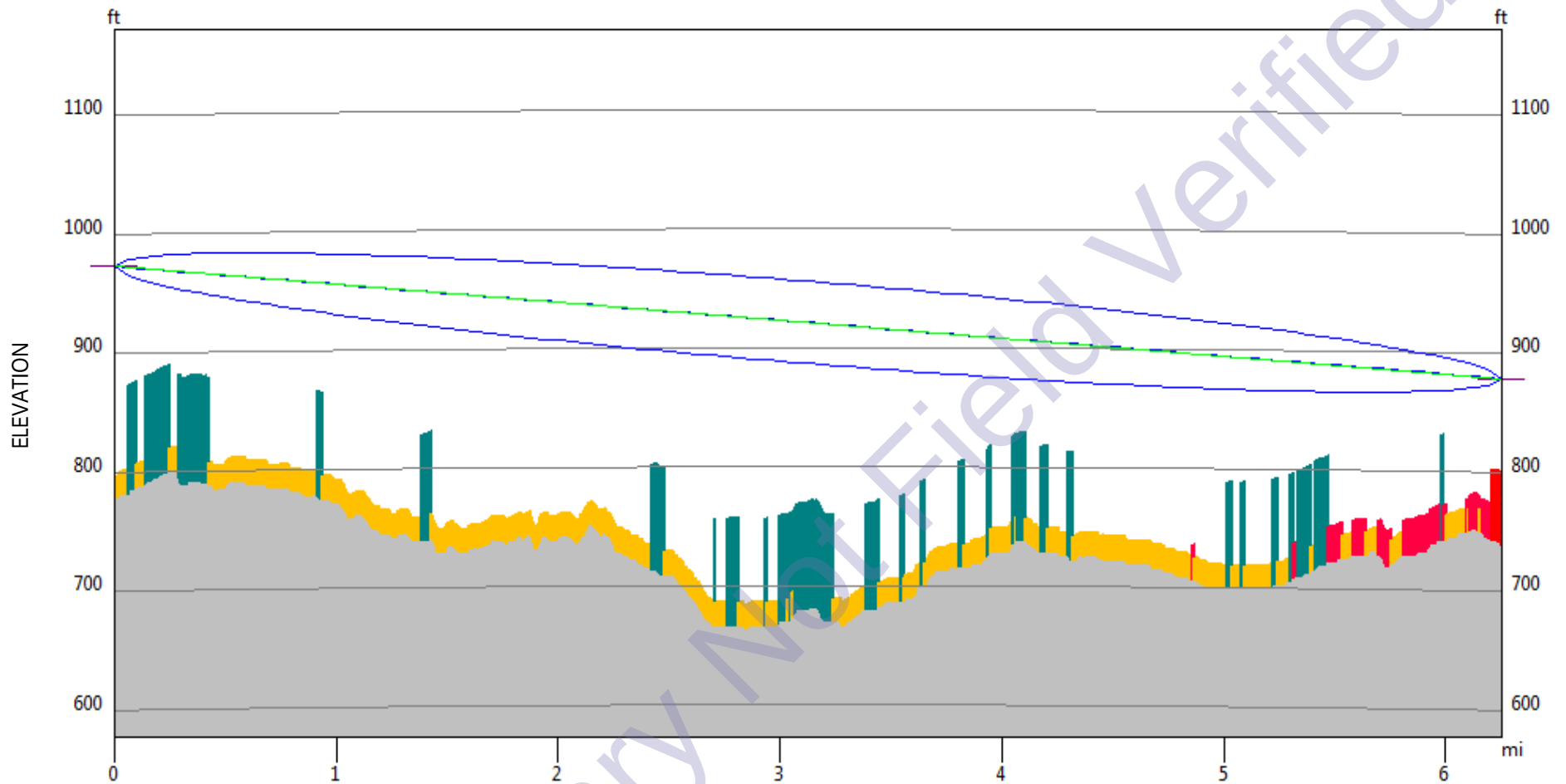


Terrain Roughness:		29.6 ft		DISTANCE		Path Length:		6.052 mi	
Site Name:		Waukegan (Bldg)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°21'38.89"N		Lake County IL					
	Longitude:	87°49'59.32"W							
	Elevation AMSL:	[665.84] ft							
	Centerlines AGL:	173.0 ft							
Reference Map:				 k1: 1.33		Site Name: Gurnee Toll (SS)			
Field Verified:				 k2: 0.88					
NAD83	Latitude:	42°22'57.47"N		Reference Map:					
	Longitude:	87°56'51.52"W							
	Elevation AMSL:	[728.16] ft							
	Centerlines AGL:	149.0 ft							
Reference Map:						Engineer: M Del Fierro			

Confidential and Proprietary Information

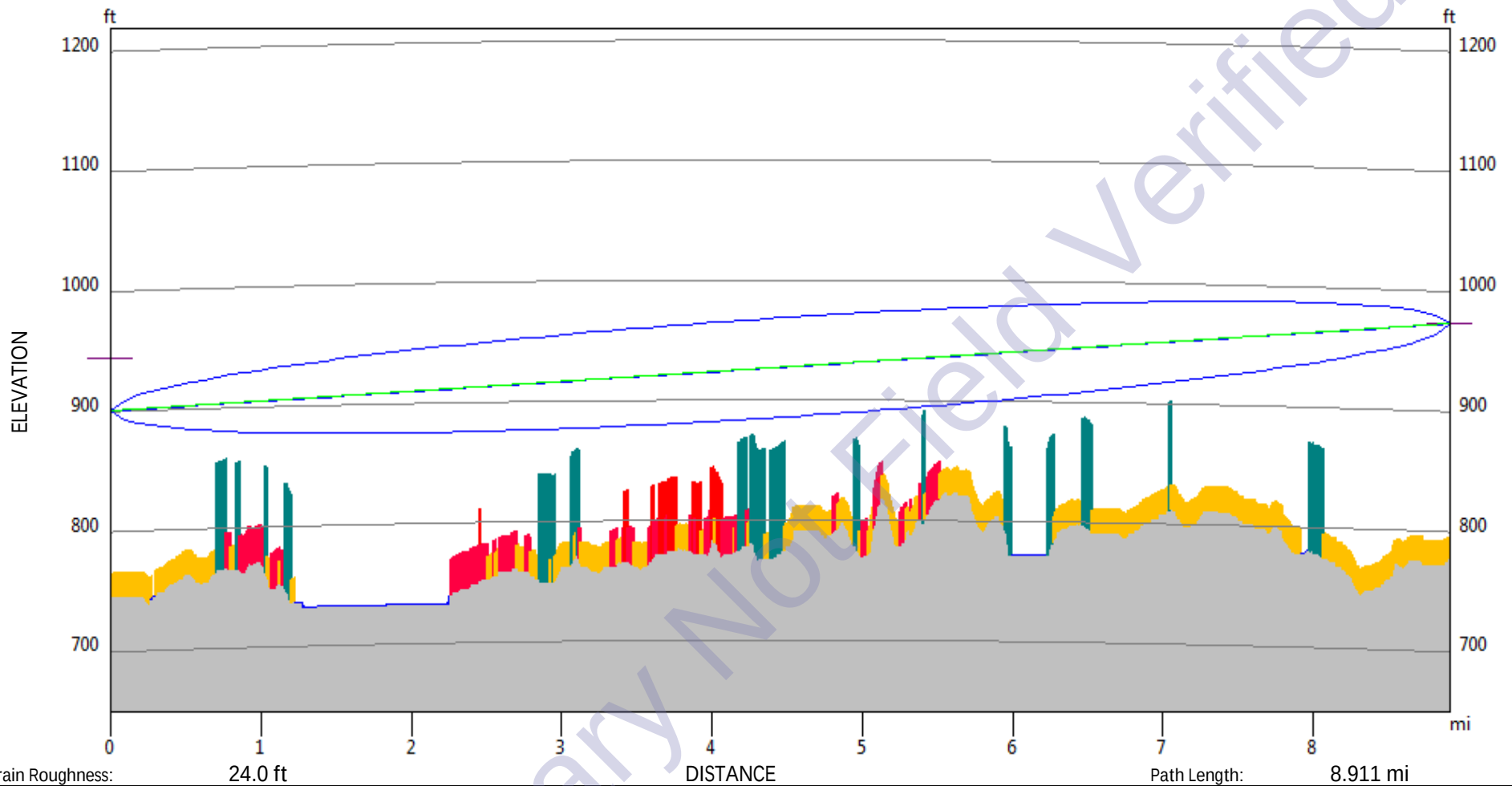


Terrain Roughness:		33.9 ft		DISTANCE		Path Length:		6.771 mi	
Site Name:		Beach Park (WT)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°27'12.86"N		Lake County IL					
	Longitude:	87°52'33.88"W							
	Elevation AMSL:	[738] ft							
	Centerlines AGL:	141.0 ft							
Reference Map:				k1: 1.33		Site Name:		Waukegan (Bldg)	
Field Verified:				k2: 0.88		Latitude:		42°21'38.89"N	
NAD83	Longitude:	87°49'59.32"W		Reference Map:		Engineer:		M Del Fierro	
	Elevation AMSL:	[665.84] ft							
	Centerlines AGL:	173.0 ft							



Terrain Roughness:		34.6 ft		DISTANCE		Path Length:		6.254 mi	
Site Name:		Antioch (WT)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°28'3.04"N		Lake County IL					
	Longitude:	87°59'49.03"W							
	Elevation AMSL:	[777.36] ft							
	Centerlines AGL:	196.0 ft							
Reference Map:				 k1: 1.33		Site Name: Beach Park (WT)			
Field Verified:	 k2: 0.88								
						Latitude:		42°27'12.86"N	
						Longitude:		87°52'33.88"W	
						Elevation AMSL:		[738] ft	
						Centerlines AGL:		141.0 ft	
						Reference Map:			
						Engineer:		M Del Fierro	

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Site Name: Antioch NW (SS)

Latitude: 42°29'28.11"N

Longitude: 88°10'6.14"W

Elevation AMSL: [744.56] ft

Centerlines AGL: 156.0 ft

Standard Power Freq: 6,775 MHz 04 September 2013

Lake County IL



k1: 1.33

k2: 0.88

Reference Map:

Field Verified:

Confidential and Proprietary Information

Site Name: Antioch (WT)

Latitude: 42°28'3.04"N

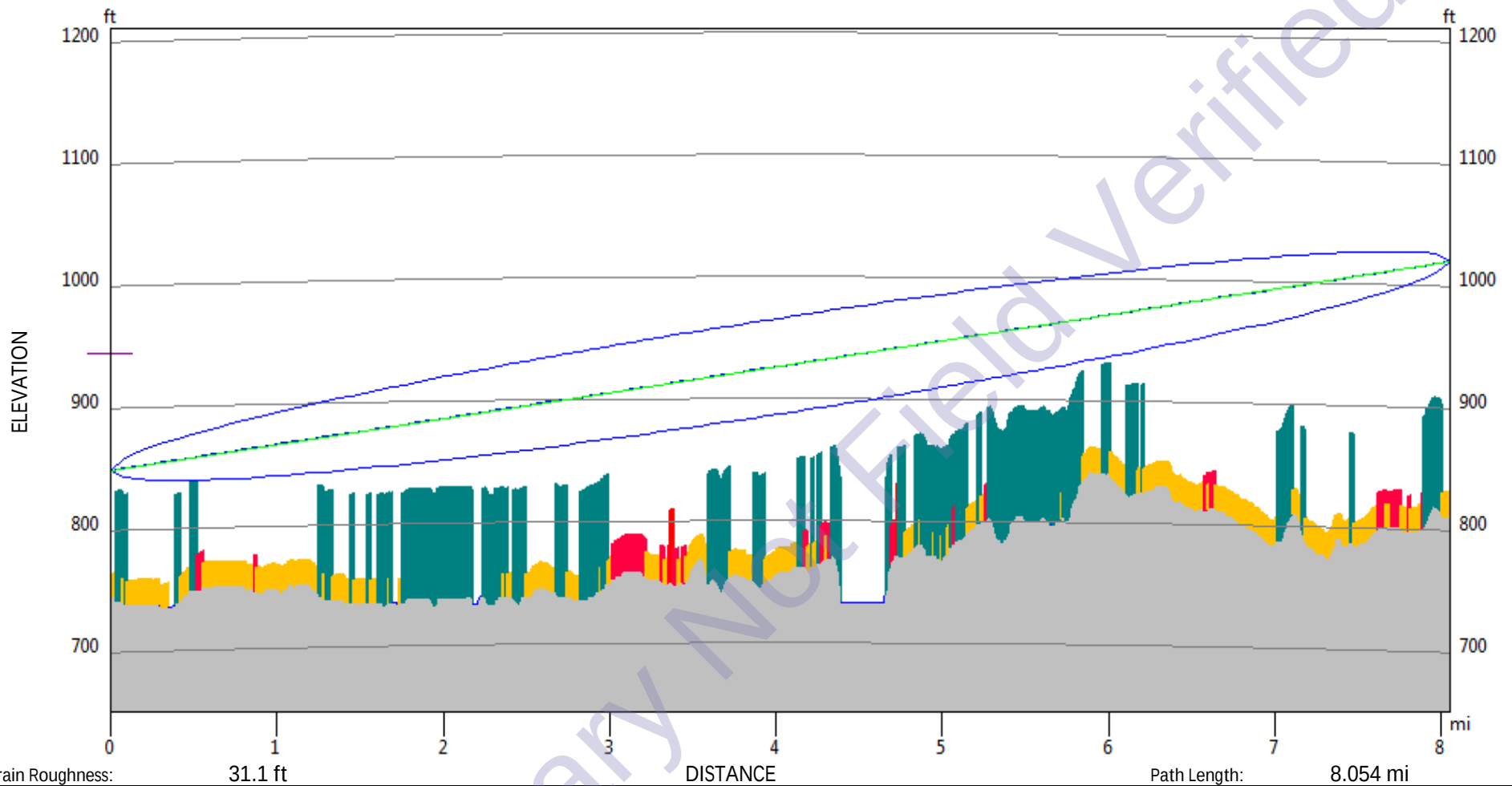
Longitude: 87°59'49.03"W

Elevation AMSL: [777.36] ft

Centerlines AGL: 196.0 ft

Reference Map:

Engineer: M Del Fierro



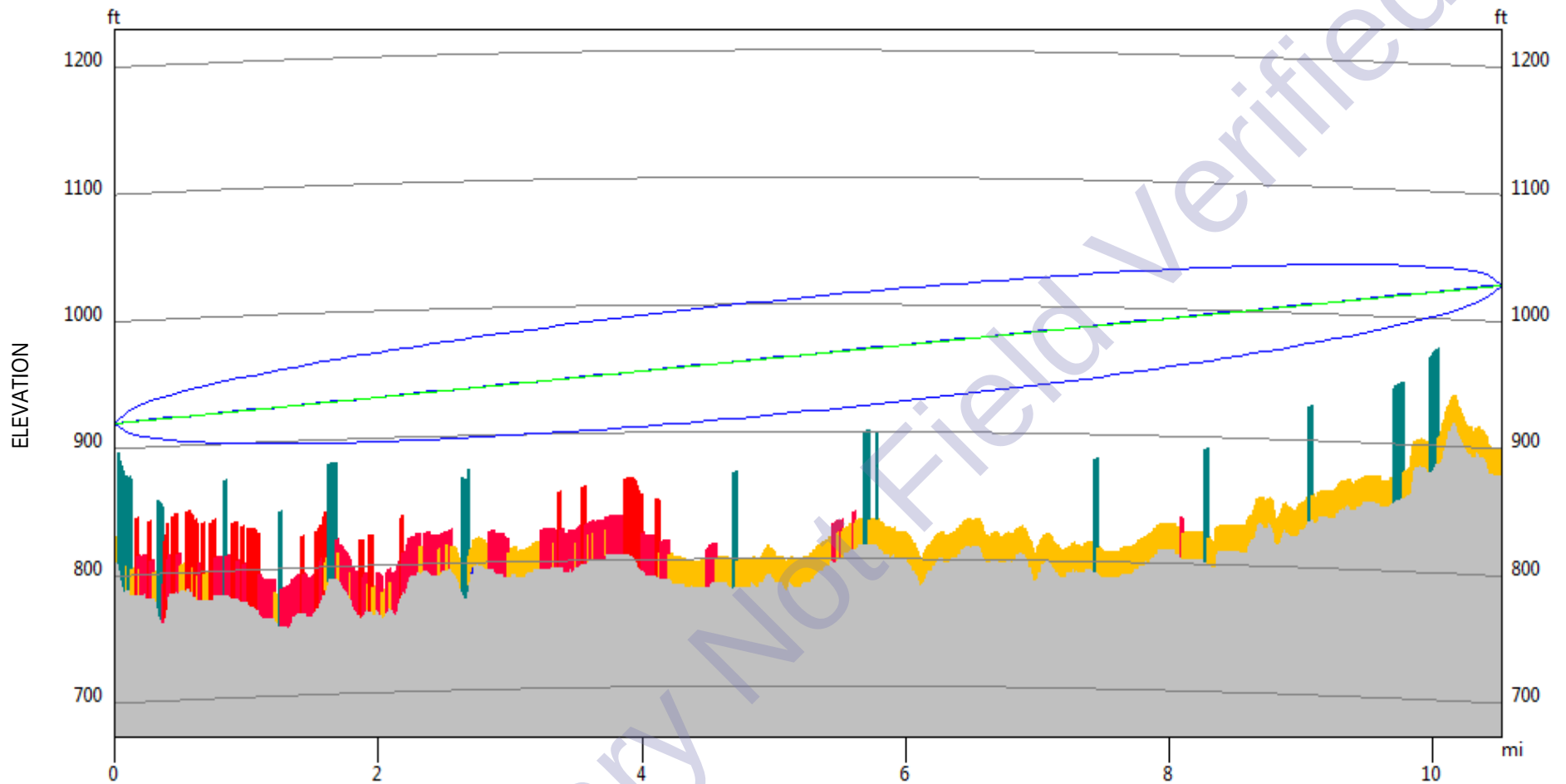
Site Name:		Antioch NW (SS)	Standard Power	Freq: 6,775 MHz	04 September 2013
NAD83	Latitude:	42°29'28.11"N			
	Longitude:	88°10'6.14"W			
	Elevation AMSL:	[744.56] ft	Lake County IL		
	Centerlines AGL:	105.0 ft			
Reference Map:				 k1: 1.33	
Field Verified:				 k2: 0.88	

Reference Map:

Field Verified:

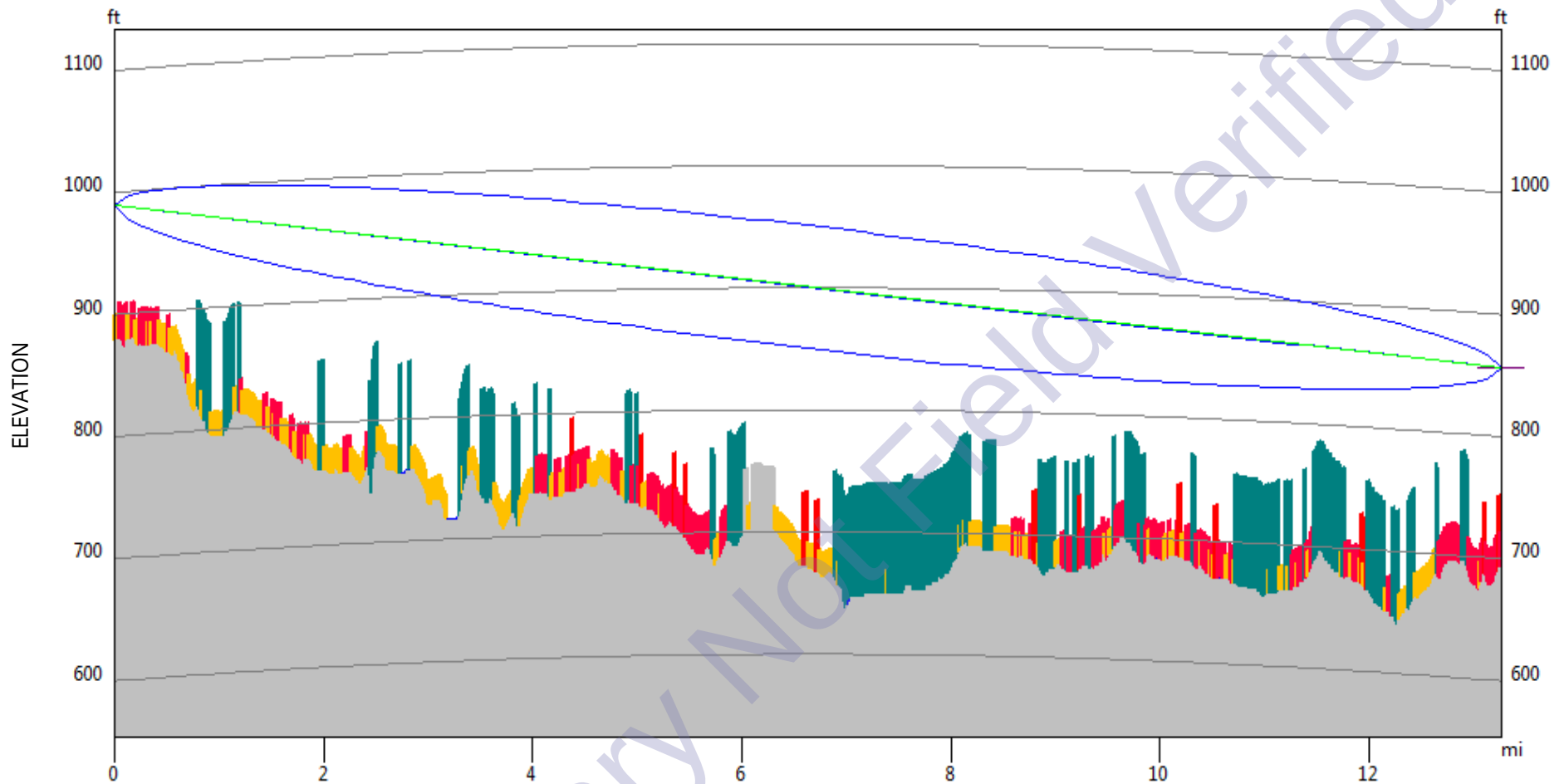
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Site Name: Lake Villa	
NAD83	Latitude: 42°23'17.08"N
	Longitude: 88°5'40.52"W
	Elevation AMSL: [810.16] ft
	Centerlines AGL: 210.0 ft
Reference Map:	
Engineer: M Del Fierro	

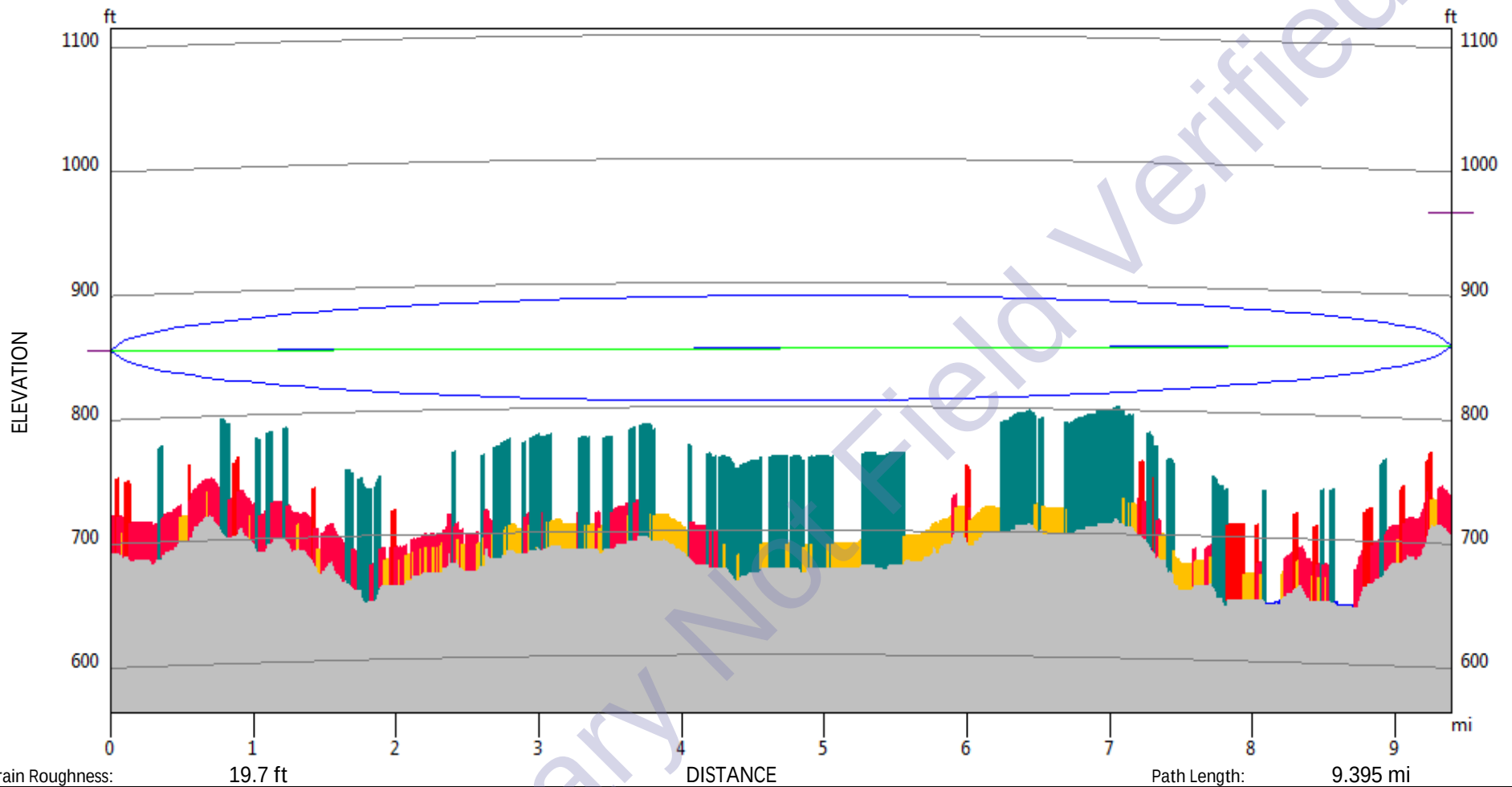


Terrain Roughness:		31.8 ft		DISTANCE		Path Length:		10.522 mi		
NAD83	Site Name:	Lake Villa	Standard Power	Freq:	6,775 MHz	04 September 2013		Site Name:	Lake Zurich (Guyed)	
	Latitude:	42°23'17.08"N		Latitude:						42°14'11.89"N
	Longitude:	88°5'40.52"W		Longitude:						88°4'17.4"W
	Elevation AMSL:	[810.16] ft		Elevation AMSL:						[879.04] ft
	Centerlines AGL:	110.0 ft		Centerlines AGL:						150.0 ft
Reference Map:				Lake County IL						
Field Verified:						 k1:		1.33		
						 k2:		0.88		
								Reference Map:		
								Engineer:	M Del Fierro	

Site Name:	Lake Zurich (Guyed)
Latitude:	42°14'11.89"N
Longitude:	88°4'17.4"W
Elevation AMSL:	[879.04] ft
Centerlines AGL:	150.0 ft
Reference Map:	
Engineer:	M Del Fierro

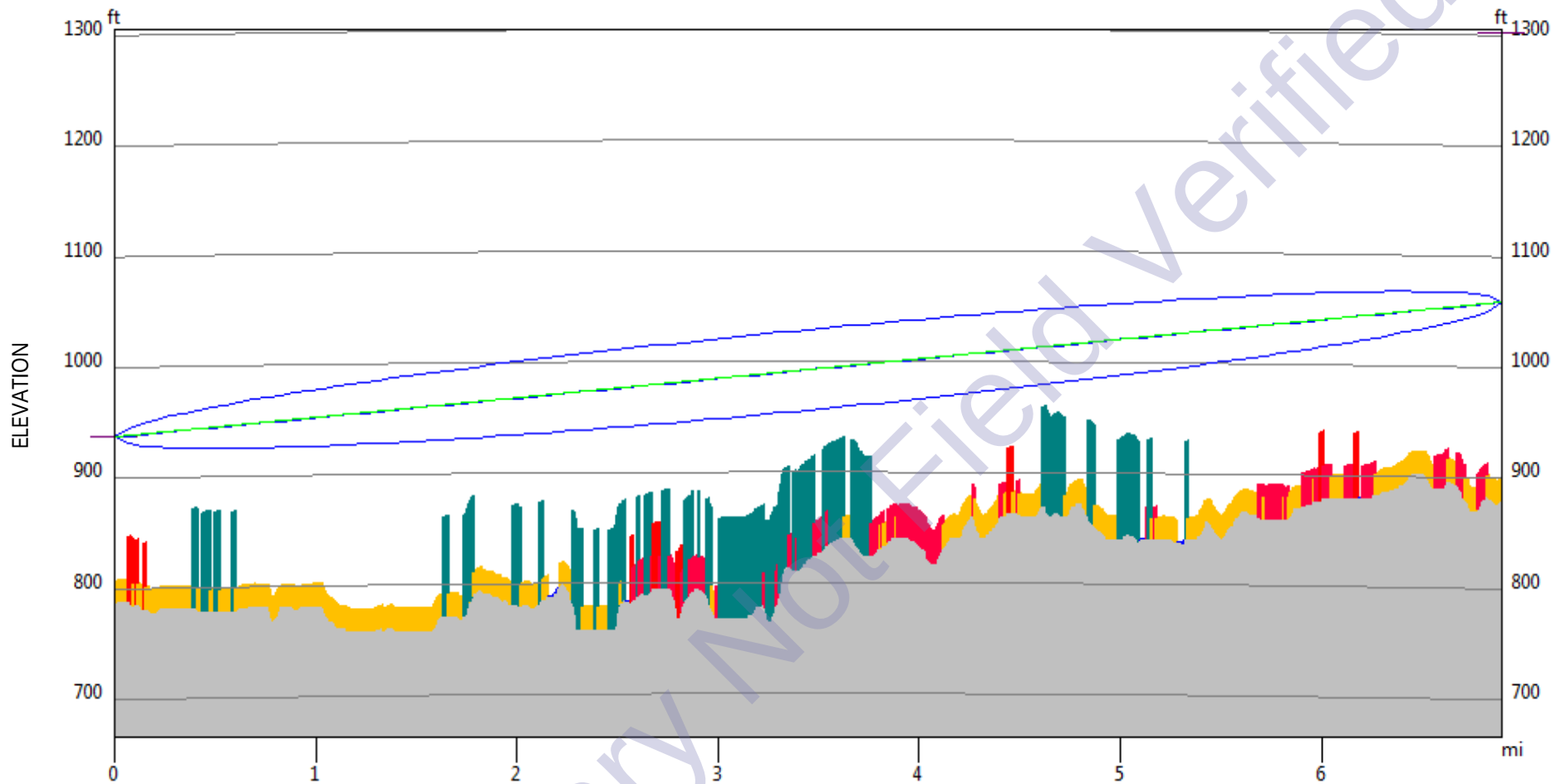


Terrain Roughness:		56.4 ft		DISTANCE		Path Length:		13.264 mi	
Site Name:		Lake Zurich (Guyed)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°14'11.89"N							
	Longitude:	88°4'17.4"W							
	Elevation AMSL:	[879.04] ft							
	Centerlines AGL:	110.0 ft							
				Lake County IL					
									
				 k1: 1.33					
				 k2: 0.88					
Reference Map:									
Field Verified:									
Site Name:		Highwood (WT)				Site Name:		Highwood (WT)	
NAD83	Latitude:	42°12'37.67"N							
	Longitude:	87°48'55.52"W							
	Elevation AMSL:	[692.08] ft							
	Centerlines AGL:	164.0 ft							
Reference Map:									
Engineer:		M Del Fierro							

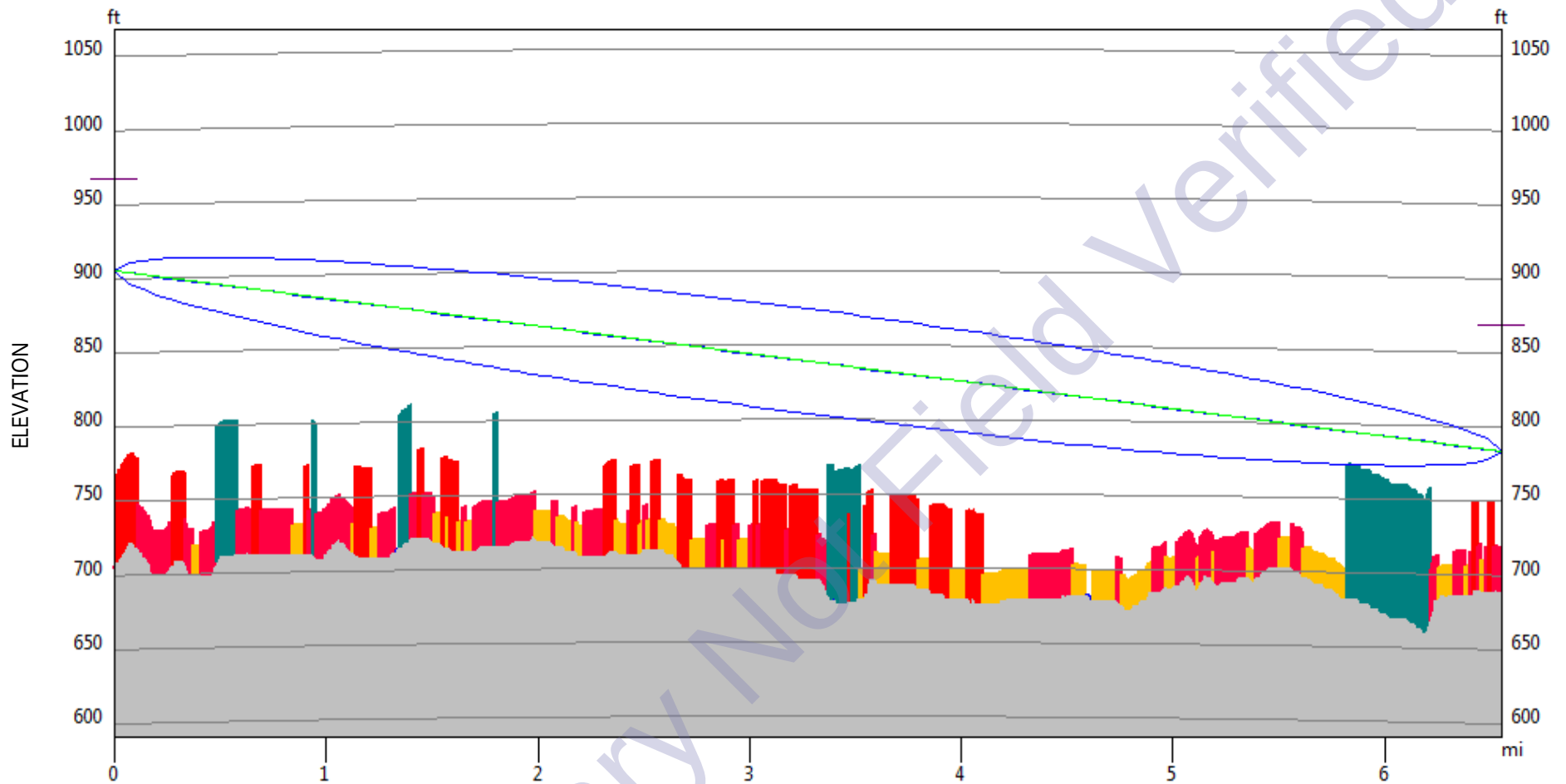


Site Name: Highwood (WT)		Standard Power	Freq: 6,775 MHz	04 September 2013	Site Name: SO Dispatch Center (
NAD83	Latitude:	42°12'37.67"N			Latitude: 42°17'47.67"N
	Longitude:	87°48'55.52"W			Longitude: 87°57'26.15"W
	Elevation AMSL:	[692.08] ft			Elevation AMSL: [705.2] ft
	Centerlines AGL:	164.0 ft			Centerlines AGL: 155.0 ft
Reference Map:		Lake County IL		Reference Map:	
Field Verified:				Engineer: M Del Fierro	
		k1: 1.33 k2: 0.88			

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Terrain Roughness:		43.7 ft		DISTANCE		Path Length:		6.897 mi			
Site Name:		Barrington (WT)		Standard Power		Freq: 6,775 MHz		04 September 2013			
NAD83	Latitude:	42°11'10.51"N		Lake County IL							
	Longitude:	88°11'15.11"W									
	Elevation AMSL:	[787.2] ft									
	Centerlines AGL:	150.0 ft									
Reference Map:				k1: 1.33		Site Name:		Lake Zurich (Guyed)			
Field Verified:	k2: 0.88			Latitude:		42°14'11.89"N					
						NAD83		Longitude:		88°4'17.4"W	
								Elevation AMSL:		[879.04] ft	
								Centerlines AGL:		180.0 ft	
								Reference Map:			
								Engineer:		M Del Fierro	



Terrain Roughness:		19.7 ft		DISTANCE		Path Length:		6.553 mi	
Site Name:		SO Dispatch Center (S)		Standard Power		Freq: 6,775 MHz		04 September 2013	
NAD83	Latitude:	42°17'47.67"N		Lake County IL					
	Longitude:	87°57'26.15"W							
	Elevation AMSL:	[705.2] ft							
	Centerlines AGL:	200.0 ft							
Reference Map:						 k1: 1.33			
Field Verified:						 k2: 0.88			

SECTION 2

MAPS, DRAWINGS AND DIAGRAMS

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

CONTRACT DOCUMENTATION



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SECTION 2

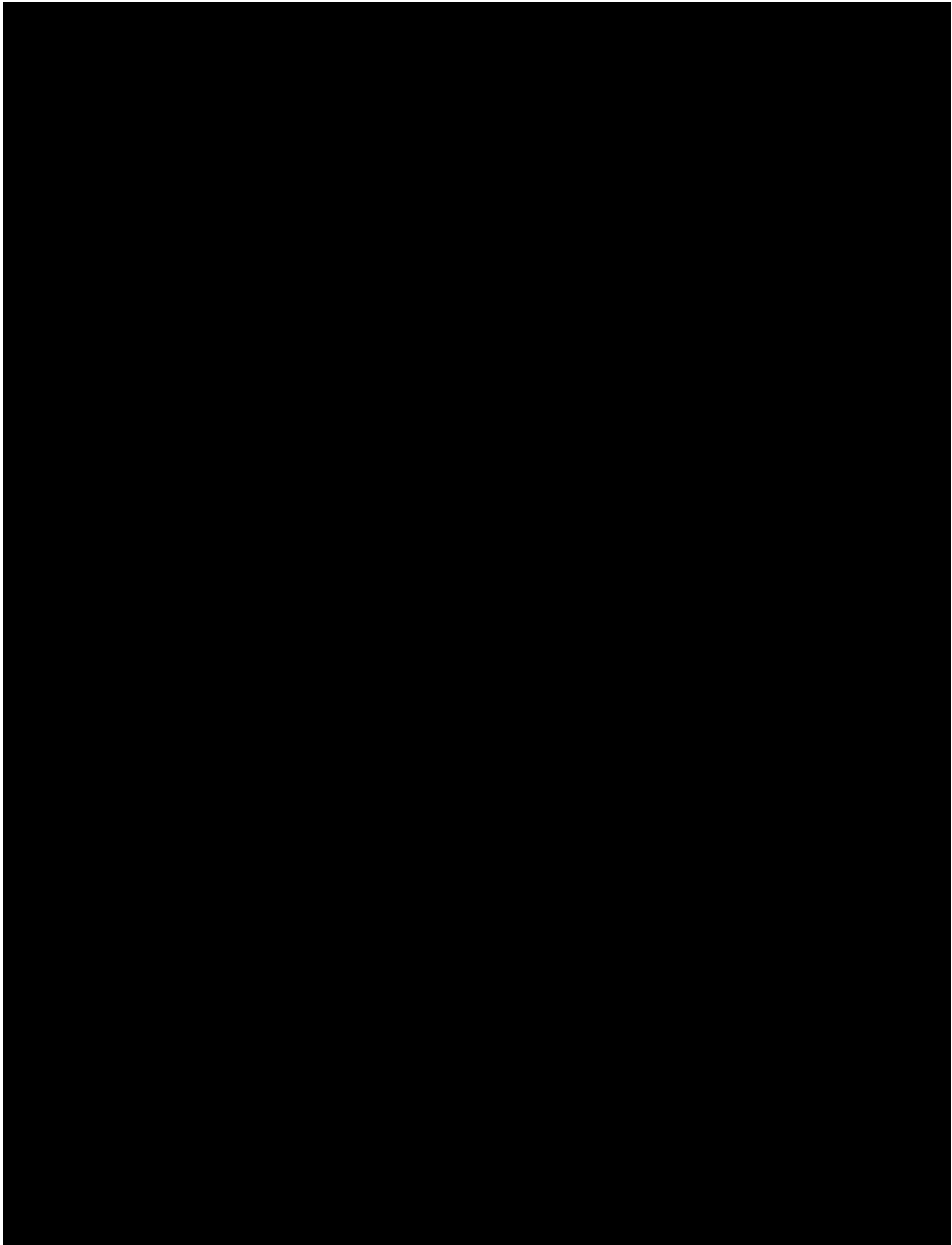
MAPS, DRAWINGS AND DIAGRAMS

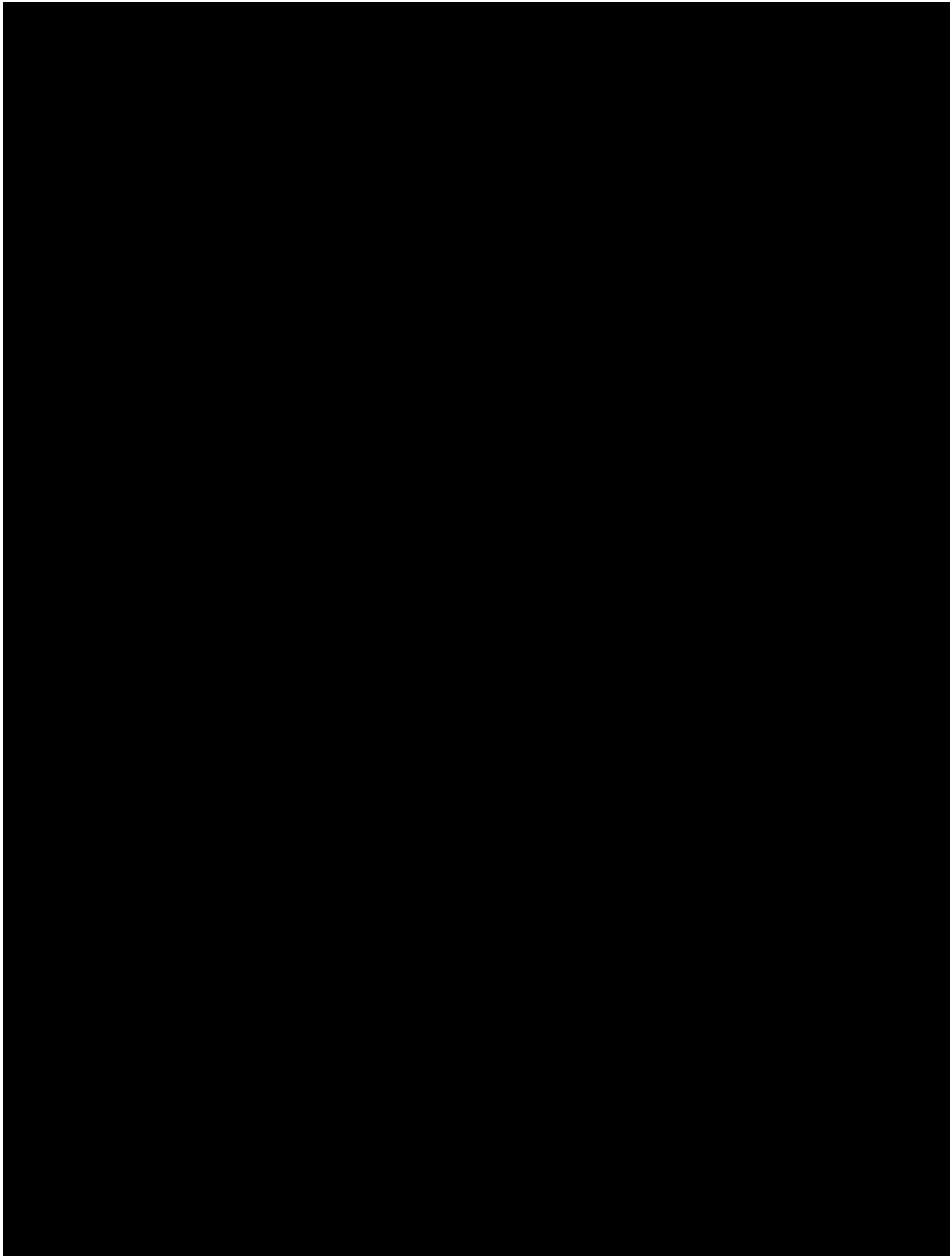
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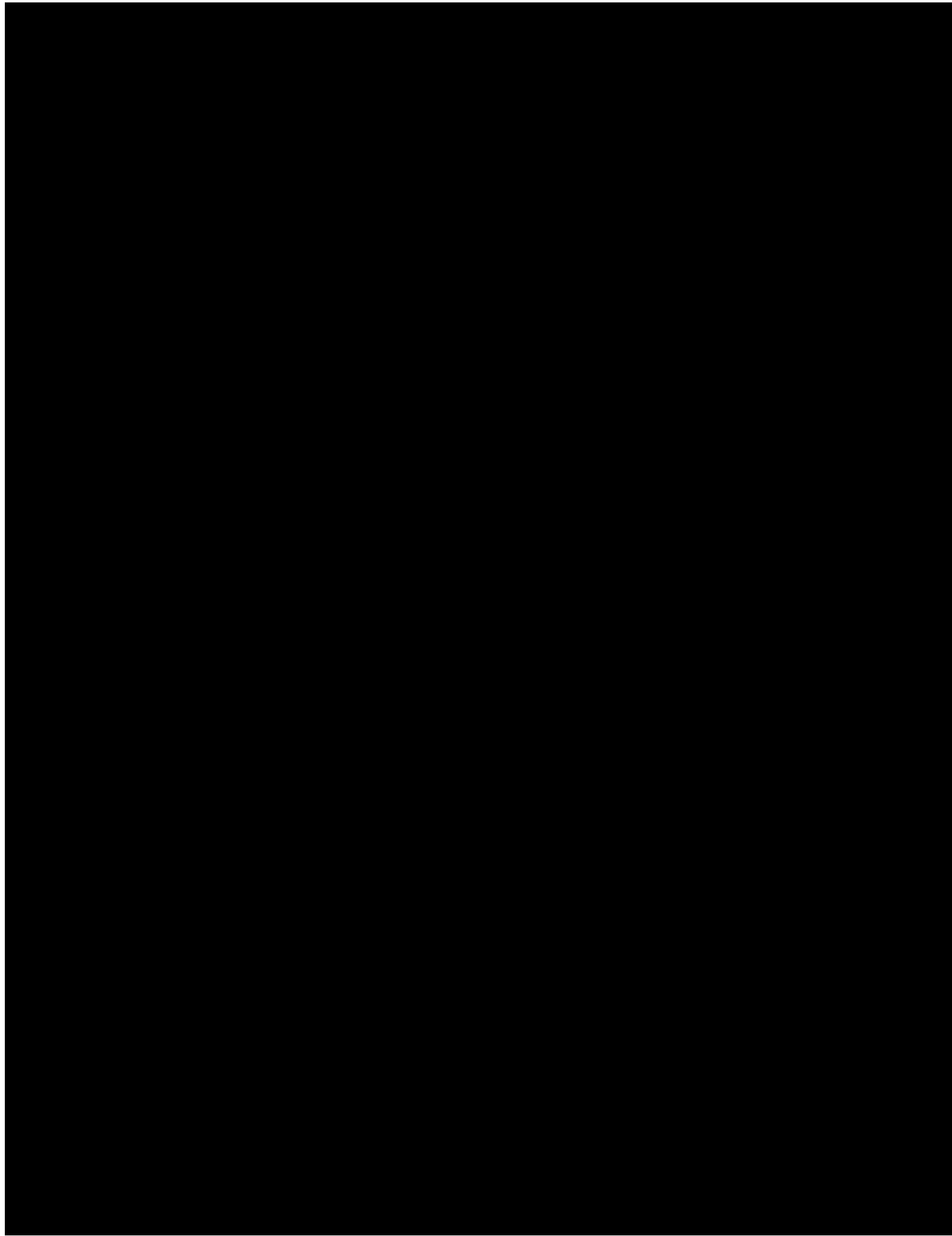


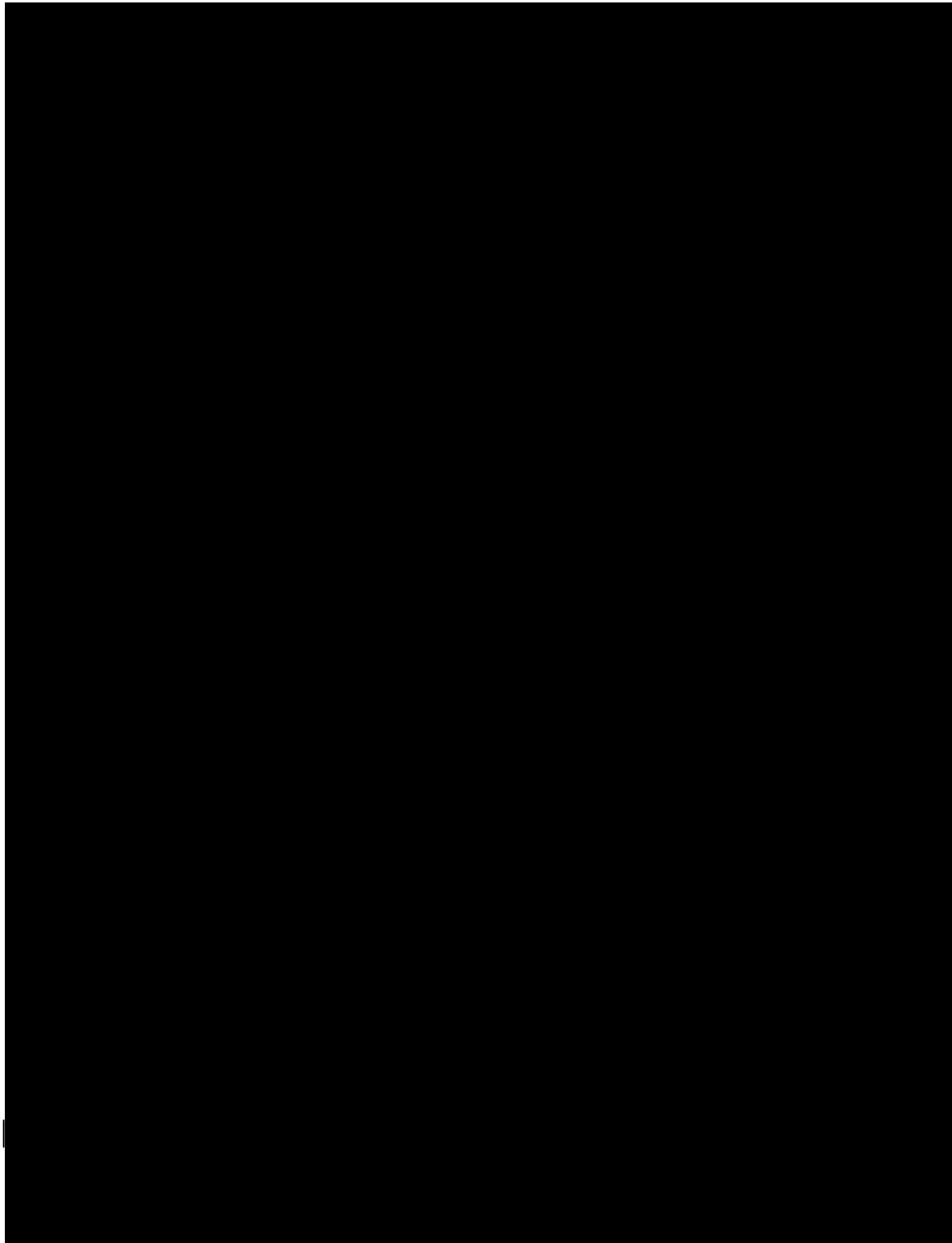
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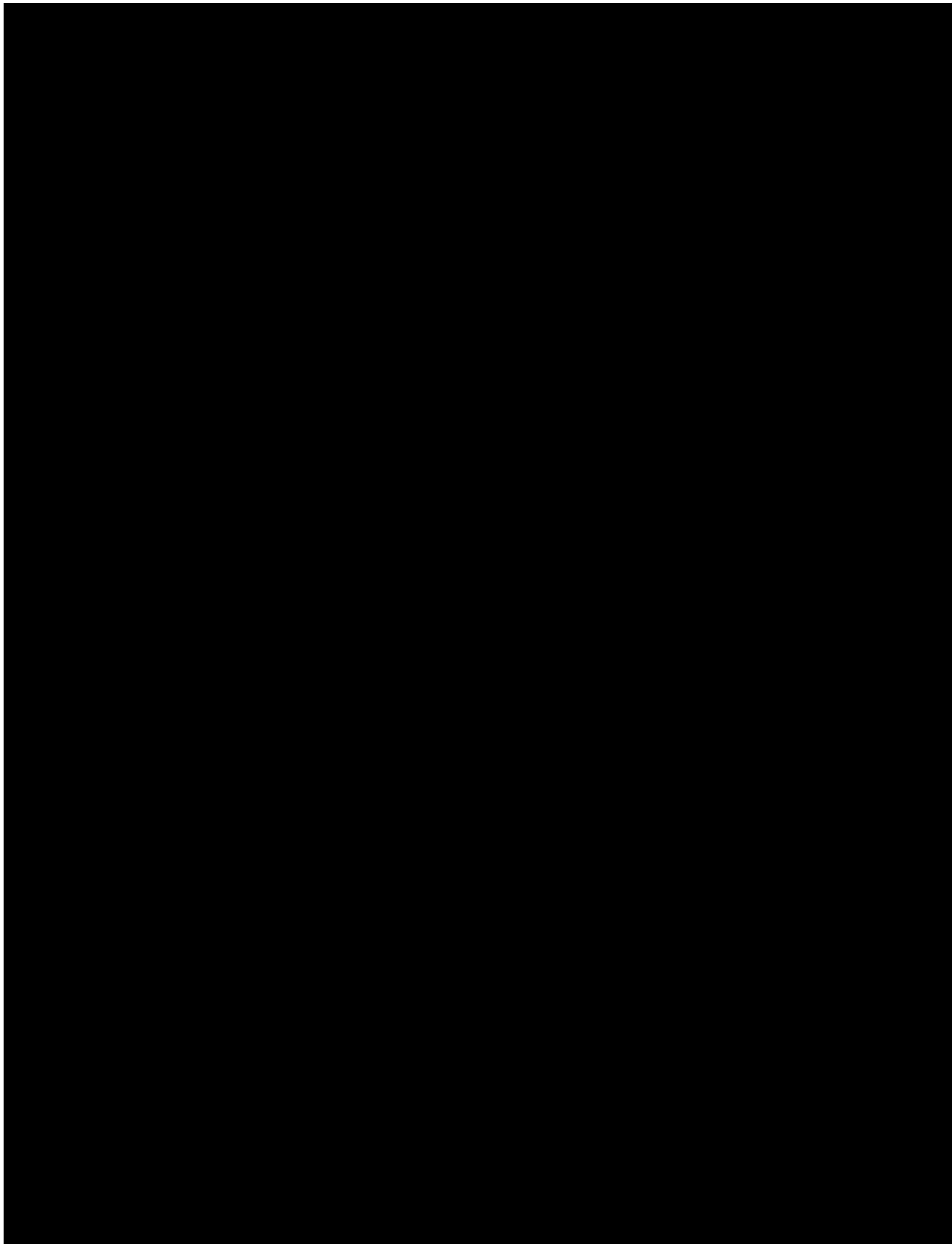












SECTION 3

EQUIPMENT LISTS

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

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SECTION 4

STATEMENT OF WORK

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

CONTRACT DOCUMENTATION



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STATEMENT OF WORK

4.1 STATEMENT OF WORK FOR THE MAIN OFFER

4.1.1 Statement of Work Overview

This document, known as the Statement of Work (SOW) describes the deliverables to be furnished to Lake County, Illinois (“County”), and the tasks to be performed by Motorola, its subcontractors, and The County to implement the solution described in this proposal. It describes the actual work involved in installation and clarifies the responsibilities for both Motorola and the County during the project implementation.

Specifically, this SOW provides:

- A summary of the phases and tasks to be completed within the project lifecycle.
- A list of the deliverables associated with the project.
- A description of the responsibilities for both Motorola and the County.
- The qualifications and assumptions taken into consideration during the development of this project.

This SOW will become a contract document that may be revised as needed to incorporate any changes associated with contract negotiations, Detailed Design Review (DDR), and any other change orders that may occur during project execution.

Any revision to this Statement of Work is to be made in writing and signed by both parties. Revisions are subject to adherence to the Lake County Purchasing ordinance and State Statute.

4.1.2 Project Resources

Motorola has organized project resources into a Systems Integration (SI) group to meet the needs of implementing sophisticated communications technology. This organization is involved from system conception to system completion.

The Motorola SI group assembles a team for each project to fulfill County-specific requirements. The Motorola SI group and Lake County’s team members will work together to provide the proposed radio system.

Motorola SI group shall not replace any Key Personnel identified within this SOW without the County’s prior written consent, which shall not be unreasonably withheld. In the event any one of the Key Personnel is reassigned within Motorola SI group in a different capacity or role, becomes incapacitated, or ceases to be employed by Motorola SI group and therefore becomes unable to perform the functions or responsibilities assigned to him or her, Motorola SI group shall (i) within ten (10) business days, temporarily replace such person with another person properly qualified to perform the functions of such replaced person and (ii) within thirty (30) calendar days, permanently replace such replaced person with another person qualified to perform the functions of such replaced person. Any decision to substitute or replace Motorola SI group sub-contract vendors identified in this SOW will require prior written notice and approval from the County.



4.1.2.1 Motorola Project Manager

The Project Manager has full responsibility for the successful completion of the implementation life cycle from start to finish. The tasks of the Project Manager include, but are not limited to, the following:

- Act as main point of contact between the County's Project Manager and Motorola resources throughout the entire project life cycle.
- Develop and manage project plan, schedule, quality and risk.
- Oversee and manage day-to-day activities, deliverables and milestone completions associated with system implementation.
- Manage/supervise field installation and implementation teams to ensure that all on-site installation, integration and optimization tasks are performed per contract requirements, industry best practices, and applicable standards and guidelines.
- Develop, update and maintain a detailed project schedule to include work tasks with predecessors, milestones, start/end dates, and task resource(s).
- Distribute updated project schedule to the County one day prior to each weekly status meeting.
- Develop a project Communications Plan which includes:
 - Project team contact information.
 - Escalation procedures.
 - Scheduled meetings:
 - ◆ Meeting cycle
 - ◆ Meeting agenda
 - ◆ Meeting report sample
 - ◆ Required attendees by Title
 - Project Status Reports:
 - ◆ Status report cycle.
 - ◆ Content to be provided in status report.
 - ◆ Status report sample.
 - ◆ Status report recipients.
 - Secure website for document sharing.
 - Participate with the County in weekly progress review meetings or as deemed necessary throughout the project life-cycle:
 - ◆ Generate mutually agreed upon meeting agenda for each meeting.
 - ◆ Develop project status reports that identify the activities of the previous review period, as well as activities planned for the upcoming review period.
- Review Project Schedule:
 - Document and distribute weekly meeting minutes to the County within five (5) business days after each meeting.
 - Provide a toll free conference and pin numbers to participants for non face-to-face meetings.
- Develop, update, maintain and distribute project punch list.
- Inspect and maintain inventory of all received equipment to ensure total delivery.
- Inspect each site to ensure readiness for receiving and installing of site equipment.
- Support hardware implementation with proper documentation, guidance and training to ensure quality workmanship and the County's satisfaction by all Motorola vendors and subcontractors.
- Coordinate closely with the County's Project Manager any needed interruptions to the existing system during implementation of the new system.
- Issue status reports that include the project status, milestones achieved, tasks behind schedule, actual and potential problems.
- Resolve deviations from the Project Schedule.



- Monitor the project to ensure that support resources are available as scheduled and as identified in the contract.
- Assume accountability for all Motorola contractor and subcontractor supplied tasks within the Project Schedule.
- Review and administer change control procedures with the County's Project Manager.
- Provide timely responses to issues related to project progress raised by the County's Project Manager.
- Work with the County's Project Manager in designing and approving the format of an action item log to be used in conjunction with the Project Schedule. The purpose of the log is to identify outstanding issues, provide continual status updates on specific tasks and to identify responsibilities of the parties.

4.1.2.2 Motorola System Engineer

The Project Engineer has full responsibility for system design and performance. The Project Engineer's primary responsibility is to ensure the technical integrity of the system design throughout the entire project life-cycle. The Project Engineer's other tasks include:

- Development of system installation documents (i.e. equipment list or bill of materials, system level, and floor and rack-up drawings).
- Define the County's communication needs, design the preliminary system and participate in the Detailed Design Review to finalize and confirm the system design to meet the County's requirements.
- Provides detailed consultative advice about the features and functionality of the mobiles, portables, and consoles purchased by the County.
- Define Motorola and County demarcation points.
- Define technical requirements for interfacing with Motorola supplied equipment.
- Develop system channel plan.
- Complete the process of defining, documenting, and acquiring the County's approval of system programming and configuration.
- Participate in the system and functionality testing at the Customer Center for System Integration (CCSi) (Motorola staging facility located in Schaumburg, IL).
- Responsible for the process of defining, documenting and executing functionality acceptance testing once the system is field installed.
- Develop and oversee execution of system acceptance tests, coverage tests and cutover plan that will balance the County's needs and approval with installation logistics.
- Provide systems and network engineering support throughout the implementation life-cycle.

4.1.2.3 Motorola System Technologist

The System Technologist has the primary responsibility as the "hands-on" system expert. The System Technologist's tasks include:

- Work with the Project Engineer to ensure the integrity of the design during system installation, programming, optimization, and testing.
- Participate in the staging and testing of the system at the Customer Center for System Integration (CCSi).
- Perform final system and site level programming, optimization, and acceptance testing.



4.1.2.4 Motorola Field Support Operations Technician

The FSO Technician has the primary responsibility for fixed network equipment and radio infrastructure installation. The FSO Technician's tasks include:

- Work with the Project Engineer to ensure the integrity of the design during system installation, programming, optimization, and testing.
- Participate in the staging and testing of the system at the Customer Center for System Integration (CCSi).
- Transport equipment from Motorola's staging facility to Lake County locations.
- Perform installation of all fixed equipment in a professional manner and in accordance with Motorola's stringent R56 standards.

4.1.2.5 Motorola Account Manager

The Account Manager will act as a liaison, responsible for addressing the County's needs that arise from day to day operations, as well as issues arising from the system implementation. The Account Manager's other tasks include:

- Assist in configuration and pricing of equipment quotes.
- Process and manage equipment orders.
- Perform a consultative role in applying Motorola's equipment solutions.
- Participate in the staging and support testing of the system.
- Represent and clarify the County's contractual request for change orders.

4.1.2.6 Motorola Customer Support Manager

The Customer Support Manager establishes the maintenance and service support program throughout the warranty and post-warranty periods. Other tasks include:

- Coordinate Motorola service support resources to enhance the quality of service delivery and to ensure the County's satisfaction over the life of their communications system.
- Oversee the execution of the County's support contract (maintenance or warranty).
- Serves as the single point of contact for service issue resolution and escalation.

4.1.2.7 Motorola Subcontractors

Motorola selects subcontractors for projects of this complexity based on their experience with such proposed systems. Selected subcontractors have worked for Motorola on numerous projects around the country. Each subcontractor, as appropriate, is responsible for its company's performance and adherence to the agreed project schedule. The subcontractor will report directly to Motorola's Project Manager on contractual issues and to the System Engineer on specific technical assignments. All subcontractors will communicate progress updates to Motorola and advise the status, level of effort and anticipated problems which will be integrated into the project's tracking system. These reports are discussed in detail on recurring project status calls and meetings for ensuring that they remain on track to deliver their promised results.

Motorola's Project Manager will be the single authority for subcontract actions and reporting and will have the full responsibility for quality performance, schedules, and cost control. Motorola will use a straightforward procedure for managing and controlling work assignments to subcontractors.



Chicago Communications, LLC

Chicago Communications is a Premier sales and authorized service organization for Motorola Two-Way Radio products. Chicago Communications currently services the greater Chicago metro area of Illinois. Chicago Communications will be responsible for assisting Motorola with the following services for the Lake County project:

- Mobile radio programming
- Portable radio programming
- Subscriber, dispatch consoles and bi-directional amplifier warranty and maintenance support

Installation Services, Inc.

Installation Services is a member of Motorola's National Site Development contractor network. Located in DeKalb County Illinois, Installation Services specializes in radio site design, tower and shelter construction, tower and building remediation and in-building coverage solutions. Installation Services will be responsible for assisting Motorola with the following services for the Lake County project:

- Shelter and radio compound construction and setup
- Water, lattice and monopole tower remediation
- Distributed antenna systems/bidirectional amplifier network design, installation, optimization and testing.
- Antenna, line, tower top amplifier and microwave dish installation

Aviat Networks

Aviat Networks is a trusted Motorola partner and an industry leading expert in microwave communication networks. Aviat Networks will be responsible for assisting Motorola with the following services for the Lake County project:

- Engineering and designing Lake County's radio system microwave backhaul.
- Programming, optimizing and testing Lake County's microwave backhaul.
- Providing user training to Lake County radio system support staff.
- Providing technical support for warranty and maintenance services.

Nice Systems

Nice Systems is a trusted Motorola partner and an industry leading expert in audio recording and data management systems. Nice Systems will be responsible for assisting Motorola with the following services for the Lake County project:

- Engineering and designing Lake County's IP radio and analog telephony logging recorders.
- Programming, optimizing and testing Lake County's logging systems.
- Providing user training to Lake County radio system support staff.
- Providing technical support for warranty and maintenance services.

4.1.3 Site Readiness Review

Prior to starting any site upgrades or equipment installations, Motorola and the County shall conduct a site readiness review at each site to examine existing work, or work performed by others, that is required to support the new radio system. The intent of the site readiness review is to document any conditions that will prevent start of equipment installation work to be performed by Motorola. The



County shall be made aware of any deficiencies found during the site readiness review. The County shall be notified immediately of any deficiencies that impact the safety of personnel or equipment.

4.1.4 Installation Equipment and Material

Motorola shall ensure the following:

- All equipment conforms to industry standards to be of the highest quality and reliability.
- All materials are new (not previously sold or refurbished) and shall be the best of their respective kinds, free of corrosion, dust, scratches, indentations or other such defects.
- The design and construction of the communications equipment shall be performed in a neat and craftsman-like manner and shall be consistent with professional engineering and installation practices.
- All equipment shall meet or exceed the latest applicable standards of the FCC, EIA and IEEE.

4.1.5 Site Cleanup

Motorola and its subcontractors shall clean-up and remove from the work site all rubbish and construction debris, resulting from their own work. Upon completion of work, the entire job site areas shall be left clean and free of trash, debris, scrap materials, and excess materials resulting from equipment installations. Upon completion of installation work, the radio equipment shelters and rooms shall be thoroughly cleaned to the satisfaction of the Motorola and County Project Managers. Motorola understands failure to comply with these requirements may result in the County's contracting to have the inside and/or outside cleanup work performed at Motorola's cost.

4.1.6 Quality Management

It is the policy of Motorola to produce and provide products and services of the highest quality which are responsive to the needs of the County. Motorola has a well-established reputation for designing and developing high-quality products and systems, on schedule, and within budget. Motorola adheres to the International Standards Organization's (ISO) quality standards.

All work will be performed consistent with high-quality commercial practice and in accordance with Motorola's Quality Standards for Fixed Equipment Installations and all applicable manufacturer installation and maintenance manuals.

4.1.6.1 Quality Commitment

Motorola believes that the establishment of a Project Quality Assurance (QA) Program is an integral component of ensuring that the County's project will achieve its objectives with the level of excellence the County expects from us. The framework for the QA Program is designed to handle the ever-increasing complexity of government and public safety systems.

4.1.6.2 Quality Assurance Program

The foundation for Motorola's QA Program is our project management framework and System Integration-Gates (SI-Gates). SI-Gates is a disciplined approach, methodology and repository of Motorola Project Management and System Integration teams' activities and best practices. Utilizing this SI-Gates approach facilitates the incorporation of our quality management system through policy and procedure so that project quality remains at the forefront throughout the project's lifecycle.



Motorola's QA Plan is a set of physical guidelines and check-points created to demonstrate that the solution's design, integration and implementation are progressing according to the County's expectations and recognized industry standards such as ISO 9001, TL 9000 and our R56 guidelines. The Quality Assurance Plan is integrated into each phase of the project, from pre-sale and contract execution through delivery of the final system and transition to on-going service and maintenance activities.

4.1.6.3 Key Quality Assurance Program benefits

Motorola works in partnership with the County to ensure that the project exceeds the County's expectations and provides the optimal value to the County's organization. By utilizing the QA Program the County can trust that:

- Project activities are properly aligned to the County's expectations, quality objectives and requirements.
- Opportunity for project schedule variability is minimized.
- Unexpected project issues are identified, investigated and resolved as effectively as possible.
- Unnecessary re-work and project delays will be avoided.
- Results are monitored to ensure they meet or exceed relevant standards and contractual performance criteria.

4.1.7 Safety and Health

Motorola holds safety as paramount; at no time shall any operation, task or evolution be undertaken or continued if deemed hazardous to the personnel, equipment or community. Safety practices shall be put in place and compliance with all local, state and federal laws and regulations shall be maintained. Motorola and its subcontractors shall adhere to the following guidelines at all times during system installation:

- Work area will be posted in accordance with OSHA regulations (i.e. medical aide, hard hat, safety glasses, etc.).
- All personnel shall be compliant with OSHA regulations, and fully trained for the type of work to be performed.
- All team members shall ensure that the workplace is maintained clean and free of safety hazards.
- All trash and install debris shall be removed daily.
- A safety and security check will be conducted at the close of each workday.

4.1.8 Frequency Coordination and Licensing

As licensee, the County is responsible for the modification, coordination and filing to the corresponding agency(ies) for procurement and modifications of all radio system frequencies relating to the proposed 700/800 MHz digital trunked radio system, as required.

Motorola will assist the County with frequency coordination and licensing by providing any required technical details and parameters necessary for proper licensing or modifications to FCC licenses.

Restrictions:

- Motorola assumes no liability or responsibility for inadequate frequency availability or frequency licensing issues.

- Motorola is not responsible for issues outside of its immediate control. Such issues include, but are not restricted to, improper frequency coordination by others and non-compliant operation of other radios.
- Motorola is not responsible for co-channel interference due to errors in frequency coordination by APCO or any other unlisted frequencies, or the improper design, installation, or operation of systems installed or operated by others.

4.1.9 Performance Schedule

Motorola has developed a detailed implementation schedule outlining key project tasks and milestones. During the implementation period, the Motorola Project Manager shall update the implementation schedule (i.e. completion dates) by the 15th day of each month. The Motorola Project Manager shall also provide a monthly report laying out progress achieved, a description of any delays and the cause of those delays, and a discussion of the effort that will be made to bring the Project back to the original schedule.

4.1.9.1 Project Punch List

Motorola PM will be responsible for creating, maintaining and distributing a project punch list throughout the project life-cycle (Contract Award to Final Acceptance). The punch list will be maintained in “real” time and distributed to all key project participants weekly. The punch list will be maintained in Microsoft Excel and will include the following details: sequential punch list item number, date identified, item description, party(ies) responsible for item resolution, expected resolution date, actual resolution date, description of resolution and any other important notes about the punch list item.

The punch list will be reviewed at each status meeting. Closed items will be marked accordingly and moved to the appropriate closed section of the report.

Motorola Responsibilities:

- Maintain “active” punch list report throughout the entire project.
- Distribute punch list report to Project Teams on a weekly basis with the following information provided in the report at a minimum:
 - Sequential punch list item number
 - Date identified
 - Item description
 - Party responsible for resolution
 - Expected resolution date
 - Resolution date
 - Resolution and test conducted
 - Notes/status about the item
- Create new entry when an item has been transferred to another responsible party and note accordingly.
- Discuss and review punch list with the County at each weekly meeting.

Lake County Responsibilities:

- Assist Motorola with resolution of identified punchlist items by providing support, such as access to the sites, equipment and system, and approval of the resolved punchlist item(s).

Completion Criteria:



- All punchlist items resolved and approved by the County.

4.1.9.2 Equipment Removals

Removals of existing EDACS radio infrastructure and console system equipment have been included as identified in the Installation sections. It is expected that Lake County will provide a central location within the County where all equipment will be delivered upon decommission and site removals which will occur after the cutover is complete.

Removal of equipment will be completed in a professional workmanship manner with no damage to existing structure. If the County deems that there is damage to due negligent actions by Motorola or any of its assigned Subcontractors, Motorola will be responsible to repair such damage. Decommission equipment will be removed/packed and stored in a manner that both parties mutually agree will be in the best method to store equipment for surplus or disposal.

Motorola will not be responsible for providing storage, care, maintenance or inventory management for decommissioned Lake County equipment.

4.1.9.3 Project Status Meetings

The Motorola PM will schedule calls or meetings as determined at the kick-off meeting. The Motorola PM will be responsible for developing the agenda, providing project status reports (i.e. schedule, punch list, action items) and distributing meeting minutes to all participants within 5 business days following the meeting.

If the team decides to have a conference call in lieu of a face-to-face meeting, the Motorola PM will provide toll free conference call number and pin for all meeting participants. For face-to-face meetings, the County will be responsible for providing meeting facility.

The agenda will include at a minimum the following topics:

- Overall project status compared to the Project Schedule.
- Product or service related issues that may affect the Project Schedule.
- Status of the action items, project deliverables, punch list, changes and risk.
- Any miscellaneous concerns of either the County or Motorola.

The County, at its discretion, may request the attendance and participation of the Motorola PM at other meetings outside the regularly scheduled meetings.

4.1.9.4 Project Submittals

Motorola understands that all key project deliverables and submittals are subject to the County's review and approval.

4.1.9.5 Milestone Completions

Key milestones have been provided as part of the Preliminary Performance Schedule. The Gantt chart is provided at the end of this Statement of Work document. This list of milestones will be reviewed and approved by Motorola and the County during the detailed design review. The Motorola PM will make necessary adjustments to the project schedule to reflect the Final Project Schedule which will include a list of milestones agreed to at the Contract Design Review meeting.



The Motorola PM will be responsible for generating each milestone completion certificate for the County's review and when deemed necessary for Motorola and the County to commemorate a completed milestone. The original copy of the signed certificate will be provided to the County and a copy of the certificate will be provided to Motorola.

4.1.10 Project Life-Cycle Phases and Responsibilities

Based on many years of experience, Motorola has developed a project implementation methodology that identifies major project phases—Contract/Project Initiation (Award), Detailed Design Review, Order Processing, Manufacturing and Staging, Installation, System Optimization, Acceptance Testing, Subscriber Installation and Project Finalization.

Throughout the duration of this project, Motorola will provide the equipment and services within each phase as described within this proposal. Detailed descriptions of the specific tasks associated with the individual phases are contained in the following sections. These align with the preliminary project schedule as noted in the Project Schedule section.

4.1.11 Contract Award/Project Initiation (Milestone)

The County and Motorola execute the contract and both parties receive all the necessary documentation.



4.1.11.1 Contract Administration

Motorola Responsibilities:

- Assign a Project Manager, as the single point of contact throughout the duration of the project life-cycle, with authority to make project decisions.
- Assign Project Engineer to be assigned throughout the duration of the project life-cycle.
- Assign other required resources necessary for project implementation.
- Schedule the project kickoff meeting with the County prior to start of the project.

Lake County Responsibilities:

- Assign a Project Manager, as the single point of contact responsible for County-signed approvals.
- Assign other resources necessary to ensure completion of project tasks for which the County is responsible.

Completion Criteria:

- Motorola internal processes are set up for project management.
- Both Motorola and the County assign all required resources.
- Project kickoff meeting is scheduled.

4.1.11.2 Project Kickoff

Motorola Responsibilities:

- Conduct a project kickoff meeting with the County.
- Introduce and review the roles of the project participants to identify communication flows and decision-making authority between project participants.
- Review the overall project scope and objectives.
- Review the resource and scheduling requirements.
- Review the Detailed Project Schedule to address upcoming milestones and/or events.
- Review the teams' interactions (Motorola and the County) / Communication Plan, meetings, reports, milestone acceptance, and the County's participation in particular phases.
- Schedule Detailed Design Review.
- Document and distribute meeting notes to all participants within three business of completing the kick-off meeting.

Lake County Responsibilities:

- The County's key project team participants attend the meeting.

Completion Criteria:

- Project kickoff meeting completed

4.1.12 Design Review

4.1.12.1 Review Contract Design

Motorola Responsibilities:

- Meet with the County's project team.
- Review the operational requirements and the impact of those requirements on various equipment configurations.
- Establish a defined baseline for the system design and identify any special product requirements and their impact on system implementation.
- Review the System Design (i.e. System Description, block diagrams, channel/frequency plan, floor and rack-up drawings and equipment list), Statement of Work, Project Schedule, and Acceptance Test Plans, and update the contract documents accordingly.
- Review the 45 day burn in requirements and mutually agree on definitions for Major and Minor failures.
- Develop and present the proposed Cutover Plan.
- Submit design documents to the County for approval. These documents form the basis of the system, which Motorola will manufacture, assemble, stage and install.
- Provide equipment power loads.

Lake County Responsibilities:

- Lake County's key project team participants attend the meeting.
- Make timely decisions, according to the Project Schedule.
- Frequency Licensing and Interference:
 - As mandated by FCC, the County, as the licensee, has the ultimate responsibility for providing all required radio licensing or licensing modifications for the system prior to system staging. This responsibility includes paying for FCC licensing and frequency coordination fees.
 - Provide the FCC "call sign" station identifier for each site prior to system staging.
 - Provide one-time fees related to frequency search, frequency modifications and submission/filings. If errors or omissions are created by either party, said party will be responsible for any additional associated fees.

Completion Criteria:

- Complete Design Documentation, which may include updated System Description, Equipment List, system drawings or other documents applicable to the project.
- Incorporate any deviations from the proposed system into the contract documents accordingly.
- The system design is "frozen" in preparation for subsequent project phases such as Order Processing and Manufacturing.
- Any applicable Change Order is executed in accordance with all material changes resulting from the Design Review to the contract.

4.1.12.2 Design Approval (Milestone)

Motorola and the County memorialize the event by signing a Design Review milestone completion certificate.



4.1.13 Detailed Cutover Plan

A detailed transition and cutover plan is required sixty days after the Contract Design Review.

Motorola Responsibilities:

- Motorola will present a cutover plan for the County's approval.
- Plan shall cover proposed cutover timeline.
- Plan shall cover procedures, user group migration, and fall back plan.

Lake County Responsibilities:

- Attend cutover meeting and approve the cutover plan.

Completion Criteria:

- Finalize the agreed cutover plan with the County.

4.1.14 Order Processing

4.1.14.1 Process Equipment List

Motorola Responsibilities:

- Validate Equipment List by checking for valid model numbers, versions, compatible options to main equipment, and delivery data.
- Enter order into Motorola's Customer Order Fulfillment (COF) system.
- Create Ship Views, to confirm with the County the secure storage location(s) to which the equipment will ship. Ship Views are the mailing labels that carry complete equipment shipping information, which direct the timing, method of shipment, and ship path for ultimate destination receipt.
- Create equipment orders.
- Reconcile the equipment list(s) to the Contract.
- Procure third-party equipment if applicable.

Lake County Responsibilities:

- Approve shipping location for equipment not to be staged and equipment shipping from staging.
- Complete and provide Tax Certificate information verifying tax status of shipping location.

Completion Criteria:

- Verify that the Equipment List contains the correct model numbers, version, options, and delivery data.
- Trial validation completed.
- Bridge the equipment order to the manufacturing facility.

4.1.15 Manufacturing

4.1.15.1 Manufacture and Procure Fixed Network Equipment

Motorola Responsibilities:

- Manufacture the Fixed Network Equipment (FNE) per final design.
- Procure any 3rd party equipment per final design.

Lake County Responsibilities:

- Provide local shipping address.

Completion Criteria:

- All non-staged equipment has been shipped to either Lake County or the installer. Non-staged equipment includes subscriber units, antennas and radio transmission lines.
- All staged equipment has been shipped to Motorola's Customer Center for Systems Integration (CCSi) in Schaumburg, IL. Staged equipment includes STARCOM21 radio site equipment, dispatch consoles, logging solution and microwave system.

4.1.15.2 Motorola Manufactured Subscribers

Motorola Responsibilities:

- Manufacture and ship any County purchased Motorola radios.
- Manufacture the subscribers based on equipment order and project schedule.

Lake County Responsibilities:

- Provide local shipping address.

Completion Criteria:

- Subscribers have been shipped to County-provided shipping address.

4.1.15.3 Ship to Staging (Milestone)

All equipment needed for staging at Motorola's factory staging facility in Schaumburg, Illinois (Customer Center for Solutions Integration (CCSi)) has been received.

All non-staged equipment has been received at either Lake County or the installer's location(s).

Non-staged equipment includes but is not limited to:

- Antennas, transmission lines and bi-directional amplifiers shall be shipped to Installation Services Inc. in Genoa Illinois.
- Materials required for tower remediation shall be shipped to the respective radio sites.
- Prefab equipment shelters, generators and DC based backup power systems shall be shipped directly from the manufacturer(s)/distributor(s) to the respective radio sites and dispatch center(s).



- Subscriber equipment (mobile and portable radios) shall be shipped to Lake County at a location to be determined during the detailed design review.

4.1.16 Develop System Fleetmap

Fleetmapping is the process of configuring the features and programming parameters of a system to function according to the unique operational requirements of each participating agency. Programming decisions for system infrastructure, dispatch consoles, and radios are inherent to tailoring system performance. Fleetmapping determines how the radio communications for each user group of an organization is controlled and includes:

- Assigning talkgroups to the radios issued to personnel.
- Assigning talkgroups to the dispatcher control positions.
- Defining the feature subsets available to the personnel using the radios and dispatcher control positions.

This Statement of Work (SOW) defines various Motorola and County deliverables required for the successful implementation of the County's radio communications system.

Motorola's major deliverables are to provide and configure the system's database parameters and console screens. The County is responsible for all subscriber radio templates, as needed. Services not contained in this SOW can be provided via the change order process.

Fleetmapping is a major undertaking and requires a joint effort between the County and Motorola Systems Engineering. High-level management of the new trunked system requires setup of a fleetmap committee that consists of various members of user agencies. This fleetmap committee sets standardized system management and operational policies (SOP) that apply to all end users. Some decisions the fleetmap committee makes are below:

- Define User Access Management List.
- Create User Database Management (e.g. talkgroups, dispatch consoles, and radio subscriber record creation/manipulation).
- Create System management and security access list.
- Choose Portable, mobile, RF control station, and dispatch console programming parameters.

Motorola works with the County after contract award to develop the fleetmap for the system and participating agencies. Motorola provides a system engineer to work with the fleetmap committee. The system engineer provides detailed consultative advice about the features and functionality of the mobiles, portables, and consoles purchased by the County. This step requires careful planning between Motorola and the fleetmap committee. Motorola conducts a series of meetings with the fleetmap committee to define fleetmapping process, discuss effective organization of talkgroups, and detail how to set up the system/radio parameters.

It is important to stress that console/radio programming decisions are the responsibility of the County's fleetmap committee in its entirety. The fleetmap committee reviews the current radio system SOP and determines what modifications, if any, are required to ensure the County's new radio system investment is fully utilized. As a best practice, Motorola recommends that the fleetmap committee create a "Console Dispatch and Radio Programming Policy" to discuss, decide how each group of subscribers will operate on the system, and decide what purchased features to activate. The goal is to develop a fleetmap that is flexible and designed to accommodate expansion.

Motorola Responsibilities:



- Develop a customized Fleetmap Development Best Practice for the County.
- Provide technical consultation on talkgroup, radio user and dispatch console programming features to the fleetmap committee.
- Deliver final fleetmap documentation.
- Introduce the “MCC 7500 Console Programming” documentation forms for each unique radio purchased by the County. Provide technical consultation to the County on console programming features and options.
- Deliver final MCC 7500 console programming documentation forms to Motorola system technologists for final programming.
- Demonstrate MCC 7500 console programming choices to the County. Execute final County-requested changes to console programming.
- Schedule required meeting(s) with the appropriate County representative(s) and agencies.



Lake County Responsibilities:

- Appoint a representative who will become the fleetmap committee chairperson with signature responsibilities for all fleetmapping decisions.
- Identify agency champions that will become members of the fleetmapping committee.
- Set SOP that will apply to all end users.
- Define and verify user groups and corresponding radio allocations.
- Develop talkgroup naming convention plan for each user group.
- Develop Radio ID distribution plan for each user group.
- Develop list of other jurisdictions' trunking systems with system ID numbers to include in radio programming.
- Develop Memorandum of Understanding (MOU) for each trunking system jurisdiction that the County plans to interoperate. The MOU should include talkgroups, radio identification range and alias authorizations, and system key provisions.
- Complete the Radio Subscriber Template Requirements Input Form for each unique radio purchased.
- Provide template information to Motorola for use during the Staging and System Testing, as needed.
- Provide programmed test radios to Lake County representatives, as needed, for live testing on the County's system.
- Complete and sign memorandum of understandings for other jurisdictional trunking systems.
- Develop conventional channel list.
- Obtain approval letters and access allowing Motorola authority to program other jurisdiction talkgroups into the County's radios.
- Develop and approve zone/channel layouts for each user group.
- Develop list of talkgroups/conventional channels to display on the dispatch console and log.
- Determine emergency configuration plan (to include radios and consoles).
- Determine feature configurations to include but not limited to Call Alert, Private Call, Telephone Interconnect, Scan, Status/Message, Secure, Failsoft and Site Preferences for both radios and consoles.
- Complete the staging fleetmap prior to staging of the system.

4.1.16.1 Fleetmapping Process

The following fleetmapping process includes a step-by-step meeting process and in which step the necessary deliverables are required from the County and Motorola.

Fleetmap Overview during Contract Design Review Meeting

The systems engineer presents the fleetmapping overview and requirements from the contract. The County identifies agency champions for the fleetmapping committee. The County appoints a committee chairperson with signature responsibility for all fleetmapping deliverables.

Lake County deliverables for next Fleetmap meeting:

- List of User Groups and corresponding radio allocations.
- Existing system fleetmap information (Zone/Channel, Console).
- Provide changes to the existing list of talkgroup names for each user group.
- Provide list of other jurisdictions' trunking systems with system ID numbers.
- As required, draft MOU for each trunking system jurisdiction that the County plans to interoperate. The MOU should include talkgroups and system key provisions.



Final Reviews - Console Screen Configuration and System Review

The County and systems engineer review and revise all console deliverables. Review the Final features and fleetmapping plans.

Motorola will use this information to program and configures console screen layouts.

Console Screen Review Meeting

The County and systems engineer review deliverables from previous meeting. The committee chair approves the console screen configuration.

Completion Criteria:

- System Fleetmap requirements completed and approved by the County.

4.1.17 Stage System

Prior to Staging the initial Fleetmapping and Templates must be completed and approved by Lake County. This is required to stage and test the equipment, prior to shipment.

All Motorola manufactured equipment is extensively tested during manufacturing and staging. In addition, Motorola provides a service unique in the communications industry to ensure all components of the system function to specification and that the entire system functions as designed. This service, called Customer Center for System Integration (CCSi) will completely assemble portions of the system in an area of Motorola's Plant Facilities in Schaumburg, Illinois. The equipment will be laid out in accordance with floor plan equipment layouts and elevation scale drawings for each RF and/or Console site. After assembly, all equipment will be individually checked. Systems Factory technicians and engineers will then fully test the system as it will be used in this project or as detailed by Motorola's Proposal.

Motorola Responsibilities:

- Set up and rack the system equipment on a site-by-site basis, as it will be configured in the field at each of the transmitter/receiver sites.
- Cut and label cables according to the approved CDR documentation.
- Power up, program, and test all staged equipment.
- Ship subscribers to staging, as needed, for testing purposes (3 units per model type).
- Program sample Subscriber units with testing template which includes the County's features to ensure system functionality.
- Inventory the equipment with serial numbers and installation references.
- Complete system documentation.
- Review Staging Acceptance Test Plan (SATP) with the County.

Lake County Responsibilities:

- Provide information on existing system interfaces as may be required.
- Provide information on room layouts or other information necessary for the assembly to meet field conditions.
- Review and approve proposed SATP.
- Provide for travel, food and other related expenses associated with the Lake County participants attending the Staging Trip.



Completion Criteria:

- System staged and ready for SATP with the County.

4.1.17.1 Perform Staging Acceptance Test Procedures

Motorola Responsibilities:

- Successfully demonstrate and document each SATP test to the County.
- Document, correct, and re-test all SATP deviations, anomalies, and failures.
- Replace and test any defective components prior to shipment to field.
- Provide Lake County six (6) paper copies and six (6) electronic copies of the factory tests reports for approval before the equipment is released for shipment.

Lake County Responsibilities:

- Witness, participate, and approve SATP.

Completion Criteria:

- SATP has been completed successfully, all issues corrected, and system is ready for installation.
- STARCOM21 radio site equipment has been shipped to Motorola's Field Service Organization warehouse in Schaumburg Illinois.
- Dispatch related equipment has shipped to Chicago Communication's warehouse in Elmhurst Illinois.

4.1.17.2 CCSi Ship Acceptance (Milestone)

Motorola and the County memorialize the event by signing Staging/Ship Acceptance milestone completion certificate.

4.1.18 Civil Work

4.1.18.1 Site Development at the Antioch NW Site

Antioch NW- Motorola to provide a 12x16 Motorola Standard Building (MSB) shelter with new outdoor 50 kW generator and 1000 gallon LP tank. The current 200' self supported tower will be used for antennas and microwave dishes.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Included
- Zoning Services – Included
- New fenced compound/expansion size – 20-foot x 50-foot.
- Clearing type – Medium.
- New power run – 150 feet, Electrical service type – Underground, 300-amp - 120/240-volt, single-phase.
- New shelter size – 12-foot x 16-foot.
- New fuel tank size – 1000 gallons- , Type – Propane under-ground.
- New generator size – 50 kW, Type – Outdoor.
- Existing tower to be used for antennas – 200 ' self supported tower.



Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare zoning drawings that can be used to describe the proposed site installation in sufficient detail.
- Prepare record drawings of the site showing the as-built information.
- Perform a boundary and topographic survey for the property on which the communication site is located or will be located.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.
- Perform four-point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Conduct ultrasonic measurements of tubular members of towers up to 350' to determine the wall thickness.
- Conduct dispersive wave testing of foundations for a three legged self-supported tower to determine their structural details for analysis when tower drawings are not available.
- Conduct construction inspection of foundation steel prior to pour, materials testing of concrete and field density tests of backfill to ensure quality construction.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.



Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.
- Perform medium clearing, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (5400 square feet).
- Grade the site compound and 10-foot path around it to provide a level, solid, undisturbed surface for installation of site components (not to exceed 2800 square feet).
- Supply and install gravel surfacing to a depth of 6 inches, underlain with geotextile fabric within the fenced in site compound area, and a 3-foot path around it (not to exceed 1456 square feet).
- Provide silt fence around the compound to control soil erosion (not to exceed 140 linear feet).
- Supply and install 8-foot high chain-link fencing with a ten-foot wide gate around the shelter compound (not to exceed 140 linear feet).
- Perform site touchup (fertilize, seed and straw) disturbed areas not covered with gravel after completion of construction work. Landscaping, decorative fencing or any other aesthetic improvement that may be required by local jurisdictions has not been included and will be handled through a negotiated contract change notice.

Site Components Installation

- Construct 1 reinforced concrete foundation necessary for a 12-foot x 16-foot shelter.
- Excavate 1 trench for 1000 gallon below ground Liquid Propane (LP) fuel tank in TIA/EIA-222 normal soil conditions.
- Construct 1 foundation for the 50 kW generator with reinforcing steel necessary for foundations.
- Supply and install 1 prefabricated concrete shelter 12-foot x 16-foot.
- Supply and install 1 1000-gallon Liquid Propane (LP) fuel tank(s), fill it with fuel and connect it to the generator.
- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank.
- Supply and install 1 standby power generator (50 kW) located within 20 feet of the ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains. Motorola will address additional environmental features on a site-by-site basis as required by site owners.
- Supply and install 1 120/240-volt, 300-amp, single-phase meter pedestal and hookup for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hookup of power to the shelter from nearby utility termination located within 150 cable feet of the shelter.
- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of the Site Owner.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 20 linear feet).

Miscellaneous Work

- Remediate for additional loading.
- Wire UPS in shelter into with existing disconnects and wire mold.



- Fuel tank refill after testing.

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated with the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site has adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the site owner.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.



- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.2 Site Development at Barrington Water Tank Tower Site

Barrington Water Tank Tower - Motorola to provide a 12x16 Motorola Standard Building (MSB) shelter with new outdoor 50 kW generator and 1000 gallon LP tank. The current 150' water tank tower will be used for antennas and microwave dishes.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Included
- Zoning Services – Included
- New power run – 75 feet, Electrical service type – Underground, 300-amp - 120/240-volt, single-phase.
- New shelter size – 12-foot x 16-foot.
- New fuel tank size – 1000 gallons- , Type – Propane under-ground.
- New generator size – 50 kW, Type – Outdoor.
- Existing tower to be used for antennas – 150 ' Water Tank Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon



execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.

- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Perform a Phase I Environmental Site Assessment (ESA), to identify obvious and reasonably likely on-site and/or off-site potential sources of contamination and prepare a report summarizing observations, findings, and conclusions for each site assessed. This study does not include Phase II assessments, risk/cost evaluations, and permitting assistance that may be required if risk factors are indicated.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.
- Supply and install gravel surfacing to a depth of 6 inches, underlain with geotextile fabric within the fenced in site compound area, and a 3-foot path around it (not to exceed 720 square feet).

Site Components Installation

- Construct 1 reinforced concrete foundation necessary for a 12-foot x 16-foot shelter.



- Excavate 1 trench for 1000 gallon below ground Liquid Propane (LP) fuel tank in TIA/EIA-222 normal soil conditions.
- Construct 1 foundation for the 50 kW generator with reinforcing steel necessary for foundations.
- Supply and install 1 prefabricated concrete shelter 12-foot x 16-foot.
- Supply and install 1 1000-gallon Liquid Propane (LP) fuel tank(s), fill it with fuel and connect it to the generator.
- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank.
- Supply and install 1 standby power generator (50 kW) located within 20 feet of the ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains. Motorola will address additional environmental features on a site-by-site basis as required by site owners.
- Supply and install 1 120/240-volt, 300-amp, single-phase meter pedestal and hookup for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hookup of power to the shelter from nearby utility termination located within 75 cable feet of the shelter.
- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of the Site Owner.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 35 linear feet).

Miscellaneous Work

- Remediate top of tank to accommodate antenna network. Mount triangular rail system on top of tower and relocate existing cellular panels to new locations on new mounting locations. Tank welding and approved process for water safety will be required.
- Construct and install raised steel support system for communications shelter 12x16 Steel, Concrete and Engineering design included.
- Internal cable mounting structure and hardware with installation
- Wire UPS in shelter into with existing disconnects and wire mold.
- Fuel tank refill after testing.

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]



Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated with the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site has adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the site owner.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.



- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.3 Site Development at Antioch Water Tank Tower Site

Antioch Water Tank Tower - Motorola to provide a 12x16 Motorola Standard Building (MSB) shelter with new outdoor 50 kW generator and 1000 gallon LP tank. The current 150' water tank tower will be used for antennas and microwave dishes

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Included.
- Zoning Services – Included.
- New power run – 125 feet, Electrical service type – Underground, 300-amp - 120/240-volt, single-phase.
- New shelter size – 12-foot x 16-foot.
- New fuel tank size – 1000 gallons- , Type – Propane under-ground.
- New generator size – 50 kW, Type – Outdoor.
- Existing tower to be used for antennas – 150 ' Water Tank Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.



- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Perform a Phase I Environmental Site Assessment (ESA), to identify obvious and reasonably likely on-site and/or off-site potential sources of contamination and prepare a report summarizing observations, findings, and conclusions for each site assessed. This study does not include Phase II assessments, risk/cost evaluations, and permitting assistance that may be required if risk factors are indicated.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.
- Supply and install gravel surfacing to a depth of 6 inches, underlain with geotextile fabric within the fenced in site compound area, and a 3-foot path around it (not to exceed 720 square feet).

Site Components Installation

- Construct 1 reinforced concrete foundation necessary for a 12-foot x 16-foot shelter.
- Excavate 1 trench for 1000 gallon below ground Liquid Propane (LP) fuel tank in TIA/EIA-222 normal soil conditions.
- Construct 1 foundation for the 50 kW generators with reinforcing steel necessary for foundations.
- Supply and install 1 prefabricated concrete shelter 12-foot x 16-foot.
- Supply and install 1 1000-gallon Liquid Propane (LP) fuel tank(s), fill it with fuel and connect it to the generator.
- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank.
- Supply and install 1 standby power generator (50 kW) located within 20 feet of the ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains. Motorola will address additional environmental features on a site-by-site basis as required by site owners.
- Supply and install 1 120/240-volt, 300-amp, single-phase meter pedestal and hookup for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hookup of power to the shelter from nearby utility termination located within 125 cable feet of the shelter.



- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of the Site Owner.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 25 linear feet).

Miscellaneous Work

- Remediate ring for additional loading- 2 6' microwave dishes- Tank welding and approved process for water safety will be required.
- Entry with stiffeners.
- Structural adders.
- Crane/ Rigging.
- Internal cable mounting structure and hardware with installation.
- Wire UPS in shelter into with existing disconnects and wire mold.
- Fuel tank refill after testing.



Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated with the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site has adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the site owner.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.



- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.4 Site Development at Beach Park Water Tank Tower Site

Beach Park Water Tank Tower - Motorola to provide a 12x16 Motorola Standard Building (MSB) shelter with new outdoor 50 kW generator and 1000 gallon LP tank. The current 150' water tank tower will be used for antennas and microwave dishes

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Included.
- Zoning Services – Included.
- New power run – 75 feet, Electrical service type – Underground, 300-amp - 120/240-volt, single-phase.
- New shelter size – 12-foot x 16-foot.
- New fuel tank size – 1000 gallons- , Type – Propane under-ground.
- New generator size – 50 kW, Type – Outdoor.
- Existing tower to be used for antennas – 150 ' Water Tank Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule

slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.

- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Perform a Phase I Environmental Site Assessment (ESA), to identify obvious and reasonably likely on-site and/or off-site potential sources of contamination and prepare a report summarizing observations, findings, and conclusions for each site assessed. This study does not include Phase II assessments, risk/cost evaluations, and permitting assistance that may be required if risk factors are indicated.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.
- Supply and install gravel surfacing to a depth of 6 inches, underlain with geotextile fabric within the fenced in site compound area, and a 3-foot path around it (not to exceed 720 square feet).

Site Components Installation

- Construct 1 reinforced concrete foundation necessary for a 12-foot x 16-foot shelter.
- Excavate 1 trench for 1000 gallon below ground Liquid Propane (LP) fuel tank in TIA/EIA-222 normal soil conditions.



- Construct 1 foundation for the 50 kW generator with reinforcing steel necessary for foundations.
- Supply and install 1 prefabricated concrete shelter 12-foot x 16-foot.
- Supply and install 1 1000-gallon Liquid Propane (LP) fuel tank(s), fill it with fuel and connect it to the generator.
- Supply and install fuel tank monitors on the tanks to monitor low fuel in tanks and run alarm wiring to the building located within 50 feet of the tank.
- Supply and install 1 standby power generator (50 kW) located within 20 feet of the ATS, including interconnection wiring between the generator, transfer switch, and site electrical service mains. Motorola will address additional environmental features on a site-by-site basis as required by site owners.
- Supply and install 1 120/240-volt, 300-amp, single-phase meter pedestal and hookup for electrical service by the local utility.
- Provide all trenching, conduit, and cabling necessary for underground hookup of power to the shelter from nearby utility termination located within 75 cable feet of the shelter.
- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of the Site Owner.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 25 linear feet).

Miscellaneous Work

- Remediate ring for additional loading- 2 6' microwave dishes- Tank welding and approved process for water safety will be required.
- Entry with stiffeners.
- Structural adders.
- Crane/ Rigging.
- Internal cable mounting structure and hardware with installation.
- Wire UPS in shelter into with existing disconnects and wire mold.
- Fuel tank refill after testing.

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]

Assumptions:



- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated with the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site has adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the site owner.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.



- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.5 Site Development at Vernon Hills Site

Vernon Township- Motorola to use existing Shelter and tower to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 180 ' Self supported Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare zoning drawings that can be used to describe the proposed site installation in sufficient detail.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.



- Perform four-point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.

Miscellaneous Work

- Remediate for additional antenna and dish loading-

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).



- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has included some cost for structural or foundation upgrades to the antenna support structure. Based on knowledge available prior to engineering analysis.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.



- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.6 Site Development at Lake Zurich Site

Lake Zurich- Motorola to use existing Shelter and tower to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 420 ' Guyed Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the



proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.

- Perform four-point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Tower Work

- Paint 2200 linear feet of transmission lines.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.

Miscellaneous Work

- Antenna and Dish removal of legacy apparatus 1 dish and 3 antennas.
- Remediate tower for additional loading.

Lake County Responsibilities:

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.

Assumptions:



- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.



- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.7 Site Development at Highwood Water Tank Tower Site

Highwood Water Tank Tower - Motorola to use existing Shelter and tower to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 150' Water Tank Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.



Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.

Miscellaneous Work

- Structural adders.
- Crane/ Rigging.
- Antenna and Dish removal of legacy apparatus 1 dish and 3 antennas.
- Remediate ring for additional loading- 1 6' microwave dishes/ antennas- Tank welding and approved process for water safety will be required.



Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.



- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.8 Site Development at Waukegan Site

Waukegan - Motorola to use existing equipment room and rooftop area to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 170 ' Rooftop.



Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Perform structural mapping, analysis, and design to antenna support structure for the proposed equipment and antenna loads. No obtrusive investigations have been included.
- Perform an x-ray of the structure (up to 15 location of three square feet each) to determine the location of structural components and rebar sizing.
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.



Miscellaneous Work

- Roof top remediation for new antennas - Current steel and mounts to be modified and replaced as needed- Crane/ Rigging required to bring steel up to roof level- Tie antenna support structure to building ground.
- Structural / engineering- support.
- Antenna and Dish removal of legacy apparatus 1 dish and 4 antennas.

Lake County Responsibilities:

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Secure clear and unencumbered title, MOU, or Lease Agreement with the property owner.
- Provide approved, standardized lease language and negotiation guidelines to assist Motorola in site acquisition.
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Provide clear and stable access road to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.



- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Provide support and entry facilities for the cables (cable ladder/chase way, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.



- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.9 Site Development at Lake Villa Site

Lake Villa- Motorola to use existing Shelter and tower to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 490 ' Guyed Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to



complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.

- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.
- Perform four-point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Tower Work

- Paint 2140 linear feet of transmission lines.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.



Miscellaneous Work

- Antenna and Dish removal of legacy apparatus 1 dish and 3 antennas.
- Remediate tower for additional loading.

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.



- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).



Completion Criteria

- Site development completed and approved by the County.

4.1.18.10 Site Development at Sheriffs Radio site

Libertyville Sheriff's Radio Site - Motorola to use existing Shelter and tower to house equipment and antenna network.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 260 ' Guyed Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by proposed construction.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Perform structural mapping, analysis, and design to antenna support structure for the proposed equipment and antenna loads. No obtrusive investigations have been included.
- Perform an x-ray of the structure (up to 15 location of three square feet each) to determine the location of structural components and rebar sizing.
- Design multi antenna support platform to support proposed antennas and dishes.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.
-



Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.

Miscellaneous Work

- Antenna and Dish removal of legacy apparatus 5 dishes and 3 antennas.
- Remediate tower for additional loading.

Lake County Responsibilities:

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites as owner/lessee.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Secure clear and unencumbered title, MOU, or Lease Agreement with the property owner.
- Provide approved, standardized lease language and negotiation guidelines to assist Motorola in site acquisition.
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.



- Provide clear and stable access road to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Provide support and entry facilities for the cables (cable ladder/chase way, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.



- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.



- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Current site generator can provide needed back up power for Motorola's proposal.

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.11 Site Development at Gurnee Toll Site

Gurnee Toll- Motorola to use existing tower and shelter support for new microwave hop and radio equipment.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 200 ' self supported Tower.

Motorola Responsibilities:

Site Acquisition

- Provide a property specialist to assist with site leasing, zoning and permitting. Should additional time or resources be required for zoning and permitting thus requiring additional documentation, submittals, resources or work, Motorola will notify the County of such action in writing. Upon execution of a negotiated contract change order, Motorola will move forward as required to complete the zoning and permitting process. Motorola will not be held accountable for schedule slippage associated with such requests nor shall other reasonable payments or project milestones be withheld.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform a boundary and topographic survey for the property on which the communication site is located or will be located.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four-point soil resistivity testing at the time of site visit.



- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits – Optional.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet – Optional.
- Supply and install 1 20-amp dual pole breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.

Miscellaneous Work

- Remediate tower for additional loading.

Lake County Responsibilities:

Site Acquisition

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.



- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the site owner will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.



- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Existing generator is sufficient to support the new equipment and ancillary equipment loads.
- The Site Owner will review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Site Owner will review and approve the re-submitted plans within 7 calendar days from the date of submittal. Motorola will inform Lake County of all delays in site design approval(s).

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.12 Site Development at Sheriff's PSAP Site

Libertyville Sheriff's PSAP - Motorola will integrate new consoles into the current dispatch center.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Included.
- Existing tower to be used for antennas – 240 ' self supported Tower.

Motorola Responsibilities:

Site Engineering

- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.
- Perform four-point soil resistivity testing at the time of site visit.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. Motorola has included an estimated budget to perform basic site remediation in the event the selected tower structure fails the analysis. Conduct site investigation necessary to develop structural analysis (cases where adequate as-built documentation is not provided).



Site Preparation

- Provide one-time mobilization costs for the construction crews. Any remobilization due to Lake County-caused interruptions/delays that are out of Motorola's control could result in additional costs that will be addressed via the change order process.

Antenna and Transmission Line Installation

- Install 2 Yagi antenna(s).
- Install up to 200 linear feet of 1/2-inch transmission line.
- Supply and install 3 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 1 100-amp breaker panel with capacity for 20 circuits.
- Supply and install 12 20-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 2 30-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Install 1 new single-phase UPS equipment and wire output to UPS distribution panel.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.

Miscellaneous Work

- Penetrations for Cable run to tower.

Lake County Responsibilities:

- Provide introduction for Motorola in assistance in negotiating an option/lease/license agreement (lease) and acquiring clear land title/site lease/shared use agreement for the candidate site.
- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites as owner/lessee.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Secure clear and unencumbered title, MOU, or Lease Agreement with the property owner.
- Provide approved, standardized lease language and negotiation guidelines to assist Motorola in site acquisition.



- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Provide clear and stable access road to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Provide support and entry facilities for the cables (cable ladder/chase way, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- Temporary site trailers (tower, housing, COWS, and generator) have not been included for cutovers. Cutover logistics will be determined on a case-by-case basis; any additional costs will be negotiated prior to the execution of cutover tasks.
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Pricing has been based on Motorola's understanding of local rates. Local codes or jurisdictional requirements in excess of prevailing wages have not been included in this proposal.



- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate. Additional landscaping or aesthetic improvements (decorative fencing, stealth towers, etc.) have not been included in this proposal.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.



- The existing utility service and backup power facilities (generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Current site generator can provide needed back up power for Motorola's proposal.

Completion Criteria:

- Site development completed and approved by the County.

4.1.18.13 Site Development Lake County Government Buildings

Site Scope Summary for all BDA Sites:

Central Permits, Administration Tower, Babcox Center, Community Based Corrections, Sheriff's Office, Health Department Garand Ave., Forest Preserve General, Forest Preserve OPS and Courts Complex.

- Engineering services for site drawings and regulatory approvals – Not included.
- Site acquisition services – Not included.
- Zoning Services – Included.

Motorola Responsibilities:

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.

Miscellaneous Work

- Provide in-building electrical 15 Amp circuits for BDA locations, the addition of electrical circuit to existing panel.

Lake County Responsibilities:

BDA sites

Central Permits, Administration Tower, Babcox Center, Community Based Corrections, Sheriff's Office, Health Department Garand Ave., Forest Preserve General, Forest Preserve OPS and Courts Complex.

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- If required, the County will prepare and submit EME plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines. [Note: Should the County desire guidance with this task, Motorola is able to recommend resources. Additionally, Appendix A of Motorola's Standards and Guidelines for Communication Sites (R56) discusses Electromagnetic Energy and provides a basic methodology for structuring an FCC compliant program. If the customer does not have a copy of Motorola's Standards and Guidelines for Communication Sites (R56) v 2005, one will be provided.]
- Assist Motorola with permitting for sites as owner/lessee.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.



- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Secure clear and unencumbered title, MOU, or Lease Agreement with the property owner.
- Provide approved, standardized lease language and negotiation guidelines to assist Motorola in site acquisition.
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Provide backup power (UPS / Generator) for the new equipment, and UPS sub-distribution panel(s) with breakers wired to dedicated outlets above the proposed equipment locations.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708.

Assumptions:

BDA sites

Central Permits, Administration Tower, Babcox Center, Community Based Corrections, Sheriff's Office, Health Department Garand Ave., Forest Preserve General, Forest Preserve OPS and Courts Complex.

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety. Subject to notice and consultation with Lake County.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- A clear obstruction-free access exists from the antenna location to the equipment room.
- Assumes BDA can be placed within 75' of a usable electrical service panel and no more than 2 penetrations will be required

Completion Criteria:



- Site development completed and approved by Lake County, Illinois.

4.1.19 System Installation

4.1.19.1 Fixed Network Equipment

The new trunked radio system shall be installed, checked, and tested with minimum interference or disruption to the existing County communications systems and operations.

4.1.19.2 Main and Redundant Prime Sites

Motorola Responsibilities:

- A one-time delivery and installation has been included. It is assumed that adequate space will be made available by Lake County to install equipment in parallel with the existing system as requested by Lake County.
- Inspect and inventory all racks, cables, computers, and other Motorola provided equipment.
- Install all equipment per Final Design approved floor and rack-up drawings, cable matrix and other final design documents.
- Properly install all equipment per R56 installation guidelines.
- Supply and install border router that acts as the demarcation point between new P25 radio system and County Enterprise Network.
- Properly ground all racks, cabinets, and equipment to protect against ground faults, electrical surges, and lightning.
- Install and connect all necessary cables (i.e. power, data) within each rack / cabinet and between racks / cabinets for system interconnection:
 - Cables will be run in the overhead cable trays per R56 guidelines.
 - Verify that all cables are properly labeled.
 - Power-up and test central site equipment.
 - Clean-up and remove from the work site on a daily basis all scrap and packaging material, resulting from equipment installations.

Lake County Responsibilities:

- Provide or coordinate access to the site, as necessary.

Completion Criteria:

- Fixed Network Equipment installation completed and ready for optimization.

4.1.19.3 P25 Simulcast Remote Sites

Motorola Responsibilities:

- A one-time delivery and installation has been included. It is assumed that adequate space will be made available by Lake County to install equipment in parallel with the existing system as requested by the County.
- Inspect and inventory all racks, cabinets, cables and other Motorola-provided equipment.
- Install all equipment per Final Design approved floor and rack-up drawings and cable matrix.
- Properly install proposed equipment per R56 installation guidelines.

- Properly ground racks, cabinets, and equipment to protect against ground faults, electrical surges and lightning.
- Install MOSCAD and configure for alarming at each site, as applicable. Reference the Programming Software Alarms Section for additional detail regarding alarming capabilities and requirements.
- Install and connect all necessary cables (i.e. power, data) within and between each rack / cabinet for system interconnection:
 - Cables will be run in the overhead cable trays per R56 guidelines.
 - Cables will exit through top of cabinet/racks.
 - Verify that all cables are properly labeled.
- All cables within the shelter shall include labels every 3 feet.
- Use shielded cabling for audio/control cables and wiring:
 - Equipment cabinet intracabling of coaxial cabling is to use 1/4" cable (10' maximum length), if applicable.
 - Power-up and test simulcast sub-system prior to integrating with Master Core.
 - Integrate and test simulcast sub-system into the Master Core.
 - Clean-up and remove from the work site on a daily basis all scrap and packaging material, resulting from equipment installation.

Lake County Responsibilities:

- Provide or coordinate access to the site, as necessary.

4.1.19.4 IP Network Management Clients

Network Management terminal with Printer will be installed and set-up at 1303 North Milwaukee Ave., Libertyville, IL.

- Install, program, configure and test GenWatch workstation and client software/license.

Motorola Responsibilities:

- Deliver equipment from County-provided central location to the locations defined above.
- A one-time delivery and installation has been included. It is assumed that adequate space will be made available by Lake County to install equipment in parallel with the existing system as requested by the County.

Lake County Responsibilities:

- Provide central location for equipment storage prior to installation.
- Provide adequate floor space for proposed equipment to be delivered directly to the proposed sites.
- Motorola coordinates the receipt of the equipment with the County's designated contact, and inventory all equipment:
 - Provide adequate floor space for installation of equipment in parallel with the existing system for cutover purposes.

Completion Criteria:

- Client installation is complete.



4.1.19.5 IP Based Console Installation

Work described in this section shall be performed at the following sites:

- Main Dispatch Center located at 1303 North Milwaukee Ave., Libertyville, IL

Motorola Responsibilities:

- A one-time delivery and installation has been included. It is assumed that adequate space will be made available by Lake County to install equipment in parallel with the existing system as requested by the County.
- Inspect and inventory all received racks, cabinets, cables, connectors, and other Motorola-provided equipment:
 - Provide proper circuit identification for each modular panel and cable (end-to-end).
 - Install the proposed console equipment per final design documents.
 - Install and configure nine (9) MCC 7500 console positions and associated accessories at Main dispatch.
 - Inter-cabling to the operator positions shall be provided with sufficient slack to permit movement of at least 5' in any direction.
 - Supply and install required cabling between Dispatch and Network equipment room (separate rooms):
 - ♦ All dispatch cabling will be routed through the ceiling via existing routing path as provided by the County.
 - ♦ All cabling shall be plenum rated.
 - Provide and install Motorola supplied punch block for external alarms as needed.
 - Connect County-supplied, previously-identified circuits into the console, to a demarcation point located within 25 feet of the console interface.
 - Install a dedicated Local Area Network (LAN) at each dispatch center to connect the proposed console positions.

Lake County Responsibilities:

- Provide adequate floor space for proposed equipment to be delivered to the proposed dispatch locations.
- Provide secure location for the Motorola-provided equipment at each site.
- Motorola coordinates the receipt of the equipment with County-designated contact, and inventory all equipment.
- Provide adequate floor space for installation of equipment in parallel with the existing system for cutover purposes.
- Provide suitable console furniture with adequate surface area for Motorola-provided equipment at each location.
- Provide adequate floor size for operator position equipment and backroom equipment.
- Relocate existing equipment if necessary to make room for new equipment.
- Inspect and approve each console installation.

Completion Criteria:

- Console installation is complete.
- Motorola and the County memorialize each site installation with a signed and dated Fixed Network Install milestone completion certificate.



4.1.19.6 Control Station/Consolette Installation

Motorola Responsibilities:

- This offer includes installation, programming and optimization for 13 control stations (locations TBD) and 9 backup consolettes for the main dispatch center located at 1303 North Milwaukee Ave., Libertyville, IL.
- Properly connectorize and ground the cabling, which will be run to the outdoor antenna location using the least obtrusive method.
- Protect the cabling by providing and installing a bulkhead lightning surge protector.
- Survey the exact mounting locations and develop control station installation plan.
- Perform the following tasks for the local control stations installations:
 - Create installation plan.
 - Assist the Customer to determine the locations of control stations and desk sets at each site.
 - Install RF local control stations identified in the equipment list. Install line (not greater than 100 feet in length) and antenna system (connectors, coax grounding kit, antenna, and surge protection).
 - Connect to the Customer-supplied ground point.
- Program all control stations once, from the template (approved by the Customer) prior to delivery.

Customer Responsibilities:

- Provide cable entry into the building through wall feed-through and seal with silicone, or provide an entry plate and boot.
- Provide necessary space for installation of the local control station. Supply, exterior or internal, vertical spaces for installation of the control station antenna with no more than a 100-foot cable run.
- Provide an elevated antenna mounting location.
- Supply a ground point of 5 ohms or less located in the immediate vicinity (within 6 feet) of the finalized location of the antenna and control station.
- Provide antenna-mounting facilities at each of the RF control station points specified, while providing an adequate means of feed-line routing and support.

Completion Criteria:

- Completion of all the control station installations, and approval by the Customer.

4.1.19.7 Control Station Complete

- Control Station installation completed and accepted by the Customer.

4.1.19.8 Logging Recorder

Work described in this section shall be performed at the Main Dispatch location:

Motorola Responsibilities:

- Provide, install and configure the Archiving Interface Server.
- Provide, install and configure the Nice 20 channel radio IP logging recorder.
- Provide, install and configure the Nice 32 channel analog telephony logging recorder.



- Provide, install and configure two (2) playback workstations.

Lake County Responsibilities:

- Install Instant Recall Recorder on operator positions, as required.
- Provide required documentation and information required for programming of the logging recorders prior to installation. This data will be captured in a standard electronic format using a template provided by Motorola. This will be used to define Lake County's specific logging track requirements and operational preferences.

Motorola Completion Criteria:

- IP Logging Recorder AIS provided.

4.1.19.9 System Installation Acceptance (Milestone)

- All equipment installations are completed and accepted by the County.
- Motorola and the County memorialize the event by signing and dating a System Installation/Title Transfer Completion milestone certificate.

4.1.20 System Optimization

4.1.20.1 Optimize System FNE

Motorola Responsibilities:

- Verify that all equipment is operating properly and that all equipment levels are set correctly.
- Check forward and reflected power for all radio equipment, after connection to the antenna systems, to verify that power is within tolerances.
- Verify communication interfaces between devices for proper operation.
- Test features and functionality are in accordance with manufacturers' specifications and that they comply with the final configuration established during the CDR/system staging.
- Test and optimize the P25 system.

Lake County Responsibilities:

- Provide access/escort to the sites.
- Provide required radio ID and alias information to enable alias database setup for interface to console.

Completion Criteria:

- System FNE optimization is complete.

4.1.20.2 Optimization Complete

System optimization is completed. Motorola and the County agree that the equipment is ready for acceptance testing.

4.1.21 Training

4.1.21.1 Perform Training

Motorola Responsibilities:

- Finalize training schedules with the County.
- Provide initial training prior to the 45 day burn-in, as needed.
- Provide remaining training as defined in the Training Plan.

Lake County Responsibilities:

- Provide adequately sized training room(s).
- Coordinate required student attendance at the scheduled class and time.

Completion Criteria:

- All training classes completed.

4.1.21.2 Training Complete

- All training classes completed.
- Motorola and the County memorialize the event by signing and dating a Training Completion milestone certificate.

4.1.22 Subscriber Units

4.1.22.1 Develop Templates

Motorola Responsibilities:

- Motorola assists Lake County in defining each radio template. Motorola has included the cost to develop up to 47 unique subscriber programming templates.
- Motorola participates in a meeting to finalize any changes among user groups.
- Program the approved templates into a radio-programming template tool.
- Program sample radios with approved templates and deliver for Lake County evaluation.

Customer Responsibilities:

- User groups create templates in a spreadsheet format.
- Forward electronic copies of the spreadsheets to the committee members for their review and comment.
- Evaluate sample radios and provide feedback.
- Approve templates.

Completion Criteria:

- Templates completed and approved by Lake County.



4.1.22.2 Program Mobiles

Motorola Responsibilities:

- Program test mobiles with each template version and activate them on the system.
- Pass all features and functionalities of the mobile template.
- Program all 106 mobiles and 13 control stations, as identified in the equipment list, in accordance with Lake County-approved programming templates, client software, and fleetmap.
- Work with Lake County to develop and approve prototypes for each type of mobile installation.
- The following guidelines are followed during programming:
 - A “one-time only” programming charge is included in the project price.

Customer Responsibilities:

- Install mobiles in the vehicles, as identified in the equipment list, and according to the installation schedule.
- The following guidelines are followed during programming:
 - Installations utilize the standard mobile mounting hardware provided with the type of unit.
 - Obtain main power leads from a voltage source as supplied in the mobiles.
 - Permanently mount the new antennas on each vehicle using the existing antenna holes created for the legacy mobile radios.
 - Install a separate temporary magnetically mounted antenna for up to 106 legacy mobile radios. This antenna and legacy radio will remain active until system cutover is complete.
 - Remove the existing 106 legacy mobile radios from the vehicles after system cutover has been completed.
- Test and verify each feature selected during the CDR process.
- Approve successful testing of each feature by initialing each test shown on the test script.
- Provide adequate number of vehicles for installations according to the project/installation schedule.
- If any installations require variations from the approved plan, Lake County must approve, before proceeding with the variance.

Completion Criteria:

- All mobiles are programmed and installed successfully and approved by Lake County.

4.1.22.3 Program and Distribute Portables

Motorola Responsibilities:

- Program test portables with each template version and activate them on the system.
- Once all templates and client software is tested and approved by Lake County, Motorola requests written approval of template acceptance.
- Program 819 new portable radios, as identified in the equipment list, based upon Lake County approved programming templates, client software, and fleetmap. A “one-time only” programming is included in the project pricing.
- Deliver units to authorized Customer personnel and inventory upon receipt.

Customer Responsibilities:

- Approve final template(s) and initiate portable programming.

- Upon receipt of portables, a Customer-authorized signatory acknowledges receipt of all portables and accessories and proper operation of a sampling of portables.
- Distribute the portables to end users.



Completion Criteria:

- All portables are successfully programmed and approved by Lake County.

4.1.22.4 Subscribers Complete

- All Subscribers are programmed and/or distributed/installed successfully, and approved by Lake County.

4.1.23 Audit and Functional Acceptance Testing

4.1.23.1 Perform R56 Audits

Motorola Responsibilities:

- Perform R56 site-installation quality audits, verifying proper physical installation and operational configurations.
- Create site evaluation report to verify site meets or exceeds requirements, as defined in Motorola's Standards and Guidelines for Communication Sites (R56).
- Record any site deficiencies.
- Distribute report to the County.
- Correct any Motorola or Motorola subcontractor owned deficiencies.

Lake County Responsibilities:

- Provide access/escort to the sites.
- Witness audit (if desired).
- Correct any County owned deficiencies.

Completion Criteria:

- All site R56 audits completed successfully.
- R56 Audit report has been distributed to the County.
- Deficiencies are included with the final project punch list.

4.1.23.2 Perform Functional Testing

Motorola Responsibilities:

- Conduct Functional Acceptance Test Plan as approved at the design review.
- Supply minimum two copies of the test plan.
- Repeat any failed test(s) once responsible party(ies) have taken corrective action(s).
- Prepare documentation of component tests to be delivered as part of the final documentation package.
- Record test results in test plan.

Lake County Responsibilities:

- Witness and participate in acceptance tests.
- Record test results in test plan.



Completion Criteria:

- Successful completion of Functional Acceptance Test Plan.

4.1.23.3 Perform Coverage Acceptance Testing

Motorola has included four (4) complete coverage test kits with this proposal. This will allow four teams consisting of Motorola and the County for executing the coverage test plan.

Note: Coverage testing will take place only between the months of May and September. The schedule is based on key milestone dates being completed as defined.

Motorola Responsibilities:

- Develop and present Coverage Acceptance Test Plan (CATP) at the Design Review (a final plan is required minimum of 8 weeks from when the test is to begin).
- Motorola and the County shall review and approve CATP prior to execution.
- Supply and set-up the four (4) required coverage test kits in County supplied vehicles.
- Execute CATP with the County.
- Submit CATP test reports to the County within the agreed period.
- If any area fails, re-test that particular area when Motorola determines that corrective action has been taken.
- Document all issues that arise during the coverage testing.
- Submit final test reports, according to the agreed period.

Lake County Responsibilities:

- Provide subscriber units to be used for CATP.
- Provide four (4) vehicles, drivers, and resources to witness and participate in the coverage testing.
- Review the test results in a timely manner.
- Timely approval of the test results, if the reports indicate compliance with the agreed requirements.

Completion Criteria:

- Successful completion of the coverage testing and approval by the County.

4.1.23.4 Test Documentation Submission

Within 30 days of successful completion of the Acceptance Testing Plan the following documentation shall be provided. Provide complete set of test documentation, including the testing procedures utilized, testing dates, testing locations, project participants, weather conditions, and a description of testing irregularities or problems encountered and testing results. Any punch list items that have not been resolved within the 30 day window shall be listed along with the proposed resolution and timeframe for completion.

Three complete printed sets of ATP documentation shall be provided in 3 ring binders along with three complete sets in electronic format (Adobe PDF) on DVD media.

- Document a complete inventory database of all equipment sold (include Database in Microsoft Access format) and segmented into equipment type and location.



- Equipment to include: item description, the make, model, model number, serial number and latest software load and version. Equipment passwords for access to password protected equipment shall also be provided to the County's Director of Communications.
- Radio Equipment to include: identification by County Communications Department with Description, make, model, model number, serial number.

4.1.23.5 45 Calendar Day Functional Reliability Testing

Motorola Responsibilities:

- Submit written notification to the County that the system is ready for the 45 day burn-in test and the initial user training and initial subscriber transitions have been successfully completed.
- Respond to any problems, according to the agreed period.
- Resolve any problems, according to the agreed period.
- Categorize the problems as major and minor, based upon agreed definitions as established during the Detailed Design Review.
- If a major failure occurs, correct the problem and re-start the 45 day operational test.
- If a minor failure occurs, correct the problem; however the 45 day operational test period continues (not re-started).

Lake County Responsibilities:

- Conduct 45 day test period.
- Report all issues *immediately* to Motorola Project Manager.

Completion Criteria:

- Successful completion of the 45 calendar-day burn-in and approval by the County.
- Motorola and the County memorialize the event by signing a milestone completion certificate.

4.1.23.6 Cutover

Due to the fact that Lake County is responsible for the subscriber installation, Lake County will play an integral part in developing and executing the cutover plan. A Detailed Cutover Plan will be reviewed and jointly defined during the Detailed Design Review.

Preliminary Cutover Plan Overview

The Cutover plan will include a mutually agreed upon gradual transition to the new system. The new equipment will be installed in parallel with the existing EDACS system as defined per Lake County. It is the County's responsibility to provide site space, electrical, power and HVAC and the antenna network at all sites as needed to support the existing equipment during cutover.

Subscribers, which will be using the new system, will require programming by Lake County prior to initial cutover and new system usage. It is recommended that both systems be programmed in the subscriber radio(s) to allow users to utilize either the new or old system as desired during the initial testing period.

Dispatch consoles will be installed at the main and back up remote dispatch locations during the initial implementation. As requested, the new consoles will be installed in parallel with the existing consoles. Site space, power, electrical will be provided by Lake County. A select number of positions will be operational for testing purposes.

System testing, optimization, coverage testing and the 45 day burn in will be completed on this agreed upon subset of channels and users. Upon completion of testing the remaining channels will be connected to the antenna network at each site and remaining users can cutover gradually to the new system.

The existing EDACS system equipment will be decommissioned as defined and Motorola will inventory the equipment and relocate the equipment to a County-designated location.

Motorola Responsibilities:

- During cutover, follow the written plan and implement the defined contingencies, as required, with little or no impact on the existing system and/or County operations.
- Complete all required/proposed training plans prior to cutover.
- Coordinate with the County to ensure all subscribers planned for cutover are activated in the system.

Lake County Responsibilities:

- Notify the user group(s) affected by the cutover (date and time).
- Conduct a roll call of all users working during the cutover, in an organized and methodical manner.
- Ensure that all subscriber users are trained.
- Distribute and install all subscriber devices prior to cutover.

Completion Criteria:

- Successful migration from the old system to the new system.

4.1.24 System Acceptance (Milestone)

Motorola and the County memorialize this event by signing a System Acceptance milestone completion certificate; system warranty commences.

4.1.25 Finalize

4.1.25.1 As-Built Documentation

Motorola Responsibilities:

- Prior to Final Acceptance, provide final copies and quantities of equipment operational, installation, service and maintenance and programming manuals.
- Provide the County's Project Manager with final "as-built" documentation (in hard copy and CD-ROM format):
 - Six (6) copies for each of the site development locations, in-building coverage locations and the dispatch center. The documentation shall be provided in 3-ring binders and three (3) copies on CD media in the original software format, including AutoCAD, Excel, and Word for drawings, spreadsheets, and text.
- As-built documentation shall include the following:
 - Completed acceptance test plans.
 - Provide six (6) complete printed sets of ATP documentation in 3-ring binders along with six (6) complete sets in electronic format (Adobe PDF) on DVD media.



- Infrastructure equipment/item description, models, serial numbers, versions, equipment locations, subscriber radio models, serial numbers.
- Equipment user passwords
- Warranty information as discussed at the Transition meeting
- Final as-built drawings:
 - System-Level block Diagrams.
 - Per Site “scaled” Equipment Floor Diagrams (per equipment & dispatch site).
 - Per Site “scaled” Equipment Rack Diagrams (per equipment & dispatch site).
- Radio propagation coverage maps.
- All external equipment inter-cabling, whether Network, RF, AC, Auxiliary Input and Output or Control cables and/or wiring installed by Motorola, shall be labeled with pre-printed adhesive wire markers. Markers shall be placed at each end, adjacent to the connector, plug or terminus. For cables and/or wiring, within the shelter, markers shall be placed at 3’ intervals along the length of the cable and/or wiring.
- Interconnection drawings that show all connections between sub-assemblies, such as terminal boards, panel assemblies or other equipment, and which external connections are made, shall be provided.
- Numbering and labeling of all Motorola-installed connections to termination blocks associated with the control consoles.
- Numbering and labeling of all Motorola installed interconnecting cabling between repeaters, the central control, any remote site controllers or processors, alarm circuits, and leased telephone company circuits, and the microwave system.
- Complete set of maintenance and operations manuals shall be provided for the system as whole and for each category of equipment purchased in association with this project.
- Manuals for OEM hardware for each component of the system.
- Any unique wiring configurations or circuit modifications installed by Motorola that are not part of the standard equipment documentation provided shall be included in the ring binder. All information as described in the previous paragraph shall be included, in addition to the theory and method of operation.
- A complete inventory of all provided equipment and software including model numbers, serial numbers, version numbers in printed form and in the latest version of Microsoft Access.
- Final fleetmap configuration, with all group I.D.’s and aliases.
- Documentation of final programming configuration for all software programmable equipment.
- A soft copy and printed copy of all equipment programming templates used in the system.

Lake County Responsibilities:

- Notify Motorola in writing following satisfactory completion of final system acceptance

4.1.25.2 Transition to Service/Project Transition Certificate

Motorola Responsibilities:

- Review the items necessary for transitioning the project to warranty support and service.
- Provide a County Support Plan detailing the warranty and post-warranty support, if applicable, associated with the Contract equipment.
- Provide additional information regarding any applicable post-warranty support, included in the Warranty/Post-Warranty section of this document.



Lake County Responsibilities:

- Participate in the Transition Service/Project Transition Certificate (PTC) process.

Completion Criteria:

- All service information has been delivered and approved by the County.

4.1.25.3 Final Acceptance (Milestone)

Motorola Responsibilities:

- Complete all required tasks outlined in this Statement of Work.
- Prior to Final Acceptance, provide final copies and quantities of equipment operational, installation, service and maintenance and programming manuals

Lake County Responsibilities:

- Complete responsibilities as outlined in this Statement of Work (SOW).
- Review and approve all required tasks outlined in the SOW.

Completion Criteria:

Motorola and the County memorialize Final Acceptance by signing a milestone completion certificate.



4.2 SCHEDULE

Motorola's proposed schedule follows:



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SECTION 6

TRAINING

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

CONTRACT DOCUMENTATION



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TRAINING

6.1 TRAINING

Overview

Motorola understands that the successful implementation and use of your communications system depends on effective training. We have developed a training proposal for Lake County to ensure a comprehensive understanding of your proposed system and all user equipment. We are leveraging over 75 years of training experience working with customers just like you to provide recommendations for your consideration. The training proposal detailed in the following pages incorporates customer feedback coupled with a best practices systematic approach to produce effective course delivery and content.

Our commitment to Lake County is to provide unsurpassed services that ensure the equipment operates efficiently for the life of the system, and in doing so, directly train your personnel to acquire a level of knowledge to utilize the system at its maximum potential.

Lake County personnel will gain in-depth understanding of the power of your new system through education and proficient daily use. Our high-quality training focuses attention on student needs. Training is complemented by our detailed documentation and available continuing education program.

We will collaborate with Lake County to develop a final customized training plan that fits your needs and assures that System Administrators, Maintenance Technicians and End Users are skilled in using your new system.

6.1.1 Training Approach

Our training solution delivers a combination of online training and field based instructor led training at Lake County locations using the operational equipment and classrooms. Motorola will employ knowledgeable and experienced instructors, well-designed courseware and integrated lab activities.

Training is based upon several key criteria:

- Course design is driven by an analysis of student needs and focuses on how-to rather than theory.
- Learning objectives are based upon what students need to accomplish on the job and focus on specific applications or components.
- Hands-on lab opportunities using Lake County specific job aids are incorporated into training to maximize the transfer of skills and the retention/reuse of information.

Our instructors bring invaluable experience and first-hand knowledge of public safety systems into their training approach. This experience and knowledge provides them a better understanding of and insight into the practical aspects of the role of Lake County Managers, Technicians and End Users. Each has a proven ability to communicate with novice as well as expert personnel.





6.1.2 Courses Proposed

Motorola Solutions has identified the following course(s) that are necessary to achieve the training goals for Lake County. Course description files for the recommended courses are provided in the matrix below and/or in the training appendix. Class delivery for instructor-led courses in the field will be tailored for your system and features.

Specifically, our proposed training plan addresses the following categories as identified in your request for proposal:

- Radio End User Trainers
- Console Operators and Supervisors

It is recommended that students bring their laptop computers for all System Administrator and Technician classes.



6.1.3 Training Plans

6.1.3.1 Radio Operator Training Plan: Train the Trainer

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
APX4000, 6000, & 7000 Portables (1 Model of each) and APX4500, 6500, & 7500 Mobiles (1 Model of each) Train-the-Trainer Utilizing the Interactive Tool Kits	Trainers	3 (8 hour sessions)	3	Waukegan, IL	Prior to training users	30 (10 per session)
Course Synopsis: This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation and hands-on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits – iEUTK), facilitation and hands-on activities to facilitate learning events supported by tailored or customized training materials and job aids. They will become proficient in discussing common tasks associated with the operation of the customer's radios. Note: The first half of the day is the radio operator class. The second half of the day teaches the trainers how to redeliver this training as well as how to utilize the Interactive End User Tool Kit.						



6.1.3.2 Console Operator and Admin Training Plan

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
MCC7500 Console Operator and Admin Utilizing the Interactive Tool Kit 8 Training Consoles Ratio 2 students per console	Dispatch Operators & Supervisors	9 (8 hour sessions)	9	Waukegan, IL	Prior to cutover	144 Total (16 per day)
Operator Course Synopsis: This course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands-on activities, the user learns how to perform common tasks associated with the console operation. Admin Course Synopsis: This course provides participants with the knowledge and skills to manage and utilize the MCC 7500 console administrator functions. Through facilitation and hands-on activities, the participant learns how to customize the console screens. Note: First half of the day is the operator class. The second half of the day is the admin class. How to utilize the Interactive End User Tool Kit is also covered in the second half of the day.						

6.1.3.3 Technical Training Plan

Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
APX CPS Programming and Template Building (Instructor-led)	System Administrators	1	2	Waukegan, IL	Prior to programming radios	12
Course Synopsis: The APX CPS Programming and Template Building course provides communications management personnel and technicians with the knowledge and training necessary to build templates and program APX 7000/7500 subscriber radio's in the most efficient way possible. The content, parameters and exercises demonstrated in the APX CPS Programming and Template Building class apply to the APX 7000 Portable and APX 7500 Mobile.						
APX Subscriber Academy (Instructor-led)	Radio Technicians	1	5	Waukegan, IL	Prior to maintaining	6



Course	Target Audience	No. of Sessions	Duration (days)	Location	Date	No. of Attendees
Course Synopsis: This course focuses on the knowledge required for a 2-way Radio Technician working in a communication environment or using the family of APX radios in the field. The course is specifically designed to provide significant amounts of hands-on, scenario based labs around configuration and troubleshooting. Key Loading and Management, Encryption, Over-The Air Programming and Mobile Radio Installation are some of the topics that will be covered in detail for both mobile and portable radios.						
MCC7000 Series Dispatch Consoles Overview (Self-paced; On-line) Prerequisite	Console Technicians	1	1 hour	Self Paced Online	Prior to console workshop	6
Course Synopsis: This course provides an overview of the MCC 7000 series of Dispatch Consoles. It includes a description of the features, illustrations of subsystem architecture options, descriptions of subsystem components, and illustrations of signal flow and call processing.						
MCC 7000 Series Dispatch Consoles Workshop (Instructor-led)	Console Technicians	1	4	Waukegan, IL	Prior to maintaining	6
Course Synopsis: This course familiarizes participants in installation, configuration, management and repair of MCC 7000 Series IP dispatch consoles, Archiving Interface Servers, AUX I/O servers, and Conventional Channel Gateways. The focus is on a detailed discussion of console hardware and hands-on activities with the installation and configuration of the MCC 7000 Series IP dispatch consoles.						



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6.2 COURSE DESCRIPTIONS

All course descriptions for the training listed above follow:



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**Duration:**

2 Days

Delivery Method

Field

Course Synopsis

The APX CPS Programming and Template Building course provides communications management personnel and technicians with the knowledge and training necessary to build templates and program APX 7000/7500 subscriber radio's in the most efficient way possible.

The content, parameters and exercises demonstrated in the APX CPS Programming and Template Building class apply to the APX 7000 Portable and APX 7500 Mobile.

Target Audience

- Radio Technicians, System Managers and anyone who has the responsibility of programming APX subscriber radios.

Prerequisites

- Knowledge of the basic features and options of two-way radios, and the basic concepts of conventional and trunking systems.

Course Objectives**After completing this course, the student will be able to:**

- Build APX 7000/7500 templates using the APX Customer Programming Software (CPS)
- Program the specific parameters related to various radio system configurations: Conventional, Single Site Trunking, Simulcast, SmartZone, ASTRO 25 and ASTRO 25 X2
- Demonstrate detailed knowledge of APX CPS navigation, tools, options and features that make efficient programming of the radio possible

- Demonstrate a complete understanding of APX CPS efficiency tools, such as Cloning, Drag and Drop, Codeplug Comparison, Radio Flashing, Advance System Key Administration and others

Course Outline

- Introduction to APX 7000 Radio
- Introduction to APX CPS
- APX CPS Install, Setup and Configuration
- Navigating APX CPS
- APX CPS Data Transfer
- Understanding and Interpreting Radio Information
- Detailed Review of Codeplug Contents
- APX Conventional Codeplug Build
- APX Type II Trunking Codeplug Build
- APX ASTRO 25 Trunking Codeplug Build
- Building Scan List
- Additional/Advanced CPS Functionality



Course Description

APX Portable and APX Mobile Train-the-Trainers



Duration

Up to 8 hours

Delivery Method

Instructor-led

Target Audience

APX Trainers, Supervisors and Support Personnel.

Course Synopsis

This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation and hands-on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits – iEUTK), facilitation and hands-on activities to facilitate learning events supported by tailored or customized training materials and job aides. They will become proficient in discussing common tasks associated with the operation of the customer's radios.

Required Pre-Work

None

Recommended Pre-requisites

Previous two-way radio and training experience

Course Objectives

- High-level overview of the customer system configuration
- General radio operation
- Proper operating procedures for specific customer features
- Perform basic operational tasks of the radio
- Utilize the provided job aids to perform specific tasks associated with the radio



Course Outline

A. Basics

1. Controls
 - a. Top and Side Buttons
 - b. Switches
 1. 3 Position toggle
 2. 2 Position Concentric
 - c. Home key
 - d. Data Key
2. Display
 - a. Front Display
 - b. Top Display
 - c. Display light
 - d. Intelligent Lighting
3. Push To Talk or Accessory PTT found on the microphone
4. Hub, hang up box (Mobile)
5. Menu
 - a. Menu Screen Anatomy
 - b. Navigating Menu Screen
6. Recent Call List (Model 3.5)
7. Unified Call List - Contacts (Model 3.5)
8. Dual Sided Radio (Model 3.5)
 - a. Dual Mics
 - b. Dual Speakers
9. Accessory Connector

B. Specific Features

1. Changing Talkgroups/Channels
2. Changing Zones
3. Mute tones of keypad
4. Talkgroup Call
5. Private Call
 - a. Accessing Private Call Feature
 - b. Initiating Private Call
 - c. Call List Programming
6. Announcement/All Call (Calls involving Multiple Talkgroups)
 - a. Initiating Announcement/All Call
7. Direct/Talkaround
8. Failsoft
9. Radio Profiles
 - a. Accessing and changing Radio Profile

C. Optional Features

1. Scan
 - a. Scan program
 - b. Priority Scan
 - c. Dynamic Priority



2. Telephone Interconnect
 - a. Accessing Telephone Interconnect Feature
 - b. Initiating a Phone Call
 - c. Phone List Programming
3. Data Services
 - a. Text Messaging
 1. Accessing the Text Messaging Feature
 2. Creating a Free Form Text Message
 3. Sending a “Canned Text Message
 - b. GPS
 - c. OTAP
4. Encryption
5. Emergency



Course Description

*APX Technical
Subscriber Academy*



Duration

5 day

Delivery Method

Classroom Instruction

Course Synopsis:

This course focuses on the knowledge required for a 2-way Radio Technician working in a communication environment or using the family of APX radios in the field. The course is specifically designed to provide significant amounts of hands-on, scenario based labs around configuration and troubleshooting. Key Loading and Management, Encryption, Over-The Air Programming and Mobile Radio Installation are some of the topics that will be covered in detail for both mobile and portable radios.

Audience

Radio technicians

Objectives

After completing this course, the student will be able to:

- Distinguish between the features and specifications of the APX 7000 and the APX 7500 radio
- Verify the correct operations of the APX 7000 and the APX 7500 radio
- Maintain and troubleshoot an APX 7000 and APX 7500 radio
- Disassemble and reassemble the radio using the documented procedures
- Verify the housing integrity of an APX 7000 portable radio
- Flash upgrade an APX 7000 and APX 7500 radio

Prerequisites

Completion of the following courses:

CPS Programming and Template Building Overview (ADT001-V or Test out ADT001-T)

Completion of the following courses or equivalent experience in Radio Communications:

Communication Systems Concepts (NST021)

Radio Systems Overview (RCS002-E or Test out RCS002-T)

Theory of Radio Operations (RCS003-E or TEST out RCS003-T)

Course Outline

- APX Radio Introduction
- APX Radio Performance Checks
- APX Radio Alignment
- APX Radio Theory Of Operation
- Radio Disassembly / Reassembly
- Vacuum Testing For Submergibility
- Mobile Radio Installation & Configuration



- Advanced Customer Programming Software
- Radio Troubleshooting



The Interactive End User Tool Kit

(iEUTK) is a revolutionary knowledge transfer tool designed to accelerate learning. Using the iEUTK allows trainers to customize operator training to match unique button, feature programming, and displays provided in the system. Each iEUTK is user friendly and menu driven. The home page in every iEUTK provides excellent navigation to the multiple areas of interest for the specific communication device. Operators select "Getting Started" to view a highly informative video overview that helps build solid foundational knowledge and quickly brings users up to speed on the operational theory of their specific device. The tailored materials are developed on-site using tool kits that allow users to modify training materials when radio or console features change. Personnel are taught how to maneuver through and tailor the iEUTK screens. The tailored selections are saved to an electronic file that the Motorola Solutions training team sends to the printer to develop the training materials. The trainers use the iEUTK to generate their instructor guides, incorporating standard operating procedures, notes, and reminders. This dynamic tool allows the customer to generate training materials on an as-needed basis depicting current features and functionality.



We use our iEUTK to produce PowerPoint™ presentations so that students can have self-paced training on any PC with Microsoft Office™.



MCC 7000 SERIES DISPATCH CONSOLES WORKSHOP

CON012

COURSE DESCRIPTION

NOVEMBER 2012



MOTOROLA SOLUTIONS LEARNING



Delivery Method

ILT = Instructor Led Training

Duration

4 days

Target Audience

System Administrators, Console Technicians

Course Overview

This course familiarizes participants in installation, configuration, management and repair of MCC 7000 Series IP dispatch consoles, Archiving Interface Servers, AUX I/O servers, and Conventional Channel Gateways. The focus is on a detailed discussion of console hardware and hands-on activities with the installation and configuration of the MCC 7000 Series IP dispatch consoles.

Prerequisites

- Completion of the following courses or equivalent knowledge:
 - Bridging the Knowledge Gap (ACT100-E or ACT101-E)
 - Networking Essentials in Communication Equipment (NST762)
 - Advanced Networking in Motorola Communications Equipment (NWT003)

Required

- MCC 7000-Series Console Overview (CON014)
- ASTRO 25 IV&D with M Core System Overview (ACS713200)
- ASTRO 25 IV&D Introduction to Radio System Management Applications (ACS713201)

Learning Outcomes

After completing the course the participant will be able to:

- Install and configure the hardware and software components of the MCC 7000 Dispatch Console Subsystem
- Perform MCC 7000 Series site connectivity and bandwidth management
- Perform System Administrator functions using the Elite Administrator software



- Troubleshoot installation and configuration problems for the MCC 7000 Series Dispatch Consoles

Lab Requirements

- AIS
- AUX I/O servers
- Network Management Terminals at a ratio of 1 for every 4 students to ensure proper hands-on

Course Modules

Module 1: Course Introduction

Module 2: Dispatch Console Overview

Topic 2-1: Features

Topic 2-2: System Views

Topic 2-4: Call Processing

Module 3: Dispatch Console Hardware

Topic 3-1: Dispatch Console Configuration

Module 4: AUX I/Os

Topic 4-1: Auxiliary Inputs/Outputs (Aux I/Os)

Module 5: Conventional Communication

Topic 5-1: Conventional Communication

Module 6: Domain Controllers

Topic 6-1: Domain Controllers and Active Directory

Module 7: Administrator Functions

Topic 7-1: Editing Current Configurations

Topic 7-2: Setting Up Folders and Resources

Topic 7-3: Setting Up Auxiliary I/Os

Topic 7-4: Configuring Toolbars

Topic 7-5: Editing Preferences

Topic 7-6: Auto Starting the MCC 7500 Dispatch Console

Topic 7-7: Setting Up Inbound Event Display

Topic 7-8: MKM 7500 Console Alias Manager

Module 8: Troubleshooting

Topic 8-1: Troubleshooting with UEM

Topic 8-2: Troubleshooting MCC 7000 Series Components



MCC 7000 SERIES DISPATCH CONSOLES OVERVIEW

CON014

COURSE DESCRIPTION

NOVEMBER 2012



MOTOROLA SOLUTIONS LEARNING



Delivery Method

OLT = Online Training

Duration

1 hour

Target Audience

System Administrators, Console Technicians

Course Overview

This course provides an overview of the MCC 7000 series of Dispatch Consoles. It includes a description of the features, illustrations of subsystem architecture options, descriptions of subsystem components, and illustrations of signal flow and call processing.

Prerequisites

- Completion of the following courses or equivalent knowledge:
- Bridging the Knowledge Gap (ACT100-E or ACT101-E)
- Networking Essentials in Communication Equipment (NST762)
- Advanced Networking in Motorola Communications Equipment (NWT003)

Required

- Select the System Overview specific to your ASTRO 25 IV&D Core:
 - ASTRO 25 IV&D with M Core System Overview (ACS713200)
 - ASTRO 25 IV&D Conventional with M Core System Overview (ACS713420)
 - ASTRO 25 IV&D with L Core System Overview (ACS713430)
 - ASTRO 25 IV&D Conventional with K Core System Overview (ACS713400)
- ASTRO 25 IV&D Introduction to Radio System Management Applications (ACS713201)

Learning Outcomes

After completing the course the participant will be able to:

- Describe the features of MCC 7000 series of Dispatch Consoles.
- Explain the various system architectures for Dispatch Console subsystems.



- Describe system components in a Dispatch Console subsystem.
- Describe the steps in the signal flow of call processing from a Dispatch Console.

Course Modules

Module 1: Course Introduction

Module 2: Console Architectures

- Topic 2-1: Introduction
- Topic 2-2: Co-located Console Sites
- Topic 2-3: Remote Console Sites
- Topic 2-4: CENTRACOM Interoperability
- Topic 2-5: Dispatch Console Subsystem
- Topic 2-6: Conventional Configurations

Module 3: Console Subsystem Components

- Topic 3-1: Introduction
- Topic 3-2: Console Operator Position
- Topic 3-3: MCC 7500 with GPIOM
- Topic 3-4: MCC 7500 with Voice Processing Module (VPM)
- Topic 3-5: MCC 7100
- Topic 3-6: Logging System
- Topic 3-7: Console Alias Manager - MKM 7000
- Topic 3-8: Auxiliary I/O Server
- Topic 3-9: Conventional Channel Gateway
- Topic 3-10: Conventional Site Controller

Module 4: Console Features

- Topic 4-1: Capacity
- Topic 4-2: Example of Console Functions
- Topic 4-3: Administrator and Dispatcher Applications
- Topic 4-4: Over-the-Ethernet Keying (OTЕК)

Module 5: Call Processing

- Topic 5-1: Introduction
- Topic 5-2: Link Op
- Topic 5-3: Call Request
- Topic 5-4: Call Setup
- Topic 5-5: Call Grant



Topic 5-6: Audio Routing

Topic 5-7: Call Continuation or Teardown

**Duration**

4 hours

Delivery Method

Instructor-led

Target Audience

Dispatch Console Operators, Supervisors, System Administrators, and Support Personnel

Course Synopsis

This course provides participants with an introduction to the dispatch console, its basic operation and tailored job aids which will be available for assistance in operation. Through facilitation and hands-on activities, the user learns how to perform common tasks associated with the console operation.

Course Objectives

- Perform basic operational tasks of the dispatch console
- Utilize the provided job aids to perform specific tasks associated with the console
- Understand a high level view of the system configuration
- High-level overview of the customer system configuration
- General console operation
- Proper operating procedures for specific customer features

Recommended Prerequisites

None

Key Topics

- Overview
- Communicating with Radios
- Advanced Signaling Features
- Resource Groups
- Working with Configurations
- Working with Aux IOs
- Troubleshooting



**Duration**

4 hours Operator, plus
4 hours Admin

Delivery Method

Instructor-led

Target Audience

Dispatch Supervisors, System Administrators

Admin Course Synopsis

This course provides participants with the knowledge and skills to manage and utilize the MCC 7500 console administrator functions. Through facilitation and hands-on activities, the participant learns how to customize the console screens.

Course Objectives

- Understand the menu items and tool bar icons
- Edit folders, multiselect/patch groups, auxiliary input output groups, windows and toolbars
- Add/delete folders

Recommended Prerequisites

None

Key Topics

- Introduction
- Configurations
- Folders and Resource Setup
- Customizing Folders
- Auto Starting the MCC 7500 Dispatch Console
- Editing Preferences
- Configuring the Toolbar
- Setting Up Aux IOs
- Resource Groups



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SECTION 7

PRICING

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

CONTRACT DOCUMENTATION



The design, technical, pricing, and other information ("Information") furnished with this submission is proprietary information of Motorola Solutions, Inc. ("Motorola") and is submitted with the restriction that it is to be used for evaluation purposes only. To the fullest extent allowed by applicable law, the Information is not to be disclosed publicly or in any manner to anyone other than those required to evaluate the Information without the express written permission of Motorola.

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PRICING

7.1 LAKE COUNTY PAYMENT SCHEDULE AND PRICING

Lake County Payment Schedule and Pricing follow:



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SECTION 8

CONTRACTUAL DOCUMENTATION

COUNTYWIDE RADIO COMMUNICATION SYSTEM

AUGUST 12, 2014

CONTRACT DOCUMENTATION



The design, technical, pricing, and other information ("Information") furnished with this submission is proprietary information of Motorola Solutions, Inc. ("Motorola") and is submitted with the restriction that it is to be used for evaluation purposes only. To the fullest extent allowed by applicable law, the Information is not to be disclosed publicly or in any manner to anyone other than those required to evaluate the Information without the express written permission of Motorola.

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CONTRACTUAL DOCUMENTATION

8.1 STARCOM21 COMMUNICATIONS SYSTEM AGREEMENT

Motorola Solutions, Inc. (“Motorola”) and Lake County, Illinois (“Customer”) enter into this “Agreement,” pursuant to which Customer will purchase and Motorola will sell the System, as described below. Motorola and Customer may be referred to individually as a “Party” and collectively as the “Parties.” For good and valuable consideration, the Parties agree as follows:

Section 1 EXHIBITS

The exhibits listed below are incorporated into and made a part of this Agreement. In interpreting this Agreement and resolving any ambiguities, the main body of this Agreement takes precedence over the exhibits and any inconsistency between Exhibits A through I will be resolved in their listed order.

- Exhibit A Motorola “Software License Agreement”
- Exhibit B “Pricing Summary” and “Payment Schedule”
 - B-1 “Pricing Summary” dated August 12, 2014
 - B-2 “Payment Schedule”
- Exhibit C “Technical and Implementation Documents”
 - C-1 “System Description” dated August 12, 2014
 - C-2 “Equipment List” dated August 12, 2014
 - C-3 “Statement of Work” dated August 12, 2014
 - C-4 “Acceptance Test Plan” or “ATP” dated August 12, 2014
 - C-5 “Performance Schedule” dated August 12, 2014
- Exhibit D Service Statement(s) of Work and “Service Terms and Conditions”
- Exhibit E System Upgrade Agreement Statement of Work
- Exhibit F “System Acceptance Certificate”
- Exhibit G RESERVED
- Exhibit H RESERVED
- Exhibit I STARCOM21 User Agreement (one per using agency)

Section 2 DEFINITIONS

Capitalized terms used in this Agreement have the following meanings:

- 2.1. “Acceptance Tests” means those tests described in the Acceptance Test Plan.
- 2.2. “Administrative User Credentials” means an account that has total access over the operating system, files, end user accounts and passwords at either the System level or box level. Customer’s



personnel with access to the Administrative User Credentials may be referred to as the Administrative User.

2.3. “Beneficial Use” means when Customer first uses the System or a Subsystem for operational purposes (excluding training or testing).

2.4. “Confidential Information” means any information that is disclosed in written, graphic, verbal, or machine-recognizable form, and is marked, designated, or identified at the time of disclosure as being confidential or its equivalent; or if the information is in verbal form, it is identified as confidential at the time of disclosure and is confirmed in writing within thirty (30) days of the disclosure. Confidential Information does not include any information that: is or becomes publicly known through no wrongful act of the receiving Party; is already known to the receiving Party without restriction when it is disclosed; is or becomes, rightfully and without breach of this Agreement, in the receiving Party’s possession without any obligation restricting disclosure; is independently developed by the receiving Party without breach of this Agreement; or is explicitly approved for release by written authorization of the disclosing Party. Both parties acknowledge that customer is subject to the Illinois Open Meetings Act (5 ILCS 120/1 et seq.) and the Illinois Freedom of Information Act (5 ILCS 140/1 et seq.)

2.5. “Contract Price” means the price for the System, excluding applicable sales or similar taxes and freight charges, and including fifteen (15) years of maintenance, support and upgrades (“Lifecycle Support Plan”).

2.6. “Effective Date” means that date upon which the last Party executes this Agreement. The Effective Date is not to be confused with the date of Beneficial Use or Acceptance date identified in the Statement of Work.

2.7. “Equipment” means the equipment that Customer purchases from Motorola under this Agreement. Equipment that is part of the System is described in the Equipment List.

2.8. “Force Majeure” means an event, circumstance, or act of a third party that is beyond a Party’s reasonable control (e.g., an act of God, an act of the public enemy, an act of a government entity, strikes or other labor disturbances, hurricanes, earthquakes, fires, floods, epidemics, embargoes, war, and riots).

2.9. “Infringement Claim” means a third party claim alleging that the Equipment manufactured by Motorola or the Motorola Software directly infringes a United States patent or copyright.

2.10. “Master Contract” means the Agreement between Motorola and the State of Illinois, known as the STARCOM21 Contract, including any and all amendments, revisions or replacements thereof as may now exist or be agreed upon from time to time.

2.11. “Motorola Software” means Software that Motorola or its affiliated company owns.

2.12. “Motorola’s Standard Managed Zone Core Agreement” sets forth the terms and conditions for the Customer to access the STARCOM21 Network. (if applicable)

2.13. “Non-Motorola Software” means Software that another party owns.

2.14. “Open Source Software” (also called “freeware” or “shareware”) means software that has its underlying source code freely available to evaluate, copy, and modify.

2.15. “Proprietary Rights” means the patents, patent applications, inventions, copyrights, trade secrets, trademarks, trade names, mask works, know-how, and other intellectual property rights in and to the Equipment and Software, including those created or produced by Motorola under this



Agreement and any corrections, bug fixes, enhancements, updates or modifications to or derivative works from the Software whether made by Motorola or another party.

2.16. “Software” means the Motorola Software and Non-Motorola Software, in object code format that is furnished with the System or Equipment.

2.17. “Specifications” means the functionality and performance requirements that are described in the Technical and Implementation Documents.

2.18. “Subsystem” means a major part of the System that performs specific functions or operations. Subsystems are described in the Technical and Implementation Documents.

2.19. “System” means the Equipment, Software, and incidental hardware and materials that are combined together into an integrated system; the System is described in the Technical and Implementation Documents.

2.20. “System Acceptance” means the Acceptance Tests have been successfully completed.

2.21. “Warranty Period” means one (1) year from the date of System Acceptance or Beneficial Use, whichever occurs first.

Section 3 SCOPE OF AGREEMENT AND TERM

3.1. SCOPE OF WORK. Motorola will provide, install and test the System, and perform its other contractual responsibilities, all in accordance with this Agreement. Customer will perform its contractual responsibilities in accordance with this Agreement.

3.2. CHANGE ORDERS. Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price, Performance Schedule, or both, and will reflect the adjustment in a change order. Neither Party is obligated to perform requested changes unless both Parties execute a written change order.

3.3. TERM. Unless terminated in accordance with other provisions of this Agreement or extended by mutual agreement of the Parties, the term of this Agreement begins on the Effective Date and continues until completion of fifteen (15) years of Lifecycle Support Plan. Notwithstanding anything contained herein to the contrary, in the event of a termination of the Master Contract pursuant to the terms thereof or otherwise, this Agreement shall terminate on the same date. In such event, the Customer will be liable to pay Motorola for the portion of the Contract Price attributable to the Equipment and/or Software delivered, and all services performed, on or before the effective date of the termination.

3.4. ADDITIONAL EQUIPMENT OR SOFTWARE. For three (3) years after the Effective Date, Customer may order additional Equipment or Software if it is then available. Each order must refer to this Agreement and must specify the pricing and delivery terms. Notwithstanding any additional or contrary terms in the order, the applicable provisions of this Agreement (except for pricing, delivery, passage of title and risk of loss to Equipment, warranty commencement, and payment terms) will govern the purchase and sale of the additional Equipment or Software. Title and risk of loss to additional Equipment will pass at shipment, warranty will commence upon delivery, and payment is due in accordance with the Local Government Prompt Payment Act. 50 ILCS 505/1 et seq.. Motorola will send Customer an invoice as the additional Equipment is shipped or Software is licensed. Alternatively, Customer may register with and place orders through Motorola Online (“MOL”), and this Agreement will be the “Underlying Agreement” for those MOL transactions rather than the MOL On-Line Terms and Conditions of Sale. MOL registration and other information may be found at

<http://www.motorola.com/businessandgovernment/> and the MOL telephone number is (800) 814-0601.

3.5. SYSTEM UPGRADES. During the fifteen (15) years of Lifecycle Support Plan, the applicable provisions of this Agreement (except for passage of title and risk of loss to Equipment, warranty commencement, and Exhibit C) will govern the implementation of the System Upgrades. Title and risk of loss to Equipment will pass at delivery, and warranty will commence upon delivery.

3.6. MAINTENANCE SERVICE. During the Warranty Period, in addition to warranty services, Motorola will provide maintenance services for the Equipment and support for the Motorola Software pursuant to the Statement of Work set forth in Exhibit D. Those services and support are included in the Contract Price. If Customer wishes to purchase additional maintenance and support services for the Equipment during the Warranty Period, or any maintenance and support services not included in the fifteen (15) years of Lifecycle Support Plan for the Equipment after the Warranty Period, the description of and pricing for the services will be set forth in a separate document. If Customer wishes to purchase extended support for the Motorola Software after the Warranty Period, it may do so by ordering software subscription services. Unless otherwise agreed by the parties in writing, the terms and conditions applicable to the fifteen (15) years of Lifecycle Support Plan and those other maintenance, support or software subscription services will be Motorola's standard Service Terms and Conditions, together with the appropriate statements of work.

3.7. MOTOROLA SOFTWARE. Any Motorola Software, including subsequent releases, is licensed to Customer solely in accordance with the Software License Agreement. Customer hereby accepts and agrees to abide by all of the terms and restrictions of the Software License Agreement.

3.8. NON-MOTOROLA SOFTWARE. Any Non-Motorola Software is licensed to Customer in accordance with the standard license, terms, and restrictions of the copyright owner on the Effective Date unless the copyright owner has granted to Motorola the right to sublicense the Non-Motorola Software pursuant to the Software License Agreement, in which case it applies and the copyright owner will have all of Licensor's rights and protections under the Software License Agreement. Motorola makes no representations or warranties of any kind regarding Non-Motorola Software. Non-Motorola Software may include Open Source Software. All Open Source Software is licensed to Customer in accordance with, and Customer agrees to abide by, the provisions of the standard license of the copyright owner and not the Software License Agreement. Upon request by Customer, Motorola will use commercially reasonable efforts to determine whether any Open Source Software will be provided under this Agreement; and if so, identify the Open Source Software and provide to Customer a copy of the applicable standard license (or specify where that license may be found); and provide to Customer a copy of the Open Source Software source code if it is publicly available without charge (although a distribution fee or a charge for related services may be applicable).

3.9. SUBSTITUTIONS. At no additional cost to Customer, Motorola may substitute any Equipment, Software, or services to be provided by Motorola, if the substitute meets or exceeds the Specifications and is of equivalent or better quality to the Customer. Any substitution will be reflected in a change order.

3.10. OPTIONAL EQUIPMENT OR SOFTWARE. This paragraph applies only if a "Priced Options" exhibit is shown in Section 1, or if the parties amend this Agreement to add a Priced Options exhibit. During the term of the option as stated in the Priced Options exhibit (or if no term is stated, then for eighteen (18) months after the Effective Date), Customer has the right and option to purchase the equipment, software, and related services that are described in the Priced Options exhibit. Customer may exercise this option by giving written notice to Seller which must designate what equipment, software, and related services Customer is selecting (including quantities, if applicable). To the extent they apply, the terms and conditions of this Agreement will govern the transaction; however, the parties acknowledge that certain provisions must be agreed upon, and they



agree to negotiate those in good faith promptly after Customer delivers the option exercise notice. Examples of provisions that may need to be negotiated are: specific lists of deliverables, statements of work, acceptance test plans, delivery and implementation schedules, payment terms, maintenance and support provisions, additions to or modifications of the Software License Agreement, hosting terms, and modifications to the acceptance and warranty provisions.

3.11. CONTINGENCIES. This Agreement is contingent upon the following: Customer securing all FCC and other approvals necessary for the existing Customer frequency licenses to accommodate increased coverage requirements and capacity prior to the Effective Date (if applicable); the STARCOM21 Oversight Committee approving Customer's access to the STARCOM21 Network prior to the Effective Date; Motorola entering into an acceptable site lease with Customer prior to the Effective Date (if applicable); and Motorola entering into a Services Agreement with Customer, subject to mutually acceptable terms and conditions, to address the system management services for STARCOM21 to be performed by Customer (if applicable), subject to approval, if any, of the State of Illinois.

3.12. MOTOROLA'S STANDARD MANAGED ZONE CORE AGREEMENT and the STARCOM21 USER AGREEMENT. The Customer hereby accepts and agrees to execute upon System Acceptance (or Beneficial Use, if Beneficial Use occurs prior to System Acceptance) and abide by all the terms of Motorola's Standard Managed Zone Core Agreement attached hereto as Exhibit H (if applicable) and the STARCOM21 User Agreement attached hereto as Exhibit I.

3.13. DIVORCE PLAN. In the case the County's needs change, or other circumstances arise, it is possible to separate or "divorce" this system at some future point. This can be accommodated by separating from the integrated solution by forming a sub-system infrastructure fully owned by Lake County. Motorola would split the channels deployed in Lake County into two separate simulcast subsystems. Lake County would retain control of their owned assets including consoles, recorders, subscribers, shelters, UPS's and re-use them in a sub system approach or could move it to their own P25 infrastructure. Lake County will retain ownership and control of all their existing (8) 800MHz frequencies. Motorola Solutions would agree to transfer ownership to Lake County of the site infrastructure for four physical channels at each of the eleven (11) simulcast radio sites within ~~to~~ Lake County. The County would be able to operate their four TDMA channels on the same eleven sites as identified in the agreement. This would provide continuity of coverage and ease of transition to a standalone subsystem solution. Lake County would be responsible to obtain leases at each site, or lease back to STARCOM21 at their four shelters if Motorola chooses to stay at all eleven (11) sites. Lake County would assume responsibility for maintaining the sub-system and would incur costs associated with future upgrades to the stations and other County-owned infrastructure.

Section 4 PERFORMANCE SCHEDULE

The Parties will perform their respective responsibilities in accordance with the Performance Schedule. By executing this Agreement, Customer authorizes Motorola to proceed with contract performance.

Section 5 CONTRACT PRICE, PAYMENT AND INVOICING

5.1. CONTRACT PRICE. The Contract Price in U.S. dollars is \$14,164,132.00. A pricing summary is included with the Payment Schedule in Exhibit B. The System price is \$9,906,054.00 and the fifteen (15) year Lifecycle Support Plan price is \$4,258,078.00, based on initial System design. Motorola has priced the services, Software, and Equipment as an integrated system. A change in Software or Equipment quantities, or services, may affect the overall Contract Price, including



discounts if applicable. Further, at the end of the first year of the Agreement and each year thereafter, a CPI percentage change calculation shall be performed. Should the annual inflation rate increase greater than 5% during the previous year, Motorola shall have the right to increase all future maintenance prices by the CPI increase amount exceeding 5%, but in no event by more than 4%, after providing the Customer with 60 days prior written notice of the increase. The Midwest Region Consumer Price Index (<http://www.bls.gov/ro5/cpimid.htm>), All items, Not seasonally adjusted shall be used as the measure of CPI for this price adjustment. Measurement will take place once the annual average for the new year has been posted by the Bureau of Labor Statistics.

5.2. INVOICING AND PAYMENT. Motorola will submit invoices to Customer according to the Payment Schedule. Except for a payment that is due on the Effective Date, payments will be due in accordance with the Local Government Prompt Payment Act. 50 ILCS 505/1 et seq., based upon receipt of invoice. Customer will make payments when due in the form of a wire transfer, check, or cashier's check from a U.S. financial institution. Overdue invoices will bear simple interest at the maximum allowable rate. For reference, the Federal Tax Identification Number for Motorola Solutions, Inc. is 36-1115800.

5.3. FREIGHT, TITLE, AND RISK OF LOSS. Motorola will pre-pay and add all freight charges to the invoices. Title to the Equipment will pass to Customer upon receipt. Title to Software will not pass to Customer at any time. Risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Motorola will pack and ship all Equipment in accordance with good commercial practices.

5.4 INVOICING AND SHIPPING ADDRESSES. Invoices will be sent to the Customer at the following address:

The city which is the ultimate destination where the Equipment will be delivered to Customer is:

The Equipment will be shipped to the Customer at the following address (insert if this information is known):

Customer may change this information by giving written notice to Motorola.

Section 6 SITES AND SITE CONDITIONS

6.1. ACCESS TO SITES. In addition to its responsibilities described elsewhere in this Agreement, Customer will provide a designated project manager; all necessary construction and building permits, zoning variances, licenses, and any other approvals that are necessary to develop or use the sites and mounting locations; and access to the work sites or vehicles identified in the Technical and Implementation Documents as reasonably requested by Motorola so that it may perform its duties in



accordance with the Performance Schedule and Statement of Work. If the Statement of Work so indicates, Motorola may assist Customer in the local building permit process.

6.2. SITE CONDITIONS. Customer will ensure that all work sites it provides will be safe, secure, and in compliance with all applicable industry and OSHA standards. To the extent applicable and unless the Statement of Work states to the contrary, Customer will ensure that these work sites have adequate: physical space; air conditioning and other environmental conditions; adequate and appropriate electrical power outlets, distribution, equipment and connections; and adequate telephone or other communication lines (including modem access and adequate interfacing networking capabilities), all for the installation, use and maintenance of the System. Before installing the Equipment or Software at a work site, Motorola will inspect the work site and advise Customer of any apparent deficiencies or non-conformities with the requirements of this Section. This Agreement is predicated upon normal soil conditions as defined by the version of E.I.A. standard RS-222 in effect on the Effective Date.

6.3. SITE ISSUES. If a Party determines that the sites identified in the Technical and Implementation Documents are no longer available or desired, or if subsurface, structural, adverse environmental or latent conditions at any site differ from those indicated in the Technical and Implementation Documents, the Parties will promptly investigate the conditions and will select replacement sites or adjust the installation plans and specifications as necessary. If change in sites or adjustment to the installation plans and specifications causes a change in the cost or time to perform, the Parties will equitably amend the Contract Price, Performance Schedule, or both, by a change order.

Section 7 TRAINING

Any training to be provided by Motorola to Customer will be described in the Statement of Work. Customer will notify Motorola immediately if a date change for a scheduled training program is required. If Motorola incurs additional costs because Customer reschedules a training program less than thirty (30) days before its scheduled start date, Motorola may recover these additional costs.

Section 8 SYSTEM ACCEPTANCE

8.1. COMMENCEMENT OF ACCEPTANCE TESTING. Motorola will provide to Customer at least ten (10) days notice before the Acceptance Tests commence. System testing will occur only in accordance with the Acceptance Test Plan.

8.2. SYSTEM ACCEPTANCE. System Acceptance will occur upon successful completion of the Acceptance Tests. Upon System Acceptance, the Parties will memorialize this event by promptly executing a System Acceptance Certificate. If the Acceptance Test Plan includes separate tests for individual Subsystems or phases of the System, acceptance of the individual Subsystem or phase will occur upon the successful completion of the Acceptance Tests for the Subsystem or phase, and the Parties will promptly execute an acceptance certificate for the Subsystem or phase. If Customer believes the System has failed the completed Acceptance Tests, Customer will provide to Motorola a written notice that includes the specific details of the failure. If Customer does not provide to Motorola a failure notice within thirty (30) days after completion of the Acceptance Tests, System Acceptance will be deemed to have occurred as of the completion of the Acceptance Tests. Minor omissions or variances in the System that do not materially impair the operation of the System as a whole will not postpone System Acceptance or Subsystem acceptance, but will be corrected according to a mutually agreed schedule.



8.3. BENEFICIAL USE. Customer acknowledges that Motorola's ability to perform its implementation and testing responsibilities may be impeded if Customer begins using the System before System Acceptance. Therefore, Customer will not commence Beneficial Use before System Acceptance without Motorola's prior written authorization, which will not be unreasonably withheld. Motorola is not responsible for System performance deficiencies that occur during unauthorized Beneficial Use. Upon commencement of Beneficial Use, Customer assumes responsibility for the use and operation of the System.

8.4 FINAL PROJECT ACCEPTANCE. Final Project Acceptance will occur after System Acceptance when all deliverables and other work have been completed. When Final Project Acceptance occurs, the parties will promptly memorialize this final event by so indicating on the System Acceptance Certificate.

Section 9 REPRESENTATIONS AND WARRANTIES

9.1. SYSTEM FUNCTIONALITY. Motorola represents that the System will perform in accordance with the Specifications in all material respects. Upon System Acceptance or Beneficial Use, whichever occurs first, this System functionality representation is fulfilled. Motorola is not responsible for System performance deficiencies that are caused by ancillary equipment not furnished by Motorola which is attached to or used in connection with the System or for reasons or parties beyond Motorola's control, such as natural causes; the construction of a building that adversely affects the microwave path reliability or radio frequency (RF) coverage; the addition of frequencies at System sites that cause RF interference or intermodulation; or Customer changes to load usage or configuration outside the Specifications.

9.2. EQUIPMENT WARRANTY. During the Warranty Period, Motorola warrants that the Equipment under normal use and service will be free from material defects in materials and workmanship. If System Acceptance is delayed beyond twelve (12) months after shipment of the Equipment by events or causes within Customer's control, this warranty expires twenty-four (24) months after the shipment of the Equipment.

9.3. MOTOROLA SOFTWARE WARRANTY. Unless otherwise stated in the Software License Agreement, during the Warranty Period, Motorola warrants the Motorola Software in accordance with the terms of the Software License Agreement and the provisions of this Section 9 that are applicable to the Motorola Software. If System Acceptance is delayed beyond twelve (12) months after shipment of the Motorola Software by events or causes within Customer's control, this warranty expires twenty-four (24) months after the shipment of the Motorola Software. TO THE EXTENT, IF ANY, THAT THERE IS A SEPARATE LICENSE AGREEMENT PACKAGED WITH, OR PROVIDED ELECTRONICALLY WITH, A PARTICULAR PRODUCT THAT BECOMES EFFECTIVE ON AN ACT OF ACCEPTANCE BY THE END USER, THEN THAT AGREEMENT SUPERCEDES THIS SOFTWARE LICENSE AGREEMENT AS TO THE END USER OF EACH SUCH PRODUCT.

9.4. EXCLUSIONS TO EQUIPMENT AND MOTOROLA SOFTWARE WARRANTIES. These warranties do not apply to: (i) defects or damage resulting from: use of the Equipment or Motorola Software in other than its normal, customary, and authorized manner; accident, liquids, neglect, or acts of God; testing, maintenance, disassembly, repair, installation, alteration, modification, or adjustment not provided or authorized in writing by Motorola; Customer's failure to comply with all applicable industry and OSHA standards; (ii) breakage of or damage to antennas unless caused directly by defects in material or workmanship; (iii) Equipment that has had the serial number removed or made illegible; (iv) batteries (because they carry their own separate limited warranty) or consumables; (v) freight costs to ship Equipment to the repair depot; (vi) scratches or other cosmetic



damage to Equipment surfaces that does not affect the operation of the Equipment; and (vii) normal or customary wear and tear.

9.5. WARRANTY CLAIMS. To assert a warranty claim, Customer must notify Motorola in writing of the claim before the expiration of the Warranty Period. Upon receipt of this notice, Motorola will investigate the warranty claim. If this investigation confirms a valid warranty claim, Motorola will (at its option and at no additional charge to Customer) repair the defective Equipment or Motorola Software, replace it with the same or equivalent product, or refund the price of the defective Equipment or Motorola Software. That action will be the full extent of Motorola's liability for the warranty claim. If this investigation indicates the warranty claim is not valid and, provided Motorola has provided written detailed reasoning for rejection of warranty claim to the Customer, then Motorola may invoice Customer for responding to the claim on a time and materials basis using Motorola's then current labor rates. Repaired or replaced product is warranted for the balance of the original applicable warranty period. All replaced products or parts will become the property of Motorola.

9.6. ORIGINAL END USER IS COVERED. These express limited warranties are extended by Motorola to the original user purchasing the System for commercial, industrial, or governmental use only, and are not assignable or transferable.

9.7. DISCLAIMER OF OTHER WARRANTIES. THESE WARRANTIES ARE THE COMPLETE WARRANTIES FOR THE EQUIPMENT AND MOTOROLA SOFTWARE PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL OTHER WARRANTIES. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 10 DELAYS

10.1. FORCE MAJEURE. Neither Party will be liable for its non-performance or delayed performance if caused by a Force Majeure. A Party that becomes aware of a Force Majeure that will significantly delay performance will notify the other Party promptly (but in no event later than fifteen days) after it discovers the Force Majeure. If a Force Majeure occurs, the Parties will execute a change order to extend the Performance Schedule for a time period that is reasonable under the circumstances.

10.2. PERFORMANCE SCHEDULE DELAYS CAUSED BY CUSTOMER. If Customer (including its other contractors) delays the Performance Schedule, it will make the promised payments according to the Payment Schedule as if no delay occurred; and the Parties will execute a change order to extend the Performance Schedule and, if requested, compensate Motorola for all reasonable charges incurred because of the delay. Delay charges may include costs incurred by Motorola or its subcontractors for additional freight, warehousing and handling of Equipment; extension of the warranties; travel; suspending and re-mobilizing the work; additional engineering, project management, and standby time calculated at then current rates; and preparing and implementing an alternative implementation plan.

10.3. LIQUIDATED DAMAGES.

10.3.1. Motorola and Customer must adhere to the Project Schedule (as it may be revised by mutually agreed change orders). If Motorola fails to achieve System Acceptance in accordance with the Project Schedule and such failure is caused by Motorola's breach of this Agreement and not by the Customer or its employees, representatives, or other contractors or by causes beyond Motorola's control, then Motorola shall pay to Customer as its sole and



exclusive remedy liquidated damages in the amount of \$1,000 for each working day attributable to Motorola's breach, as more fully described below.

10.3.2. Motorola and Customer agree that, although such liquidated damages are difficult to ascertain, they are a reasonable approximation of the amount of damages Customer would suffer caused by Motorola's breach in failing to achieve System Acceptance as scheduled, and that such liquidated damages are not a penalty. These liquidated damages are intended to compensate Customer for all damages caused by such delay, including those relating to the administration of the Agreement and other related contracts, additional costs incurred by Customer for engineering and other personnel, expenditures resulting from the inability of Customer to use the System during the delay, and other miscellaneous obligations and expenditures which Customer would incur as a result of such delay. In determining the liquidated damages amount, Motorola and Customer have taken into consideration the other provisions of this Agreement that protect Owner, including the Performance Bond, the Payment Bond, and Milestone Payments.

10.3.3. The maximum amount of liquidated damages that Motorola will be liable to pay Customer is \$100,000.

10.3.4. For Customer to assert a claim for liquidated damages, it must first provide formal written notice to Motorola. Motorola shall be entitled to a fourteen (14) day grace period before Customer is entitled to any liquidated damages. This liquidated damages provision is for the benefit of only Customer and not for any other party purchasing off of this Agreement and only relates to the original System.

10.3.5. If the Project Schedule is being delayed such that Motorola will, or is likely to, owe liquidated damages to Customer, both Motorola and Customer shall take such actions as may be reasonable to mitigate the amount of liquidated damages that Motorola will owe Customer. These actions will be discussed during the implementation progress meetings.

Section 11 DISPUTES

The Parties will use the following procedure to address any dispute arising under this Agreement (a "Dispute").

11.1. **GOVERNING LAW.** This Agreement shall be governed by and construed according to the laws of the State of Illinois. Jurisdiction and venue shall be in the 19th Judicial Circuit Court, State of Illinois or the U.S. District Court for the Northern District of Illinois.

11.2. **NEGOTIATION.** Either Party may initiate the Dispute resolution procedures by sending a notice of Dispute ("Notice of Dispute"). The Parties will attempt to resolve the Dispute promptly through good faith negotiations including 1) timely escalation of the Dispute to executives who have authority to settle the Dispute and who are at a higher level of management than the persons with direct responsibility for the matter and 2) direct communication between the executives. If the Dispute has not been resolved within ten (10) days from the Notice of Dispute, the Parties will proceed to mediation unless both parties agree to extend the ten (10) day schedule.

11.3 **MEDIATION.** The Parties will choose an independent mediator within thirty (30) days of a notice to mediate from either Party ("Notice of Mediation"). Neither Party may unreasonably withhold consent to the selection of a mediator. If the Parties are unable to agree upon a mediator, either Party may request that American Arbitration Association nominate a mediator. Each Party will bear its own costs of mediation, but the Parties will share the cost of the mediator equally. Each Party



will participate in the mediation in good faith and will be represented at the mediation by a business executive with authority to settle the Dispute.

11.4. LITIGATION, VENUE and JURISDICTION. If a Dispute remains unresolved for sixty (60) days after receipt of the Notice of Mediation, either Party may then submit the Dispute to a court of competent jurisdiction in the state in which the System is installed. Each Party irrevocably agrees to submit to the exclusive jurisdiction of the courts in such state over any claim or matter arising under or in connection with this Agreement.

11.5. CONFIDENTIALITY. All communications pursuant to subsections 11.2 and 11.3 will be treated as compromise and settlement negotiations for purposes of applicable rules of evidence and any additional confidentiality protections provided by applicable law. The use of these Dispute resolution procedures will not be construed under the doctrines of laches, waiver or estoppel to affect adversely the rights of either Party.

Section 12 DEFAULT AND TERMINATION

12.1. DEFAULT BY A PARTY. If either Party fails to perform a material obligation under this Agreement, the other Party may consider the non-performing Party to be in default (unless a Force Majeure causes the failure) and may assert a default claim by giving the non-performing Party a written and detailed notice of default. Except for a default by Customer for failing to pay any amount when due under this Agreement which must be cured immediately, the defaulting Party will have thirty (30) days after receipt of the notice of default to either cure the default or, if the default is not curable within thirty (30) days, provide a written cure plan. The defaulting Party will begin implementing the cure plan immediately after receipt of notice by the other Party that it approves the plan. If Customer is the defaulting Party, Motorola may stop work on the project until it approves the Customer's cure plan. Motorola shall approve or reject Customer's cure plan within ten (10) business days after receipt.

12.2. FAILURE TO CURE. If a defaulting Party fails to cure the default as provided above in Section 12.1, unless otherwise agreed in writing, the non-defaulting Party may terminate any unfulfilled portion of this Agreement. In the event of termination for default, the defaulting Party will promptly return to the non-defaulting Party any of its Confidential Information. If Customer is the non-defaulting Party, terminates this Agreement as permitted by this Section, and completes the System through a third Party, Customer may as its exclusive remedy recover from Motorola reasonable costs incurred to complete the System to a capability not exceeding that specified in this Agreement less the unpaid portion of the Contract Price. Customer will mitigate damages and provide Motorola with detailed invoices substantiating the charges.

12.3. CONVENIENCE. Customer may terminate this Agreement (in whole or part) at any time. To exercise this right, Customer must provide to Motorola formal written notice at least ninety (90) days in advance of the effective date of the termination. The notice must explicitly state the effective date of the termination and whether the contract termination is in whole or in part, and if in part, which part is being terminated. If Customer exercises this right to terminate for convenience, it will be liable to pay Motorola for (1) the portion of the Contract Price attributable to the Equipment and/or Software delivered, and all services performed, on or before the effective date of the termination; and (2) costs and expenses that Motorola incurs as a result of the termination of the Agreement, including but not limited to costs and expenses associated with cancellation of subcontracts, restocking fees, removal of installation or test equipment, etc. If the portion of the Contract Price and/or the recoverable costs and expenses attributable to the termination of the Agreement are not readily ascertainable, Customer will be liable to pay Motorola for the reasonable value of such Equipment, Software, services, costs and expenses. Notwithstanding the above,



Customer shall have no right to terminate this Agreement if Motorola has given Customer a notice of default and such default has not been cured.

Section 13 INDEMNIFICATION

13.1. **GENERAL INDEMNITY BY MOTOROLA.** Motorola will indemnify and hold Customer harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Customer to the extent it is caused by the negligence of Motorola, its subcontractors, or their employees or agents, while performing their duties under this Agreement, if Customer gives Motorola prompt, written notice of any the claim or suit. Customer will cooperate with Motorola in its defense or settlement of the claim or suit. This section sets forth the full extent of Motorola's general indemnification of Customer from liabilities that are in any way related to Motorola's performance under this Agreement.

13.2. **GENERAL INDEMNITY BY CUSTOMER.** Customer will indemnify and hold Motorola harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Motorola to the extent it is caused by the negligence of Customer, its other contractors, or their employees or agents, while performing their duties under this Agreement, if Motorola gives Customer prompt, written notice of any the claim or suit. Motorola will cooperate with Customer in its defense or settlement of the claim or suit. This section sets forth the full extent of Customer's general indemnification of Motorola from liabilities that are in any way related to Customer's performance under this Agreement.

13.3. PATENT AND COPYRIGHT INFRINGEMENT.

13.3.1. Motorola will defend at its expense any suit brought against Customer to the extent it is based on a third-party claim alleging that the Equipment manufactured by Motorola or the Motorola Software ("Motorola Product") directly infringes a United States patent or copyright ("Infringement Claim"). Motorola's duties to defend and indemnify are conditioned upon: Customer promptly notifying Motorola in writing of the Infringement Claim; Motorola having sole control of the defense of the suit and all negotiations for its settlement or compromise; and Customer providing to Motorola cooperation and, if requested by Motorola, reasonable assistance in the defense of the Infringement Claim. In addition to Motorola's obligation to defend, and subject to the same conditions, Motorola will pay all damages finally awarded against Customer by a court of competent jurisdiction for an Infringement Claim or agreed to, in writing, by Motorola in settlement of an Infringement Claim. Customer must consent to Motorola defense of claims, as required by law. Such consent will not be unreasonably withheld.

13.3.2. If an Infringement Claim occurs, or in Motorola's opinion is likely to occur, Motorola may at its option and expense: (a) procure for Customer the right to continue using the Motorola Product; (b) replace or modify the Motorola Product so that it becomes non-infringing while providing functionally equivalent performance; or (c) accept the return of the Motorola Product and grant Customer a credit for the Motorola Product, less a reasonable charge for depreciation. The depreciation amount will be calculated based upon generally accepted accounting standards.

13.3.3. Motorola will have no duty to defend or indemnify for any Infringement Claim that is based upon: (a) the combination of the Motorola Product with any software, apparatus or device not furnished by Motorola; (b) the use of ancillary equipment or software not furnished by Motorola and that is attached to or used in connection with the Motorola Product; (c) Motorola Product designed or manufactured in accordance with Customer's designs, specifications, guidelines or instructions, if the alleged infringement would not have occurred without such designs, specifications, guidelines or instructions; (d) a modification of the Motorola Product by a party other than Motorola; (e) use of the



Motorola Product in a manner for which the Motorola Product was not designed or that is inconsistent with the terms of this Agreement; or (f) the failure by Customer to install an enhancement release to the Motorola Software that is intended to correct the claimed infringement. In no event will Motorola's liability resulting from its indemnity obligation to Customer extend in any way to royalties payable on a per use basis or the Customer's revenues, or any royalty basis other than a reasonable royalty based upon revenue derived by Motorola from Customer from sales or license of the infringing Motorola Product.

13.3.4. This Section 13 provides Customer's sole and exclusive remedies and Motorola's entire liability in the event of an Infringement Claim. Customer has no right to recover and Motorola has no obligation to provide any other or further remedies, whether under another provision of this Agreement or any other legal theory or principle, in connection with an Infringement Claim. In addition, the rights and remedies provided in this Section 13 are subject to and limited by the restrictions set forth in Section 14.

Section 14 LIMITATION OF LIABILITY

Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, indemnification, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the price of the Equipment, Software, or services with respect to which losses or damages are claimed. **ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT, EXCEPT FOR PERSONAL INJURY OR DEATH, MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SALE OR USE OF THE EQUIPMENT OR SOFTWARE, OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT.** This limitation of liability provision survives the expiration or termination of the Agreement and applies notwithstanding any contrary provision. No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account.

Section 15 CONFIDENTIALITY AND PROPRIETARY RIGHTS

15.1. **CONFIDENTIAL INFORMATION.** During the term of this Agreement, the parties may provide each other with Confidential Information. Each Party will: maintain the confidentiality of the other Party's Confidential Information and not disclose it to any third party, except as authorized by the disclosing Party in writing or as required by a court of competent jurisdiction; restrict disclosure of the Confidential Information to its employees who have a "need to know" and not copy or reproduce the Confidential Information; take necessary and appropriate precautions to guard the confidentiality of the Confidential Information, including informing its employees who handle the Confidential Information that it is confidential and is not to be disclosed to others, but these precautions will be at least the same degree of care that the receiving Party applies to its own confidential information and will not be less than reasonable care; and use the Confidential Information only in furtherance of the performance of this Agreement. Confidential Information is and will at all times remain the property of the disclosing Party, and no grant of any proprietary rights in the Confidential Information is given or intended, including any express or implied license, other than the limited right of the recipient to use the Confidential Information in the manner and to the extent permitted by this Agreement. Notwithstanding the requirements of the preceding paragraph,



both parties acknowledge that the Customer is subject to the provisions of the Open Meetings Act 5 ILCS 120/1 et seq and the Freedom of Information Act 5 ILCS 140/1 et seq.

15.2. **PRESERVATION OF MOTOROLA'S PROPRIETARY RIGHTS.** Motorola, the third party manufacturer of any Equipment, and the copyright owner of any Non-Motorola Software own and retain all of their respective Proprietary Rights in the Equipment and Software, and nothing in this Agreement is intended to restrict their Proprietary Rights. All intellectual property developed, originated, or prepared by Motorola in connection with providing to Customer the Equipment, Software, or related services remain vested exclusively in Motorola, and this Agreement does not grant to Customer any shared development rights of intellectual property. Except as explicitly provided in the Software License Agreement, Motorola does not grant to Customer, either directly or by implication, estoppel, or otherwise, any right, title or interest in Motorola's Proprietary Rights. Customer will not modify, disassemble, peel components, decompile, otherwise reverse engineer or attempt to reverse engineer, derive source code or create derivative works from, adapt, translate, merge with other software, reproduce, distribute, sublicense, sell or export the Software, or permit or encourage any third party to do so. The preceding sentence does not apply to Open Source Software which is governed by the standard license of the copyright owner.

15.3. This Section 15 shall also apply to Motorola's Standard Managed Zone Core Agreement. (if applicable)

Section 16 GENERAL

16.1. **TAXES.** The Contract Price does not include any excise, sales, lease, use, property, or other taxes, assessments or duties, all of which will be paid by Customer except as exempt by law. If Motorola is required to pay any of these taxes, Motorola will send an invoice to Customer and Customer will pay to Motorola the amount of the taxes (including any interest and penalties) within twenty (20) days after the date of the invoice. Customer will be solely responsible for reporting the Equipment for personal property tax purposes, and Motorola will be solely responsible for reporting taxes on its income or net worth.

16.2. **ASSIGNABILITY AND SUBCONTRACTING.** Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Customer. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement. Motorola must obtain Customer's prior written consent to subcontract, such consent not to be unreasonably withheld. Customer hereby consents to Motorola subcontracting to Chicago Communications LLC, Installation Services, Inc., NICE-Systems Ltd. and Aviat Networks, Inc.

16.3 **WAIVER.** Failure or delay by either Party to exercise a right or power under this Agreement will not be a waiver of the right or power. For a waiver of a right or power to be effective, it must be in a writing signed by the waiving Party. An effective waiver of a right or power will not be construed as either a future or continuing waiver of that same right or power, or the waiver of any other right or power.



16.4. SEVERABILITY. If a court of competent jurisdiction renders any part of this Agreement invalid or unenforceable, that part will be severed and the remainder of this Agreement will continue in full force and effect.

16.5. INDEPENDENT CONTRACTORS. Each Party will perform its duties under this Agreement as an independent contractor. The Parties and their personnel will not be considered to be employees or agents of the other Party. Nothing in this Agreement will be interpreted as granting either Party the right or authority to make commitments of any kind for the other. This Agreement will not constitute, create, or be interpreted as a joint venture, partnership or formal business organization of any kind.

16.6. HEADINGS AND SECTION REFERENCES. The section headings in this Agreement are inserted only for convenience and are not to be construed as part of this Agreement or as a limitation of the scope of the particular section to which the heading refers. This Agreement will be fairly interpreted in accordance with its terms and conditions and not for or against either Party.

16.7. ENTIRE AGREEMENT. This Agreement, including all Exhibits, constitutes the entire agreement of the Parties regarding the subject matter of the Agreement (providing a Starcom21 based County wide radio communications system) and supersedes all previous agreements, proposals, and understandings, whether written or oral, relating to this subject matter. This Agreement may be executed in multiple counterparts, each of which shall be an original and all of which shall constitute one and the same instrument. A facsimile copy or computer image, such as a PDF or tiff image, or a signature shall be treated as and shall have the same effect as an original signature. In addition, a true and correct facsimile copy or computer image of this Agreement shall be treated as and shall have the same effect as an original signed copy of this document. This Agreement may be amended or modified only by a written instrument signed by authorized representatives of both Parties. The preprinted terms and conditions found on any Customer purchase order, acknowledgment or other form will not be considered an amendment or modification of this Agreement, even if a representative of each Party signs that document.

16.8. NOTICES. Notices required under this Agreement to be given by one Party to the other must be in writing and either personally delivered or sent to the address shown below by certified mail, return receipt requested and postage prepaid (or by a recognized courier service, such as Federal Express, UPS, or DHL), or by facsimile with correct answerback received, and will be effective upon receipt:

Motorola Solutions, Inc.

Lake County

Attn: Commercial Counsel

Attn: Purchasing Manager

1303 East Algonquin Road, IL01/8

18 N. County Street

Schaumburg, IL 60196

Waukegan, IL 60085

fax: (847) 576-0721

fax: (847) 984-5889

16.9. COMPLIANCE WITH APPLICABLE LAWS. Each Party will comply with all applicable federal, state, and local laws, regulations and rules concerning the performance of this Agreement or use of the System. Customer will obtain and comply with all Federal Communications Commission ("FCC") licenses and authorizations required for the installation, operation and use of the System before the scheduled installation of the Equipment. Although Motorola might assist



Customer in the preparation of its FCC license applications, neither Motorola nor any of its employees is an agent or representative of Customer in FCC or other matters.

16.10. **AUTHORITY TO EXECUTE AGREEMENT.** Each Party represents that it has obtained all necessary approvals, consents and authorizations to enter into this Agreement and to perform its duties under this Agreement; the person executing this Agreement on its behalf has the authority to do so; upon execution and delivery of this Agreement by the Parties, it is a valid and binding contract, enforceable in accordance with its terms; and the execution, delivery, and performance of this Agreement does not violate any bylaw, charter, regulation, law or any other governing authority of the Party.

16.11. **ADMINISTRATOR LEVEL ACCOUNT ACCESS.** Motorola will provide Customer with Administrative User Credentials. Customer agrees to only grant Administrative User Credentials to those personnel with the training or experience to correctly use the access. Customer is responsible for protecting Administrative User Credentials from disclosure and maintaining Credential validity by, among other things, updating passwords when required. Customer may be asked to provide valid Administrative User Credentials when in contact with Motorola System support. Customer understands that changes made as the Administrative User can significantly impact the performance of the System. Customer agrees that it will be solely responsible for any negative impact on the System or its users by any such changes. System issues occurring as a result of changes made by an Administrative User may impact Motorola's ability to perform its obligations under the Agreement or its Maintenance and Support Agreement. In such cases, a revision to the appropriate provisions of the Agreement, including the Statement of Work, may be necessary. To the extent Motorola provides assistance to correct any issues caused by or arising out of the use of or failure to maintain Administrative User Credentials, Motorola will be entitled to bill Customer and Customer will pay Motorola on a time and materials basis for resolving the issue.

16.12. **SURVIVAL OF TERMS.** The following provisions will survive the expiration or termination of this Agreement for any reason: Section 3.7 (Motorola Software); Section 3.8 (Non-Motorola Software); if any payment obligations exist, Sections 5.1 and 5.2 (Contract Price and Invoicing and Payment); Subsection 9.7 (Disclaimer of Implied Warranties); Section 11 (Disputes); Section 14 (Limitation of Liability); and Section 15 (Confidentiality and Proprietary Rights); and all of the General provisions in Section 16.

16.13. **LABOR STATUTES, RECORDS AND RATES CONSTRUCTION.**

All Contractors and Sub Contractors shall familiarize themselves with all provisions of all Acts referred to herein and in addition shall make an investigation of labor conditions and all negotiated labor agreements which may exist or are contemplated at this time. Nothing in the Acts referred to herein shall be construed to prohibit the payment of more than the prevailing wage scale.

In the employment and use of labor, the Contractor and any subcontractor of the Contractor shall conform to all Illinois Constitutional and statutory requirements including, but not limited to, the following:

1.0 Equal Employment Opportunity:

1.1 Illinois Constitution, Article I, Section 17, which provides: "All persons shall have the right to be free from discrimination on the basis of race, color, creed, national ancestry and sex in the hiring and promotion practices of any employer or in the sale or rental of property."



1.2 Illinois Constitution, Article I, Section 18, which provides: "The equal protection of the laws shall not be denied or abridged on account of sex by the state or its units of local government and school districts."

1.3 The Public Works Employment Discrimination Act, 775 ILCS 10/1, provides in substance that no person may be refused or denied employment by reason of unlawful discrimination, nor may any person be subjected to unlawful discrimination in any manner in connection with contracting for or performance of any work or service of "any kind by, for, on behalf of, or for the benefit of the State, or of any department, bureau, commission, board or other political subdivision or agency thereof."

1.4 Contractor shall comply with the Illinois Human Rights Act, 775 ILCS 5/1-101 et seq., as amended and any rules and regulations promulgated in accordance therewith, including, but not limited to the Equal Employment Opportunity Clause, Illinois Administrative Code, Title 44, Part 750 (Appendix A), which is incorporated herein by reference. Furthermore, the Contractor shall comply with the Public Works Employment Discrimination Act, 775 ILCS 10/0.01 et seq., as amended.

2.0 The Veterans Preference Act, 330 ILCS 55/1, provides: "In the employment and appointment to fill positions in the construction, addition to, or alteration of all public works undertaken or contracted for by the State, or any of its political subdivisions thereof, preference shall be given to persons who have been members of the Armed Forces of the United States...in times of hostilities with a foreign country..."

3.0 The Servicemen's Employment Tenure Act, as amended, 330 ILCS 60/2, "safeguarding the employment and the rights and privileges inhering in the employment contract, of servicemen."

4.0 The Prevailing Wage Act, 820 ILCS 130/1 et seq., provides: "It is the policy of the State of Illinois that a wage of no less than the general prevailing hourly rate as paid for work of a similar character in the locality in which the work is performed, shall be paid to all laborers, workers and mechanics employed by or on behalf of any and all public bodies engaged in public works." The current Schedule of Prevailing Wages for Lake County is enclosed and must be prominently posted at the project site by the Contractor.

4.1 The Prevailing Wage Act, 820 ILCS 130/4, provides: "All bid specifications shall list the specified rates to all laborers, workers and mechanics in the locality for each craft or type of worker or mechanic needed to execute the contract. If the Department of Labor revises the prevailing rate of hourly wages to be paid by the public body, the revised rate shall apply to such contract, and the public body shall be responsible to notify the Contractor and each subcontractor of the revised rate."

4.1.1 The County shall notify the Contractor of any revised rates as determined by the Department of Labor and as received by the County. It shall be the responsibility and liability of the Contractor to promptly notify each and every subcontractor of said revised rates.

4.1.2 Unless otherwise specified in the Contract Documents, the Contractor shall assume all risks and responsibility for any changes to the prevailing hourly wage which may occur during the Contract Time. A revision to the prevailing rate of hourly wages shall not be cause for any adjustment in the Contract Sum.

4.2 The Prevailing Wage Act, 820 ILCS 130/5 provides that the Contractor and each Sub Contractor shall, “submit monthly, in person, by mail or electronically a certified payroll to the public body in charge of the project.”

4.2.2 The certified payroll records shall include each worker’s name, address, telephone number, social security number, classification, number of hours worked each day, the hourly wage and starting and ending times each day.

4.2.3 Included with the payroll records, the Contractor and each Sub Contractor shall attest, in writing, to the veracity and accuracy of the records and that the hourly rate paid is not less than the general prevailing wages required.

5.0 The Child Labor Law, as amended, 820 ILCS 205/1, which provides: "No minor under 16 years of age at any time shall be employed, permitted or suffered to work in any gainful occupation...in any type of construction work within this state."

The Contractor will include verbatim or by reference the provisions contained herein in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that such provisions will be binding upon such subcontractor. The Contractor will be liable for compliance with these provisions by such subcontractors.

The Contractor and each subcontractor shall keep or cause to be kept an accurate record of names, occupations and actual wages paid to each laborer, workman and mechanic employed by him in connection with the contract. This record shall be open at all reasonable hours for inspection by any representative of the County or the Illinois Department of Labor and must be preserved for four (4) years following completion of the contract.

6.0 Illinois Workers on Public Workers Act: In the employment and use of labor, the Contractor and any subcontractor of the Contractor shall conform to all Illinois Constitutional and statutory requirements including, but not limited to, the following: “Illinois Workers on Public Works Act, 30 ILCS 570/ et seq, including Public Act 096-0929 signed into law on June 16, 2010.” The level of unemployment in the State of Illinois has exceeded 5% for two (2) consecutive calendar months as of November 30, 2011.

16.14. PUBLIC CONSTRUCTION BOND ACT. Motorola shall provide a performance bond and a payment bond, each in the amount of \$1,984,410.00, as required by 30 ILCS 550/1 et seq. for that portion of this Agreement that constitutes a public work.

16.15. INSURANCE. Motorola shall maintain for the duration of this contract and any extensions thereof insurance issued by a company or companies qualified to do business in the State of Illinois, in the following types and amounts:

Workmen’s Compensation Insurance covering all liability of Motorola arising under the Workmen’s Compensation Act and Workmen’s Occupational Disease Act; limits of liability not less than:
Employers Liability:

Each Accident \$1,000,000
Disease- Policy Limit \$1,000,000
Disease- Each Employee \$1,000,000



- **Automobile Liability Insurance** shall be maintained to respond to claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle. This policy shall be written to cover any auto whether owned, leased, hired, or borrowed.

Each Occurrence Limit:

\$ 1,000,000

- **Commercial General Liability** in a broad form, to include, but not be limited to, coverage for the following where exposure exists: Premises/Operations, Independent Contractors, Products/Completed Operations, Personal Injury and Contractual Liability, limits of liability not less than:

General Aggregate Limit

\$ 2,000,000

Each Occurrence Limit

\$ 1,000,000

Products- Completed Operations

\$ 1,000,000

Motorola agrees that with respect to the general liability insurance, the Customer shall be:

- included as additional insured **by blanket endorsement** as their interest may appear;
- provided with Certificates of Insurance evidencing the above required insurance, after execution of this Agreement and thereafter with certificates evidencing renewals or replacements of said policies of insurance prior or upon the expiration or cancellation of any such policies. Forward Notices and Certificates of Insurance to: Lake County Purchasing Division, 18 No. County St. – 9th Fl., Waukegan, IL 60085-4350.

Customer shall be provided with thirty (30) days notice, in writing, of cancellation or material change from Motorola.

The Parties hereby enter into this Agreement as of the Effective Date.

Motorola Solutions, Inc.

Customer

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

Date: _____

Date: _____



Exhibit A

SOFTWARE LICENSE AGREEMENT

This Exhibit A Software License Agreement ("Agreement") is between Motorola Solutions, Inc., ("Motorola"), and Lake County, Illinois ("Licensee").

For good and valuable consideration, the parties agree as follows:

Section 1 DEFINITIONS

1.1 "Designated Products" means products provided by Motorola to Licensee with which or for which the Software and Documentation is licensed for use.

1.2 "Documentation" means product and software documentation that specifies technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which such information is provided).

1.3 "Open Source Software" means software with either freely obtainable source code, license for modification, or permission for free distribution.

1.4 "Open Source Software License" means the terms or conditions under which the Open Source Software is licensed.

1.5 "Primary Agreement" means the Starcom21 Communications System Agreement to which this exhibit is attached.

1.6 "Security Vulnerability" means a flaw or weakness in system security procedures, design, implementation, or internal controls that could be exercised (accidentally triggered or intentionally exploited) and result in a security breach such that data is compromised, manipulated or stolen or the system damaged.

1.7 "Software" (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Motorola; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

Section 2 SCOPE

Motorola and Licensee enter into this Agreement in connection with Motorola's delivery of certain proprietary Software or products containing embedded or pre-loaded proprietary Software, or both. This Agreement contains the terms and conditions of the license Motorola is providing to Licensee, and Licensee's use of the Software and Documentation.



Section 3 GRANT OF LICENSE

3.1. Subject to the provisions of this Agreement and the payment of applicable license fees, Motorola grants to Licensee a personal, limited, non-transferable (except as permitted in Section 7) and non-exclusive license under Motorola's copyrights and Confidential Information (as defined in the Primary Agreement) embodied in the Software to use the Software, in object code form, and the Documentation solely in connection with Licensee's use of the Designated Products. This Agreement does not grant any rights to source code.

3.2. If the Software licensed under this Agreement contains or is derived from Open Source Software, the terms and conditions governing the use of such Open Source Software are in the Open Source Software Licenses of the copyright owner and not this Agreement. If there is a conflict between the terms and conditions of this Agreement and the terms and conditions of the Open Source Software Licenses governing Licensee's use of the Open Source Software, the terms and conditions of the license grant of the applicable Open Source Software Licenses will take precedence over the license grants in this Agreement. If requested by Licensee, Motorola will use commercially reasonable efforts to: (i) determine whether any Open Source Software is provided under this Agreement; (ii) identify the Open Source Software and provide Licensee a copy of the applicable Open Source Software License (or specify where that license may be found); and, (iii) provide Licensee a copy of the Open Source Software source code, without charge, if it is publicly available (although distribution fees may be applicable).

Section 4 LIMITATIONS ON USE

4.1. Licensee may use the Software only for Licensee's internal business purposes (internal business purposes means the purposes of all County Departments, Commissions and Agencies) and only in accordance with the Documentation. Any other use of the Software is strictly prohibited. Without limiting the general nature of these restrictions, Licensee will not make the Software available for use by third parties on a "time sharing," "application service provider," or "service bureau" basis or for any other similar commercial rental or sharing arrangement.

4.2. Licensee will not, and will not permit or enable any third party to: (i) reverse engineer, disassemble, peel components, decompile, reprogram or otherwise reduce the Software or any portion to a human perceptible form or otherwise attempt to recreate the source code; (ii) modify, adapt, create derivative works of, or merge the Software; (iii) copy, reproduce, distribute, lend, or lease the Software or Documentation to any third party, grant any sublicense or other rights in the Software or Documentation to any third party, or take any action that would cause the Software or Documentation to be placed in the public domain; (iv) remove, or in any way alter or obscure, any copyright notice or other notice of Motorola's proprietary rights; (v) provide, copy, transmit, disclose, divulge or make the Software or Documentation available to, or permit the use of the Software by any third party or on any machine except as expressly authorized by this Agreement; or (vi) use, or permit the use of, the Software in a manner that would result in the production of a copy of the Software solely by activating a machine containing the Software. Licensee may make one copy of Software to be used solely for archival, back-up, or disaster recovery purposes; provided that Licensee may not operate that copy of the Software at the same time as the original Software is being operated. Licensee may make as many copies of the Documentation as it may reasonably require for the internal use of the Software.

4.3. Unless otherwise authorized by Motorola in writing, Licensee will not, and will not permit or allow any third party to: (i) install a licensed copy of the Software on more than one unit of a Designated Product; or (ii) copy onto or transfer Software installed in one unit of a Designated Product onto one other device. Licensee may temporarily transfer Software installed on a Designated Product to another device if the Designated Product is inoperable or malfunctioning, if Licensee



provides written notice to Motorola of the temporary transfer and identifies the device on which the Software is transferred. Temporary transfer of the Software to another device must be discontinued when the original Designated Product is returned to operation and the Software must be removed from the other device. Licensee must provide prompt written notice to Motorola at the time temporary transfer is discontinued.

4.4. When using Motorola's Radio Service Software ("RSS"), Licensee must purchase a separate license for each location at which Licensee uses RSS. Licensee's use of RSS at a licensed location does not entitle Licensee to use or access RSS remotely. Licensee may make one copy of RSS for each licensed location. Licensee shall provide Motorola with a list of all locations at which Licensee uses or intends to use RSS upon Motorola's request.

4.5. Licensee will maintain, during the term of this Agreement and for a period of two years thereafter, accurate records relating to this license grant to verify compliance with this Agreement. Motorola or an independent third party ("Auditor") may inspect Licensee's premises, books and records, upon reasonable prior notice to Licensee, during Licensee's normal business hours and subject to Licensee's facility and security regulations. Motorola is responsible for the payment of all expenses and costs of the Auditor. Any information obtained by Motorola and the Auditor will be kept in strict confidence by Motorola and the Auditor and used solely for the purpose of verifying Licensee's compliance with the terms of this Agreement.

Section 5 OWNERSHIP AND TITLE

Motorola, its licensors, and its suppliers retain all of their proprietary rights in any form in and to the Software and Documentation, including, but not limited to, all rights in patents, patent applications, inventions, copyrights, trademarks, trade secrets, trade names, and other proprietary rights in or relating to the Software and Documentation (including any corrections, bug fixes, enhancements, updates, modifications, adaptations, translations, de-compilations, disassemblies, emulations to or derivative works from the Software or Documentation, whether made by Motorola or another party, or any improvements that result from Motorola's processes or, provision of information services). No rights are granted to Licensee under this Agreement by implication, estoppel or otherwise, except for those rights which are expressly granted to Licensee in this Agreement. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Software, Designated Products, Documentation or related services, remains vested exclusively in Motorola, and Licensee will not have any shared development or other intellectual property rights.

Section 6 LIMITED WARRANTY; DISCLAIMER OF WARRANTY

6.1. The commencement date and the term of the Software warranty will be a period of ninety (90) days from Motorola's shipment of the Software (the "Warranty Period"). If Licensee is not in breach of any of its obligations under this Agreement, Motorola warrants that the unmodified Software, when used properly and in accordance with the Documentation and this Agreement, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the Software. Whether a defect occurs will be determined by Motorola solely with reference to the Documentation. Motorola does not warrant that Licensee's use of the Software or the Designated Products will be uninterrupted, error-free, completely free of Security Vulnerabilities, or that the Software or the Designated Products will meet Licensee's particular requirements. Motorola makes no representations or warranties with respect to any third party software included in the Software.



6.2 Motorola's sole obligation to Licensee and Licensee's exclusive remedy under this warranty is to use reasonable efforts to remedy any material Software defect covered by this warranty. These efforts will involve either replacing the media or attempting to correct significant, demonstrable program or documentation errors or Security Vulnerabilities. If Motorola cannot correct the defect within a reasonable time, then at Motorola's option, Motorola will replace the defective Software with functionally-equivalent Software, license to Licensee substitute Software which will accomplish the same objective, or terminate the license and refund the Licensee's paid license fee.

6.3. Warranty claims are described in the Primary Agreement.

6.4. The express warranties set forth in this Section 6 are in lieu of, and Motorola disclaims, any and all other warranties (express or implied, oral or written) with respect to the Software or Documentation, including, without limitation, any and all implied warranties of condition, title, non-infringement, merchantability, or fitness for a particular purpose or use by Licensee (whether or not Motorola knows, has reason to know, has been advised, or is otherwise aware of any such purpose or use), whether arising by law, by reason of custom or usage of trade, or by course of dealing. In addition, Motorola disclaims any warranty to any person other than Licensee with respect to the Software or Documentation.

Section 7 TRANSFERS

Licensee will not transfer the Software or Documentation to any third party (third party means a person or entity that is not a County Department, Commission or Agency) without Motorola's prior written consent. Motorola's consent may be withheld at its discretion and may be conditioned upon transferee paying all applicable license fees and agreeing to be bound by this Agreement. If the Designated Products are Motorola's radio products and Licensee transfers ownership of the Motorola radio products to a third party, Licensee may assign its right to use the Software (other than RSS and Motorola's FLASHport® software) which is embedded in or furnished for use with the radio products and the related Documentation; provided that Licensee transfers all copies of the Software and Documentation to the transferee, and Licensee and the transferee sign a transfer form to be provided by Motorola upon request, obligating the transferee to be bound by this Agreement.

Section 8 TERM AND TERMINATION

8.1 Licensee's right to use the Software and Documentation will begin when the Primary Agreement is signed by both parties and will continue for the life of the Designated Products with which or for which the Software and Documentation have been provided by Motorola, unless Licensee breaches this Agreement, in which case this Agreement and Licensee's right to use the Software and Documentation may be terminated upon notice by Motorola.

8.2 Within thirty (30) days after termination of this Agreement, Licensee must certify in writing to Motorola that all copies of the Software have been removed or deleted from the Designated Products and that all copies of the Software and Documentation have been returned to Motorola or destroyed by Licensee and are no longer in use by Licensee.

8.3 Licensee acknowledges that Motorola made a considerable investment of resources in the development, marketing, and distribution of the Software and Documentation and that Licensee's breach of this Agreement will result in irreparable harm to Motorola for which monetary damages would be inadequate. If Licensee breaches this Agreement, Motorola may terminate this Agreement and be entitled to all available remedies at law or in equity (including immediate injunctive relief and



repossession of all non-embedded Software and associated Documentation unless Licensee is a Federal agency of the United States Government).

Section 9 UNITED STATES GOVERNMENT LICENSING PROVISIONS

This Section applies if Licensee is the United States Government or a United States Government agency. Licensee's use, duplication or disclosure of the Software and Documentation under Motorola's copyrights or trade secret rights is subject to the restrictions set forth in subparagraphs (c)(1) and (2) of the Commercial Computer Software-Restricted Rights clause at FAR 52.227-19 (JUNE 1987), if applicable, unless they are being provided to the Department of Defense. If the Software and Documentation are being provided to the Department of Defense, Licensee's use, duplication, or disclosure of the Software and Documentation is subject to the restricted rights set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 (OCT 1988), if applicable. The Software and Documentation may or may not include a Restricted Rights notice, or other notice referring to this Agreement. The provisions of this Agreement will continue to apply, but only to the extent that they are consistent with the rights provided to the Licensee under the provisions of the FAR or DFARS mentioned above, as applicable to the particular procuring agency and procurement transaction.

Section 10 CONFIDENTIALITY

Licensee acknowledges that the Software and Documentation contain Motorola's valuable proprietary and Confidential Information and are Motorola's trade secrets, and that the provisions in the Primary Agreement concerning Confidential Information apply.

Section 11 LIMITATION OF LIABILITY

The Limitation of Liability provision is described in the Primary Agreement.

Section 12 NOTICES

Notices are described in the Primary Agreement.

Section 13 GENERAL

13.1. **COPYRIGHT NOTICES.** The existence of a copyright notice on the Software will not be construed as an admission or presumption of publication of the Software or public disclosure of any trade secrets associated with the Software.

13.2. **COMPLIANCE WITH LAWS.** Licensee acknowledges that the Software is subject to the laws and regulations of the United States and Licensee will comply with all applicable laws and regulations, including export laws and regulations of the United States. Licensee will not, without the prior authorization of Motorola and the appropriate governmental authority of the United States, in any form export or re-export, sell or resell, ship or reship, or divert, through direct or indirect means, any item or technical data or direct or indirect products sold or otherwise furnished to any person within any territory for which the United States Government or any of its agencies at the time of the action, requires an export license or other governmental approval. Violation of this provision is a material breach of this Agreement.



13.3. ASSIGNMENTS AND SUBCONTRACTING. Motorola may assign its rights under this Agreement, or encumber or sell its rights in any Software, without prior notice to or consent of Licensee.

13.4. GOVERNING LAW. This Agreement is governed by the laws of the United States to the extent that they apply and otherwise by the internal substantive laws of the State to which the Software is shipped if Licensee is a sovereign government entity, or the internal substantive laws of the State of Illinois if Licensee is not a sovereign government entity. The terms of the U.N. Convention on Contracts for the International Sale of Goods do not apply. In the event that the Uniform Computer Information Transaction Act, any version of this Act, or a substantially similar law (collectively "UCITA") becomes applicable to a party's performance under this Agreement, UCITA does not govern any aspect of this Agreement or any license granted under this Agreement, or any of the parties' rights or obligations under this Agreement. The governing law will be that in effect prior to the applicability of UCITA.

13.5. THIRD PARTY BENEFICIARIES. This Agreement is entered into solely for the benefit of Motorola and Licensee. No third party has the right to make any claim or assert any right under this Agreement, and no third party is deemed a beneficiary of this Agreement. Notwithstanding the foregoing, any licensor or supplier of third party software included in the Software will be a direct and intended third party beneficiary of this Agreement.

13.6. SURVIVAL. Sections 4, 5, 6.4, 7, 8, 9, 10, 11 and 13 survive the termination of this Agreement.

13.7. ORDER OF PRECEDENCE. In the event of conflicts between this Software License Agreement and the Primary Agreement, the parties agree that the provisions of this Software License Agreement prevail, only with respect to the licensing of Software covered by this Software License Agreement.

13.8 SECURITY. Motorola uses reasonable means in the design and writing of its own Software and the acquisition of third party Software to limit Security Vulnerabilities. While no software can be guaranteed to be free from Security Vulnerabilities, if a Security Vulnerability is discovered, Motorola will take the steps set forth in Section 6 of this Agreement.



Exhibit C

Technical and Implementation Documents



Exhibit D

Service Statement(s) of Work and Service Terms and Conditions

Service Terms and Conditions

Motorola Solutions, Inc. (“Motorola”) and the customer named in the Communications System Agreement (“Customer”) hereby agree as follows:

Section 1 APPLICABILITY

These Service Terms and Conditions apply to Maintenance Services provided in accordance with the Statements of Work included in Exhibit D of the Communications System Agreement to which these terms and conditions are attached.

Section 2 DEFINITIONS AND INTERPRETATION

2.1. “Agreement” means these Service Terms and Conditions and the other attachments in Exhibit D of the Communications System Agreement, all of which are incorporated herein by this reference. In interpreting this Agreement and resolving any ambiguities, these Service Terms and Conditions take precedence over the other attachments in Exhibit D.

2.2. “Equipment” means the equipment that is specified in the attachments or is subsequently added to this Agreement.

2.3. “Services” means those installation, maintenance, support, training, and other services described in this Agreement.

Section 3 ACCEPTANCE

Customer accepts these Service Terms and Conditions and agrees to pay the prices set forth in Exhibit B of the Communications System Agreement to which these terms and conditions are attached.

Section 4 SCOPE OF SERVICES

4.1. Motorola will provide the Services described in this Agreement or in a more detailed statement of work or other document attached to this Agreement. At Customer’s request, Motorola may also provide additional services at Motorola’s then-applicable rates for the services.

4.2. If Motorola is providing Services for Equipment, Motorola parts or parts of equal quality will be used; the Equipment will be serviced at levels set forth in the manufacturer’s product manuals; and routine service procedures that are prescribed by Motorola will be followed.

4.3. If Customer purchases from Motorola additional equipment that becomes part of the same system as the initial Equipment, the additional equipment may be added to this Agreement and will be billed at the applicable rates after the warranty for that additional equipment expires.



4.4. All Equipment must be in good working order on the Start Date or when additional equipment is added to the Agreement. Upon reasonable request by Motorola, Customer will provide a complete serial and model number list of the Equipment. Customer must promptly notify Motorola in writing when any Equipment is lost, damaged, stolen or taken out of service. Customer's obligation to pay Service fees for this Equipment will terminate at the end of the month in which Motorola receives the written notice.

4.5. Customer must specifically identify any Equipment that is labeled intrinsically safe for use in hazardous environments.

4.6. If Equipment cannot, in Motorola's reasonable opinion, be properly or economically serviced for any reason, Motorola may modify the scope of Services related to that Equipment; remove that Equipment from the Agreement; or increase the price to Service that Equipment.

4.7. Customer must promptly notify Motorola of any Equipment failure. Motorola will respond to Customer's notification in a manner consistent with the level of Service purchased as indicated in this Agreement.

Section 5 EXCLUDED SERVICES

5.1. Service excludes the repair or replacement of Equipment that has become defective or damaged from use in other than the normal, customary, intended, and authorized manner; use not in compliance with applicable industry standards; excessive wear and tear; or accident, liquids, power surges, neglect, acts of God or other force majeure events.

5.2. Unless specifically included in this Agreement, Service excludes items that are consumed in the normal operation of the Equipment, such as batteries or magnetic tapes.; upgrading or reprogramming Equipment; accessories, belt clips, battery chargers, custom or special products, modified units, or software; and repair or maintenance of any transmission line, antenna, microwave equipment, tower or tower lighting, duplexer, combiner, or multicoupler. Motorola has no obligations for any transmission medium, such as telephone lines, computer networks, the internet or the worldwide web, or for Equipment malfunction caused by the transmission medium.

Section 6 TIME AND PLACE OF SERVICE

Service will be provided at the location specified in this Agreement. When Motorola performs service at Customer's location, Customer will provide Motorola, at no charge, a non-hazardous work environment with adequate shelter, heat, light, and power and with full and free access to the Equipment. Waivers of liability from Motorola or its subcontractors will not be imposed as a site access requirement. Customer will provide all information pertaining to the hardware and software elements of any system with which the Equipment is interfacing so that Motorola may perform its Services. Unless otherwise stated in this Agreement, the hours of Service will be 8:30 a.m. to 4:30 p.m., local time, excluding weekends and holidays. Unless otherwise stated in this Agreement, the price for the Services exclude any charges or expenses associated with helicopter or other unusual access requirements; if these charges or expenses are reasonably incurred by Motorola in rendering the Services, Customer agrees to reimburse Motorola for those charges and expenses.



Section 7 CUSTOMER CONTACT

Customer will provide Motorola with designated points of contact (list of names and phone numbers) that will be available twenty-four (24) hours per day, seven (7) days per week, and an escalation procedure to enable Customer's personnel to maintain contact, as needed, with Motorola.

Section 8 PAYMENT

Motorola will invoice Customer annually in advance for each year of Services. All other charges will be billed monthly. Payments will be due in accordance with the Local Government Prompt Payment Act. 50 ILCS 505/1 et seq., based upon receipt of invoice. Customer will reimburse Motorola for all property taxes, sales and use taxes, excise taxes, and other taxes or assessments that are levied as a result of Services rendered under this Agreement (except income, profit, and franchise taxes of Motorola) by any governmental entity.

Section 9 WARRANTY

Motorola warrants that its Services under this Agreement will be free of defects in materials and workmanship for a period of ninety (90) days from the date the performance of the Services are completed. In the event of a breach of this warranty, Customer's sole remedy is to require Motorola to re-perform the non-conforming Service or to refund, on a pro-rata basis, the fees paid for the non-conforming Service. **MOTOROLA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Section 10 DEFAULT/TERMINATION

10.1. If either party defaults in the performance of this Agreement, the other party will give to the non-performing party a written and detailed notice of the default. The non-performing party will have thirty (30) days thereafter to provide a written plan to cure the default that is acceptable to the other party and begin implementing the cure plan immediately after plan approval. If the non-performing party fails to provide or implement the cure plan, then the injured party, in addition to any other rights available to it under law, may immediately terminate this Agreement effective upon giving a written notice of termination to the defaulting party.

10.2. Any termination of this Agreement will not relieve either party of obligations previously incurred pursuant to this Agreement, including payments which may be due and owing at the time of termination. All sums owed by Customer to Motorola will become due and payable immediately upon termination of this Agreement. Upon the effective date of termination, Motorola will have no further obligation to provide Services.

10.3. Customer may terminate this Agreement (in whole or part) at any time. To exercise this right, Customer must provide to Motorola formal written notice at least thirty (30) days in advance of the effective date of the termination. The notice must explicitly state the effective date of the termination and whether the contract termination is in whole or in part, and if in part, which part is being terminated. If Customer exercises this right to terminate for convenience, it will be liable to pay Motorola for (1) the portion of the Contract Price attributable to the Services performed, on or before the effective date of the termination; and (2) costs and expenses that Motorola incurs as a result of the termination of the Agreement, including but not limited to costs and expenses associated with cancellation of subcontracts, restocking fees, removal of installation or test equipment, etc. If



the portion of the Contract Price and/or the recoverable costs and expenses attributable to the termination of the Agreement are not readily ascertainable, Customer will be liable to pay Motorola for the reasonable value of such Services, costs and expenses. Notwithstanding the above, Customer shall have no right to terminate this Agreement if Motorola has given Customer a notice of default and such default has not been cured.

Section 11 LIMITATION OF LIABILITY

Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the price of twelve (12) months of Service provided under this Agreement. **ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT, EXCEPT FOR PERSONAL INJURY OR DEATH, MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT.** No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account. This limitation of liability will survive the expiration or termination of this Agreement and applies notwithstanding any contrary provision.

Section 12 EXCLUSIVE TERMS AND CONDITIONS

12.1. This Agreement supersedes all prior and concurrent agreements and understandings between the parties, whether written or oral, related to the Services, and there are no agreements or representations concerning the subject matter of this Agreement except for those expressed herein. The Agreement may not be amended or modified except by a written agreement signed by authorized representatives of both parties.

12.2. Customer agrees to reference this Agreement on any purchase order issued in furtherance of this Agreement, however, an omission of the reference to this Agreement will not affect its applicability. In no event will either party be bound by any terms contained in a Customer purchase order, acknowledgement, or other writings unless: the purchase order, acknowledgement, or other writing specifically refers to this Agreement; clearly indicate the intention of both parties to override and modify this Agreement; and the purchase order, acknowledgement, or other writing is signed by authorized representatives of both parties.

Section 13 PROPRIETARY INFORMATION; CONFIDENTIALITY; INTELLECTUAL PROPERTY RIGHTS

13.1. Any information or data in the form of specifications, drawings, reprints, technical information or otherwise furnished to Customer under this Agreement will remain Motorola's property, will be deemed proprietary, will be kept confidential, and will be promptly returned at Motorola's request. Customer may not disclose, without Motorola's written permission or as required by law, any confidential information or data to any person, or use confidential information or data for any purpose other than performing its obligations under this Agreement. The obligations set forth in this Section survive the expiration or termination of this Agreement. Both parties acknowledge that



Customer is subject to the Illinois Open Meetings Act (5 ILCS 120/1 et seq.) and the Illinois Freedom of Information Act (5 ILCS 140/1 et seq.).

13.2. Unless otherwise agreed in writing, no commercial or technical information disclosed in any manner or at any time by Customer to Motorola will be deemed secret or confidential. Motorola will have no obligation to provide Customer with access to its confidential and proprietary information, including cost and pricing data.

13.3. This Agreement does not grant directly or by implication, estoppel, or otherwise, any ownership right or license under any Motorola patent, copyright, trade secret, or other intellectual property, including any intellectual property created as a result of or related to the Equipment sold or Services performed under this Agreement.

Section 14 FCC LICENSES AND OTHER AUTHORIZATIONS

Customer is solely responsible for obtaining licenses or other authorizations required by the Federal Communications Commission or any other federal, state, or local government agency and for complying with all rules and regulations required by governmental agencies. Neither Motorola nor any of its employees is an agent or representative of Customer in any governmental matters.

Section 15 COVENANT NOT TO EMPLOY

During the term of this Agreement and continuing for a period of two (2) years thereafter, Customer will not hire, engage on contract, solicit the employment of, or recommend employment to any third party of any employee of Motorola or its subcontractors without the prior written authorization of Motorola. This provision applies only to those employees of Motorola or its subcontractors who are responsible for rendering services under this Agreement. If this provision is found to be overly broad under applicable law, it will be modified as necessary to conform to applicable law.

Section 16 MATERIALS, TOOLS AND EQUIPMENT

All tools, equipment, dies, gauges, models, drawings or other materials paid for or furnished by Motorola for the purpose of this Agreement will be and remain the sole property of Motorola. Customer will safeguard all such property while it is in Customer's custody or control, be liable for any loss or damage to this property, and return it to Motorola upon request. This property will be held by Customer for Motorola's use without charge and may be removed from Customer's premises by Motorola at any time without restriction.

Section 17 GENERAL TERMS

17.1. If any court renders any portion of this Agreement unenforceable, the remaining terms will continue in full force and effect.

17.2. This Agreement and the rights and duties of the parties will be interpreted in accordance with the laws of the State in which the Services are performed.

17.3. Failure to exercise any right will not operate as a waiver of that right, power, or privilege.



17.4. Neither party is liable for delays or lack of performance resulting from any causes that are beyond that party's reasonable control, such as strikes (not by Motorola's or its subcontractors' employees), material shortages, wars, riots or acts of God.

17.5. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

17.6. Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Customer. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event.

17.7. Motorola has priced the Agreement based on the initial System configuration and Service plans. A change in Software or Equipment quantities, or Services, may affect the overall Contract Price, including discounts if applicable. Further, at the end of the first year of the Agreement and each year thereafter, a CPI percentage change calculation shall be performed. Should the annual inflation rate increase greater than 5% during the previous year, Motorola shall have the right to increase all future maintenance prices by the CPI increase amount exceeding 5%, but in no event by more than 4%, after providing the Customer with 60 days prior written notice of the increase. The Midwest Region Consumer Price Index (<http://www.bls.gov/ro5/cpimid.htm>), All items, Not seasonally adjusted shall be used as the measure of CPI for this price adjustment. Measurement will take place once the annual average for the new year has been posted by the Bureau of Labor Statistics.

17.8. If Motorola provides Services after the termination or expiration of this Agreement, the terms and conditions in effect at the time of the termination or expiration will apply to those Services and Customer agrees to pay for those services on a time and materials basis at Motorola's then effective hourly rates.



Statement of Work

Infrastructure Repair with Advanced Replacement

1.0 Description of Services

Infrastructure Repair with Advanced Replacement is a repair service for Motorola and select third party Infrastructure as set forth in the applicable attached Exhibit(s), all of which are hereby incorporated into this Statement of Work (SOW) by this reference. Infrastructure may be repaired down to the Component level, as applicable, at the Motorola Infrastructure Depot Operations (IDO). At Motorola's discretion, select third party Infrastructure may be sent to the original equipment manufacturer or third party vendor for repair. If Infrastructure is no longer supported by the original equipment manufacturer or third party vendor, Motorola may replace Infrastructure with similar Infrastructure, when possible.

When available, Motorola will provide Customer with an Advanced Replacement unit(s) or FRU(s) in exchange for Customer's malfunctioning FRU(s). Non-standard configurations, Customer-modified Infrastructure and certain third party Infrastructure are excluded from Advanced Replacement service. Malfunctioning FRU (s) will be evaluated and repaired by IDO and returned to IDO FRU inventory upon completion of repair.

The terms and conditions of this SOW are an integral part of Motorola's Service Terms and Conditions or other applicable agreement to which it is attached and made a part thereof by this reference.

2.0 Motorola has the following responsibilities:

- 2.1. Use commercially reasonable efforts to maintain an inventory of FRU.
- 2.2. Provide new or reconditioned units as FRU to Customer or Servicer, upon request and subject to availability. The FRU will be of similar kit and version, and will contain like boards and chips, as the Customer's malfunctioning Infrastructure.
- 2.3. Program FRU to original operating parameters based on templates provided by Customer as required in Section 3.5. If Customer template is not provided or is not reasonably usable, a standard default template will be used.
- 2.4. Properly package and ship Advanced Replacement FRU from IDO or select third party FRU inventory to Customer specified address.
 - 2.4.1. During normal operating hours of Monday through Friday 7:00am to 7:00pm CST, excluding holidays, FRU will be sent next day air via Federal Express Priority Overnight or UPS Red, unless otherwise requested. Select third party FRU may ship second day air via Federal Express Priority Overnight or UPS red as noted in the attached exhibit(s). Motorola will pay for such shipping, unless Customer requests shipments outside of the above mentioned standard business hours and/or carrier programs, such as NFO (next flight out). In such cases, Customer will be subject to shipping and handling charges.
 - 2.4.2. When sending the Advanced Replacement FRU to Customer, provide a return air bill in order for Customer to return the Customer's malfunctioning FRU. The Customer's malfunctioning FRU will become property of IDO or select third party and the Customer will own the Advanced Replacement FRU.
 - 2.4.3. When sending a Loaner FRU to Customer, IDO will not provide a return air bill for the malfunctioning Infrastructure. The Customer is responsible to arrange and pay for shipping the malfunctioning Infrastructure to IDO. IDO will repair and return the Customer's Infrastructure and will provide a return air bill for the customer to return IDO's Loaner FRU.
- 2.5. Provide repair return authorization number upon Customer request for Infrastructure that is not classified as an Advanced Replacement or Loaner FRU.
- 2.6. Receive malfunctioning Infrastructure from Customer and document its arrival, repair and return.
- 2.7. Perform the following service on Motorola Infrastructure:
 - 2.7.1. Perform an operational check on the Infrastructure to determine the nature of the problem.

- 2.7.2. Replace malfunctioning FRU or Components.
 - 2.7.3. Verify that Motorola Infrastructure is returned to Motorola manufactured specifications, as applicable
 - 2.7.4. Perform a Box Unit Test on all serviced Infrastructure.
 - 2.7.5. Perform a System Test on select Infrastructure.
 - 2.8. Provide the following service on select third party Infrastructure:
 - 2.8.1. Perform pre-diagnostic and repair services to confirm Infrastructure malfunction and eliminate sending Infrastructure with no trouble found (NTF) to third party vendor for repair, when applicable.
 - 2.8.2. Ship malfunctioning Infrastructure to the original equipment manufacturer or third party vendor for repair service, when applicable.
 - 2.8.3. Track Infrastructure sent to the original equipment manufacturer or third party vendor for service.
 - 2.8.4. Perform a post-test after repair by Motorola, original equipment manufacturer, or third party vendor to confirm malfunctioning Infrastructure has been repaired and functions properly in a Motorola System configuration, when applicable.
 - 2.9. Re-program repaired Infrastructure to original operating parameters based on templates provided by Customer as required by Section 3.5. If Customer template is not provided or is not reasonably usable, a standard default template will be used. If IDO determines that the malfunctioning Infrastructure is due to a Software defect, IDO reserves the right to reload Infrastructure with a similar Software version. Enhancement Release(s), if needed, are subject to additional charges to be paid by Customer unless the Customer has a Motorola Software Subscription agreement.
 - 2.10. Properly package repaired Infrastructure unless Customer's malfunctioning FRU was exchanged with an IDO FRU. Motorola will return Customer's FRU(s) to IDO's FRU inventory, upon completion of repair.
 - 2.11. Ship repaired Infrastructure to the Customer specified address during normal operating hours set forth in 2.4.1. FRU will be sent two-day air unless otherwise requested. Motorola will pay for such shipping, unless Customer requests shipments outside of the above mentioned standard business hours and/or carrier programs, such as NFO (next flight out). In such cases, Customer will be subject to shipping and handling charges.
- 3.0 Customer has the following responsibilities:
- 3.1. Contact or instruct Servicer to contact the Motorola System Support Center (SSC) and request an Advanced Replacement, or Loaner FRU and a return authorization number (necessary for all non-Advanced Replacement repairs) prior to shipping malfunctioning Infrastructure or third party Infrastructure named in the applicable attached Exhibit.
 - 3.1.1. Provide model description, model number, serial number, type of System and Firmware version, symptom of problem and address of site location for FRU or Infrastructure.
 - 3.1.2. Indicate if Infrastructure or third party Infrastructure being sent in for service was subjected to physical damage or lightning damage.
 - 3.1.3. Follow Motorola instructions regarding inclusion or removal of Firmware and Software applications from Infrastructure being sent in for service.
 - 3.1.4. Provide Customer purchase order number to secure payment for any costs described herein.
 - 3.2 Pay for shipping of Advanced Replacement or Loaner FRU from IDO if Customer requested shipping outside of standard business hours or carrier programs set forth in section 2.4.1.
 - 3.3 Within five (5) days of receipt of the Advanced Replacement FRU from IDO's FRU inventory, properly package Customer's malfunctioning Infrastructure and ship the malfunctioning Infrastructure to IDO for evaluation and repair as set forth in 2.7. Customer must send the return air bill, referenced in 2.4.2 above back to IDO in order to ensure proper tracking of the returned Infrastructure. Customer will be subject to a replacement fee for malfunctioning Infrastructure not properly returned. For Infrastructure and/or third party Infrastructure repairs that are not exchanged in advance, properly package Infrastructure and ship the malfunctioning FRU, at Customer's expense and risk of loss to Motorola. Customer is responsible for properly packaging the Customer malfunctioning Infrastructure FRU to ensure that the shipped Infrastructure arrives un-damaged and in repairable condition. Clearly print the return authorization number on the outside of the packaging.



- 3.4 If received, Customer must properly package and ship Loaner FRU back to IDO within five (5) days of receipt of Customer's repaired FRU.
- 3.5 Maintain templates of Software/applications and Firmware for reloading of Infrastructure as set forth in paragraph 2.3 and 2.9.
- 3.6 For Digital In-Car Video Infrastructure, remove video from equipment prior to sending Infrastructure in for repair. Video retrieval is a separate service and is not included as part of this SOW. Additional services and fee applies.
- 3.7 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Infrastructure Repair with Advanced Replacement services to Customer.
- 4.0 In addition to any exclusions named in Section 5 of the Service Terms and Conditions or in any other underlying Agreement to which this SOW is attached, the following items are excluded from Infrastructure Repair with Advanced Replacement:
 1. All Infrastructure over seven (7) years from product cancellation date.
 2. All Broadband/WiNS Infrastructure three (3) years from product cancellation date.
 3. Physically damaged Infrastructure.
 4. Third party Equipment not shipped by Motorola.
 5. Consumable items including, but not limited to, batteries, connectors, cables, tone/ink cartridges.
 6. Video retrieval from Digital In-Car Video equipment.
 7. Test equipment.
 8. Racks, furniture and cabinets.
 9. Firmware and/or Software upgrades.

ASTRO® 25 Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Antenna Systems	Excludes all Equipment such as bi-directional amplifiers, multicouplers, combiners, tower top pre-amplifiers, antennas, cables, towers, tower lighting, and transmission lines
Backhaul	Includes PTP (Point-to-Point Wireless) PTP 49600 and PTP 800 licensed series Excludes all other PTP technologies
Base Station(s) and Repeater(s)	Includes Quantar, MTR3000, STR3000, GTR8000, GTR8000 HPD, IntelliRepeater, Network Management (Please refer to the SOW for details) is not available on all stations. Quantar high power booster power amplifier, power supply and control board Excludes Fan Modules, Dual Circulator Tray, Site RMC Tray
Central Electronics Bank(s)	Includes Logging Recorder Interface and Network Hub Excludes all other technologies see SOW specifically for NICE logging recorders
Channel Bank(s)	Includes Premisys, Telco, IMACS models 600, 800. Excludes Siemens
Comparator(s)	Includes Spectratrac, Digitac, and ASTRO-tac 9600, ASTRO-tac 3000, GMC8000, Comparators.
Computer(s)/Workstations/Modems	Includes computers (Pentium I, II, III, IV) directly interface with or control the communications System, including Systemwatch II, PT800 tablet HP x1100, HPx2100, HP xw4000-4600, HPz400, HP VL600, HP VL800, HPz400, ML850 laptop, MW810, ML900 laptop, ML910 laptop, Compaq XW4000. Includes keyboards, mice, trackballs. Excludes all other laptop and desktop computer technologies and all 286, 386, 486 computers; defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention,
Console(s)	Includes Centracom Gold Elite, MCC7500, MCC5500, MIP5000, VPM, as part of complete communication System – including headset jacks, dual footswitches, and gooseneck microphones. Excludes cables
Controller - trunking	Includes SmartNet II prime and remote controllers, MTC3600, GCP8000, Site Controller PSC9600, CSC7000, MTC9600, MZC3600, MZC5000 (Includes Netra240 & T5220). Excludes SSMT and SCMS controllers. CD ROM Drive, Fan Tray
Dictaphones and Recording Equipment	Excludes all types and models.
Digital Interface Unit(s)	Included
Digital Signaling Modem(s)	Included upon modem model availability
Digital Voice Modem(s)	Included upon modem model availability
Embassy Switch	Includes AEB, AIMI, ZAMBI, AMB
Firewalls	Includes Nortel Alteon ASF5105, 5106, Juniper SS520, ISSG140, SSG5, ISG1000C, ISG2000
Intrusion Detector	Includes Proventia 201 Linux IDSS, Proventia CX4002C
ISSI Gateway	Includes T5220 Sun server Solaris 10 OS
Links	Includes PTP 49600 and 800 licensed series
Logging Recorder	Excludes all technologies see SOW specifically for NICE logging recorders
Management Terminals	Includes computers (Pentium I, II, III, IV) that directly interface with or control the communications System, including Systemwatch II. Excludes laptop computers and all 286, 386, 486 computers.
MBEX(s) or NOVA Interconnect	Included
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All Equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention, as well as monitors that were not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Motobridge	Included
Moscad	Includes NFM (Network Fault Management), as part of communication System only, RTU, SDM Site Manager RTU. Standalone MOSCAD and System Control and Data Acquisition (SCADA) must be quoted separately. Includes FSA4000. Excludes all other fire alarming systems.

ASTRO 25 Infrastructure Repair cont.	Inclusions, Exclusions, Exceptions and Notes
Network Fault Management	Includes Full Vision, Unified Event Manager Excludes NMC
Gateway	Includes PDG:CPX8216, IVD & HPD PDG on HP DL360, MOTOBIDGE
Printer(s)	Includes printers that directly interface with the communications system.
RAS(s)	Excludes RAS 1100, 1101 and 1102
Receiver(s)	Includes Quantar, MTR2000 and ASTRO-TAC, GPW8000, GTR8000, GTR8000 HPD Receivers. Excludes Fan Modules, Dual Circulator Tray, Site RMC Tray
Routers	Includes GGM8000, ST5500, ST5598, S2500-S6000
Servers	Includes Netra 240, Netra T5220, cPCI, HP DL360, HP ML370, HP ML110, HP ML530, HP TC2110, 2120 HP InfoVista Server. IR8000 series, LX4000 series, Intel Server TSRL-T2, TIGPR2U, Proventia 201 Linux IDSS, Proventia GX4002C, Trak9100. Network Management Server includes cPCI Chassis, Power Supply, Fan Tray, Controller Hard Drive, CD ROM Drive, Tape Drive, CPU, Client PC's, Core Security Management Server, Firewall Servers, Intrusion Detection Sensor Server. Excludes Dell Servers, Monitors, Memory Module 0182915Y02, Rear Fan RLN5352, Central Process Card 0182915Y01
Simulcast Distribution Amplifier(s)	Included
Site Frequency Standard(s)	Includes Rubidium, GPS and Netclocks systems sold with the Motorola System.
Secure	Includes KMF crypto card, end to end Cryptor for IVD PDEG Cryptor
SMARTX	Includes VPM
Switch	Includes Nortel Passport PBX, Cisco Catalyst 6509, HP 5308 LAN switch, HP ProCurve Switch 2524, 2650, 2626, HP3500, HP2610, 3Com PS40, SS1100
Telco PBX	Includes Avaya Dfinity PBX, S8300, S8500, Intel Server (ACSS), TSRLT2, TIGPR2U
Terminal Servers	Includes IR8000, LX4000S, LX4000T, Paradyne
Universal Simulcast Controller Interface(s)	Included
UPS Systems	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.
Workstation	Included

SmartZone System Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Antenna Systems	Excludes all Equipment such as bi-directional amplifiers, multicouplers, combiners, tower top pre-amplifiers, antennas, cables, towers, tower lighting, and transmission lines.
Base Station(s) and Repeater(s)	Includes: Quantar, Quantro, Digital, MTR2000 ONLY.
Central Electronics Bank(s)	Includes Logging Recorder, Interface and Network Hub Excludes all other technologies see SOW specifically for NICE logging recorders
Channel Bank(s)	Includes Premisys and Telco Excludes Siemens
Comparator(s)	Includes Spectratrac, Digitac, and ASTRO-tac Comparators
Computer(s)	Includes computers (Pentium I, II, III, IV) that directly interface with or control the communications System, including Systemwatch II, keyboards, mice and trackballs. Excludes laptop computers and all 286, 386, 486 computers, defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention.
Console(s)	Includes Centracom Gold Elite, MCC7500, MCC5500, MIP5000 as part of complete communication System – including headset jacks, dual footswitches, and gooseneck microphones. Excludes cables
Controller(s) -Trunking	Includes SmartNet II prime and remote controllers. Excludes SSMT and SCMS controllers.
Dictaphones, Logging Recorders and Recording Equipment	Excludes all technologies see SOW specifically for NICE logging recorders
Digital Interface Unit(s)	Included
Digital Signaling Modem(s)	Included upon modem model availability
Digital Voice Modem(s)	Included upon modem model availability
Embassy Switch	Includes AEB, AIMI, ZAMBI, AMB
Management Terminals	Includes computers (Pentium I, II, III, IV) that directly interface with or control the communications System, including Systemwatch II. Excludes laptop computers and all 286, 386, 486 computers.
MBEX(s) or NOVA Interconnect	Included
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All Equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention as well as monitors that were not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Moscad	Includes NFM (Network Fault Management), as part of communication System only. Standalone MOSCAD and System Control and Data Acquisition (SCADA) must be quoted separately. Includes FSA4000. Excludes all other fire alarming systems.
Motobridge	Included
Network Fault Management	Includes Full Vision Excludes NMC
Printer(s)	Includes printers that directly interface with the communications System.
RAS(s)	Excludes RAS 1100, 1101 and 1102
Receiver(s)	Includes Quantar and MTR2000, ASTRO-TAC Receivers
Simulcast Distribution Amplifier(s)	Included
Site Frequency Standard(s)	Includes Rubidium, GPS and Netclocks systems sold with the Motorola System. Excludes MFS -Rubidium Standard Network Time and Frequency devices
Universal Simulcast Controller Interface(s)	Included
UPS Systems.	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.

Motorola, Inc.

1303 E. Algonquin Road, Schaumburg, IL 60196 U.S.A.\

Approved by Contract and Compliance 11/20/09

Version 2.0 5/16/13

SmartZone System Infrastructure cont.	Inclusions, Exclusions, Exceptions and Notes
Zone Manager	Excludes HP715/33, HP 715/50 servers. Excludes x-terminals NDS14C and NDS17C
Zone Controller(s)	Includes console terminals. Excludes all Sun/IMP hard drives <u>except</u> TLN3495A 0820 1 GB drive as well as the following SUN/IMP CPUSET's: TLN3278B 0406, TLN3343A 0424 and TLN3278A 0181/0389.

SmartNet System Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Antenna Systems	Excludes all Equipment such as bi-directional amplifiers, multicouplers, combiners, tower top pre-amplifiers, antennas, cables, towers, tower lighting, and transmission lines
Base Station(s) and Repeater(s)	Includes Quantar, Quantro, Digital MSF5000, MTR2000, and Desktrac L35SUM7000-T Repeaters ONLY. Network Management (please refer to the SOW for details) is not available on all stations.
Central Electronics Bank(s)	Includes Logging Recorder Interface and Network Hub Excludes all other technologies see SOW specifically for NICE logging recorders
Channel Bank(s)	Includes Premisys and Telco. Excludes Siemens
Comparator(s)	Includes Spectratrac, Digitac, and ASTRO-tac Comparators.
Computer(s)	Includes computers (Pentium I, II, III, IV) directly interface with or control the communications System, including Systemwatch II, keyboards, mice and trackballs, Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention.
Console(s)	Includes Centracom Gold Elite, MCC7500, MCC5500, MIP5000 as part of complete communication System – including headset jacks, dual footswitches, and gooseneck microphones. Excludes cables
Controller - trunking	Includes SmartNet II prime and remote controllers. Excludes SSMT and SCMS controllers.
Dictaphones, Logging Recorders and Recording Equipment	Excludes all technologies see SOW specifically for NICE logging recorders
Digital Interface Unit(s)	Included
Digital Signaling Modem(s)	Included upon modem model availability
Digital Voice Modem(s)	Included upon modem model availability
Embassy Switch	Includes AEB, AIMI, ZAMBI, AMB
Management Terminals	Includes computers (Pentium I, II, III, IV) directly interface with or control the communications System, including Systemwatch II. Excludes laptop computers and all 286, 386, 486 computers.
MBEX(s) or NOVA Interconnect	Included
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All Equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention as well as monitors not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Moscad	INFM (Network Fault Management), as part of communication System only. Standalone MOSCAD and System Control and Data Acquisition (SCADA) must be quoted separately. Includes FSA4000. Excludes all other fire alarming systems.
Motobridge	Included
Network Fault Management	Includes Full Vision. Excludes NMC
Printer(s)	Includes printers that directly interface with the communications System.
RAS(s)	Excludes RAS 1100, 1101 and 1102
Receiver(s)	Includes Quantar, MTR2000 and ASTRO-TAC Receivers.

SmartNet System Infrastructure cont.	Inclusions, Exclusions, Exceptions and Notes
Simulcast Distribution Amplifier(s)	Included
Site Frequency Standard(s)	Includes Rubidium, GPS and Netclocks systems sold with the Motorola System. Excludes MFS -Rubidium Standard Network Time and Frequency devices
Universal Simulcast Controller Interface(s)	Included
UPS Systems.	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.

Broadband Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Access Points	Includes PMP (Canopy), Motomesh Duo, Motomesh Quattro, Meshcam, Motomesh Solo, Motomesh AP7181 intelligent access points. Excludes all other technologies
Backhaul	Includes PMP (Canopy) and PTP (Point-to-Point Wireless) PTP 49600 and 800 licensed series Excludes all other technologies
Cables, connectors and testers	Excluded
Cameras	Includes Meshcam Excludes all other technologies, fixed black & white, color, pan tilt zoom analog, pan tilt zoom IP, fixed hybrid (IP and Analog) cameras
Cluster Management Modules (CMM)	Includes PMP (Canopy). Excludes all other technologies
Digital Video Recorder	Includes Mobile Video Enforcer Excludes all other technologies
Docking Station	Includes Mobile Video Enforcer Excludes all other technologies
GPS Synch Box	Excluded
Links	Includes PTP 49600 and 800 licensed series
Mobile Internet Switching Controller(MISC)	Excluded
Modems	Includes Mobile Video Enforcer Excludes all other technologies
Monitors	Includes Mesh,MotoMesh Excludes all other technologies
Mounting Bracket	Excluded
Multiplexers	Excluded
Network Interface Card	Excludes RAD data multiplexers
Network Switches	Includes Mesh, MotoMesh, Meshcam Excludes all other technologies
Networking Enablers	Included
Personal Tracking Device	Excludes Asymmetric DSL Broadband Gateway, Asymmetric Customer Premise Equipment, Symmetric DSL Broadband Gateway, Symmetric DSL-CPE's and accessories
Power Supply	Includes MeshTrack Excludes all other technologies
Reflector Hardware Kit	Included
Server	Excluded
Software	Included HP DL360, Mobile Video Enforcer system server Excludes all other technologies
Subscriber Modules	Excluded
Surge Suppressor/LPU	Includes, PMP (Canopy) Excludes all other technologies
UPS	Excluded
Video Recording System	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any one-site services.
Wireless Router AC and DC Input	Includes Mobile Video Enforcer Excludes all other technologies

Conventional System Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Antenna Systems	Excludes all Equipment such as bi-directional amplifiers, multicouplers, combiners, tower top pre-amplifiers, antennas, cables, towers, tower lighting, and transmission lines
Base Station(s) and Repeater(s)	Quantar, Quantro, MTR2000, MTR3000, GTR8000 including IPCCGW. Excludes MICOR and MSF5000
Central Electronics Bank(s)	Includes logging recorder interface and network hub Excludes all other technologies see SOW specifically for NICE logging recorders
Channel Bank(s)	Includes Premisys and Telco. Excludes Siemens
Comparator(s)	Includes Spectratrac, Digitac, ASTRO-tac, GMC8000.
Computer(s)	Includes computers (Pentium I, II, III, IV) directly interface with or control the communications System, including Systemwatch II, keyboards, mice and trackballs. Excludes laptop computers and all 286, 386, 486 computers. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention.
Console(s)	Includes Centracom Gold Elite, MCC7500, MCC5500, MIP5000 as part of complete communication System – including headset jacks, dual footswitches, and gooseneck microphones. Excludes cables and Commandstar mother board CDN6271. Commandstar and Commandstar Lite are also excluded as a conventional system operator position but can be covered when services are purchased separately.
Dictaphones, Logging Recorders and Recording Equipment	Excludes all technologies see SOW specifically for NICE logging recorders
Digital Interface Unit(s) (DIU)	Included
Digital Signaling Modem(s)	Included upon modem model availability
Embassy Switch	Includes AEB, AIMI, ZAMBI, AMB
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention as well as monitors not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Moscad	Includes NFM (Network Fault Management), as part of communication System only. Standalone MOSCAD and System Control and Data Acquisition (SCADA) must be quoted separately. Includes FSA4000 Excludes all other fire alarming systems.
Motobridge	Included
Printer(s)	Includes printers that directly interface with the communications System.
Receiver(s)	Includes Quantar, MTR2000, ASTRO-TAC, GPW8000 receivers.
Simulcast Distribution Amplifier(s)	Included
Site Frequency Standard(s)	Includes Rubidium, GPS and Netlocks systems sold with the Motorola System. Excludes MFS -Rubidium Standard Network Time and Frequency devices
Universal Simulcast Controller Interface(s)	Included
UPS Systems.	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.

Data System Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Base Station(s) and Repeater(s)	Includes Quantar (DSS3, DBS), GTR8000.
Computer(s)	Includes computers (Pentium I, II, III, IV) that directly interface with or control the communications System. Includes keyboards, mice and trackballs. Excludes laptop computers and all 286, 386, 486 computers. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention.
Dictaphones , Logging Recorders and Recording Equipment	Excludes all technologies see SOW specifically for NICE logging recorders
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention as well as monitors not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Printer(s)	Includes printers that directly interface with the communications System.
Radio Network Controller	Includes One (1) RNC and One (1) RNC Console. Redundant RNC's must be quoted separately. Excludes RNC1000, NCP500, NCP2000, NCP2500 and NCP3000.
Site Data Link Modem(s)	Included
UPS Systems.	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.
Wireless Network Gateway	Excluded from the prime/remote site or system agreement but can be covered when services are purchased separately.

Cassidian Communications Infrastructure Repair w Advanced Replacement Vesta Pallas, Vesta Standard (Maars/ComCentrex), Vesta Meridian and Sentinel Patriot Systems	Inclusions, Exclusions, Exceptions and Notes
ACU (Auto Control Unit)	Includes Vesta systems only Excludes Sentinel Patriot
ARU (Alarm Reporting Unit)	Included
ALI (Automatic Location Identification) Controller	Includes Analog Station Card(s), Called ID Board(s), Conference Board(s), DTMF Tone Receiver Board(s), Digital Station Card(s), E&M Card(s), Ground Loop Start Card(s), MF Receiver Board(s), 911 Line Card(s)
ANI (Asynchronous Network Interface) Controller	Included
BCM (Business Communication Manager)	Includes Vesta Pallas only Excludes all other technologies
Cable(s)	Excluded
CIM (Console Interface Module)	Includes Sentinel Patriot Excludes all other technologies
CRU (Call Record Unit)	Included
CIU (CAD Interface Unit)	Included
Computer(s)/Workstation	Includes computers sourced by Cassidian Communications and sold by Motorola that directly interface with or control the Cassidian Communications Systems, monitor, sound card, keyboards, mice and trackballs. Excludes defective or phosphor-burned cathode ray tubes (CRT) and burned-in flat panel display image retention.
Controllers	Includes Vesta Standard Excludes all other technologies
DBU (Data Base Unit)	Includes Vesta Standard Excludes all other technologies
Digital Logging Recorders, Logging Recorders and Recording Equipment	Includes Pyxis, Cassidian Communications sourced and sold by Motorola Excludes all other technologies see SOW specifically for NICE logging recorders
Herbie	Includes Vesta systems only Excludes Sentinel Patriot
Line Boosters/Amplifier/Short haul modems	Excluded
Modified Network LAN Switch	Included
Modem(s)	Includes ALI modem sources and sold by Motorola Excludes all other technologies
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications Systems. Excludes Non-Certified monitors, defective or phosphor-burned cathode ray tubes (CRT), flat panel monitors with burned in image retention and monitors not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
MTU (Multi-line Trunk Unit)	Includes Vesta Pallas only Excludes All other technologies
Printer(s)	Includes Cassidian Communications sourced and sold by Motorola that directly interface with the communications System
Power Supplies, PSU (Power Supply Unit)	Includes Vesta Pallas, Vesta Standard Excludes all other technologies
RMU (Remote Maintenance Unit)	Includes Vesta Standard only Excludes all other technologies
Ring Generator(s)	Included
Routers	Included
RIS (Radio Interface Subset)	Included (note, only works with the Herbie)
Server(s) ALI	Includes Vesta servers, Sentinel Patriot Excludes all other technologies
Telephone(s)	Includes 911 and KEM administrator telephone sourced with the 911 System and sold by Motorola. Excludes Nortel (Avaya) telephone sets
TIU (Trunk Interface Unit)	Includes Vesta Standard Excludes all other technologies

Console Only Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Card Cages	Included
Central Electronics Bank(s) (CEB)	Includes Logging Recorder Interface and Network Hub, Base Interface Module (BIM), Console Operator Interface Module (COIM), Operator Interface Module (OMI). Excludes all other technologies see SOW specifically for NICE logging recorders
Central Electronic Shelf (CES)	Included
Computer(s)	Includes computers that directly interface with CEB. Includes keyboards, mice and trackballs. Excludes laptop computers and all 286, 386, 486 computers. Defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel display image retention.
Console(s)	Includes consoles (CommandSTAR, CommandSTAR lite, Centracom Gold Elite MCC7500, MCC7500 w/ VPM, MCC5500, MIP5000, MC1000, MC2000, MC2500, MC3000) as part of complete communication System – Including headset jacks, dual footswitches, and gooseneck microphones and Console Interface Electronics. Excludes cables
Console Audio Box (CAB)	Included
Dictaphones, Logging Recorders and Recording Equipment	Excludes all technologies see SOW specifically for NICE logging recorders
Junction Box	Included
Microwave Equipment.	Excluded from service agreement but may be repaired on an above contract, time and material basis. All Equipment must be shipped to IDO. Excludes any on-site services.
Monitor(s)	Includes all Motorola certified monitors connected to computers that directly interface with or control the communications System. Excludes defective or phosphor-burned cathode ray tubes CRT(s) and burned-in flat panel displays image retention as well as monitors not shipped by Motorola and/or cannot be confirmed by a Motorola factory order number.
Site Frequency Standard(s)	Includes Netclocks systems Excludes MFS -Rubidium Standard Network Time and Frequency devices
UPS Systems.	Excluded from service agreements but may be repaired on an above contract, time and material basis. All UPS Systems must be shipped to IDO for repair. Excludes batteries and any on-site services.

Digital In-Car Video Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
Cables, connectors and testers	Excluded
Cameras	Includes 22X Front Camera. Excludes rear cameras
Data Talker Wireless Transmitters	Excluded
Digital Video Recorder	Includes Base unit running DP-2 software
Data Storage Module	Included
LCD Monitor	Includes DP-1 & DP-2 versions only
Video Retrieval	It is the customer's responsibility to remove the video before sending the DSM into the Motorola Repair Depot for repair. Video retrieval is a separate service and is excluded from this SOW.

MOTOTRBO Infrastructure Exhibit	Inclusions, Exclusions, Exceptions and Notes
XRC9000 Controller	Included TT2213* single site; TT2215* multi site *Next day (24 hour) delivery if request is received before 1:00 p.m. CST; Second day (48 hour) delivery if request is received after 1:00 p.m. CST
MTR3000	Includes T3000
MIP5000 MOTOTRBO Gateway	Includes L3598
XRT9000 Gateway	Includes TT2386A

Statement of Work

Local Radio Support

1.0 Description of Service

Local Radio Support provides an operational check of Equipment that is specifically named in the applicable Agreement to which this Statement of Work is attached. An operational check is an analysis of the Equipment to identify external or internal defects.

If the Equipment has an external defect, or can be Restored without opening the radio case, the Equipment will be Restored and returned to Customer. If the Equipment has an internal defect, or is not serviceable without opening the radio case, then the Equipment will require additional service provided by the Servicer and not described in this Statement of Work.

Local Radio Support includes service on standard palm microphones and single mobile control heads, provided that they are required for normal operation of the two-way mobile and are included at the point of manufacture. Local Radio Support excludes repairs to: optional accessories; iDEN accessories; iDEN mobile microphones; non-standard mobile microphones, mobile external speakers; optional or additional control heads, single and multiple unit portable chargers; batteries, mobile antennas; mobile power & antenna cables and power supplies.

The following are excluded from Local Radio Support service unless they are purchased as an option for an additional fee. The options are OnSite, Radio Survey and Analysis, Portable Remote Speaker Microphones, Portable Antenna Replacements Mobile Remote Control Heads.

The terms and conditions of this SOW are an integral part of Motorola's Service Terms and Conditions or other applicable agreement to which it is attached and made a part thereof by this reference.

2.0 Motorola has the following responsibilities:

- 2.1 Service to be performed at the Servicer facility during Standard Business Days.
- 2.2 Perform an operational check on Equipment to determine the nature of the problem.
- 2.3 Remove/reinstall mobile or data Equipment from/to vehicle as needed for servicing.

3.0 Customer has the following responsibilities:

- 3.1 Deliver and pick up Equipment to/from the Servicer facility.
- 3.2 Inform Servicer of description of problem for Equipment brought in for service.
- 3.3 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Local Radio Support service to Customer.

Statement of Work

Network Monitoring, OnSite Infrastructure Response and Dispatch Service

Motorola will provide Network Monitoring, Dispatch Service and OnSite Infrastructure Response services to Customer Systems. These services are applicable only for the following system types: ASTRO®, ASTRO® 25, ARC 4000, SmartZone®/OmniLink® v2.0.3 and higher, SmartNet®, Private Data (with a wireless network gateway) v2.0.3 and higher, and Harmony® Wireless Communications System.

The terms of this Statement of Work (SOW) are an integral part of the Motorola Service Terms and Conditions or other applicable Agreement(s) with the Customer to which this SOW is appended and made a part thereof by this reference.

1.0 Description of Services

Network Monitoring is a service designed to electronically monitor Elements of a Communication System for Events, as set forth in the Monitored Elements Table. When the Motorola System Support Center (SSC) detects an Event, trained technologists acknowledge and remotely diagnose the Event, and initiate an appropriate response per the customer profile. Appropriate responses could include, but are not limited to, continuing to monitor the Event for further development, transferring the Event to Technical Support, or opening a Case for dispatch of a Servicer. If dispatched, the Servicer will respond at the Customer location based on pre-defined Severity Levels set forth in the Severity Definitions Table and Response times set forth in the On-Site Response Time Table in order to Restore the System.

Motorola will provide Case management as set forth herein. The SSC maintains contact with the on-site Servicer until System Restoral occurs and Case is closed. The SSC will continuously track and manage Case activity from open to close through an automated Case tracking process.

2.0 Motorola Responsibilities:

- 2.1. Provide dedicated Connectivity through a private network connection necessary for monitoring ASTRO and ASTRO25, SmartZone/ OmniLink, Private Data, and Harmony Wireless Communications network types. The Connectivity Matrix set forth in Appendix 1 further describes the Connectivity options.
- 2.2. If determined necessary by Motorola, provide Motorola owned equipment for monitoring ASTRO and ASTRO 25 System elements. If Motorola installs or replaces Motorola owned equipment, the type of equipment and location installed is listed in the Motorola Owned & Supplied Equipment Table.
- 2.3. If determined necessary by Motorola, provide Motorola owned equipment for monitoring SmartNet System elements. If Motorola installs or replaces Motorola owned equipment, the type of equipment and location installed is listed in the Motorola Owned & Supplied Equipment Table.
- 2.4. Verify Connectivity and Event monitoring prior to System Acceptance or Start Date.
- 2.5. Continuously receive data from Customer monitored System and Customer initiated service requests.
- 2.6. Remotely access the Customer's System to perform remote diagnosis as permitted by Customer pursuant to section 3.1
- 2.7. Create a Case, as necessary. Gather information to perform the following:
 - 2.7.1. Characterize the issue
 - 2.7.2. Determine a plan of action
 - 2.7.3. Assign and track the Case to resolution.
- 2.8. Dispatch a Servicer, as required, by Motorola standard procedures and provide necessary Case information collected in section 2.7
- 2.9. Ensure the required personnel have access to Customer information as needed.
- 2.10. Disable and enable System devices, as necessary, for Servicers.
- 2.11. Servicer will perform the following on-site:
 - 2.11.1. Run diagnostics on the Infrastructure or FRU.

- 2.11.2. Replace defective Infrastructure or FRU, as applicable. Customer, Servicer or Motorola may provide Infrastructure or FRU.
 - 2.11.3. Provide materials, tools, documentation, physical planning manuals, diagnostic/test equipment and any other requirements necessary to perform the Maintenance service.
 - 2.11.4. If a third party Vendor is needed to Restore the System, the Servicer may accompany that Vendor onto the Customer's premises.
 - 2.12. Verify with Customer that Restoration is complete or System is functional, if required by Customer's repair Verification preference described in the Customer Support Plan required by section 3.5. If Verification by Customer cannot be completed within 20 minutes of Restoration, the Case will be closed and the Servicer will be released.
 - 2.13. Escalate the Case to the appropriate party upon expiration of a Response time.
 - 2.14. Close the Case upon receiving notification from Customer or Servicer, indicating the Case is resolved.
 - 2.15. Notify Customer of Case Status, as described in the Customer Support Plan required by section 3.5 at the following Case levels:
 - 2.15.1. Open and closed; or
 - 2.15.2. Open, assigned to the Servicer, arrival of the Servicer on site, deferred or delayed, closed.
 - 2.16. Provide, when requested by Customer, the following reports, as applicable:
 - 2.16.1. Case activity reports to Customer.
 - 2.16.2. Network Monitoring Service reports for Customer System(s).
 - 2.16.3. Network Activity/Availability Reports for ASTRO25, SmartZone/ OmniLink, and Private Data Systems only.
 - 2.17. Respond in accordance to pre-defined Response times upon receipt from Customer of Customer managed passwords required for proper access to the Customer's System.
 - 2.18. Apply additional support charges above and beyond the contracted service agreements that may apply if it is determined that System faults were caused by the Customer making changes to critical System parameters.
- 3.0 Customer Responsibilities:
- 3.1. Allow Motorola Continuous remote access to obtain System availability and performance data.
 - 3.2. Allow Motorola to access System if firewall has been installed; provide permanent/dedicated access for SNMP traps (outbound) and ZDS polling (inbound). Also provide continuous utility service to any Motorola equipment installed or utilized at Customer's premises to support delivery of the Service.
 - 3.3. Order and maintain dedicated dial-up phone lines for telephone service for SMARTNET System types. The Connectivity Matrix set forth in Appendix 1 further describes the Connectivity options.
 - 3.4. Unless otherwise specified, Motorola recommends a private network connection for all other Systems. The Connectivity Matrix set forth in Appendix 1 further describes the Connectivity options.
 - 3.5. Provide Motorola with pre-defined Customer information and preferences prior to Start Date necessary to complete Customer Support Plan., including, but not limited to:
 - 3.5.1.1. Case notification preferences and procedure
 - 3.5.1.2. Repair Verification Preference and procedure
 - 3.5.1.3. Database and escalation procedure forms.
 - 3.5.1.4. Submit changes in any information supplied in the Customer Support Plan to the Customer Support Manager.
 - 3.6. Provide the following information when initiating a service request:
 - 3.6.1. Assigned System ID number
 - 3.6.2. Problem description and site location
 - 3.6.3. Other pertinent information requested by Motorola to open a Case.
 - 3.7. Notify the SSC when Customer performs any activity that impacts the System. (Activity that impacts the System may include, but is not limited to, installing software or hardware upgrades, performing upgrades to the network, or taking down part of the system to perform maintenance.)
 - 3.8. Allow Servicers access to Equipment (including any Connectivity or monitoring equipment) if remote service is not possible.
 - 3.9. Allow Servicers access to remove Motorola owned monitoring equipment upon cancellation of service.
 - 3.10. Supply Infrastructure or FRU, as applicable, in order for Motorola to Restore the System as set forth in paragraph 2.11.2
 - 3.11. Maintain and store in an easy accessible location any and all Software needed to Restore the System.

- 3.12. Maintain and store in an easily accessible location proper System backups.
- 3.13. Verify with the SSC that Restoration is complete or System is functional, if required by the Repair Verification Preference provided by Customer in accordance with section 3.5.
- 3.14. Provide all Customer managed passwords required to access the Customer's System to Motorola upon request or when opening a Case to request service support or enable Response to a technical issue.
- 3.15. Pay additional support charges above and beyond the contracted service agreements that may apply if it is determined that System faults were caused by the Customer making changes to critical System parameters
- 3.16. Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the services described in this SOW.

Severity Definitions Table

Severity Level	Problem Types
Severity 1	▪ Response is provided Continuously ▪ Major System failure ▪ 33% of System down ▪ 33% of Site channels down ▪ Site Environment alarms (smoke, access, temp, AC power) as determined by the SSC. ▪ This level is meant to represent a major issue that results in an unusable system, sub-system, Product, or critical features from the Customer's perspective. No Work-around or immediate solution is available.
Severity 2	▪ Response during Standard Business Day ▪ Significant System Impairment not to exceed 33% of system down ▪ System problems presently being monitored ▪ This level is meant to represent a moderate issue that limits a Customer's normal use of the system, sub-system, product, or major non-critical features from a Customer's perspective
Severity 3	▪ Response during Standard Business Day ▪ Intermittent system issues ▪ Information questions ▪ Upgrades/preventative maintenance ▪ This level is meant to represent a minor issue that does not preclude use of the system, sub-system, product, or critical features from a Customer's perspective. It may also represent a cosmetic issue, including documentation errors, general usage questions, recommendations for product enhancements or modifications, and scheduled events such as preventative maintenance or product/system upgrades.

On-Site Response Time Table (Customer's Response Time Classification is designated in the Service Agreement).

Severity Level	Standard Response Time	Premier Response Time	Limited Response Time	Off Deferral
Severity 1	Within 4 hours from receipt of Notification Continuously	Within 2 hours from receipt of Notification Continuously	Within 4 hours from receipt of Notification Standard Business Day	Time provided by Servicer *
Severity 2	Within 4 hours from receipt of Notification Standard Business Day	Within 4 hours from receipt of Notification Standard Business Day	Within 4 hours from receipt of Notification Standard Business Day	Time provided by Servicer *
Severity 3	Within 24 hours from receipt of Notification Standard Business Day	Within 24 hours from receipt of Notification Standard Business Day	Within 24 hours from receipt of Notification Standard Business Day	Time provided by Servicer *

- Please note these are Standard Commitment times. The commitment times should be based on the Customers Support Plan.
- Provide update **before** the specific contractual commitments come due.
* Note: Provide update to System Support Center **before** Deferral time comes due.

Appendix 1

Connectivity Matrix

System Type	Connectivity	Responsibility
ASTRO® 25	T1	Motorola
SmartZone/OmniLink v3.5 and below	256K	Motorola
SmartZone/OmniLink v4 and above	512K	Motorola
Private Data	256K	Motorola
ARC 4000	T1 or VPN	Motorola
MESH	T1 or VPN	Motorola
Harmony	T1	Motorola
MotoBridge	T1 or VPN	Motorola
SmartNet	Dial-up	Customer

Private Network Connection IP VPN (All Customers)	Public Internet Connection IP VPN (Option Available only to Customers outside of the US)
Standard solution for real time Connectivity	Non Standard solution for Connectivity
Dedicated bandwidth configuration provided to monitor Customers	No dedicated bandwidth provided to monitor Customers
Protected from unauthorized intrusion	Low risk of unauthorized intrusion
Encryption available	Encryption is required
Connectivity available through Motorola	Customer provides Connectivity to the internet via an internet service provider selected by Customer.

Motorola Owned & Supplied Equipment Table

Equipment Type	Location Installed
Firewall/Router	Master Site
System Support Server	Master Site for each Zone

**MOTOROLA**

System Type	Equipment
ASTRO 25 (release 7.0-and higher) SECURITY ELEMENTS Monitoring and managing Security Elements is dependent on Customer purchasing and Core Security Management Server as Equipment with the Customer System	Packet Routing Network; Zone Controllers; Database Server; FullVision Server; UEM Server; Zone Statistical Server; Air Traffic Router; System Statistics Server; User Configuration Server; Packet Data Gateway Server; PBX; Interconnect Server; Motorola Gold Elite Gateway (MGEG); AEB; CEB; Conventional Channel Gateway (CCGW); Core, Exit, Gateway, Peripheral, Border, and Site routers, HP Switches master, prime, console (MCC7500) and repeater sites switches, GGSN; CWR MOSCAD Overlay (TenSr, Station, Channel Banks, TRAK GPS, Site Power, Microwave) Simulcast RF Site (Site Controllers, Comparators, Stations); Intelli Repeater RF Site (Stations); Intelli Site Repeater RF Site (Site Controllers, Stations). The SMARTX box is a transparent box that connects the legacy equipment to ASTRO core. The SMARTX box is not part of the monitored elements. DOES NOT INCLUDE MONITORING OF ANY MOSCAD ALARM POINTS THAT DO NOT DIRECTLY IMPACT THE PERFORMANCE OF THE RADIO NETWORK. DOES NOT INCLUDE MONITORING OF ANYTHING OUTSIDE OF THE RADIO NETWORK UNLESS SPECIFICALLY STATED If Motorola Security Monitoring service is purchased - Core Security Management Server, Intrusion Detection Sensor, Firewall, Anti-virus Application, Servicer Authentication, Centralized Logging Server
ASTRO 25 (release 6.3 – 6.9) SECURITY ELEMENTS Monitoring and managing Security Elements is dependent on Customer purchasing and Core Security Management Server as Equipment with the Customer System	Nortel; Packet Routing Network; Zone Controllers; Database Server; FullVision Server; Zone Statistical Server; Air Traffic Router; System Statistics Server; User Configuration Server; Packet Data Gateway Server; PBX; Interconnect Server; Motorola Gold Elite Gateway (MGEG); AEB; CEB; ARCADACS Cross Connect Switch; Simulcast RF Site (Site Controllers, Comparators, Stations); Intelli Repeater RF Site (Stations); Intelli Site Repeater RF Site (Site Controllers, Stations); MOSCAD Overlay (TenSr, Station, Channel Banks, TRAK GPS, Site Power, Microwave) DOES NOT INCLUDE MONITORING OF ANY MOSCAD ALARM POINTS THAT DO NOT DIRECTLY IMPACT THE PERFORMANCE OF THE RADIO NETWORK. DOES NOT INCLUDE MONITORING OF ANYTHING OUTSIDE OF THE RADIO NETWORK UNLESS SPECIFICALLY STATED If Motorola Security monitoring is purchased - Core Security Management Server, Intrusion Detection Sensor, Firewall, Anti-virus Application, Servicer Authentication, Centralized Logging Server

ASTRO 25 6.0 - 6.2	Nortel; Packet Routing Network; Zone Controllers; Database Server; FullVision Server; Zone Statistical Server; Air Traffic Router; System Statistics Server; User Configuration Server; Packet Data Gateway Server; PBX; Interconnect Server; Motorola Gold Elite Gateway (MGE); AEB; CEB; ARCADACS Cross Connect Switch; Simulcast RF Site (Site Controllers, Comparators, Stations); Intelli Repeater RF Site (Stations);Intelli Site Repeater RF Site (Site Controllers, Stations); MOSCAD Overlay (TenSr, Station, Channel Banks, TRAK GPS, Environmental Alarms, Microwave)
SmartZone 4.1	Zone Controllers; Database Server; Digital Interface Unit (DIU); Central Electronic Bank (CEB) Interface; AEB; FullVision Server; Air Traffic Router; System Statistics Server (Multi-Zone); Zone Statistical Server; User Configuration Server; NOVA 2000 (Interconnect); Remote RF Sites (Site Controllers Including Simulcast, Stations); MOSCAD Overlay (Stations-Non Trunked, Comparater, TenSr Channel Banks, Environmental Alarms, Microwave)
ARC 4000	Zone Controller, Network Manager Servers, User Configuration Server, Zone Database Server, FullVision Server, Air Traffic Router Server, Packet Data Router & Radio Network Gateway (IV&D), Data Collection Device, Master Site Router (Core, Gateway), Master Site Switches, Individual Site Routers, Individual Site Switches
Astro LE	Site Controllers; Environmental Alarms; Channel Banks
SMARTNET Monitored by MOSCAD SiteSentry	Site Controllers; Stations; Environmental Alarms; Channel Banks. Site Sentry is a canceled product. No new customers.
Private Data	Wireless Network Gateway (WNG); Radio Network Controller (RNC); Base Station
Harmony (HWCS)	MSO, EBTS
MOTObridge	SIP, OMC, Gateway Units

Statement of Work

Network Preventative Maintenance

1.0 Description of Service

Network Preventative Maintenance will provide an operational test and alignment, on the Customer's Infrastructure Equipment (infrastructure or fixed network equipment only) to ensure the Infrastructure meets original manufacturer's specifications, as set forth in the applicable attached Exhibit(s), all of which are hereby incorporated by this reference. Customer's System type determines which Exhibit is applicable (i.e. SmartZone system exhibit, SmartNet system exhibit). Network Preventative Maintenance will be performed during Standard Business Days. If the System or Customer requirements dictate this service must occur outside of Standard Business Days, Motorola will provide an additional quotation. Customer is responsible for any charges associated with helicopter or other unusual access requirements or expenses.

The terms and conditions of this SOW are an integral part of Motorola's Service Terms and Conditions or other applicable agreement to which it is attached and made a part thereof by this reference.

2.0 Motorola has the following responsibilities:

- 2.1 Notify the Customer of any possible System downtime needed to perform this service.
- 2.2 Physically inspect the Infrastructure Equipment in the system (equipment cabinets, general circuitry, fault indicators, cables, and connections).
- 2.3 Remove any dust, and/or foreign substances from the Infrastructure.
- 2.4 Clean filters, if applicable.
- 2.5 Measure, record, align, adjust the Infrastructure Equipment parameters in accordance with the manufacturer's service manuals and the Rules and Regulations of the Federal Communications Commission (FCC), where applicable.

3.0 Customer has the following responsibilities:

- 3.1 Provide preferred schedule for Network Preventative Maintenance to Motorola.
- 3.2 Authorize and acknowledge any scheduled System downtime.
- 3.3 Maintain periodic backup of databases, Software applications and Firmware.
- 3.4 Establish and maintain a suitable environment (heat, light, and power) for the Equipment location and provide the Servicer full, free, and safe access to the Equipment so that the Servicer may provide services. All sites shall be accessible by standard service vehicles.
- 3.5 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Network Preventative Maintenance services to Customer.

Conventional Network Preventative Maintenance Checklist

Conventional Infrastructure	Operational Check (where applicable)
Base Station(s), Repeater(s), Control Station(s)	Transmitter modulation,
	RF power output/reflected
	RF Frequency Measured/adjusted
	Receiver Sensitivity Measured/Adjusted
	Audio Input & Output Levels
	Combiner & Circulator Loss
	Receiver Desense (Full Duplex Only)
	Check Power Supply Voltages
Consoles Positions/Remotes	Audio Input & Output Levels
	Ethernet Operation
	Controller Power Supply Voltage, and AC Ripple
	Switches, Lights, CRT
	CEB Signal Levels
	Wiring and Grounding for each Position
	Check and Clean keyboards, CPU. CRT's
	CEB diagnostics
Comparators (Voting) and /or Satellite Receivers	Audio Input & Output Levels
	Receiver Sensitivity Measured/Adjusted
	Comparator power supply voltage
	Check for proper signal voting
Power UPS	Check Diagnostics/Alarms
	AC/DC Voltages/Batteries
	Switch-Over Operations
Generator	Switch to Generator Power
AC to DC Power Unit (RF equipment)	Switch to Battery Power
All Equipment	Check Diagnostics/Alarms
Other Equipment	Check all system printers
	Check all modems for proper levels & synchronization
	MBX/Other telco interface common equipment

Data – Network Preventative Maintenance Checklist

Data Infrastructure	Operational Check (where applicable)
Data Base Station (Quantar)	RSSI Calibration Check (-90)
	Transmit Frequency Adjustments
	Transmitter Deviation Adjustments
	Transmitter modulation Compensation
	Transmitter Power out and Adjustments
	Reflect Power Measurement
	Receiver Sensitivity Test
	Receive Antenna De-sense Test
MSF 5000 Base Stations	RSSI Calibration Check
	VCO Calibration Check (.38Micro Volt)
	Injection Filter Adjustments
	Pre-selector/Image Filter Adjustments
	Transmit Frequency Adjustments
	RF Power out Measurements
	RF Forward and Reflect Trip adjust
	Transmit Deviation Adjustments
	Receiver Sensitivity Test
	Transmitter modulation Compensation
Gemini Base Station	RSSI Calibration Check
	Transmit Frequency Adjustments
	RF Power out Measurements
	RF Forward and Reflect Trip adjust
	Transmit Deviation Adjustments
	Receiver Sensitivity Test
	Transmitter modulation Compensation
	Power Supply Voltage Check
	Power Supply Ripple Voltage Check
Radio Network Controllers	Power Supply In-take Fan
	Host connection check
	Message buffering
	RF Interface
	Base Interface
Wireless Network Gateway	Visually check system status and fault LEDs.
	Check SMIT for any module errors.
	Check each major modules
	Power Supply Voltage Check
	Visually check all cabling
	Capture all log and error reports
UDS/Paradyne Modems	Check for received line level
	Perform remote modem digital loopback test
	Check telco/microwave circuit
UPS	Check Batteries
	Switch-Over Operations
	AC/DC Voltages



SMARTNET Network Preventative Maintenance Checklist

SMARTNET Infrastructure	Operational Check (where applicable)
Repeater(s), Control Station(s)	Transmitter modulation,
	RF power output/reflected
	RF Frequency Measured/adjusted
	Receiver Sensitivity Measured/Adjusted
	Power Supplies
	Audio Input & Output Levels
	Combiner & Circulator Loss
	Receiver Desense (Full Duplex Only)
Consoles Positions/Remotes	Check Power Supply Voltages
	Audio Input & Output Levels
	Ethernet Operation
	CEB Power Supply Voltage, and AC Ripple
	Switches, Lights, CRT
	CEB Signal Levels
	Wiring and Grounding for each Position
	Check and Clean keyboards, CPU. CRT's
Central Controllers, DIGITAC Comparators	CEB Diagnostics
	Central Controller and Power Supplies
	T Bar Switched
	Simulcast Controller
	Simulcast Remote Controller
	Distribution Amp
	DIGITAC Comparator
	Receiver Multi-Couplers
	Check for receiver to Comparator audio path.
	Check to see if equalization is required.
	Check for proper audio to Status Tone ratio
GPS	Confirm that all Receiver RX Notch Filters are either IN or OUT
	Roll to Redundant Receive Reference Module
	Frequency Standards (check 1 PPS, 5 MPPS, composite)
Site Equipment	Check Power Supply Voltages
	Audio Network Analyzer
	Baseline Database Server
	System Manager Terminal
POWER UPS	Site Test/System Calibration Equipment
	Check Diagnostics/Alarms
	AC/DC Voltages/Batteries
	Switch-Over Operations
	Switch to Generator Power
	Switch to Battery Power
	Check Diagnostics/Alarms
Generator	
AC to DC Power Unit (RF equipment)	
All Equipment	
Other Equipment	Check Diagnostics/Alarms
	Check all system printers
	Check all modems for proper levels & synchronization
	MBX/Other telco interface common equipment



SmartZone -Network Preventative Maintenance Checklist

SmartZone Infrastructure	Operational Check (where applicable)
Repeater(s), Control Station(s)	Transmitter modulation
	RF power output/reflected
	RF Frequency Measured/adjusted
	Receiver Sensitivity Measured/Adjusted
	Audio Input & Output Level
	Check Low Speed Data
	Combiners & Circulator Loss
	Receiver Desense (Full Duplex Only)
	Power Supply voltages
Consoles Positions/Remotes	Audio Input & Output Level
	Ethernet Operation
	CEB Power Supply Voltage, and AC Ripple
	Switches, Lights, CRT
	CEB Signal Levels
	Wiring and Grounding for each Position
	Check and Clean keyboards, CPU. CRT's
	CEB Diagnostics
Central Controllers, DIGITAC Comparators	Central Controller and Power Supplies
	T Bar Switched
	Simulcast Controller
	Simulcast Remote Controller
	Distribution Amp
	DIGITAC Comparator
	Receiver Multi-Couplers and Tower Mounted Amplifier
	Check for receiver to Comparator audio path.
	Check for proper audio to Status Tone ratio
	Confirm that all Receiver RX Notch Filters are either IN or OUT
GPS	Roll to Redundant Receive Reference Module
	Check Frequency Standards
	Check Power Supply Voltages
Site Equipment	Audio Network Analyzer
	Baseline Database Server
	System Manager Terminal
	Site Test/System Calibration Equipment
Power UPS	Check Diagnostics/Alarms
	AC/DC Voltages/Batteries
	Switch-Over Operations
Generator	Switch to Generator Power
AC to DC Power Unit (RF equipment)	Switch to Battery Power
All Equipment	Check Diagnostics/Alarms
Other Equipment	Check all system printers
	Check all modems for proper levels & synchronization
	MBX/Other telco interface common equipment



ASTRO® LE -Network Preventative Maintenance Checklist

Astro LE Infrastructure	Operational Check (where applicable)
CO-LOCATED/REMOTE SITE Repeater(s), Control Station(s) Site Controllers Router/Switches All Equipment	
	TX Frequency in Hz
	TX Power Output of Station (Forward/Reflected)
	TX Power Output out of Combiner (Forward/Reflected)
	TX Low Speed Deviation
	TX Test Pattern Deviation
	TX BER
	RX Tower/Rack Mounted Amplifier
	RX RF Level at 5% BER at Receiver and Through Multi-Coupler
	Receiver Desense/ Degradation do to Site Noise and TX Desense
	Wireline Audio Input & Output Levels
	Check Lights/Fan Operation
	Check/Align Frequency Standard
	Roll to Redundant Controller (pre-approved by customer)
	Test Site Trunking/Failsoft Modes (pre-approved by customer)
	Multiple Control Channel Switching (pre-approved by customer)
	Check Lights/Fan Operation
	Check Diagnostics/Alarms
	Power Supply Voltages
MASTER/PRIME SITE (RF Equipment) Master/Prime Site Controllers Router/Switches ASTRO-TAC Comparators Channel Bank	
	Check Lights/Fan Operation
	Roll to Redundant Controller (pre-approved by customer)
	Check Lights/Fan Operation
	Check for receiver to Comparator audio path
	ACTAC 9600 Comparator All sites on line? V.24 link health-link delays
	Channel Bank/ transport health for all sites (diagnostics/alarms)
	Roll to Redundant Power Supply (pre-approved by customer)
MASTER/PRIME SITE (Servers)	Site Control Manager/Site Command Server (Clients)
	Backup Databases
	Terminal Server
	Remote Access Test
GPS	Roll to Redundant Receive Reference Module (pre-approved by customer)
	Frequency Standards (check 1 PPS, 5 MPPS, composite)
	Check Power Supply Voltages
POWER UPS Generator	Check Diagnostics/Alarms
	AC/DC Voltages/Batteries
	Switch-Over Operations
	Switch to Generator Power (pre-approved by customer)



AC to DC Power Unit (RF equipment)	Switch to Battery Power (pre-approved by customer)
	Check Diagnostics/Alarms
All Equipment	
TRUNKING TEST (Completed at all Sites)	Talkgroup Call
	Multigroup Call
	Private Call
	Secure Call



ASTRO® 25 ARC4000, 6.x, & 7.x Network Preventative Maintenance Checklist

ASTRO® 25 ARC4000, 6.x, & 7x	Operational Check (where applicable) Reference existing site PM documents for exact measurements
CO-LOCATED/REMOTE SITE Repeater(s), Control Station(s)	TX Frequency in Hz TX Power Output of Station (Forward/Reflected) TX Power Output out of Combiner (Forward/Reflected) TX Low Speed Deviation TX Test Pattern Deviation TX BER RX Tower/Rack Mounted Amplifier RX RF Level at 5% BER at Receiver and Through Multi-Coupler Receiver Desense/ Degradation do to Site Noise and TX Desense Wireline Audio Input & Output Levels
Site Controllers	Check Lights/Fan Operation Check/Align Frequency Standard Roll to Redundant Controller (pre-approved by customer) Test Site Trunking/Failsoft Modes (pre-approved by customer) Multiple Control Channel Switching (pre-approved by customer)
Router/Switches	Check Lights/Fan Operation
All Equipment	Check Diagnostics/Alarms Power Supply Voltages
MASTER/PRIME SITE (RF Equipment) Master/Prime Site Controllers	Check Lights/Fan Operation Roll to Redundant Controller (pre-approved by customer)
Router/Switches	Check Lights/Fan Operation
ASTRO-TAC Comparators	Check for receiver to Comparator audio path ACTAC 9600 Comparator All sites on line? V.24 link health- link delays
Channel Bank	Channel Bank/ transport health for all sites (diagnostics/alarms) Roll to Redundant Power Supply (pre-approved by customer)
MASTER/PRIME SITE (Servers)	Master Site Servers health (diagnostics/alarms) Complete backup of databases Roll to Redundant Zone Controller (pre-approved by customer)
Misc Equipment	Remote Access Test Check all modems for proper levels & synchronization MBX/Other telco interface common equipment
GPS	Roll to Redundant Receive Reference Module (pre-approved by customer) Frequency Standards (check 1 PPS, 5 MPPS, composite) Check Power Supply Voltages
POWER UPS	Check Diagnostics/Alarms AC/DC Voltages/Batteries Switch-Over Operations
Generator	Switch to Generator Power (pre-approved by customer)
AC to DC Power Unit (RF equipment)	Switch to Battery Power (pre-approved by customer)
All Equipment	Check Diagnostics/Alarms



CONSOLES POSITIONS/REMOTES	Audio Input & Output Level
	Ethernet Operation
	CEB/MCC Power Supply Voltage, and AC Ripple
	Switches, Lights, CRT
	CEB/MCC Signal Levels
	Wiring and Grounding for each Position
	Check and Clean keyboards, CPU. CRT's
	CEB/AEB/MCC diagnostics
TRUNKING TEST (Completed at all sites)	Talkgroup Test
	Multigroup Call
	Private Call
	Secure Call

E911 System Exhibit

Infrastructure Type	Operational Check (when applicable)
ANI Controller	Power supply check -DC Voltage
	Processor card battery test
	Review of advisory log
	Inspect phone, handsets, cords, touch tone pads, lights, and telephone instruments at main PSAP and remote location.
	Test operation of each 911 trunk and administrative phone line
	Check ANI cable routing and verify all connections (tighten cable/connector strain relief devices, review punch block wiring)
	Verify dial-up access
	Verify any spare circuit boards are operational
	Inspect ANI cabinets (ventilation/cooling, secure covers)
ALI Controller	Verify no alarm status on call screen. Check alarm/event log
	Check size of call detail records, purge if necessary
	Size of hard space remaining and advise customer. Purge if necessary.
	Test operation of all servers, terminals/clients printers, at main PSAP and remote locations
	Make test 911 calls to verify ALI information is properly displayed on all terminals/clients at main PSAP and remote locations
	Verify any spare ALI equipment or devices are operational
	If system uses local ALI or TSL, verify system properly receives Telco subscriber updates as required
	Check ALI cable routing and verify all connections (tighten cable/connector strain relief devices where necessary)
	Inspect all computer and terminal equipment (fans, vents, keyboards, CRTs, etc) .
	Verify ALI components are receiving proper ventilation/cooling
Other	Generate test alarm and verify that Motorola NMO receives outbound alarms for Site Sentry Device (SEB)
	Verify inbound remote maintenance access of both ANI and ALI functions through all remote access devices (SEB or maintenance modems)
	Check and verify proper installation of all grounding cables and connectors.
	Verify operational status of surge suppression equipment
	Verify operational status of standby power systems (UPS equipment, AC generators)



Statement of Work

NICE Gold Maintenance without remote access

Overview

Motorola utilizes NICE equipment to provide a complete, reliable and robust solution for Customer audio recording requirements.

1.0 Description of Services

Motorola System Support Center (SSC) will initiate the Customer service request to NICE Systems, Inc. (NICE). NICE will deliver services identified in the NICE Gold Maintenance tables provided in this SOW. Post warranty services provided by NICE include phone coverage, on site support and hardware support for applicable NICE IP Logging Equipment integrated within a Motorola network or MCC 7500 console site.

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Terms and Conditions or other applicable Agreement to which it is attached and made a part thereof by this reference.

2.0 Motorola has the following responsibilities:

- 2.1 Respond to request for post warranty support for the Restoration of a failed System.
- 2.2 Collect model, serial number information, customer name and customer contact.
- 2.3 Provide a case number.
- 2.4 Contact NICE support and provide them with customer, case number, model, and serial number information. NICE will contact the customer/field team and work the issue to completion.
- 2.5 Advise caller of procedure for determining any additional requirements.
- 2.6 Coordinate resolutions with agreed upon third party vendor.
- 2.7 Close the case once the NICE issue has been resolved.

3.0 Customer has the following responsibilities:

- 3.1 Contact Motorola System Support Center (SSC) to initiate a service request.
- 3.2 Provide model and serial number.
- 3.3 Provide a contact name and contact phone number.

4.0 NICE has the following responsibilities:

- 4.1 Provide repair return authorization numbers to Customer.
- 4.2 Provide services in accordance with Table 1, per the time zone where the equipment resides, Monday through Friday, excluding holidays, and within the normal response times.
- 4.3 Receive malfunctioning hardware from Customer and document its arrival, repair and return.
- 4.4 Perform the following service on NICE hardware:
 - 4.4.1. Replace malfunctioning components. NICE will use commercially reasonable efforts to repair or replace, in its discretion, any hardware found to be defective under normal and proper use and service during the contract period. An in-coverage unit will be repaired and returned at no charge except for under the following conditions:
 - (1) The unit has been modified or damaged due to improper packaging; or
 - (2) If a unit is received for repair and found operable in accordance with current NICE standards, it will be classified as "no trouble found" and it will be returned in the same condition in which it was received.

- 4.5 Coordinate any repair activity with Motorola and Customer to ensure resolution
- 4.6 On site reporting the NICE service provider (SP) will:
 - 4.6.1. Arrive at the Customer site and go directly to the Customer contact
 - 4.6.2. When SP is ready to leave, notify the Customer contact
 - 4.6.3. Provide verbal reports to the Customer contact on all work complete and in progress by NICE
 - 4.6.4. Sign out and leave with the Customer contact a visit report of the work accomplished by NICE and the outstanding issues
- 4.7 Provide to the Customer contact within one (1) week of the on site visit a follow-up report on any outstanding issues
- 4.8 Contact Motorola System Support Center to close the case
- 4.9 Perform services according to NICE service priorities

Table 1

This option is available to customers where the location of the equipment is within 4-hour drive time to most major metropolitan areas (identified at the time of purchase).

Support Coverage	Twenty-four (24) hours, seven (7) days per week
Call Back Response Time	Sixty (60) minutes after receipt of call from authorized representative
On-Site Response Time for Priority 1 Service Issues	Four (4) hours

Gold Available within a 4 Hour Drive Time	Priority 1	Priority 2	Priority 3	Priority 4
Phone Availability	24*7	24*7	24*7	24*7
Support Coverage	24*7	24*7	24*7	24*7
Call Back Response Time	60 minutes	120 minutes	24 hours	24 hours
On Site Response Times*	4 hours	24 hours	48 hours	48 hours

**On Site Response Time are in effect following the determination that on site support is required. Repair parts are shipped overnight, unless otherwise pre-arranged. The arrival of the technician and the shipped parts will be coordinated to coincide.*

Priority 1 – Critical Failure – In a 100% recording environment, any failure of equipment, NICE software or communications to the NICE products which results in loss of recording channels or data, or if allowed to persist will result in such recording loss.

Priority 2 – Major Problem – Any problem resulting in loss of ability to retrieve calls or loss of replay functionality for two or more workstations.

Priority 3 – Product Anomaly – Any problem affecting one or more workstations which does not result in a loss of recording or replay but nevertheless results in diminished Product response or performance, for example if an administrator loses the ability to add or delete users.

Priority 4 – System Inquiry, planned intervention or request for information.

4.10 Software Upgrades- NICE's standard maintenance services shall include installation of only such software updates to the NICE software which, in NICE's sole discretion, are necessary to ensure efficient operation of the products ("NICE Software Updates"). NICE will provide Customer with a version of the NICE Software Update for Customer to review and authorize for installation. Upon such installation, Customer shall receive a copy of all written materials necessary to allow Customer to operate such NICE Software Updates. All NICE Software Updates are licensed for use solely on the Equipment on which the relevant NICE Software was first installed.

5.0 Ineligible Products-Additional Service fees shall apply for any maintenance provided by NICE for any and all individual products that are damaged by causes not caused directly by the gross negligence or intentional misconduct of NICE and external to the relevant individual product, including without limitation, damages to a individual product caused by: (i) neglect, mishandling, misuse and/or unauthorized repair by anyone other than NICE or a NICE certified technician; (ii) failure to maintain the Site in accordance with NICE's installation site specifications ("Installation Site Specifications"); (iii) relocation from the Site specified by the parties; (iv) use by anyone other than NICE or a NICE certified technician for purposes other than those for which it was designed, as described in the applicable documents, Operating Manuals and/or specifications provided by NICE; (v) use by anyone other than NICE or a NICE certified technician or material or supplies, including without limitation software and firmware programming, that do not meet NICE's specifications and instructions; (vi) use of the Products with any Non-Nice Hardware and/or (vii) an accident, transportation, improper cooling or humidity control, failure to telephone equipment or communication lines, failure or fluctuation of electrical power, other unusual physical or electrical stress and/or failure of interconnect equipment not provided by NICE or a NICE certified technician.

6.0 In addition to any exclusions set forth in Section 7.0 below or in any other underlying Agreement to which this SOW is attached, the following items are excluded:

1. All Infrastructure older than seven (7) years from product cancellation date
2. Physically damaged Infrastructure
3. Third party Equipment not shipped by Motorola
4. Consumable items including, but not limited to, batteries, connectors, cables, tone/ink cartridges
5. Test Equipment
6. Racks, furniture and cabinets
7. Firmware and/or Software upgrades

7.0

Data System Infrastructure	Inclusions, Exclusions, Exceptions and Notes for Infrastructure Repair
Logging Recorder	Includes NICE IP logging recorders Excludes all other technologies
Rack Mounts/Shelves	Includes NICE rack mount/shelf ONLY Excludes all other technologies
Replay Station	Excluded
Servers/Storage Center	Includes NICE servers/storage centers ONLY Excludes all other technologies
Workstation	Excluded

Servicer Statement of Work

OnSite Infrastructure Response With Local Dispatch

The Servicer will provide OnSite Infrastructure Response services to the Customer. The relationship between Motorola and the Servicer shall be as set forth in this Statement of Work (SOW). Subcontracts for OnSite Infrastructure Response will be electronically posted by Motorola on Motorola's website for Servicers.

Motorola reserves the right to alter, amend or change the scope of work with 30 days written notice to Servicer. All terms or Attachment C-Service Subcontract will remain in full force and effect during the term and any subsequent terms of this SOW.

- 1.0 Description of Service
OnSite Infrastructure Response provides for on-site technician Response by the Servicer. The Servicer will respond to the Customer location based on pre-defined Severity Levels set forth in the Severity Definitions Table and Response times set forth in the Response Time Table in order to Restore the System. .
- 2.0 Motorola has the following responsibilities:
 - 2.1 Provide the following Customer information to Servicer:
 - 2.1.1 Customer name, contact and address
 - 2.1.2 System type and Equipment descriptions
 - 2.1.3 Site identification (site names, site ids, addresses and zip codes)
 - 2.1.4 Site access requirements
 - 2.1.5 Provide Equipment list including type and quantity, when available.
 - 2.2 Provide technical support, when requested.
 - 2.3 Provide Infrastructure/Component/FRU if Customer has purchased and malfunctioning Infrastructure is covered under service agreement with IDO such as Infrastructure Repair or Infrastructure Repair with Advanced Replacement
- 3.0 Servicer has the following responsibilities:
 - 3.1 Receive service request Continuously from Customer.
 - 3.2 Assign technical resources and provide estimated time of arrival (ETA) to Customer.
 - 3.3 Respond to the Customer site within Response time commitment set forth in the Response Time Table
 - 3.4 Maintain virus protection software, operating system patches for any equipment that may interact with the Customers System Equipment.
 - 3.5 Servicer will perform the following on-site:
 - 3.5.1 Run diagnostics on the Infrastructure or FRU.
 - 3.5.2 Replace defective Infrastructure or FRU, as applicable. Customer, Servicer or Motorola may provide Infrastructure or FRU. If IDO is providing the FRU, Servicer is responsible for requesting the return authorization.
 - 3.5.3 Provide materials, tools, documentation, physical planning manuals, diagnostic/test equipment and any other requirements necessary to perform the Maintenance service.
 - 3.5.4 If a third party Vendor is needed to Restore the System, the Servicer should accompany Vendor onto the Customer's premises.
 - 3.6 Call Customer upon Restoration and request Verification. If Customer cannot be contacted within twenty (20) minutes, the Servicer is released from the Customer site. Provide service ticket document to Customer and to Motorola representative upon request. Service ticket documentation shall include:
 - 3.6.1 Resolution action.
 - 3.6.2 Technical information on application product or system
 - 3.6.3 Defective FRU or part number (model #) used
 - 3.7 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide this service to Customer.

Severity Definitions Table

Severity Level	Problem Types
Severity 1	- Response is provided Continuously - Major System failure 33% of System down 33% of Site channels down - Site Environment alarms (smoke, access, temp, AC power. - This level is meant to represent a major issue that results in an unusable system, sub-system, Product, or critical features from the Customer's perspective. No Work-around or immediate solution is available.
Severity 2	- Response during Standard Business Day - Significant System Impairment not to exceed 33% of system down - System problems presently being monitored - This level is meant to represent a moderate issue that limits a Customer's normal use of the system, sub-system, product, or major non-critical features from a Customer's perspective
Severity 3	- Response during Standard Business Day - Intermittent system issues - Information questions - Upgrades/Preventative maintenance - This level is meant to represent a minor issue that does not preclude use of the system, sub-system, product, or critical features from a Customer's perspective. It may also represent a cosmetic issue, including documentation errors, general usage questions, recommendations for product enhancements or modifications, and scheduled events such as preventative maintenance or product/system upgrades.

Response Times Table

Severity Level	Regular Response Time	Premier Response Time	Limited Response Time
Severity 1	Within 4 hours from Notification Continuously	Within 2 hours from Notification Continuously	Within 4 hours from Notification Standard Business Day
Severity 2	Within 4 hours from Notification Standard Business Day	Within 4 hours from Notification Standard Business Day	Within 4 hours from Notification Standard Business Day
Severity 3	Within 24 hours from Notification Standard Business Day	Within 24 hours from Notification Standard Business Day	Within 24 hours from Notification Standard Business Day



Statement of Work

Security Update Service (SUS)

1.0 Definitions

Terms that are capitalized but not defined in this Statement of Work shall have the definition given to such terms in the Service Terms and Conditions, the Communications System Agreement or other applicable agreement. The following terms have the following meanings:

1.1 Non-Motorola Software: Software whose copyright is owned by a party other than Motorola or its affiliated company, including but not limited to the anti-virus definitions, operating system software patches and signature files that will be pre-tested pursuant to this Statement of Work.

1.2 System: The currently shipping Motorola ASTRO® 25 System Release and up to 5 releases prior.

1.3 Supported Release: Security Update Service is available on the currently shipping Motorola ASTRO® 25 System Release and up to 5 releases prior. If a customer is on a System Release outside of the N-5 release schedule, then they cannot purchase this service.

2.0 Description of Services

With Security Update Service (“Service”), Motorola pretests the updated commercial anti-virus definitions for the Microsoft Windows based boxes on a System. This Service includes Motorola obtaining Microsoft Security Updates for Windows operating system, Solaris recommended patch bundles, Red Hat Linux security patches, anti-virus definitions* and intrusion detection sensor updates for Motorola supplied equipment from applicable original equipment manufacturer (OEM).

Motorola will evaluate and pre-test each update on Motorola’s ASTRO 25 test System components for operational impact. Motorola’s verification and evaluation process for anti-virus definitions will consist of applying each update to an appropriate ASTRO 25 system release that corresponds and is consistent with supported** and fielded systems.

Each assessment will consist of no less than 36 hours of examination time to evaluate the impact each anti-virus update has to the system. Upon satisfactory completion of the assessment pertaining to anti-virus signatures, these updates will be provided on a weekly basis either automatically or through connecting to Motorola’s secured extranet connection. When anti-virus definitions classified as Category 4 (Severe, difficult to contain) and Category 5 (Very Severe, very difficult to contain) by the commercial



supplier are released, Motorola will determine if a high-priority release is necessary. Operating system updates/patches will be made available to our customers electronically upon successful testing in our lab environments on a monthly basis for Microsoft patches and on a quarterly basis for all others.

NOTICE: If a customer wants antivirus and IDS updates automatically deployed onto their network, then they must purchase the Security Monitoring service. Otherwise, customers may download the updates from the secure extranet site and manually deploy them onto their network. Motorola will perform testing only on standard configurations certified by Motorola System Integration Testing (SIT) and Motorola supplied equipment/software prior to making an update available to Customers.

* - Not all systems are provided antivirus for Microsoft and UNIX platforms. To receive full antivirus support under this service offering, the customer must have a standard ASTRO 25 system that is supported and also has implemented antivirus for UNIX.

** - Supported is defined as the current system release and the last five prior. Support beyond this model requires approval from the Customer Service Manager and the Security Services Product Manager. For extended coverage, please communicate a formal request to your account manager.

The customer will be responsible for deploying Microsoft, Oracle, Sun Microsystems, UNIX, and Linux security updates from a Motorola provided secured extranet Web site. Antivirus and IDS updates will be capable of being pushed automatically to the customer ASTRO25 network only if the Security Monitoring service is purchased by the customer. If there is a recommended configuration change that is successfully tested on the ASTRO 25 test System, Motorola will provide detailed instructions for performing the configuration change.

Inclusions: Security Update Service is available on the currently shipping Motorola ASTRO 25 System Release and up to 5 releases prior. If a customer is on a System Release outside of the N-5 release schedule, then they cannot purchase this service.

Exclusions: Systems that have non-standard configurations that have not been certified by Motorola SIT are specifically excluded from this Service unless otherwise agreed in writing by Motorola. Service does not include pre-tested intrusion detection system (IDS) updates for IDS solutions not purchased through Motorola. NICE Recorder, certain consoles, MARVLIS, Symbol Equipment, AirDefense Equipment, AVL, and Radio Site Security products are also excluded. The scope of service coverage is defined by Motorola Services and is subject to change based on OEM support lifecycles. The terms and conditions of this Statement of Work are an integral part of Motorola's Service Terms and Conditions or other applicable Agreement to which it is attached and made a part thereof by this reference.



3.0 Motorola has the following responsibilities:

3.1 Obtain anti-virus definitions for the Microsoft Windows platform, intrusion detection sensor signatures for Motorola supplied IDS, Microsoft Security Updates for Windows Operating system, Solaris operating system recommended patch bundles, and Red Hat Linux security patches from Motorola selected commercial suppliers.

3.2 Evaluate anti-virus definitions classified as Category 4 and 5 by Motorola selected commercial supplier to determine if a high-priority release is required. Motorola in its discretion will determine the urgency of the update based on the impact to the System.

3.3 Identify and document latest System vulnerabilities and compliance issues discovered during quarterly vulnerability scan performed in Section 3.4.

3.4 Investigate new vulnerabilities and compliance issues that are identified. Recommended response may include, but is not limited to, ASTRO 25 Systems, deploy security software updates; deploy operating system security updates or patches; implement configuration changes; upgrade to current ASTRO 25 System Release (actual upgrade expense not included in this service offering); or recommending a compensating control.

3.5 Pre-test recommended remediation when applicable and make documentation and/or software updates available to Customer electronically.

3.6 Provide documented response with recommended remediation when applicable for all new vulnerabilities quarterly or at Motorola's discretion to Customer electronically.

3.7 Test anti-virus definitions, intrusion detection sensor signatures, and operating system security updates/patches by deploying them on a dedicated ASTRO 25 test System with the standard supported configurations, which include Motorola's then current approved cohabitated applications.

3.8 Confirm that tested anti-virus definitions, intrusion detection sensor signatures, and operating system security updates/patches do not degrade or compromise System functionality on dedicated test System within the standard supported configurations.

3.9 Address issues identified during testing to support functionality under the procedures specified in 3.8 above by working with Motorola selected commercial supplier or Motorola product development engineering team.

3.10 Release pre-tested anti-virus definitions and intrusion detection sensor signatures for Motorola supplied IDS electronically on a weekly basis upon successful completion of the weekly test cycle to be completed one week after release by commercial supplier unless an issue is detected or within 36 hours from Motorola selected commercial supplier's Category 4 & 5 certified virus definitions being available or at Motorola's discretion if determined by Motorola to be a high-priority release. Release may include



the anti-virus definition file, intrusion detection sensor signatures, updated configuration files, instructions and other information deemed pertinent by Motorola.

3.11 Release Microsoft, Solaris and Red Hat Linux operating system security patches/updates when they are certified and available with instructions for obtaining patch/update for Customer deployment on the Customer system. Microsoft operating system security updates will be released monthly as available from Motorola selected commercial supplier upon successful completion of monthly test cycle. Solaris and Red Hat Linux operating system security patches will be released quarterly upon successful completion of quarterly test cycle or at Motorola's discretion.

3.12 Notify Customer when the latest release is available with instructions on where to obtain latest release.

3.13 Provide technical assistance if there is an issue with the installation of an update.

3.14 Maintain annual Customer subscriptions for anti-virus definitions and intrusion detection sensor signatures, with Motorola selected commercial supplier.

4.0 Customer has the following responsibilities:

4.1 Provide means for accessing pre-tested files electronically.

4.2 Deploy pre-tested files on Customer System as instructed in the "Read Me" text provided.

4.3 Implement recommended remediation(s) on Customer System as determined necessary by Customer.

4.4 Upgrade System to a Supported System Release as necessary to continue Service.

4.5 Identify one point of contact for issues specific to Security Update Service.

4.6 Cooperate with Motorola and perform all acts that are reasonable and/or necessary to enable Motorola to electronically provide Security Update Service – Platinum to Customer.

4.7 Comply with the terms of the applicable license agreement between Customer and the Non-Motorola Software copyright owner.

4.8 Adhere closely to the System Support Center (SSC) troubleshooting guidelines provided upon system acquisition. A failure to follow SSC guidelines may cause Customer and Motorola unnecessary or overly burdensome remediation efforts that may result in a service fee to Customer.



5.0 WARRANTIES AND DISCLAIMER:

Motorola warrants that its services will be free of defects in materials and workmanship for a period of ninety (90) days following completion of the service. Your sole remedies are to require Motorola to re-perform the affected service or at Motorola's option to refund, on a pro-rata basis, the service fees paid for the affected service.

During the applicable Warranty Period, Motorola warrants that the tested anti-virus definitions, intrusion detection sensor signatures, and operating system security updates/patches do not degrade or compromise System functionality, and that after incorporation of the recommended remediation action the System Software, when used properly and in accordance with the Documentation, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the Software. Product and Software documentation that specifies technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which this information is provided) are collectively referred to as "Documentation." Whether a defect occurs will be determined solely with reference to the Documentation. Motorola does not warrant that Customer's use of the Software or Products will be uninterrupted or error-free or that the Software or the Products will meet Customer's particular requirements.

MOTOROLA DISCLAIMS ALL OTHER WARRANTIES WITH RESPECT TO PRE-TESTED ANTI-VIRUS DEFINITIONS, DATABASE SECURITY UPDATES, OPERATING SYSTEM SOFTWARE PATCHES, AND INTRUSION DETECTION SENSOR SIGNATURE FILES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT. FURTHER, MOTOROLA DISCLAIMS ANY WARRANTY CONCERNING THE NON-MOTOROLA SOFTWARE AND DOES NOT GUARANTEE THAT CUSTOMER'S SYSTEM WILL BE ERROR-FREE OR IMMUNE TO VIRUSES OR WORMS AS A RESULT OF THESE SERVICES.

Statement of Work

Service From the Start - LITE

End Users

1.0 Description

Service From the Start-LITE provides board level service for the Equipment that is specifically named in the applicable agreement to which this Statement of Work (SOW) is attached or any of the agreement's subsequent revisions. Services are performed at the Radio Support Center (RSC), or Federal Technical Support Center.

In addition to Equipment specifically named in the applicable agreement to which this Statement of Work is attached, Service From the Start LITE includes service on single mobile control heads provided that they are required for normal operation of the Equipment and are included at the point of manufacture.

Service From the Start LITE excludes repairs to: optional accessories; standard mobile palm microphones; non-standard mobile microphones; iDEN accessories; iDEN mobile microphones; portable remote speaker microphones; optional or additional control heads; mobile external speakers; single and multiple unit portable chargers; batteries; mobile power and antenna cables; mobile antennas; portable antennas, and power supplies. Engraving service is not covered under standard Service From the Start LITE. This service does not cover defects, malfunctions, performance failures or damage to the unit resulting from physical, liquid, or chemical damage. An estimate for non-covered repairs will be provided for units displaying extensive damage.

Service From the Start LITE is non-cancelable and non-refundable. If Equipment is added to the agreement subsequent to the Start Date, these units are also non-cancelable and non-refundable for the agreement duration. All Equipment must be in good working order on the Start Date or when additional Equipment is added to the agreement. Equipment may only be added to the agreement, via a customer signed or emailed Motorola Inventory Adjustment Form (IAF). Complete and accurate serial numbers and model descriptions must be supplied.

All inventory adjustment requests for add-on subscriber units received prior to the 15th of the month will be effective the 1st of the following month. Equipment add-on requests received after the 15th of the month will be effective the 1st of the next succeeding month.

Equipment deletions from the agreement may only be deleted under the following limited conditions:

- a) Equipment was stolen and proof of theft is provided to Motorola; or
- b) Motorola determines Equipment is damaged beyond repair; or
- c) Motorola determines Equipment is no longer supportable or is obsolete; or
- d) Equipment had already been under a previous contract for at least the twelve month requirement.

Equipment deletions, where applicable, will be effective at the end of the month in which the request was received.

The terms and conditions of this Statement of Work are an integral part of the Motorola Service Agreement or other applicable agreement to which it is attached and made a part thereof by this reference. If there are any inconsistencies between the provisions of the Motorola Service Agreement or other applicable agreement and this Statement of Work, the provisions of this Statement of Work shall prevail.

2.0 Motorola has the following responsibilities:

- 2.1 Test and Restore the Equipment to Motorola factory specifications, including Factory Mutual (FM), and Mine Hazard Safety Association (MHSA).
- 2.2 Reprogram Equipment to original operating parameters based on the Customer template, if retrievable, or from a Customer supplied backup. If the Customer template or code plug is not usable, a generic template or code plug utilizing the latest Radio Service Software (RSS) or Customer Programming Software (CPS) version for that Equipment will be used. The Equipment will require additional programming by the Customer to Restore the original template. All Firmware is upgraded to the latest release for each individual product line.
- 2.3 Clean external housing of the Equipment. External components of unit will only be replaced when functionality has been diminished.
- 2.4 Pay the outbound freight charges. Motorola will pay the inbound freight charges if the Customer uses the Motorola designated delivery service.
- 2.5 Provide the Motorola repair request and Inventory Adjustment Form (IAF) via Motorola On Line (MOL).
- 2.6 Process inventory adjustment requests received by email or fax from Customer. If the request is received by email, Motorola will email an acknowledgement to the sender.
- 2.7 Perform covered services as requested by Customer on the Motorola repair request form.
- 2.8 If applicable, notify Customer of changes in Motorola designated inventory adjustment email address or fax number.

3.0 Customer has the following Responsibilities:

- 3.1 Supply Motorola complete and accurate serial numbers and model description.
- 3.2 Utilize the Motorola designated delivery service program to obtain Motorola payment for inbound shipping
- 3.3 Access the Motorola repair request form and Inventory Adjustment Form (IAF) through Motorola On Line (MOL).
- 3.4 Initiate service request via Motorola On Line (MOL) or complete a Motorola repair request form with contract number referenced, and submit with each unit of Equipment sent in for service. Mobile control heads or accessory items sent in must reference the serial number of the main unit.
- 3.5 If desired, supply Motorola with a Software template or programming in order to assist in returning the Equipment to original operating parameters. This step must be completed for Equipment that will not power up. If applicable, record the current flashcode for each radio.
- 3.6 If Motorola must utilize a generic template or code plug to Restore Equipment to operating condition, Customer is responsible for any programming required to Restore Equipment to desired parameters.
- 3.7 Provide a signed or emailed Motorola Inventory Adjustment Form (IAF) for all Equipment additions.
- 3.8 Local services or annual maintenance required for maintaining normal operation of the equipment, unless specified on the service agreement.



Statement of Work

Technical Support Service

1.0 Description of Services

The Technical Support service provides centralized remote telephone support for technical issues that require a high level of communications systems expertise or troubleshooting on Equipment. The Motorola System Support Center's (SSC) Technical Support Operation is staffed with technologists who specialize in the diagnosis and resolution of system performance issues. Technical Support Service: (i) does not include software upgrades that may be required for issue resolution; (ii) does not include Customer training; (iii) is only available for those system types supported and approved by Technical Support Operations and (iv) limited to Infrastructure currently supported by Motorola,

Technical Support is applicable to the following system types: ASTRO®, ASTRO® 25, ARC 4000, SmartZone® v2.0.3 and higher, SmartZone®/OmniLink®, E911, Private Data v2.0.3 and higher, SmartNet®, Conventional Two-Way, Wireless Broadband and Digital In-Car Video.

The terms and conditions of this Statement of Work (SOW) are an integral part of Motorola's Service Terms and Conditions or other applicable Agreement to which it is attached and made a part thereof by this reference.

2.0 Motorola has the following responsibilities:

- 2.1. Respond to requests for Technical Support for the Restoration of failed Systems and diagnosis of operation problems in accordance with the response times set forth in the Remote Technical Support Response Times Table and the Severity Level defined in the Severity Definitions Table.
 - 2.1.1. If Infrastructure is no longer supported by Motorola, Technical Support will diagnosis the System but may not be able to resolve the issue without the Customer replacing the Infrastructure.
- 2.2. Advise caller of procedure for determining any additional requirements for issue characterization, and Restoration which includes providing a known fix for issue resolution when available.
- 2.3. Attempt remote access to System for remote diagnostics, when possible.
- 2.4. Maintain communication with the Servicer or Customer in the field until close of the Case, as needed.
- 2.5. Coordinate technical resolutions with agreed upon third party Vendor(s), as needed.
- 2.6. Escalate and manage support issues, including Systemic issues, to Motorola engineering and product groups, as applicable.
- 2.7. Escalate the Case to the appropriate party upon expiration of a Response time.
- 2.8. Provide Configuration Change Support and Work Flow changes to Systems that have dial in or remote access capability.
- 2.9. Determine, in its sole discretion, when a Case requires more than the Technical Support services described in this SOW and notify Customer of an alternative course of action.

3.0 Customer has the following responsibilities:

- 3.1. Provide Motorola with pre-defined information prior to Start Date necessary to complete Customer Support Plan.
 - 3.1.1. Submit changes in any information supplied in the Customer Support Plan to the Customer Support Manager.
- 3.2. Contact the SSC in order to access the Technical Support Operation, provide name of caller, name of Customer, System ID number, Service Agreement number, site(s) in questions, and brief description of the problem.
- 3.3. Supply on-site presence when requested by System Support Center.
- 3.4. Validate issue resolution prior to close of the Case.



- 3.5. Allow Motorola remote access to the System by equipping the System with the necessary Connectivity.
- 3.6. Remove video from Digital In-Car Video equipment prior to contacting Motorola. If Technical Support assists the Customer in removing video, the Customer acknowledges, understands and agrees that Motorola does not guarantee or warrant that it will be able to extract any captured video or that any captured video will not be damaged, lost or corrupted.
- 3.7. Acknowledge that Cases will be handled in accordance with the times and priorities as defined in Remote Technical Support Response Times Table and the Severity Level defined in the Severity Definitions Table.
- 3.8. Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide the Technical Support service to Customer.

Severity Definitions Table

Severity Level	Problem Types
Severity 1	▪ Response is provided Continuously ▪ Major System failure ▪ 33% of System down ▪ 33% of Site channels down ▪ Site Environment alarms (smoke, access, temp, AC power). ▪ This level is meant to represent a major issue that results in an unusable system, sub-system, Product, or critical features from the Customer's perspective. No Work-around or immediate solution is available.
Severity 2	▪ Response during Standard Business Day ▪ Significant System Impairment not to exceed 33% of system down ▪ System problems presently being monitored ▪ This level is meant to represent a moderate issue that limits a Customer's normal use of the system, sub-system, product, or major non-critical features from a Customer's perspective
Severity 3	▪ Response during Standard Business Day ▪ Intermittent system issues ▪ Information questions ▪ Upgrades/preventative maintenance ▪ This level is meant to represent a minor issue that does not preclude use of the system, sub-system, product, or critical features from a Customer's perspective. It may also represent a cosmetic issue, including documentation errors, general usage questions, recommendations for product enhancements or modifications, and scheduled events such as preventative maintenance or product/system upgrades.

Remote Technical Support Response Times Table

SEVERITY	RESPONSE
Severity 1	Within 1 Hour from receipt of Notification, Continuously
Severity 2	Within 4 Hours from receipt of Notification, Standard Business Day
Severity 3	Within next Business Day, Standard Business Day

Exhibit E

System Upgrade Agreement Statement of Work



STATEMENT OF WORK

ASTRO 25 SYSTEM UPGRADE AGREEMENT II (SUA II)

1.0 Description of Service and Obligations

- 1.1 As major system releases become available, Motorola agrees to provide the system owner with the software, hardware and implementation services required to execute up to one system infrastructure upgrade in a two-year period for their ASTRO 25 system. Additionally, if purchased, the Security Update Service (SUS) coverage is defined in Appendix C.
- 1.2 The parties agree that the system owner will have, at their option, the choice of upgrading in either Year 1 or Year 2 of the coverage period. To be eligible for the ASTRO 25 System Upgrade Agreement II, the ASTRO 25 system must be at system release 7.7 or later.
- 1.3 Motorola agrees to provide minor software upgrades, known as “patch releases”, which may include commercial Operating Software (“OS”) and application software patches and service pack updates when and if available. Currently, the parties acknowledge that Motorola’s service includes Microsoft Windows and Server OS, Red Hat Linux, Sun Solaris and any Motorola software service packs that may be available. Motorola agrees to provide only patch releases that have been analyzed, pre-tested, and certified in a dedicated ASTRO 25 test lab to ensure that they are compatible and do not interfere with the ASTRO 25 network functionality. Corresponding 3rd Party software and operating system patches will be released quarterly upon successful completion of the regular test cycle or at Motorola’s discretion. Once a patch release has been validated as safe for deployment on the radio network, Motorola agrees to post it on a Motorola secure extranet site for the Customer to download and deploy.
 - 1.3.1 The parties agree that minor software upgrades, and patch release coverage, which include commercial OS and application software patches and service pack updates, will terminate should the customers system release version become more than 5 system release versions from the current shipping release version.
- 1.4 The parties agree that ASTRO 25 system release upgrades are considered “major” upgrades if they include commercial OS and application software updates as well as Motorola system release software. System releases shall be pre-tested and certified in Motorola’s Systems Integration Test lab. ASTRO 25 system releases shall improve the system functionality and operation from previous releases and may include some minor feature enhancements. At Motorola’s option, system releases may also include significant new feature enhancements as optional features. The SUA II does not include coverage for new optional feature software or hardware. Optional features may be offered for purchase.
- 1.5 The parties agree to the Eligible System Release Upgrade Paths available to the system owner as per the system release upgrade chart referenced and incorporated in Appendix A.
- 1.6 Motorola agrees that this Agreement entitles a Customer to past software versions for the purpose of downgrading product software to a compatible release version.

- 1.7 Motorola agrees that the following ASTRO 25 system release software for the following products are covered under this Agreement: base stations, site controllers, comparators, routers, LAN switches, servers, dispatch consoles, NICE IP logging recorder, NICE replay stations (Scenario Replay and Inform Lite), network management terminals, Network Fault Management (NFM) products, network security devices such as firewalls and intrusion detection sensors, and associated peripheral infrastructure software.
- 1.8 Product programming software such as Radio Service Software (“RSS”), Configuration Service Software (“CSS”), and Customer Programming Software (“CPS”) are also covered under this Agreement.
- 1.9 The parties agree that the SUA II makes available the subscriber radio software releases that are shipping from the factory during the SUA II coverage period. The parties further agree that new subscriber radio options and features not previously purchased are excluded from SUA II coverage. Additionally, subscriber software installation and reprogramming are excluded from the ASTRO 25 SUA II coverage.
- 1.10 Motorola agrees to provide hardware version updates and/or replacements necessary to upgrade the system to an eligible system release with an equivalent level of functionality up to once in a two-year period. Hardware will be upgraded and/or replaced if required to maintain the existing feature & functionality of the eligible system release. The parties agree that any updates to hardware versions and/or replacement hardware required to support new features or those not specifically required to maintain existing functionality are not included.
- 1.11 Motorola agrees that the following hardware components are eligible for full product replacement when necessary per the eligible system release upgrade and if originally provided by Motorola:
 - 1.11.1 Servers
 - 1.11.2 PC Workstations
 - 1.11.3 Routers
 - 1.11.4 LAN Switches
- 1.12 Motorola agrees that the following hardware components are eligible for board-level replacement when necessary per the eligible system release upgrade. The parties agree that “board-level replacement” is defined as any Field Replaceable Unit (“FRU”) for the products listed:
 - 1.12.1 GTR 8000 Base Stations
 - 1.12.2 GCP 8000 Site Controllers
 - 1.12.3 GCM 8000 Comparators
 - 1.12.4 MCC 7500 Console Operator Positions
 - 1.12.5 STR 3000 Base Stations
 - 1.12.6 Quantar Base Stations
 - 1.12.7 Centracom Gold Elite Console Operator Interface Electronics
 - 1.12.8 Centracom Gold Elite Central Electronics Banks
 - 1.12.9 Ambassador Electronics Banks

- 1.12.10 Motorola Gold Elite Gateways
- 1.12.11 ASTROTAC Comparators
- 1.12.12 PSC 9600 Site Controllers
- 1.12.13 PBX Switches for Telephone Interconnect
- 1.12.14 NFM/NFM XC/MOSCAD RTU
- 1.13 The ASTRO 25 SUA II does not cover all products. Refer to section 2.0 for exclusions and limitations.
- 1.14 Motorola agrees to provide implementation services necessary to upgrade the system to an eligible system release with an equivalent level of functionality up to once in a two-year period. The parties agree that any implementation services that are not directly required to support the system upgrade are not included. The parties further agree that implementation services necessary for system expansions and/or new features or functionality that are implemented concurrent with the system upgrade are not included.
- 1.15 As major system releases become available, Motorola Agrees to provide the following software design and technical resources necessary to complete system release upgrades up to a maximum of one system release upgrade per two-year contract period.:
 - 1.15.1 Review infrastructure system audit data as needed.
 - 1.15.2 Identify additional system equipment needed to implement a system release, if applicable.
 - 1.15.3 Complete a proposal defining the system release, equipment requirements, installation plan, and impact to system users.
 - 1.15.4 Advise Customer of probable impact to system users during the actual field upgrade implementation.
 - 1.15.5 Program management support required to perform the system upgrade.
 - 1.15.6 Field installation labor required to perform the system upgrade.
 - 1.15.7 Upgrade operations engineering labor required to perform the system upgrade.
- 1.16 The parties agree that the ASTRO 25 SUA II pricing is based on the system configuration outlined in Appendix B. The parties further agree that this configuration is to be reviewed annually on the contract renewal date. Any change in system configuration may require an ASTRO 25 SUA II price adjustment.
- 1.17 The parties agree and acknowledge that the ASTRO 25 SUA II applies only to system release upgrades within the ASTRO 25 7.x platform.
- 1.18 Motorola agrees to issue the Software Maintenance Agreement (“SMA”) bulletin on an annual basis and post it in soft copy on a designated extranet site for Customer access. Standard and optional features for a given ASTRO 25 system release are listed in the SMA bulletin.
- 1.19 The parties agree that all services described in this SOW are available during the Standard Business Day unless otherwise agreed to by Motorola.

1.20 Coverage Continuity.

- 1.20.1 The parties acknowledge and agree that the ASTRO 25 SUA II requires continuous coverage beginning within (90) days after the expiration of system warranty. Should the Customer delay purchase of an ASTRO 25 SUA II beyond (90) days from system warranty expiration or elect to discontinue the ASTRO 25 SUA II and later decide to reinstate coverage, additional payment(s) will be necessary to cover the period for which coverage was discontinued or delayed. The total of payments for lapses in coverage will not exceed 3 years in equivalent ASTRO 25 SUA II coverage.

1.21 The Customer agrees that they shall:

- 1.21.1 Contact Motorola upon receiving the SMA bulletin to engage the appropriate Motorola resources for a system release upgrade.
- 1.21.2 Purchase any additional software and hardware necessary to implement optional system release features or system expansions.
- 1.21.3 Provide or purchase labor to implement optional system release features or system expansions.
- 1.21.4 Provide high-speed internet connectivity at the zone core site(s) for use by Motorola to perform remote upgrades and diagnostics during the upgrade period.
- 1.21.5 Properly store and make available hardware and software required to perform software upgrade services needed for installation of the system release.
- 1.21.6 If the Servicer is required to travel beyond two (2) hours or one hundred twenty (120) miles by vehicle from the prime site to a remote site to deliver this service, the Customer is responsible for incremental travel and expenses incurred.
- 1.21.7 Inform system users of software upgrade plans and scheduled system downtime. Perform appropriate system backups and make them readily available during the installation of the system release.
- 1.21.8 Assist Motorola in the preparation of a Customer Support Plan before system acceptance and provide all information necessary to complete the Customer Support Plan.
- 1.21.9 Cooperate with Motorola and perform all acts that are reasonable or necessary to enable Motorola to provide software upgrade services.

2.0 Exclusions and Limitations

- 2.1 The parties agree that Systems that have non-standard configurations that have not been certified by Motorola Systems Integration Testing are specifically excluded from the ASTRO 25 SUA II unless otherwise agreed in writing by Motorola and included in this SOW.
- 2.2 The parties agree that the ASTRO 25 SUA II does not include hardware replacement for all products. Version updates may be available in some cases, but complete product replacement is not covered for all products.

- 2.3 The parties acknowledge and agree that the ASTRO 25 SUA II does not cover the following products:
- NICE Full Inform
 - MCC5500 Dispatch Consoles
 - MIP5000 Dispatch Consoles
 - Plant/E911 Systems
 - MOTOBRIDGE Solutions
 - ARC 4000 Systems
 - Motorola Public Sector Applications Software (“PSA”)
 - Custom SW, CAD, Records Management Software
 - Data Radio Devices
 - Mobile computing devices such as Laptops
 - Non-Motorola two-way radio subscriber products
 - Genesis Products
 - Point-to-point products such as Microwave terminals and association multiplex equipment
- 2.4 The parties further agree that the ASTRO 25 SUA II does not cover any hardware or software supplied to the system owner by any Motorola business sector other than Motorola Solutions and/or purchased directly from a third party, unless specifically included in this SOW.
- 2.5 The parties agree that the ASTRO 25 system release upgrades include limited security updates issued by Microsoft, Solaris and Red Hat certified with each individual system release.
- 2.6 The parties agree that the ASTRO 25 SUA II does not cover software support for virus attacks or other applications that are not part of the ASTRO 25 system, or unauthorized modifications or other misuse of the covered software. Motorola is not responsible for management of anti-virus or other security applications (such as Norton). Anti-virus and/or security application support may be covered under a separate agreement.
- 2.7 The parties agree that upgrades for equipment add-ons or expansions during the term of the contract are not included in the coverage of this SOW unless otherwise agreed to by Motorola.

3.0 Special provisions

- 3.1 Customer acknowledges that if its System has a Special Product Feature, additional engineering may be required to prevent an installed system release from overwriting the Special Product Feature. Upon request, Motorola will determine whether a Special Product Feature can be incorporated into a system release and whether additional engineering effort is required. If additional engineering is required Motorola will issue a change order for the change in scope and associated increase in the price for the ASTRO 25 SUA II.
- 3.2 Customer acknowledges that they may use the software (including any System Releases) only in accordance with the applicable Software License Agreement. The SUA II Statement of Work is not intended to modify or terminate an existing Software License Agreement. The SUA II or services rendered by Motorola does not alter Motorola’s software intellectual property rights.
- 3.3 Customer acknowledges that SUA II services do not include repair or replacement of hardware or software necessary due to defects that are not corrected by the system release, nor does it include

repair or replacement of defects resulting from any nonstandard or improper use or conditions or from unauthorized installation of software.

- 3.4 The parties agree that ASTRO 25 SUA II coverage and the parties' responsibilities described in this Statement of Work will automatically terminate if Motorola no longer supports the ASTRO 25 7.x software version in the Customer's system or discontinues the SUA II program; in either case, Motorola will refund to Customer any prepaid fees for System Upgrade Agreement services applicable to the terminated period.
- 3.5 Motorola may suspend or terminate the ASTRO 25 SUA II if the following conditions apply:
- Customer fails to pay Motorola any fees for the ASTRO 25 SUA II when due
 - Customer breaches the Software License Agreement or other applicable agreement
 - Customer's rights to use the software under the Software License Agreement expire or are terminated
 - Customer replaces its Motorola System with a system from another manufacturer

4.0 WARRANTIES AND DISCLAIMER:

Motorola warrants that its services will be free of defects in materials and workmanship for a period of ninety (90) days following completion of the service (“Warranty Period”). Your sole remedies are to require Motorola to re-perform the affected service or at Motorola's option to refund, on a pro-rata basis, the service fees paid for the affected service. Product and software documentation that specifies technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which this information is provided) are collectively referred to as “Documentation.” During the applicable Warranty Period, Motorola warrants that the tested anti-virus definitions, intrusion detection sensor signatures, and operating system security updates/patches do not degrade or compromise System functionality, and that after incorporation of the recommended remediation action the System Software, when used properly and in accordance with the Documentation, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the software. Whether a defect occurs will be determined solely with reference to the Documentation. Motorola does not warrant that Customer’s use of the software or products will be uninterrupted or error-free or that the software or the products will meet Customer’s particular requirements.

MOTOROLA DISCLAIMS ALL OTHER WARRANTIES WITH RESPECT TO PRETESTED ANTI-VIRUS DEFINITIONS, DATABASE SECURITY UPDATES, OPERATING SYSTEM SOFTWARE PATCHES, AND INTRUSION DETECTION SENSOR SIGNATURE FILES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT. FURTHER, MOTOROLA DISCLAIMS ANY WARRANTY CONCERNING THE NON-MOTOROLA SOFTWARE AND DOES NOT GUARANTEE THAT CUSTOMER’S SYSTEM WILL BE ERROR-FREE OR IMMUNE TO VIRUSES OR WORMS AS A RESULT OF THESE SERVICES.

Appendix A – ASTRO 25 Eligible System Release Upgrade Paths

Release Date	Platform Release	Available Upgrade Paths	
Oct-05	R7.0	N/A	
Jun-06	R7.1	N/A	
Dec-06	R7.2	7.7	
Mar-07	R7.1.1	N/A	
Dec-07	R7.4	7.7	
Jun-08	R7.5	7.7	
Dec-08	R7.6	7.7	
Jun-09	R7.7	7.9	7.11
Jan-10	R7.8	7.9	
Dec-10	R7.9	7.11	7.13
Aug-11	R7.11	7.13	7.14 (planned)
Mar-12	R7.12	N/A	
Nov-12	R7.13	7.14 (planned)	7.15 (planned)
Nov-13	R7.14 (planned)	7.15 (planned)	7.16 (planned)

The information contained herein is provided for information purposes only and is intended only to outline Motorola's presently anticipated general technology direction. The information in the roadmap is not a commitment or an obligation to deliver any product, product feature or software functionality and Motorola reserves the right to make changes to the content and timing of any product, product feature or software release. Prices for any future product or software included herein will be separately negotiated when and if such product or software becomes available.

The most current eligible system release upgrade paths can be found in the most recent SMA bulletin.

Appendix B - System Pricing Configuration

This configuration is to be reviewed annually on the contract renewal date. Any change in system configuration may require an ASTRO 25 SUA II price adjustment.

ASTRO 25 SMA, SUA, SUA II - System Pricing Configuration																
Lifecycle subscription agreement pricing is based on the system configuration below. This configuration is to be reviewed annually on the contract renewal date. Change in system configuration may result in price adjustment for the new term.																
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028		
Core																
Master Site Configuration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zones in Operation (Including DSR and Dark Master Sites)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zone Features: IV&D, OTAR, TDMA, Telephone Interconnect, CNI, HPD, ISSI CSMS, IA, POP25, Text Messaging, Outdoor Location, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RF System																
Voice RF Sites & RF Simulcast Sites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repeaters/Stations (FDMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Repeaters/Stations (TDMA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPD RF Sites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPD Stations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dispatch Console System																
Dispatch Sites	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gold Elite Operator Positions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCC 7500 Operator Positions (GPIOM)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCC 7500 Operator Positions (VPM)	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Conventional Channel Gateways (CCGW)	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Conventional Site Controllers (GCP 8000 Controller)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Logging System																
Number of AIS Servers	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Voice Logging Recorder	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Logging Replay Clients	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Network Management and MOSCAD NFM																
Network Management Clients	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOSCAD NFM Systems	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MOSCAD NFM RTUs	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
MOSCAD NFM Clients	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fire Station Alerting (FSA)																
FSA Systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FSA RTUs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FSA Clients	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subscribers																
Voice Subscribers non-APX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Voice Subscribers APX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPD Subscribers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Computing and Networking Hardware (for SUA / SUA II, actual replacement qty may be less than shown)																
Workstations - High Performance	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Workstations - Mid Performance	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Servers - High Performance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Servers - Mid Performance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LAN Switch - High Performance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LAN Switch - Mid Performance	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Routers	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Training																
# of onsite, instructor-led, 3-day training sessions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Exhibit F

System Acceptance Certificate

Customer Name: _____

Project Name: _____

This System Acceptance Certificate memorializes the occurrence of System Acceptance. Motorola and Customer acknowledge that:

1. The Acceptance Tests set forth in the Acceptance Test Plan have been successfully completed.
2. The System is accepted.

Customer Representative:

Signature: _____

Print Name: _____

Title: _____

Date: _____

Motorola Representative:

Signature: _____

Print Name: _____

Title: _____

Date: _____

FINAL PROJECT ACCEPTANCE:

Motorola has provided and Customer has received all deliverables, and Motorola has performed all other work required for Final Project Acceptance.

Customer Representative:

Signature: _____

Print Name: _____

Title: _____

Date: _____

Motorola Representative:

Signature: _____

Print Name: _____

Title: _____

Date: _____



Exhibit G

RESERVED



Exhibit H

RESERVED

[NOTE: If applicable, Motorola Solutions' Standard Managed Zone Core Agreement will be provided.]



Exhibit I

STARCOM21 User Agreement

This user agreement follows in the next section.

[NOTE: A StarCom21 User Agreement must be executed by each using agency if such using agencies are not governed by the same governmental unit; i.e., the Customer.]



8.2 STARCOM21 USER AGREEMENT

THIS STARCOM21 USER AGREEMENT including all Attachments hereto (the “User Agreement”) is made as of _____ (the “Effective Date”) by and between Motorola Solutions, Inc., a Delaware corporation (“Motorola”), and _____ Lake County, Illinois (“User”). No modification, amendment or waiver of any provision of this User Agreement shall be effective unless approved in writing by each of the Parties hereto.

Introduction

In 2001, Motorola and the State of Illinois (“State”) entered into Master Contract #TCVS1500, as amended January 15, 2005 and as amended or replaced subsequently, hereinafter referred to as the “Master Contract” pursuant to which the State agreed to lease from Motorola, and Motorola agreed to build, own and operate, a statewide, trunked-digital voice radio network for the State. As part of that contract, the parties agreed that the network, commonly referred to as the STARCOM21 Network (“STARCOM21”) had to have the capability of being expanded consistent with the Public Safety Wireless Network for use by other federal, state and local agencies as well as qualified non-governmental entities. The Master Contract is an indefinite quantity, non-exclusive master contract established for the use of State agencies, universities, boards, authorities and commissions (collectively “State Users”), and is also established for the use of federal, county and local governmental agencies and qualified non-governmental entities.

The Parties agree that the User Agreement shall be the vehicle that will be utilized to identify the terms and conditions that non-State Users will agree to in order to be able to access STARCOM21. Motorola is obligated in the Master Contract to provide certain levels of performance, and this User Agreement coordinates the rights and responsibilities of the parties in compliance with the Master Contract’s performance requirements. The obligations of Motorola to the State in the Master Contract take precedence over anything herein.

Pursuant to the Master Contract, Motorola is required, under the direction, guidance and oversight of the State, to supervise the day-to-day operations of STARCOM21 and maintain, and oversee, STARCOM21’s performance, coverage, functionality, availability, and reliability requirements. As a result of additional governmental and non-governmental entities utilizing STARCOM21, the State established an Oversight Committee. That Oversight Committee will govern the manner in which STARCOM21 is used by governmental and non-governmental entities. The State and Motorola are required to develop a joint system administration plan for STARCOM21.

NOW, THEREFORE, in consideration of the foregoing and the mutual promises herein contained, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, Motorola and User hereby covenant and agree that all the provisions above are hereby incorporated by reference, as if fully set forth herein, and hereby covenant and agree as follows:

1. DEFINITIONS:

ISP: Illinois State Police. The ISP provides common communication channels to county and local law enforcement agencies including VHF frequencies known as “ISPERN” and “IREACH” and its



inter-jurisdictional radio communications known as “HF-4”. STARCOM21 will incorporate and supplement these frequencies by interfacing the frequencies to ISP dispatch consoles.

ISPERN: Illinois State Police Emergency Radio Network is a dedicated VHF high-band radio channel established in 1965 to provide interagency communications capability to municipal, county, State, and Federal law-enforcement agencies to facilitate coordination of operations, wide-area dissemination of criminal or traffic offense information, and officer safety, and shall be integrated with STARCOM21.

IREACH: Illinois Radio Emergency Assistance Channel is a dedicated radio channel, 155.055 MHz, used for coordination of official public-safety activities by State or local agencies, including police, fire, EMS, IEMA, highway maintenance and natural resources, and shall be integrated with STARCOM21.

STARCOM21: Statewide, leased, trunked, digital voice mobile radio system being made available to the State by Motorola in compliance with the features, statewide coverage requirements, system performance, grade of service and reliability and other requirements set forth in the STARCOM21 Master Contract between Motorola and the State. As part of the Master Contract, Motorola is required to deploy, install and commission an infrastructure comprised of at least 169 tower sites or other “high” repeater sites, outfitted with fixed radio and transport equipment. The infrastructure will utilize the radio trunking control protocol conforming to the Association of Public Safety Communications Officials (“APCO”) Project 25 common air interface (“CAI”) standard. Subscriber services and user equipment must conform to APCO P25 standards for functionality, interoperability and construction.

2. ACCEPTANCE

This document, including the preceding clauses and any attachments, will become a contract when accepted in writing by an authorized employee of Motorola and an authorized signatory of the User. It is agreed that services will be provided only on the terms and conditions herein.

3. SERVICES AND USER FEES

3.1 User requests, and Motorola agrees to provide, the additional services at the fees detailed on Attachment A that are unique to User and that do not conflict or limit Motorola’s ability to meet its obligations to the State under the Master Contract. The fees do not include any taxes, assessments or duties, all of which will be paid by User, except as exempt by law. User and Motorola understand and agree that User shall load on STARCOM21 the radios specified in Attachment A pursuant to the schedule set forth in that attachment (User may load the specified radios onto STARCOM21 in advance of the schedule with prior written approval of Motorola).

3.2 User understands and agrees that any and all programming of User equipment or other related expenses associated with the service provided to User under this User Agreement shall be the responsibility of and paid for by User. Any incompatibility resulting from equipment provided by User shall be at User’s sole risk, responsibility and expense. Motorola agrees to take no action that would result in programming or reprogramming of User equipment prior to discussing such action with User.

3.3 User specifically acknowledges that Motorola is managing STARCOM21 on behalf of the State and is only authorized to provide access to STARCOM21 in accordance with its obligations under the Master Contract. To the extent that any User authorizes Motorola to use its resources in connection with STARCOM21 (e.g. frequencies, towers, sites, etc.) all STARCOM21 Users shall be



entitled to use such resources in connection with their use of STARCOM21, subject to FCC restrictions or authorizations. The provisions of this paragraph 3.3 are subject to the following requirements:

- a. Any expansions of STARCOM21 to accommodate radio communication needs for authorized, non-State users cannot compromise or degrade STARCOM21's functionality and performance, service level (i.e. "Grade of Service"), availability, and radio coverage for existing STARCOM21 Users. Motorola will be required to provide STARCOM21 Users access to any additional working channels or sites deployed to expand STARCOM21 at no additional cost to the State.
- b. Participating STARCOM21 Users that have patching requirements will need to have such requirements reviewed and approved by the Motorola System Manager and, if applicable, the Oversight Committee. Approval of additional patching is contingent on the impact that the patches will have on the Grade of Service for existing STARCOM21 Users.

The use of vehicular repeaters on STARCOM21 is contingent on spectrum availability and will need to be reviewed by the Motorola System Manager and, if applicable, the Oversight Committee.

User further understands certain talk group prioritization of non-first responder public safety users may occur.

4. REGULATORY ISSUES

4.1 It shall be the responsibility and obligation of User to seek all approvals including federal, state, county, municipal or other governmental authority having jurisdiction over User in order to enter into this User Agreement.

4.2 User understands that numerous entities, including, without limitation, public safety users and special emergency users, will utilize STARCOM21.

4.3 User understands that pursuant to Federal Communications Commission (FCC) rules only certain entities are qualified to utilize STARCOM21. User represents and warrants that it will meet all FCC eligibility requirements to utilize STARCOM21 during the term of this User Agreement. User represents, warrants and covenants on the date hereof and throughout the term of this User Agreement that it is, and will remain, qualified to utilize STARCOM21 and that it meets, and will continue to meet, all such FCC eligibility requirements. If for any reason User finds that it is not in compliance with FCC regulations, it shall immediately notify Motorola in writing, (but under no circumstances exceeding 14 days) and outline a course of action to come into compliance within a reasonable period of time.

4.4 User understands and acknowledges that some or all of the licenses pursuant to which STARCOM21 operates are held by governmental and non-governmental entities, who are also Licensees. For purposes of this User Agreement, a Licensee is defined as a qualified governmental or non-governmental entity that owns its own frequencies and agrees to allow those frequencies to be utilized on STARCOM21 by STARCOM21 participants. User acknowledges that all shared transmitter use must be subject to Licensees' control. User understands there may be significant consequences to Motorola and other STARCOM21 Users should access to and use of such transmitters be unreasonably withheld by a Licensee.

4.5 User understands that Motorola and/or the Licensees can discontinue service, remove one or more licenses from STARCOM21, or take any other steps that they reasonably believe are in the best interests of STARCOM21 or that may be necessary to comply with any federal, state, or local law, order, or directive. Any such action shall not give rise to any claim on the part of User against



Motorola or the Licensees. Motorola shall provide written notice to User of any action under this paragraph no less than ninety (90) days prior to taking such action unless otherwise required by law.

5. TERM

5.1 Unless otherwise provided in Attachment A, this User Agreement will remain in full force and effect for a period of one (1) year from the Effective Date. After such one (1) year period, it shall automatically renew for additional one (1) year periods unless either party notifies the other party in writing of its intent not to renew at least ninety (90) days prior to the end of the then current term. Notwithstanding anything contained herein or in Attachment A to the contrary, expiration of the STARCOM21 TCVS-1500 Master Contract or any amendment thereto or replacement contract thereof due to the time limit set forth in either: a) the Illinois Procurement Code (30 ILCS 500/20-60 et al.); or b) the contract itself, shall not result in the automatic termination of this Agreement, provided that Motorola and the State enter into a functionally equivalent replacement contract to ensure continuity of services and operation of the STARCOM21 radio system.

5.2 In the event any frequency authorization held by User, Motorola, or any other Licensee under which STARCOM21 operates is revoked by the FCC, then Motorola may elect to terminate this User Agreement without any liability to Motorola or the Licensees, upon written notification from Motorola to User.

6. ASSIGNMENT SUBCONTRACT

User may not assign its rights or delegate its duties hereunder in whole or in part without the express written consent of Motorola. Motorola may assign its rights, delegate or subcontract its duties hereunder in whole or in part consistent with Motorola's obligations under the Master Contract, provided that written notice is given to User.

7. ADDITIONAL UNITS

If User is not in default, then at any time during the term of this User Agreement or any renewal period hereof, service will be provided for additional radios ordered by the User, up to the total number of additional radios specified in Attachment A, and according to the terms of Attachment A.

8. COVENANTS OF USER

User agrees (a) to observe and abide by all applicable statutes, laws, ordinances, rules and regulations, including but not limited to those of the FCC, and (b) to operate its radios and any related equipment so as not to cause undue interference with any other users using STARCOM21. Motorola reserves the right to temporarily suspend service to specific radio users subsequent to notification of the user due to harmful interference or disruptive radio use created by such individual user. Any such action shall not give rise to any claim on the part of User against Motorola or STARCOM21 Users. User recognizes that applicable FCC rules and other statutes, laws, ordinances, rules and regulations may change from time to time and that, accordingly, Motorola may propose modifications to this User Agreement to comply with any such changes in FCC requirements, and User shall not unreasonably withhold approval of such changes.



9. COVERAGE

9.1 STARCOM21 coverage prediction is based on the knowledge of the propagation of radio signals and the ways in which they are attenuated as they travel through the atmosphere, over terrain, through trees, around buildings, and around various obstacles. Predicted coverage is dependent on many factors including the following: (1) transmitter power; (2) receiver sensitivity; (3) antenna gains; (4) transmission line loss; (5) antenna height; (6) noise; (7) tree density; (8) buildings; (9) terrain variations; and (10) atmospheric conditions. Coverage is also dependent on user factors including: (1) antenna type and location; (2) radio programming; (3) battery condition of portables; (4) maintenance of the radio; and (5) firmware version.

9.2 User acknowledges that one hundred percent (100%) coverage of any area at all times is improbable. Testing and experience with actual field conditions indicate adverse propagation conditions, such as short-term unpredictable meteorological effects and sky wave interference from distant stations, can interrupt service at any time. Such events are beyond the reasonable control of Motorola and STARCOM21 Users. Other causes beyond the reasonable control of Motorola and STARCOM21 Users include but are not limited to motor ignition and other electrical noise that could be minimized by corrective devices at User's expense.

10. DEFAULT AND REMEDIES

10.1 If (a) User fails to make any payment of any sum due or fails to perform as required by any other provision hereunder, and continues in such failure for fifteen (15) days after written notice has been sent by Motorola to User or (b) User defaults under a System Management Agreement or similar agreement whereby User contracts with Motorola for management services for User's FCC license(s) in conjunction with STARCOM21 and such default continues beyond any applicable cure period, then the User shall be deemed in default under this User Agreement.

10.2 In the event of default by User hereunder, Motorola has the right, at its option, to immediately terminate this User Agreement, retain all payments made hereunder, deny User any service provided by STARCOM21, and impose a separate charge for disconnect and a separate charge for reconnect expenses, each in an amount reasonably determined by Motorola. If disconnect takes place, User may also be subjected to additional costs for reprogramming its equipment in an amount reasonably determined by Motorola and User agrees to immediately pay all such costs. Each and all of the rights and remedies of Motorola hereunder are cumulative to, and not in lieu of, each and every other such right and remedy and every other right and remedy afforded by law and equity. In the event that Motorola determines that it is necessary to exercise the rights above, then Motorola will provide User written notice of its intention to exercise such right and provide ninety (90) days notice prior to the exercise of such right.

11. DISCLAIMER OF WARRANTIES AND LIMITATIONS OF REMEDIES

WITH RESPECT TO ANY EQUIPMENT WHICH MAY BE USED CONSISTENT WITH THIS USER AGREEMENT TO ACCESS STARCOM21 OR ANY SERVICES PROVIDED HEREUNDER, MOTOROLA AND STARCOM21 USERS HEREBY DISCLAIM ALL REPRESENTATIONS AND WARRANTIES, DIRECT OR INDIRECT, EXPRESS OR IMPLIED, WRITTEN OR ORAL, IN CONNECTION WITH SUCH EQUIPMENT (WHETHER PURCHASED OR LEASED BY USER FROM MOTOROLA OR FROM A THIRD PARTY) AND SERVICES, INCLUDING BUT NOT LIMITED TO, ANY AND ALL EXPRESS AND IMPLIED WARRANTIES OF SUITABILITY, DURABILITY, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE.



12. INTERRUPTION OF SERVICE; FORCE MAJEURE

Notwithstanding any other provision of this User Agreement, neither Motorola nor STARCOM21 Users shall be liable to User or any other person for any loss or damage, regardless of cause, for interruption, delay, or loss of radio service except as described in Section 13 hereof. Motorola and/or STARCOM21 Users do not assume and shall have no liability under this User Agreement for failure to provide, interruption, or delay in providing service due directly or indirectly to causes beyond the control of Motorola and/or STARCOM21 Users or their agents, employees or contractors, including without limitation, matters listed in Sections 8 and 9 herein, results of the rebanding projects, acts of God, acts of a public enemy, acts or failures to act on the part of any third party, acts by civil or military authority, governmental priorities, strikes or other labor disturbances; earthquakes, fires, floods, epidemics, embargoes, war or riot. In the event of any failure or delay attributable to the fault of Motorola, STARCOM21 Users or their agents, employees or contractors, User's sole remedy shall be limited as is more fully described in Section 13 below.

13. LIMITATIONS OF LIABILITY

13.1 User acknowledges that the radio service provided hereunder uses radio channels to transmit voice and data communications and that the service may not be completely private. Neither Motorola, nor Licensees shall be liable to User for any claims, loss, damages or cost that may result from lack of privacy on STARCOM21.

13.2 Neither Motorola, nor STARCOM21 Users shall be liable for any damage, accident, injury or the like occasioned by the use of the radio service or the presence of equipment, including 700 or 800 MHz radio handsets and other devices, facsimile units, and ancillary equipment of User and/or Motorola.

13.3 Neither Motorola, nor STARCOM21 Users shall be liable for any defacement or damage to User's motor vehicle(s) or any personal or real property resulting from the presence of 700 or 800 MHz radio and ancillary equipment.

13.4 NO INDEMNIFICATION SHALL BE PROVIDED HEREUNDER BY MOTOROLA OR LICENSEES.

13.5 EXCEPT FOR PERSONAL INJURY OR DEATH, MOTOROLA'S TOTAL LIABILITY RELATED TO THE SERVICES PERFORMED HEREUNDER, WHETHER FOR BREACH OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT, OR OTHERWISE, WILL BE LIMITED TO THE DIRECT DAMAGES RECOVERABLE UNDER LAW, BUT NOT TO EXCEED THE PRICE OF THE USER FEES AND SERVICES IDENTIFIED IN ATTACHMENT A WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED (UNLESS LIABILITY IS OTHERWISE DISCLAIMED HEREIN IN WHICH CASE, MOTOROLA SHALL HAVE NO LIABILITY).

13.6 USER ACKNOWLEDGES AND AGREES THAT IN NO EVENT WILL MOTOROLA, OR STARCOM21 USERS HAVE ANY LIABILITY TO USER UNDER THIS USER AGREEMENT FOR LOSSES OR DAMAGES OF ANY KIND RELATED TO ANY EQUIPMENT, INCLUDING WITHOUT LIMITATION, PERSONAL INJURY OR DEATH, PROPERTY DAMAGE, LOSSES OR DAMAGES IN EITHER CONTRACT WARRANTY, INDEMNIFICATION, NEGLIGENCE, OR STRICT LIABILITY IN TORT, OR OTHERWISE.

13.7 USER ACKNOWLEDGES AND AGREES THAT IN NO EVENT WILL LICENSEES HAVE ANY LIABILITY TO USER UNDER THIS USER AGREEMENT FOR LOSSES OR



DAMAGES OF ANY KIND RELATED TO SERVICES PERFORMED HEREUNDER, INCLUDING WITHOUT LIMITATION, PERSONAL INJURY OR DEATH, PROPERTY DAMAGE, LOSSES OR DAMAGES IN EITHER CONTRACT WARRANTY, INDEMNIFICATION, NEGLIGENCE, OR STRICT LIABILITY IN TORT, OR OTHERWISE.

13.8 NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY, ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT NEITHER MOTOROLA, NOR LICENSEES WILL BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOODWILL, REVENUES, SAVINGS, OR PROFITS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS USER AGREEMENT, THE EQUIPMENT, OR THE PERFORMANCE OF SERVICES PURSUANT TO THIS USER AGREEMENT.

13.9 No action for contract breach or otherwise relating to the transactions contemplated by this User Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account.

13.10 User does not waive any of its protection under the Local Government and Governmental Tort Immunity Act.

14. NOTICES

Any notice or demand required or permitted to be given or made hereunder shall be given or made by certified or registered mail to the addresses shown immediately below the signature of the parties' signatory to this User Agreement.

15. WAIVER

Failure or delay on the part of any party to exercise any right, remedy, power or privilege hereunder shall not operate as a waiver thereof. A waiver, to be effective, must be in writing and signed by the party making the waiver. A written waiver of a default shall not operate as a waiver of any other default or of the same type default on a future occasion.

16. GENERAL

In the event of a conflict between the obligations of Motorola to User under this User Agreement and the obligations of Motorola to the State under the Master Contract, the obligations of Motorola to the State will take precedence over those to User hereunder. No modification or amendment of this User Agreement, including any attachments hereto, shall be valid unless made in writing and signed by the parties hereto. This User Agreement constitutes the entire agreement of the parties related to the subject matter hereof and shall supersede all prior offers, proposals, negotiations and agreements, except where incorporated into or referenced by this User Agreement. If any provision of this User Agreement or the application thereof to any person or circumstance shall, at any time or to any extent, be invalid or unenforceable, the remainder of this User Agreement shall not be affected thereby. This User Agreement is exclusively for the benefit of the parties hereto and STARCOM21 Users and shall, under no circumstances, be deemed to benefit any other party whatsoever except STARCOM21 Users. This User Agreement shall be construed in accordance with and governed by the laws of the State of Illinois. All of the Sections in this User Agreement shall survive the expiration or



termination of this User Agreement for any reason, with the exception of the following: Sections 1, 2, 5, 6 and 7.

IN WITNESS WHEREOF, User and Motorola, by and through their authorized representatives, have made and executed this User Agreement.

MOTOROLA

MOTOROLA SOLUTIONS, INC., a Delaware corporation

By: _____

Title: _____

Date: _____

Address

Motorola Solutions, Inc.
Attn: Commercial Counsel
Motorola Solutions Law Department
1303 East Algonquin Road, IL01/8
Schaumburg, IL 60196

Copy to:

Motorola Solutions, Inc.
Attn: STARCOM21 System Manager
1301 E. Algonquin Road; Room 3070
Schaumburg, IL 60196

USER

Lake County, Illinois

By: _____

Title: _____

Date: _____

Address

Attn: Purchasing Manager

18 N. County St.

Waukegan, IL 60085



ATTACHMENT A TO STARCOM21 USER AGREEMENT

THIS ATTACHMENT A TO THE USER AGREEMENT sets forth the STARCOM21 management services to be provided by Motorola and the fees for those services.

STARCOM21 Management Services

Motorola shall perform the following STARCOM21 management services:

- Shared Access, Maintenance, and System Upgrades of the Motorola Owned Master Site – Master Switching Office (Zone Controller).
- 24x7 Maintenance of the Motorola Owned RF Site Infrastructure.
 - On-site Response
 - Depot Repair
 - Remote Monitoring
 - HVAC Maintenance (of STARCOM21 sites)
 - Generator, Battery, UPS Maintenance (of STARCOM21 sites)
 - Generator Fuel
 - Antenna System Maintenance
- Telco Leased Line – Site Connectivity
 - Motorola will provide connectivity to the STARCOM21 sites.
- Software Maintenance
 - Motorola will provide a Software Subscription Agreement (SSA) as part of the Annual Fee (as defined below). The SSA includes software and hardware upgrades only to Motorola owned STARCOM21 infrastructure.
 - Motorola agrees not to make any software or hardware changes to the Master Switch Office which would require upgrades to the User infrastructure without advance notification to User.

Any services not specifically set forth above shall not be provided by Motorola, including, but not limited to the following:

- Radio hardware maintenance
- Any software or hardware upgrades that may be required to the User owned infrastructure or radio units.

The radios will be loaded on STARCOM21 in accordance with the following schedule:



Fees

The initial monthly fee for STARCOM21 management services shall be calculated as follows: the number of radios loaded on the system multiplied by the applicable fee for each radios category of use (“Monthly Fee”) as determined by reference to the Master Contract between Motorola and the State of Illinois. The parties have agreed that initially there will be ___TBD*___ radios loaded on the system. The initial annual fee shall be the monthly fee multiplied by twelve (12). There shall be no airtime charges (i.e., roaming) assessed. User will be invoiced on a monthly basis in advance of the period of service. Payment will be due net twenty (20) days after date of invoice. All fees are subject to increase based upon the terms of the Master Contract.

Additional Terms and Conditions to the User Agreement

Any information or data in the form of specifications, drawings, reprints, technical information or otherwise furnished to User under this User Agreement will remain Motorola’s property, will be deemed proprietary, will be kept confidential, and will be promptly returned at Motorola's request. User may not disclose, without Motorola's written permission or as required by law, any confidential information or data to any person, or use confidential information or data for any purpose other than performing its obligations under this User Agreement. Unless otherwise agreed in writing, no commercial or technical information disclosed in any manner or at any time by User to Motorola will be deemed secret or confidential. Motorola will have no obligation to provide User with access to its confidential and proprietary information, including cost and pricing data. This User Agreement does not grant directly or by implication, estoppel, or otherwise, any ownership right or license under any Motorola patent, copyright, trade secret, or other intellectual property, including any intellectual property created as a result of or related to the services performed under this User Agreement. This Section shall survive the expiration or termination of the User Agreement.

The term “Master Contract” shall include any and all amendments, revisions or replacements thereof as may now exist or be agreed upon from time to time by Motorola and the State.

Motorola will commit to maintaining the coverage as deployed (11 designated sites) as long as Lake County utilizes the STARCOM21 System. If changes should be required in the future that would affect the 11 deployed sites, then Motorola agrees to consult with and gain approval from the County in advance of making any required modifications.

Lake County Grade of Service

Motorola shall operate, maintain and enhance the STARCOM21 System to provide a consistent level of working voice channel resources to Lake County Users on the public safety side. Motorola shall guarantee a Grade of Service equal to or better than 1% ($P = .01$), to all Lake County Users. “Grade of Service” shall mean the percentage of calls in the System which cannot be completed immediately (i.e., calls that are blocked and receive a busy indication) during the System Busy Hour (within a twenty four (24) hour interval, the hour with the highest average traffic load, averaged over all of the days in a calendar month). Motorola shall guarantee this Grade of Service for the Term of the User Agreement. Motorola assumes full responsibility for the equal to or better than 1% Grade of Service requirement and shall guarantee this level of service in this Agreement. Should Motorola have difficulty providing this guaranteed level of service the County will consider options presented by Motorola provided they are within the limits allowable by the FCC and/or prevailing NPSAC RCRC authority. Radio traffic and queuing/busy times shall be recorded by the System's assorted management and control platforms. Motorola shall accumulate and produce this data on a monthly



basis to calculate the aggregate Grade of Service experienced by all County Users. This Grade of Service calculation, and all data reduction, shall be submitted to the County monthly.

The County will review the Grade of Service (G.O.S.) reports provided by Motorola every month to determine if G.O.S. has been met. If there is a G.O.S. concern the County will review the previous 12 months of G.O.S. data to determine if the requirement has been met for the year and provide Notice of said concern. If the Parties find that Motorola has failed to meet the aggregate G.O.S. requirement of 1% in the Lake County cell during any two (2) consecutive months, or during any three (3) non-consecutive months within a twelve (12) consecutive-month period shall result in Motorola Solutions installing and commissioning the necessary number of additional working channels, to the extent permitted by available frequencies licensed to the County by the FCC. Motorola shall take this action at no additional cost to the County within a specified timeframe agreed to by the Parties. If additional channels cannot be added to the affected site due to structural, legal, technical or space issues, the Parties agree to discuss an alternate mitigation plan.

Special events and emergency situations that result in isolated, large increases in radio traffic will be excused from the Grade of Service agreement. A G.O.S. exception is further defined as any event where the traffic, on a given cell, rises to more than 200% the normal average traffic during one or more hours and causes the site to exceed contractual G.O.S.



8.3 STARCOM21 SYSTEM MANAGEMENT AGREEMENT

THIS AGREEMENT (the “Agreement”) is made and entered into as of _____ (the “Effective Date”), by and between Motorola Solutions, Inc., a Delaware corporation (“Motorola”) and Lake County, Illinois (“Licensee”). This Agreement is subject to acceptance by Motorola. Motorola and Licensee may be referred to individually as a “Party” and collectively as the “Parties.”

RECITALS

WHEREAS Motorola is in the business of designing, establishing and operating wireless communications systems; and

WHEREAS, Motorola manages a shared, wide-area 700 and 800 MHz trunked voice radio system throughout Illinois (the “Wide-Area Network” or “System”) in accordance with certain standards and requirements set forth in Motorola’s agreement with the State of Illinois, known as the STARCOM21 Contract (including any and all amendments, revisions or replacements thereof as may now exist or be agreed upon from time to time, the “State Contract”); and

WHEREAS Licensee has been issued the necessary licenses (collectively with any related future authorizations, the “Licenses”) by the Federal Communications Commission (the “FCC”) to operate 700 and/or 800 MHz frequencies in Illinois that Licensee desires to incorporate into the System. A schedule of the Licenses that Licensee currently holds are listed on Attachment A; and

WHEREAS Licensee desires to enter into a management arrangement with Motorola and Motorola desires to assist Licensee in Licensee’s continued operations under the Licenses (the “Licensed Operations”), in accordance with the requirements of 47 C.F.R. §90.179 (the “FCC Rule”); and

WHEREAS the parties hereto wish to document in this Agreement the terms and conditions by which Motorola will manage the Licensed Operations on behalf of Licensee; and

WHEREAS Licensee and Motorola are familiar with the FCC Rule, and it is the intention of the parties hereto that this Agreement not diminish any of Licensee’s duties and/or responsibilities as an FCC licensee; and

WHEREAS, by separate agreement (called a “User Agreement”), Licensee may contract with Motorola to provide service on the Wide-Area Network or access to certain parts of the Wide-Area Network pursuant to the terms of the User Agreement;



NOW, THEREFORE, in consideration of the foregoing and the mutual promises herein contained, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto covenant and agree as follows:

1. APPOINTMENT OF MANAGER

1.1 Appointment. Licensee hereby appoints Motorola to manage the Licensed Operations as is more fully described herein, and Motorola hereby accepts such appointment. Motorola shall provide the technical and managerial services set forth in this Agreement on behalf of Licensee.

1.2 Available Channel Capacity. Provided that the necessary regulatory approvals are secured and maintained from the FCC and from any other federal, state or other governmental authority having jurisdiction over Licensee or the Licensed Operations, Licensee shall make available the full channel capacity of the Licensed Operations for the duration of this Agreement to allow Motorola to accommodate users on the System (the “Users”) in accordance with the terms and conditions as herein provided.

2. SERVICES

2.1 In General. Subject to the general authority and oversight of Licensee, Motorola shall be responsible for the operation of the Licensed Operations. Motorola’s responsibilities shall include managing, overseeing, arranging for and directing the planning, design, construction, equipping and operation of the Licensed Operations as part of the System, all of the foregoing being subject to the general authority of Licensee. On Licensee’s behalf, Motorola shall be responsible for contracting with, and collecting fees from, Users of the System. Motorola shall use reasonable commercial efforts consistent with sound and reasonable practice to conduct (or cause to be conducted) such business and to render (or cause to be rendered), assist with, obtain or contract for all services, as shall be necessary for the planning, design, construction, equipping and operation of the Licensed Operations as part of the System, including without limitation, the following:

- (a) Generally providing management services to perform all of the day-to-day functions associated with the Licensed Operations and doing or assisting with any and all other acts or executing such other agreements, documents or instruments as are reasonably determined by Motorola to be necessary to carry out the development, construction and operation of the Licensed Operations as part of the System, whether or not specifically enumerated herein;
- (b) The hiring and supervision of Motorola personnel and any subcontractors necessary to operate the Licensed Operations;
- (c) Payment of all expenses and fees incurred or payable by the Licensed Operations as part of the System as provided in Section 2.4 hereof;
- (d) Assisting Licensee in preparing, maintaining and submitting any applications, reports, notices or other documentation related to the System required by the FCC Rule; and
- (e) Providing for appropriate office recordkeeping, bookkeeping and internal accounting services and arranging for and/or overseeing outside accounting services.

2.2 Control. The parties understand that discretion, control over and responsibility for the Licensed Operations shall remain vested in Licensee. Licensee will supervise Motorola’s activities and will retain control over the Licensed Operations as required under applicable FCC rules and regulations. It



is the intention of the parties hereto that this Agreement will not diminish any of Licensee's duties and/or responsibilities as an FCC licensee.

2.3 Consolidation. In arranging for the provision of goods and services to Licensee, including, without limitation, the services referred to in Section 2.1 hereof, Motorola may make arrangements to consolidate the purchase of such goods and services with purchases for other 700 and 800 MHz systems owned, operated or managed by Motorola or its affiliates.

2.4 Expenses. Licensee and Motorola agree that Motorola shall be responsible for all fees and expenses arising from day-to-day operation and maintenance of the System. As part of this day-to-day system maintenance, Motorola shall maintain, repair and replace existing equipment to the extent necessary to satisfy system performance standards required under the State Contract. Collectively, all of these fees and expenditures referred to in this subsection are the "Expenses" of the System.

2.5 System Expansions or Upgrades.

(a) The parties hereto acknowledge that, during the term of this Agreement, Motorola may recommend expansions of or upgrades to the Licensed Operations or its capabilities and equipment (including additional licenses, equipment and software related thereto). Motorola shall advise Licensee of such proposed expansions or upgrades at the periodic meetings of the User Group, of which Licensee is a member and whose meeting Motorola is hereby authorized to attend. User Group recommendations will be considered by the Oversight Committee, which will have final authority to approve or reject implementation of proposed expansions or upgrades. Licensee will be responsible for the costs to upgrade its equipment and software to maintain compatibility with the Wide-Area Network. Licensee shall cooperate with Motorola to implement the expansion or upgrade, including applying for any necessary FCC or other governmental authorizations or permits.

(b) The parties hereto acknowledge that, during the term of this Agreement, Licensee may recommend expansions of or upgrades to the Licensed Operations or its capabilities and equipment (including additional licenses, equipment and software related thereto). Licensee shall advise Motorola of such proposed expansions or upgrades at the periodic meetings of the User Group, of which Licensee is a member and whose meeting Motorola is hereby authorized to attend. User Group recommendations will be considered by the Oversight Committee, which will have final authority to approve or reject implementation of proposed expansions or upgrades. Licensee will be responsible for the costs to upgrade its equipment and software to maintain compatibility with the Wide-Area Network. Licensee shall cooperate with Motorola to implement the expansion or upgrade, including applying for any necessary FCC or other governmental authorizations or permits.

3. WIDE-AREA NETWORK; EXCLUSIVE AGENT; COOPERATION

3.1 Wide-Area Network.

(a) Licensee acknowledges that Motorola desires to incorporate the Licensed Operations into the System to be managed and operated by Motorola and to install additional Users on the System who are eligible, or may become eligible in the future, to utilize the System. Licensee understands that numerous entities, including, without limitation, public safety users and special emergency users, will utilize the Wide-Area Network. Licensee agrees to allow Motorola to take such actions upon Licensee's receipt of the necessary regulatory approvals from the FCC and from any other federal, state, county, municipal or other governmental authority having jurisdiction over Licensee or the System, to allow Motorola to incorporate the Licensed Operations into the System. Accordingly, Licensee agrees to share the Licensed Operations with current and future licensees on the System in accordance with the FCC Rule.



(b) Provided that the necessary regulatory approvals are secured by Licensee from the FCC and from any other federal, state or other governmental authority having jurisdiction over Licensee or the System, Licensee grants Motorola the right to (i) combine the channels of Licensee's Licensed Operations with other channels of the System, and (ii) connect Licensee's channels into the System, if Motorola so chooses. To the extent necessary or appropriate to facilitate or implement Motorola's management and operation of the System, Licensee will cooperate in the execution of any other agreements as Motorola from time to time may reasonably request.

3.2 Exclusive Agent. Subject to Section 3.1 hereof, Motorola shall act as Licensee's exclusive agent with respect to operating the System and providing service to Users. Motorola's agency authority includes, without limitation, the authority to enter into new written agreements with additional Users, as required by the FCC Rule. It is understood that nothing herein shall prevent Motorola from selling mobile equipment, maintenance or other services on such equipment to Users who may utilize capacity on the System.

3.3 User Loading and System Construction. Subject to the provisions of Section 3.1(a) hereof, the parties hereto shall cooperate with respect to the future use of the System by Users and the loading of Users on the System and any expansions thereof as provided for herein. Licensee shall take all reasonable steps necessary to assist Motorola in accomplishing these activities with respect to the Licensed Operations.

4. FCC MATTERS

4.1 Control. Licensee is the holder of the Licenses to provide the Licensed Operations. As required under applicable laws, Licensee shall supervise Motorola's activities and exercise control thereof over the Licensed Operations. It is expressly agreed and understood that nothing in this Agreement is intended to or will constitute a transfer of "control" (as defined by the FCC) of any of the Licenses from Licensee to Motorola or to any other person.

4.2 Reports. Licensee will prepare, maintain and submit, as applicable, in accordance with FCC rules and regulations, all applications, reports, notices and/or other documentation required to provide the Licensed Operations. Motorola shall assist Licensee in preparing, maintaining and submitting any applications, reports, notices and other documentation, if any, required by the FCC Rule.

4.3 Authorizations. Licensee, with Motorola's assistance, shall be responsible for obtaining any licenses or other authorizations required by the FCC to provide the Licensed Operations and approved expansions thereto. Licensee shall also be responsible for complying with the FCC Rule and with the rules and regulations of any federal, state or local regulatory agency with jurisdiction over Licensee and the Licensed Operations. Licensee shall provide notice to Motorola of any FCC correspondence or inquiries on matters that relate to the Licenses, the Licensed Operations, or System within ten (10) days of Licensee's receipt of same.

4.4 Compliance. Motorola shall be responsible for assuring that all work performed and required of Motorola, as set forth under this Agreement shall be in substantial compliance with all applicable laws. Similarly, Licensee agrees to comply with all applicable laws.

4.5 Agreement. In the event that the FCC determines that any provision of this Agreement, or the relationship between Motorola and Licensee created hereby, violates the FCC Rule, the parties hereto shall immediately make good faith and diligent efforts to bring this Agreement or such relationship into compliance with such FCC Rule, and any applicable FCC order relating thereto, subject to the provisions of Section 13.9 hereof.



5. FEES

Motorola shall assess initial fees for Users of the System (“User Fees”) as it determines appropriate in its sole discretion. Motorola may revise User Fees from time to time as provided in the applicable User Agreement. All User Fees will be paid directly to Motorola by the Users, pursuant to agreements between Motorola and each User of the System. Motorola’s fee for management of the Licensed Operations (the “Management Fee”) is included in the User Fees paid by Licensee.

6. CONFIDENTIALITY AND PROPRIETARY RIGHTS

6.1. Definitions. Capitalized terms used in this Agreement have the following meanings:

“Confidential Information” means any information that is disclosed in written, graphic, verbal, or machine-recognizable form, and is marked, designated, or identified at the time of disclosure as being confidential or its equivalent; or if the information is in verbal form, it is identified as confidential at the time of disclosure and is confirmed in writing within thirty (30) days of the disclosure.

Confidential Information does not include any information that: is or becomes publicly known through no wrongful act of the receiving Party; is already known to the receiving Party without restriction when it is disclosed; is or becomes, rightfully and without breach of this Agreement, in the receiving Party’s possession without any obligation restricting disclosure; is independently developed by the receiving Party without breach of this Agreement; or is explicitly approved for release by written authorization of the disclosing Party. Both parties acknowledge that Customer is subject to the Illinois Open Meetings Act (5 ILCS 120/1 et seq.) and the Illinois Freedom of Information Act (5 ILCS 140/1 et seq.).

“Proprietary Rights” means the patents, patent applications, inventions, copyrights, trade secrets, trademarks, trade names, mask works, know-how, ideas and concepts, processes, methodologies, tools, techniques, and other intellectual property rights.

6.2 Confidential Information. During the term of this Agreement, the Parties may provide each other with Confidential Information. Each Party will: maintain the confidentiality of the other Party’s Confidential Information and not disclose it to any third party, except as authorized by the disclosing Party in writing or as required by a court of competent jurisdiction; restrict disclosure of the Confidential Information to its employees who have a “need to know” and not copy or reproduce the Confidential Information; take necessary and appropriate precautions to guard the confidentiality of the Confidential Information, including informing its employees who handle the Confidential Information that it is confidential and is not to be disclosed to others, but those precautions will be at least the same degree of care that the receiving Party applies to its own confidential information and will not be less than reasonable care; and use the Confidential Information only in furtherance of the performance of this Agreement or pursuant to the license granted immediately below. The disclosing Party owns and retains all of its Proprietary Rights in and to its Confidential Information, except the disclosing Party hereby grants to the receiving Party the limited right and license, on a non-exclusive, irrevocable, and royalty-free basis, to use the Confidential Information for any lawful business purpose in the manner and to the extent permitted by this Agreement.

6.3. Preservation Of Proprietary Rights. Each Party owns and retains all of its Proprietary Rights that exist on the Effective Date. Motorola owns and retains all Proprietary Rights that are developed, originated, or prepared in connection with this Agreement, the System, or the performance of services by Motorola pursuant to this Agreement and this Agreement does not grant to Licensee any shared development rights. At Motorola’s request and expense, Licensee will execute all papers and provide reasonable assistance to Motorola to enable Motorola to establish the Proprietary Rights. Unless otherwise explicitly stated herein, this Agreement does not restrict a Party concerning its own



Proprietary Rights and is not a grant (either directly or by implication, estoppel, or otherwise) of a Party's Proprietary Rights to the other Party.

7. TERM; RENEWAL

7.1 Term; Renewal. Except as provided in Sections 7.2 and 7.3 hereof, the term of this Agreement shall commence upon the Effective Date and shall remain in full force and effect for a period of one (1) year from the Effective Date ("Initial Term"). After the Initial Term, this Agreement shall renew automatically on the same terms and conditions set forth herein unless otherwise amended by the parties hereto, for additional one (1) year periods, unless either party notifies the other party in writing of its intent not to renew at least ninety (90) days prior to the end of the then current term. Notwithstanding anything contained herein to the contrary, in the event that the State Contract expires, is cancelled, or is terminated, this Agreement shall terminate on the same date. Notwithstanding anything to the contrary herein, expiration of the STARCOM21 TCVS-1500 Master Contract or any amendment thereto or replacement contract thereof due to the time limit set forth in either: a) the Illinois Procurement Code (30 ILCS 500/20-60 et al.); or b) the contract itself, shall not result in the automatic termination of this Agreement, provided that Motorola and the State enter into a functionally equivalent replacement contract to ensure continuity of services and operation of the STARCOM21 radio system.

7.2 Termination by Breach.

(a) In the event of material breach of the Agreement by Motorola, and Motorola's failure to cure the breach within ninety (90) days of Motorola's receipt of written notice from Licensee regarding such breach, Licensee may elect to terminate the Agreement. Such termination will be effective 30 days after Motorola's receipt of a second written notice from Licensee expressing its intent to terminate the Agreement.

(b) In the event of (a) material breach of the Agreement by Licensee, and Licensee's failure to cure the breach within ninety (90) days of Licensee's receipt of written notice from Motorola regarding such breach or (b) Licensee defaults under a User Agreement or similar agreement whereby Licensee contracts with Motorola for service on the Wide-Area Network or access to certain parts of the Wide-Area Network and such default continues beyond any applicable cure period, Motorola may elect to terminate the Agreement. Such termination will be effective 30 days after Licensee's receipt of a second written notice from Motorola expressing its intent to terminate the Agreement.

7.3 Use of Licensed Operations. It is understood and agreed that upon termination of this Agreement, Motorola shall have no further right to manage the Licensed Operations. Motorola shall execute and/or file any document or instrument necessary to evidence such termination.

8. REPRESENTATIONS; WARRANTIES; COVENANTS

8.1 Licensee. Licensee represents and warrants that it: (a) is the duly authorized licensee of the FCC Licenses in Attachment A (the "Licenses") and is duly qualified under all laws, rules and regulations to hold such Licenses, (b) is the sole owner and real-party-in-interest of the Licenses and that no other party has an interest of any kind in such Licenses, (c) has the requisite authority and/or capacity, as applicable, to perform its undertakings pursuant to this Agreement, (d) is familiar with the applicable rules and regulations of the FCC, including without limitation those requiring that a licensee retain control of its licenses, (e) is aware of no impediment to the performance of its undertakings hereunder, and (f) shall maintain the Licenses in full force and effect and as part of the System for the full term of this Agreement. Licensee further represents that the Licensed Operations



for the Licenses, as currently being provided, are consistent with the Licenses and are fully compliant with all applicable laws and the FCC Rule.

8.2 Motorola. Motorola represents that it: (a) is a corporation organized and existing under the laws of the State of Delaware and is duly authorized and in good standing under the laws of the State of Illinois; and (b) has the requisite authority to perform its undertakings pursuant to this Agreement.

8.3 **DISCLAIMER OF OTHER WARRANTIES. THESE WARRANTIES ARE THE COMPLETE WARRANTIES PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL OTHER WARRANTIES. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

9. INDEMNIFICATION

9.1 General Indemnity By Motorola. Motorola will indemnify and hold Licensee harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Licensee to the extent it is caused by the negligence of Motorola, its subcontractors, or their employees or agents, while performing their duties under this Agreement, if Licensee gives Motorola prompt, written notice of the claim or suit. Licensee will cooperate with Motorola in its defense or settlement of the claim or suit. This section sets forth the full extent of Motorola's general indemnification of Licensee from liabilities that are in any way related to Motorola's performance under this Agreement. Customer must consent to Motorola defense of claims, as required by law. Such consent will not be unreasonably withheld.

9.2. General Indemnity By Licensee. Licensee will indemnify and hold Motorola harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Motorola to the extent it is caused by the negligence of Licensee, its other contractors, or their employees or agents, while performing their duties under this Agreement, if Motorola gives Licensee prompt, written notice of any the claim or suit. Motorola will cooperate with Licensee in its defense or settlement of the claim or suit. This section sets forth the full extent of Licensee's general indemnification of Motorola from liabilities that are in any way related to Licensee's performance under this Agreement.

9.3 Limitation. The rights and remedies provided in this Section 9 are subject to and limited by the restrictions set forth in Section 10.

10. LIMITATION OF LIABILITY

Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, indemnification, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the annual User Fees paid by Licensee. **ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SYSTEM, THE LICENSED OPERATIONS OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT.** This limitation of liability



provision survives the expiration or termination of the Agreement and applies notwithstanding any contrary provision. No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account.

11. OTHER INTERESTS AND CONFLICTS

Motorola and its affiliates may engage in, or possess an interest in, other business ventures of any nature or description, independently or with others, whether currently existing or hereafter created, including the acquisition, construction, management, operations and sale of 700 and 800 MHz systems, and Licensee shall not have any rights in or to such independent ventures or the income or profits derived therefrom.

12. FORCE MAJEURE

No party hereto shall be liable for delays in performance, or for failure to perform, due to: acts of God, acts of a public enemy, acts or failures to act on the part of any other party, acts by civil or military authority, governmental priorities, strikes or other labor disturbances (not by Motorola's or its subcontractors' employees); earthquakes, fires, floods, epidemics, embargoes, war or riot, and loss or damage beyond the reasonable control of either party.

13. MISCELLANEOUS

13.1 Survival. Sections 5, 6, 8.3, 10, and 13 shall survive the expiration, termination, or cancellation of this Agreement for any reason.

13.2 No Third Party Beneficiaries. This Agreement shall not confer any rights or remedies upon any person other than the parties hereto.

13.3 Entire Agreement. This Agreement constitutes the entire Agreement between the parties hereto and supersedes any prior understandings, agreements, or representations by or between the parties, written or oral, that may have related in any way to the subject matter hereof (system management).

13.4 Succession. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

13.5 Counterparts. This Agreement may be executed in one or more counterparts, each of which, when executed, shall be deemed an original and all of which together will constitute one and the same instrument. This Agreement shall be binding upon the transmission by facsimile by each party of a signed signature page thereof to the other party. If such transmission occurs, the parties hereto shall each also immediately post, by overnight courier, a fully executed counterpart of the Agreement to the other party.

13.6 Headings; Construction. The section headings contained in this Agreement are inserted for reference and convenience purposes only and shall not affect in any way the meaning or interpretation of this Agreement nor be deemed to constitute a part hereof. This Agreement has been fully reviewed and negotiated by the parties hereto and their respective counsel.

13.7 Notices. All notices, requests, demands, communications or information which are required to be or may be given under or in connection with this Agreement shall be in writing and



shall be deemed given when delivered personally or by facsimile copy (with transmission confirmed), or upon receipt (or on the date rejected or returned if not accepted) after dispatch by certified or registered first class mail, postage prepaid, return receipt requested, or by reputable overnight courier directed to the party to whom the same is so given or made at the address or facsimile number of such party as hereinafter set forth or such other address or facsimile number as the parties hereto may hereinafter designate:

To Motorola:

System Manager, STARCOM21

Motorola Solutions, Inc.

1301 E. Algonquin Road, Room 3070

Schaumburg, IL 60196

Fax: (847) 538-6020

and to

Motorola Solutions, Inc.

Motorola Solutions Law Department

1303 East Algonquin Road – IL01/8

Schaumburg, IL 60196

Fax: (847) 576-0721

To Licensee:

Lake County, Illinois

Attn: Purchasing Manager

18 N. County St.

Waukegan, IL 60085

Fax: (847) 984-5889

13.8 Amendments. No amendment of any provision of this Agreement shall be valid unless the same shall be an instrument in writing and signed by Motorola and Licensee.

13.9 Severability. Any term or provision of this Agreement or any other agreement, document or writing given pursuant to or in connection with this Agreement that is or shall be deemed invalid or unenforceable in any situation in any jurisdiction shall be ineffective to the extent of such invalidity



only and stricken as though never written, without in any way affecting the validity or enforceability of the remaining terms and provisions in any other situation or in any other jurisdiction; provided that if the remaining parts materially alter the benefits of the Agreement for either party, the parties shall use commercially reasonable efforts to promptly modify the terms of this Agreement in order to achieve the intended result while maintaining compliance with the law.

13.10 Other Expenses. Motorola and Licensee each will bear its own costs and expenses (including legal fees and expenses) incurred in connection with this Agreement and the transactions contemplated hereby. Motorola and Licensee shall each be responsible for any broker fees incurred by them in connection with transactions contemplated hereby. To the extent that a party may have any liability to a broker or any other liability, that liability should be and remains the sole liability of that party and that party shall indemnify and hold harmless the other party from any liability related to such broker.

13.11 Specific Performance. Each of the parties acknowledges and agrees that the other party may be damaged irreparably in the event any of the provisions of this Agreement are not performed in accordance with their specific terms or otherwise are breached. Accordingly, each of the parties agrees that the other party may be entitled to seek an injunction or injunctions to prevent breaches of the provisions of this Agreement and to enforce specifically this Agreement and the terms and provisions hereof in any action instituted in Illinois, in addition to any other remedy to which it may be entitled, at law or in equity.

13.12 Waivers. No action or inaction taken at any time pursuant to this Agreement, including the failure to require performance of any obligation provided for in this Agreement or any investigation by or on behalf of either party, shall in any way affect the right to require such performance at any time thereafter or be deemed to constitute a waiver by the party taking or not taking such action of compliance with any representation, warranty, covenant or agreement contained herein and/or in any exhibit. The waiver by either party hereto of any default, misrepresentation or breach of any provision of this Agreement shall not operate or be construed as a waiver of any prior or subsequent breach of the same or any other such provision or constitute a waiver of the responsibility or obligation itself.

13.13 Assignability And Subcontracting. Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Licensee. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

13.14 Disputes

The Parties will use the following procedure to address any dispute arising under this Agreement (a "Dispute").

(a) Governing Law. This Agreement will be governed by and construed in accordance with the laws of the State of Illinois.

(b) Negotiation. Either Party may initiate the Dispute resolution procedures by sending a notice of Dispute ("Notice of Dispute"). The Parties will attempt to resolve the Dispute promptly through good faith negotiations including 1) timely escalation of the Dispute to executives who have authority to settle the Dispute and who are at a higher level of management than the persons with direct responsibility for the matter and 2) direct communication between the executives. If the Dispute has not been resolved within ten (10) days from the Notice of Dispute, the Parties will proceed to mediation unless both parties agree to extend the ten (10) day schedule.

(c) Mediation. The Parties will choose an independent mediator within thirty (30) days of a notice to mediate from either Party ("Notice of Mediation"). Neither Party may unreasonably withhold consent to the selection of a mediator. If the Parties are unable to agree upon a mediator, either Party may request that American Arbitration Association nominate a mediator. Each Party will bear its own costs of mediation, but the Parties will share the cost of the mediator equally. Each Party will participate in the mediation in good faith and will be represented at the mediation by a business executive with authority to settle the Dispute.

(d) Litigation, Venue And Jurisdiction. If a Dispute remains unresolved for sixty (60) days after receipt of the Notice of Mediation, either Party may then submit the Dispute to a court of competent jurisdiction in the state in which the System is installed. Each Party irrevocably agrees to submit to the exclusive jurisdiction of the courts in such state over any claim or matter arising under or in connection with this Agreement.

(e) Confidentiality. All communications pursuant to subsections 13.14(b) and 13.14(c) will be treated as compromise and settlement negotiations for purposes of applicable rules of evidence and any additional confidentiality protections provided by applicable law. The use of these Dispute resolution procedures will not be construed under the doctrines of laches, waiver or estoppel to affect adversely the rights of either Party.

13.15 Cooperation. Each of the parties hereto shall cooperate with the others and take such steps and execute such documents as may be necessary from time to time to effectuate the terms and conditions of this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the Effective Date.

Motorola

Licensee

MOTOROLA SOLUTIONS, INC.

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

Date: _____

Date: _____



Attachment A

Schedule of Current Licenses

Set forth on the following 5 pages of Radio Station Authorization for Call Sign WPMB711, File Number 0005923728.





Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LAKE, COUNTY OF

ATTN: RADIO DEPT. G.R. GORR
LAKE, COUNTY OF
1303 N. MILWAUKEE AVE
LIBERTYVILLE, IL 60048

Call Sign WPMB711	File Number 0005923728
Radio Service	
YE - PubSafty/SpecEmer/PubSaftyNtlPlan, 806-817/851-862MHz,Trunked	
Regulatory Status PMRS	
Frequency Coordination Number	

FCC Registration Number (FRN): 0002829141

Grant Date 05-03-2013	Effective Date 09-10-2013	Expiration Date 05-19-2023	Print Date 09-11-2013

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

- Loc. 1** Address: 1303 N MILWAUKEE AVE
City: LIBERTYVILLE County: LAKE State: IL
Lat (NAD83): 42-17-47.0 N Long (NAD83): 087-57-32.0 W ASR No.: 1009761 Ground Elev: 216.0
- Loc. 2** Address: 1510 N CEDAR LAKE RD
City: LAKE VILLA County: LAKE State: IL
Lat (NAD83): 42-23-17.1 N Long (NAD83): 088-05-40.3 W ASR No.: 1008724 Ground Elev: 248.0
- Loc. 3** Address: 25705 FAIRFIELD RD
City: LAKE ZURICH County: LAKE State: IL
Lat (NAD83): 42-14-12.1 N Long (NAD83): 088-04-17.3 W ASR No.: 1008723 Ground Elev: 268.0
- Loc. 4** Address: 18 N COUNTY ST
City: WAUKEGAN County: LAKE State: IL
Lat (NAD83): 42-21-39.1 N Long (NAD83): 087-49-59.3 W ASR No.: Ground Elev: 201.5
- Loc. 5** Address: 700 SHERIDAN ROAD
City: HIGHWOOD County: LAKE State: IL
Lat (NAD83): 42-12-37.7 N Long (NAD83): 087-48-55.9 W ASR No.: Ground Elev: 211.5
- Loc. 6** Area of Operation
Land Mobile Control Station meeting the 6.1 Meter Rule: IL

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LAKE, COUNTY OF

Call Sign: WPMB711

File Number: 0005923728

Print Date: 09-11-2013

Loc. 7 Area of Operation

Operating within a 35.0 km radius around fixed location 1

Loc. 8 Address: 32093 PLAINE ROAD

City: WARREN TOWNSHIP

County: LAKE

State: IL

Lat (NAD83): 42-19-44.0 N

Long (NAD83): 087-54-38.0 W

ASR No.: 1007617

Ground Elev: 212.7

Antennas

Loc. No.	Ant. No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000851.25000000	FB2S	1		20K0F1E 20K0F3E	100.000	251.000	80.0	76.0	06-27-2009
1	1	000851.63750000	FB2S	1		20K0F1E 20K0F3E	100.000	200.000	80.0	76.0	06-27-2009
1	1	000852.12500000	FB2S	1		20K0F1E 20K0F3E	100.000	251.000	80.0	76.0	06-27-2009
1	1	000852.81250000	FB2S	1		20K0F1E 20K0F3E	100.000	251.000	80.0	76.0	06-27-2009
1	1	000853.56250000	FB2S	1		20K0F1E 20K0F3E	100.000	251.000	80.0	76.0	06-27-2009
2	1	000851.25000000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000851.30000000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000851.63750000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000851.68750000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000852.12500000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000852.72500000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000852.81250000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
2	1	000853.56250000	FB2C	1		20K0F1E 20K0F3E	50.000	275.000	61.0	71.0	06-27-2009
3	1	000851.25000000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000851.30000000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000851.63750000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000851.68750000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000852.12500000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009

Licensee Name: LAKE, COUNTY OF

Call Sign: WPMB711

File Number: 0005923728

Print Date: 09-11-2013

Loc. No.	Ant. No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
3	1	000852.72500000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000852.81250000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
3	1	000853.56250000	FB2C	1		20K0F1E 20K0F3E	100.000	500.000	120.0	154.0	06-27-2009
4	1	000851.25000000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000851.30000000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000851.63750000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000851.68750000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000852.12500000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000852.72500000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000852.81250000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	1	000853.56250000	FB2C	1		20K0F1E 20K0F3E	57.000	500.000	53.0	55.9	06-27-2009
4	2	000851.25000000	FB2C	1		20K0F1E 20K0F3E	57.500	500.000	53.0	55.9	06-27-2009
4	2	000851.30000000	FB2C	1		20K0F1E 20K0F3E	57.500	500.000	53.0	55.9	06-27-2009
4	2	000851.63750000	FB2C	1		20K0F1E 20K0F3E	57.500	500.000	53.0	55.9	06-27-2009
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4	2	000853.56250000	FB2C	1		20K0F1E 20K0F3E	57.500	500.000	53.0	55.9	06-27-2009
5	1	000851.25000000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
5	1	000851.30000000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
5	1	000851.63750000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009

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5	1	000851.68750000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
5	1	000852.12500000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
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5	1	000852.81250000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
5	1	000853.56250000	FB2C	1		20K0F1E 20K0F3E	31.500	200.000	38.0	55.9	06-27-2009
6	1	000806.25000000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000806.30000000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000806.63750000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000806.68750000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000807.12500000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000807.72500000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000807.81250000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
6	1	000808.56250000	FX1	45		20K0F1E 20K0F3E	35.000	140.000			
7	1	000806.01250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000806.25000000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000806.30000000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000806.51250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000806.63750000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000806.68750000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000807.01250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000807.12500000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000807.51250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
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7	1	000808.56250000	MO	1180		20K0F1E 20K0F3E	35.000	50.000			06-27-2009
7	1	000851.01250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000851.51250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000852.01250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000852.51250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
7	1	000853.01250000	MO	1180		20K0F3E	35.000	50.000			06-27-2009
8	1	000851.25000000	FB2C	1		20K0F1E 20K0F3E	72.400	500.000	62.2	64.9	06-27-2009
8	1	000851.30000000	FB2C	1		20K0F1E 20K0F3E	72.400	500.000	62.2	64.9	06-27-2009
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8	1	000852.81250000	FB2C	1		20K0F1E 20K0F3E	72.400	500.000	62.2	64.9	06-27-2009
8	1	000853.56250000	FB2C	1		20K0F1E 20K0F3E	72.400	500.000	62.2	64.9	06-27-2009

Control Points

Control Pt. No. 1

Address: 1303 N MILWAUKEE AVE

City: LIBERTYVILLE

County: LAKE

State: IL

Telephone Number: (847)377-7115

Waivers/Conditions:

NONE



CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
07/17/2014

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Aon Risk Services Central, Inc. Chicago IL Office 200 East Randolph Chicago IL 60601 USA	CONTACT NAME:	
	PHONE (A/C. No. Ext): (866) 283-7122	FAX (A/C. No.): (800) 363-0105
E-MAIL ADDRESS:		
INSURER(S) AFFORDING COVERAGE		NAIC #
INSURED Motorola Solutions, Inc. Attn Karen Napier 1303 East Algonquin Road Schaumburg IL 60196 USA	INSURER A: Liberty Mutual Fire Ins Co	23035
	INSURER B: Liberty Insurance Corporation	42404
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

Holder Identifier :

COVERAGES

CERTIFICATE NUMBER: 570054622754

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☒ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☒ POLICY ☐ PRO-JECT ☐ LOC OTHER:	Y		TB2641005169074	07/01/2014	07/01/2015	EACH OCCURRENCE	\$1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	\$250,000
							MED EXP (Any one person)	\$10,000
							PERSONAL & ADV INJURY	\$1,000,000
							GENERAL AGGREGATE	\$2,000,000
							PRODUCTS - COMP/OP AGG	\$1,000,000
A	AUTOMOBILE LIABILITY ☒ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NON-OWNED AUTOS			AS2-641-005169-014	07/01/2014	07/01/2015	COMBINED SINGLE LIMIT (Ea accident)	\$1,000,000
							BODILY INJURY (Per person)	
							BODILY INJURY (Per accident)	
							PROPERTY DAMAGE (Per accident)	
	UMBRELLA LIAB ☐ OCCUR EXCESS LIAB ☐ CLAIMS-MADE DED ☐ RETENTION						EACH OCCURRENCE	
							AGGREGATE	
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	WA764D005169084 All other States WC7641005169094 WI	07/01/2014	07/01/2015	☒ PER STATUTE ☐ OTH-ER	
B					07/01/2014	07/01/2015	E.L. EACH ACCIDENT	\$1,000,000
							E.L. DISEASE-EA EMPLOYEE	\$1,000,000
							E.L. DISEASE-POLICY LIMIT	\$1,000,000

Certificate No : 570054622754

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Re: CSA - Countywide Radio Communication Agreement. Lake County is included as Additional Insured with respect to the General Liability policy as required by written agreement.

CERTIFICATE HOLDER

CANCELLATION

Lake County Purchasing Division, 18 No. County St 9th Floor Waukegan IL 60085-4350 USA	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE <i>Aon Risk Services Central, Inc.</i>

LAKE COUNTY, IL

REQUEST FOR PROPOSALS
COUNTYWIDE RADIO
COMMUNICATIONS SYSTEM

EXHIBIT A
TECHNICAL SPECIFICATION

AUGUST 12, 2013

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1.0 INTRODUCTION

1.1 DEFINITIONS

The meaning of certain words as used within this solicitation shall be controlled through the use of the following definitions unless stated otherwise in the document.

700 MHz means the radio spectrum between 764 and 806 Megahertz as currently authorized by the FCC

800 MHz means the radio spectrum between 806 and 861 Megahertz as currently authorized by the FCC

APCO means the Association of Public-Safety Communications Officials, International

API means application programming interface, an interface that enables one program to use the facilities provided by another program

Autonomous Network means another land mobile radio network operated by an independent unit of government.

Backbone means a network of redundant components that provides communications between network RF transmission sites, communications centers where consoles are located, and the master network control location

BER means bit error rate

Business Day means any day, Monday – Friday that is not designated as a legal holiday by the County.

C or C++ means a compiled, computer software language

CATP means Coverage Acceptance Test Procedure

CMRS means Commercial Mobile Radio service

DTMF means dual tone multi-frequency

DSX means digital cross connection

Electronic Patch (or Network Gateway patch) means a device such as a Motorola Motobridge®, Harris NetworkFirst®, Raytheon ACU-1000® or similar product designed to provide interoperability between radio systems employing incompatible electronic technologies or architectures

FCC means the Federal Communications Commission

FDMA means frequency division multiple access

Fixed Network Equipment (FNE) means all hardware and software used to transmit and receive radio signals including but not necessarily limited to: the system's 800 MHz (700 MHz capable) transceivers, comparator/voter, system control systems, combiners, multiplexers, antennae, microwave transceivers and dishes, etc.

Full-Duplex means the ability to simultaneously transmit and receive a radio signal

Half-Duplex – See Semi-Duplex

In-building Coverage means the amount of signal margin in decibels or dB provided for in a radio system design for the purpose of overcoming signal attenuation due to building structure, in order to provide at least the minimum signal level necessary to provide acceptable portable radio communications inside a building. The RFP refers to 12 dB and 16 dB building penetration losses. It is the difference in signal strength between the outside and the inside of a building.

Link Budget An RF link budget is the wireless system designer's tool that allows them to incorporate the performance characteristics of the specific equipment used in a design and to determine the level of the wireless signal (or system sensitivity) necessary to provide the required level of performance.

LMR means Land Mobile Radio system

Network Site means a location proposed by the Offeror and approved by the County for the installation of FNE

Non-Compliant – See Non-Responsive

Non-Responsive (Non-Compliant) means that a requirement of the solicitation was not met and the proposal is subject to rejection

NPSPAC means the National Public Safety Planning and Advisory Committee

NPSPAC Region 54 means the coordinating body authorized by the National Public Safety Planning Advisory Committee with administrative authority over the County

PSTN means the Public Switched Telephone Network

Project 25 (P25) means a standard for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in an emergency

Repeater means an electronic device designed to instantly retransmit at a higher power the transmission of a subscriber

RF means radio frequency

Semi-Duplex (Half-Duplex) means the ability to non-simultaneously transmit and receive a radio signal using two discrete radio frequencies

Simplex – See Talkaround.

Solicitation means this document through which the requirements of the procurement are defined

SQL means structured query language, a relational database program used with a computer system

Offeror means the firm or entity with which the County will have contracted to install the System (synonymous with “Contractor”, “Supplier”, and “Bidder”)

System means all electronics, hardware, and software components routinely employed to operate the 800 MHz (700 MHz capable) digital trunked network including but not limited to fixed network equipment, antennae, transmission lines, electronic control consoles, microwave system, towers, tower grounding systems, associated subsystems, etc., resulting in a fully operational, licensable, highly reliable 800 MHz (700 MHz capable) digital trunked public safety and non-public safety radio communications capability meeting the requirements of and intended to be procured as a result of this solicitation.

Talkaround (Simplex) means the ability of a mobile or portable radio to communicate directly with another mobile or portable radio without the support of the network

TDMA means time division multiple access

Turnkey Solution means the entire system and all tasks or services associated with the system, including the preparation of sites or structures for the installation of System components, including the removal of any existing components of any kind, shall be performed under the responsibility of the Offeror.

2.0 BACKGROUND AND GENERAL DESCRIPTION OF WORK

2.1 CURRENT SYSTEM DESCRIPTION

A description of the public safety communications systems that are currently in use in Lake County is given in the following sections.

2.1.1 Lake County 800 MHz Trunked System

Lake County, IL owns and operates an 800 MHz trunked radio system. The system is described in the following sections.

2.1.1.1 Description of the existing Harris EDACS 800 MHz System

The County operates radio license WPMB711 which licenses a total of 8 frequencies at 5 transmit/receive sites and a 6th control point site in a simulcast configuration. The County operates a dual mode analog/digital Ericsson EDACS trunked radio system at these 6 sites. Additionally, WPMB711 includes 5 of those 8 channels at a 6th site for a backup system. Radio licensee WPSZ771 includes the 5 National Public Safety Planning Advisory Committee (NPSPAC) mutual aid channels at that same 6th site for mutual aid purposes.

All of the frequencies identified in both WPMB711 and WPSZ771 are part of the NPSPAC frequency band (806-809/851-854 MHz).

2.1.1.2 System Functionality

The 800 MHz EDACS system is a public safety trunked system. This is a proprietary system that provides radio coverage within Lake County. The system was designed for 90%, 12 dB in-building countywide radio coverage for portable radios equipped with speaker microphone antenna attachment (at shoulder level).

There are approximately 1,500 radios operating on the County radio system, 1,000 portables and 500 mobiles. Approximately 1208 of these radios are operated by County departments/agencies.

A total of twenty-one (21) departments/agencies operate on the radio system, eleven (11) County and ten (10) local government.

There are approximately 288 radios used by local governments that operate on the County radio system as follows:

Forest Preserve District – 128

Chem-Bio Group – 7

Homeland Security Group – 52

Island Lake Police – 29

Local and Regional PSAP Centers – 32

Lake County MEG – 25
Wauconda Fire/EMA – 4
Lake Bluff Police – 1
Gurnee Police – 1
Park City Police – 9

2.1.2 **Equipment & Sites**

2.1.2.1 **Primary System**

Lake County currently operates a 5-site and 1 Control Point site; 8-channel EDACS simulcast trunked radio system. The five transmit/receive sites are:

Site Name (Address)	Latitude	Longitude
Lake Zurich (25705 Fairfield Rd.)	42:14:12.1	88:04:17.3
Highwood (700 Sheridan Rd.)	42:12:37.7	87:48:55.9
Waukegan (18 N. County St.)	42:21:39.1	87:49:59.3
Lake Villa (1510 N. Cedar Lake Rd.)	42:23:17.1	88:05:40.3
Gurnee (32093 O’Plaine Rd.) also known as Warren	42:19:44.0	87:54:38.0

Each site contains 8 EDACS MASTR III base station/repeaters and associated Radio Frequency (RF) multiplexing and combining equipment. Each site uses two 5-port combiners, of which 4 ports are currently occupied on each. There are a total of 3 antennas at each site; 2 transmit and 1 receive.

The frequencies utilized at each simulcast site are shown in the Table below

Channel	Base Station Frequency (MHz)	Mobile Frequency (MHz)
1	851.2500	806.2500
2	851.3000	806.3000

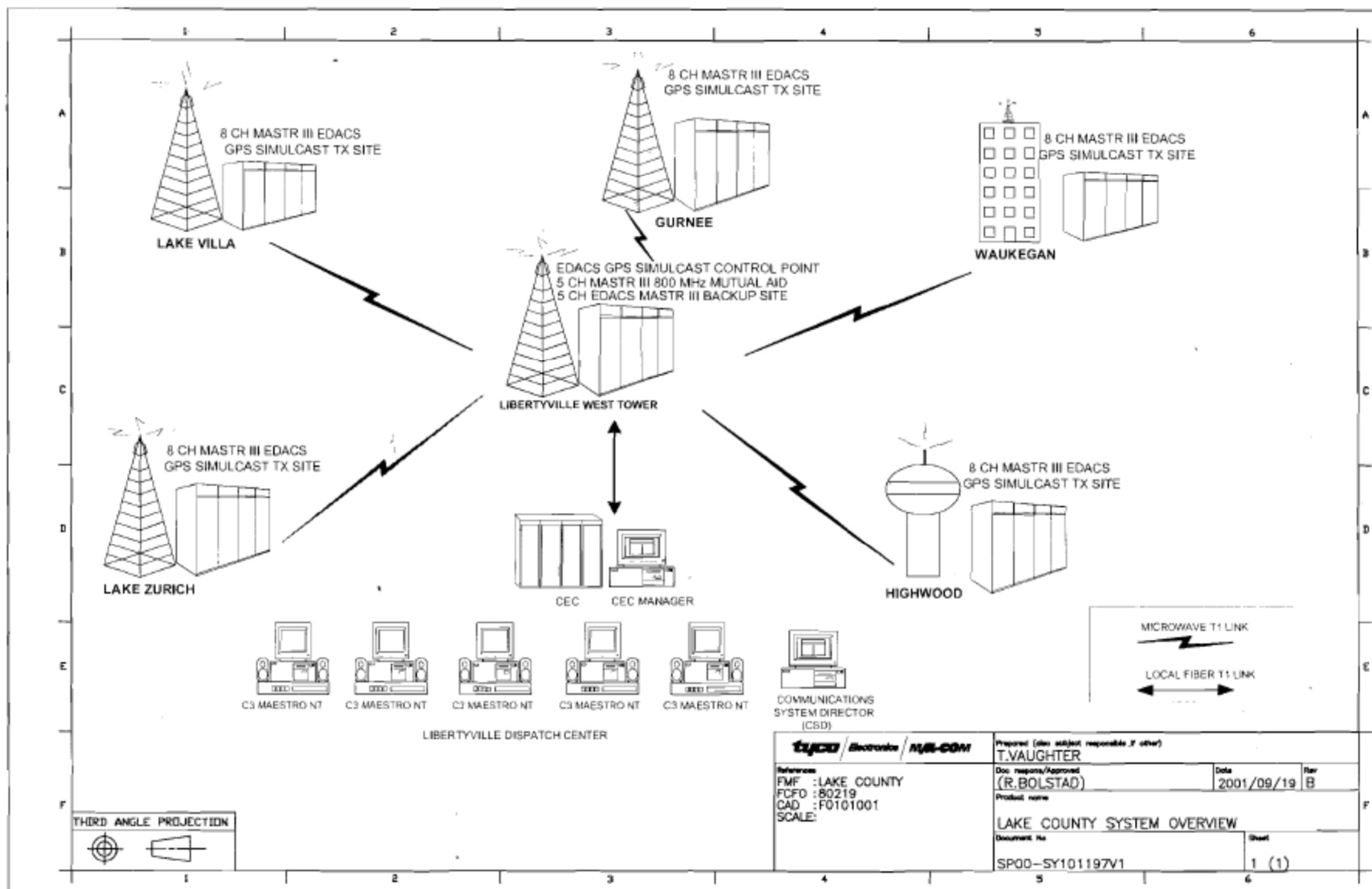
Channel	Base Station Frequency (MHz)	Mobile Frequency (MHz)
3	851.6375	806.6375
4	851.6875	806.6875
5	852.1250	807.1250
6	852.7250	807.7250
7	852.8125	807.8125
8	853.5625	808.5625

The radio sites that operate in a simulcast mode are linked by a microwave system (Alcatel MDR-8700, 6.7 GHZ). The figure on the next page provides an overview of the system configuration.

The additional information on the microwave system is as follows:

Licenses: WPQQ753 (Libertyville), WPTF809 (Gurnee), WPQQ756 (Lake Villa), WPQQ754 (Lake Zurich), WPQQ757 (Highwood), WPQQ750 (Waukegan)

Frequencies (MHz): 6755.0, 6775.0, 6655.0, 6695.0, 6690.0, 6850.0, 6615.0, 6855.0, 6595.0, 6815.0



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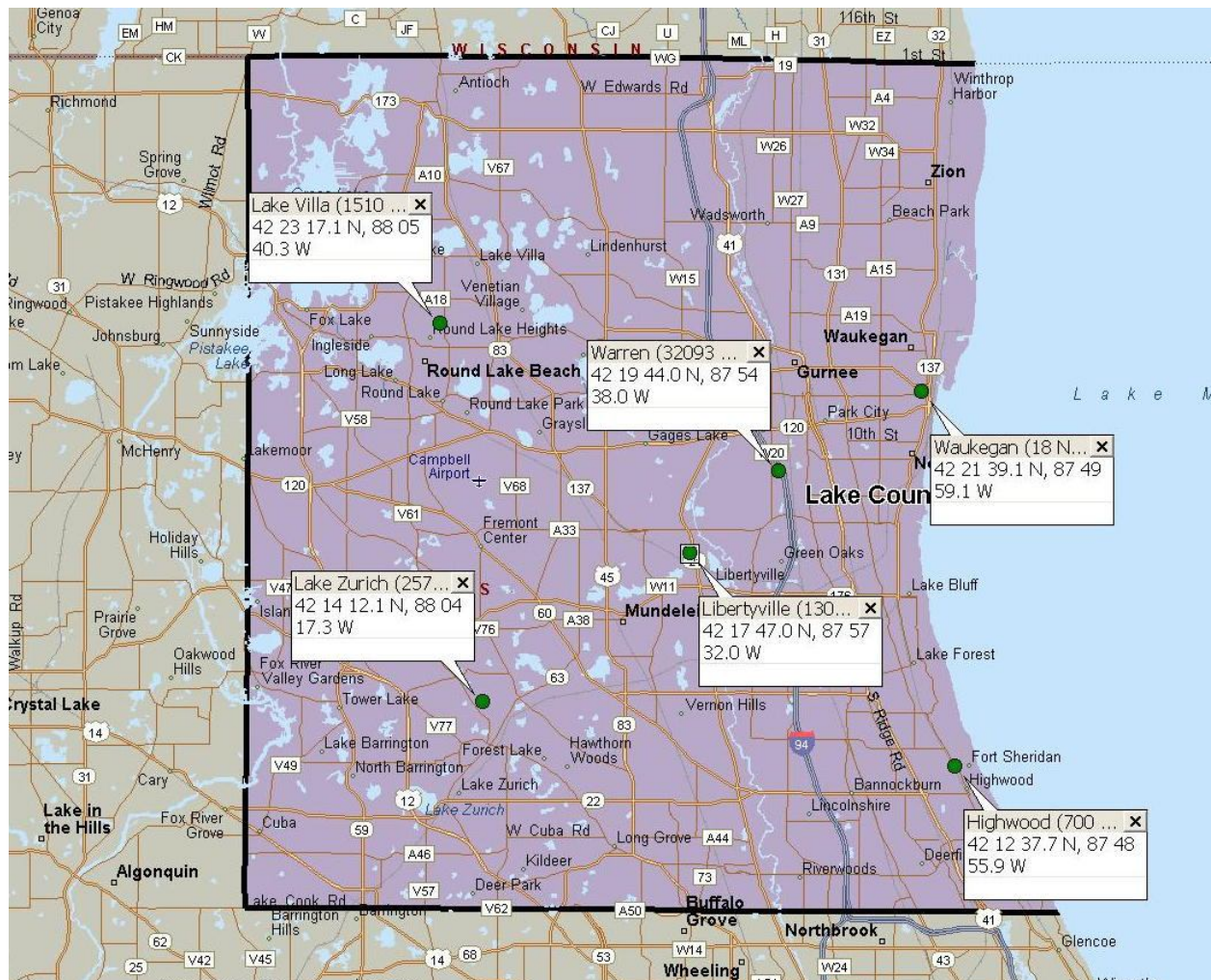
2.1.3 Backup and Mutual Systems

The backup system is a single-site system located at the Control Point site, 1303 N. Milwaukee Ave in Libertyville, IL (42:17:47.0/87:57:32.0). This site houses a 5-channel EDACS trunked radio system in addition to a 5-channel conventional mutual aid system utilizing the 5 NPSPAC channels. This site also uses 2 combiners, 2 transmit antennas and a single receive antenna. The frequencies in use at this site are displayed in the table below.

Channel	Base Station Frequency (MHz)	Mobile Frequency (MHz)
Backup System		
1	851.2500	806.2500
3	851.6375	806.6375
5	852.1250	807.1250
7	852.8125	807.8125
8	853.5625	808.5625
Mutual Aid System		
1	851.0125	806.0125
2	851.5125	806.5125
3	852.0125	807.0125
4	852.5125	807.5125
5	853.0125	808.5125

A map of all of the sites is displayed on the next page.

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2.1.4 Antennas and RF Combining Equipment

Each of the 5 transmit/receive sites of the simulcast system utilizes two 5-port combiners, of which 4 ports are currently occupied on each (with the exception of Waukegan), which feed 2 transmit antennas. A single receive antenna with Tower-Top mounted Amplifier (TTA) and receive multi-coupler is used at each site.

The Waukegan site is unique in that one of the combiners has its fifth port in use. For this combiner, the 5th port is used to provide a signal source for the in-building system that supports the Lake County Administration Building, Courthouse and Jail.

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2.1.5 Dispatch

The County Sheriff's Primary Dispatch Center at 1303 N. Milwaukee Ave. in Libertyville uses six (6) 911 Dispatch radio consoles to operate on the system with the ability to communicate with all radio system users and interface to 24 different conventional radio systems. The radio consoles are EDACS C3 Maestro XP from Harris Corporation. The positions are equipped with radio control stations and portable radios as backup to the consoles.

The County Sheriff's Primary Dispatch Center currently provides contractual law enforcement dispatch services for the following communities:

- Long Grove
- Deer Park
- Lake Barrington
- North Barrington
- Village of Volo
- Beach Park
- Forest Preserve

The Sheriff's Office also provides services to unincorporated areas of the County including the Chain of Lakes.

2.1.6 Coverage

The system was designed for 95%, on-street, countywide radio coverage for portable radios equipped with a speaker microphone antenna attachment (at shoulder level) and 90%, 12 dB in-building countywide radio coverage for portable radios equipped with a speaker microphone antenna attachment (at shoulder level).

2.2 BDAs in Lake County 800 MHz System

The Lake County system includes a Bi-Directional Amplifier (BDA) and fiber-optic in-building system to enhance the radio signal inside the Lake County Administration Building, Courthouse and Jail. The in-building system is connected via fiber to the Waukegan simulcast site located on the 12th floor penthouse of the Lake County building.

In addition to this BDA system, the County utilizes 2 mutual aid 800 MHz frequencies as backup to this BDA system. There is a back-to-back repeater configuration in use at the jail and one at the courthouse.

The County also has BDAs located at two branch courts at Lakehurst & Grayslake. These units are both Allen Telecom model #TPA7510180M. Each BDA uses two indoor antennas.

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2.2.1 Channel Loading

The radio system consists of 176 talk groups. The radio system channel usage capacity averages around 16.5 % per year. The radio system Push to Talk (PTT) transmissions average 3,000,000 per year.

The following table shows the talkgroups and their abbreviated name displayed on the radio for the County departments.

Talkgroup Abbreviation	Talkgroup Name
AC-ADMIN	Animal Control Administration
AC-DISP	Animal Control Dispatch
AC-DTL1	Animal Control Detail 1
AC-DTL2	Animal Control Detail 2
ALT-1	Tactical Unit Alternate 1 (Encrypted)
ALT-2	Tactical Unit Alternate 2 (Encrypted)
ALT-3	Tactical Unit Alternate 3 (Encrypted)
BLDGSECR	Andy Frain Building Security
BLDSRVS1	Facility Maintenance Building Services 1
BLDSRVS2	Facility Maintenance Building Services 2
CAR-CAR	Sheriff Office Car to Car
CID-TAC1	CID Tactical Unit 1 (Encrypted)
CID-TAC2	CID Tactical Unit 2 (Encrypted)
CIVIL-PR	Sheriff Office Civil Processing Div.
COM-NET	Com-Net Ericsson Testing Talk Group
CORADMIN	Coroner Office Administration
COR-COM1	Coroner Office Common Talk Group 1
COR-COM2	Coroner Office Common Talk Group 2

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Talkgroup Abbreviation	Talkgroup Name
COR-DISP	Coroner Office Dispatch
CRT-SECR	Sheriff Office Court Security Div.
DES-TST	Encryption Test talk Group (Encrypted)
DOTADMIN	Division of Transportation Administration
DOT-COM1	Division of Transportation Common 1
DOT-COM2	Division of Transportation Common 2
DOT-DISP	Division of Transportation Dispatch
DOTFLAG1	Division of Transportation Survey Talk Group 1
DOTFLAG2	Division of Transportation Survey Talk Group 2
DOTFLAG3	Division of Transportation Survey Talk Group 3
DOTMAINT	Division of Transportation Maintenance
EMPATCH1	Emergency Patch Talk Group 1
EMPATCH2	Emergency Patch Talk Group 2
EMPATCH3	Emergency Patch Talk Group 3
FIRECOM	Fire Command (Digital)
FLTSVRS	Sheriff Office Fleet Services
FP-ADMIN	Forest Preserve Administration
FP-COM1	Forest Preserve Common Talk Group 1
FP-COM2	Forest Preserve Common Talk Group 2
FP-DISP	Forest Preserve Dispatch

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Talkgroup Abbreviation	Talkgroup Name
FP-DTL1	Forest Preserve Detail Talk Group 1
FP-DTL2	Forest Preserve Detail Talk Group 2
FP-MAINT	Forest Preserve Maintenance
FP-RANGR	Forest Preserve Rangers
I LK ADM	Island Lake Administration
I LK CAR	Island Lake Car to Car
I LK DIS	Island Lake Dispatch
I LK INV	Island Lake Investigation (Digital)
I LK SUP	Island Lake Supervisor (Digital)
INTER10A	Interoperable Talk Group 10A
INTER10B	Interoperable Talk Group 10B (Digital)
INTER-1A	Interoperable Talk Group 1A
INTER-1B	Interoperable Talk Group 1B (Digital)
INTER-2A	Interoperable Talk Group 2A
INTER-2B	Interoperable Talk Group 2B (Digital)
INTER-3A	Interoperable Talk Group 3A
INTER-3B	Interoperable Talk Group 3B (Digital)
INTER-4A	Interoperable Talk Group 4A
INTER-4B	Interoperable Talk Group 4B (Digital)
INTER-5A	Interoperable Talk Group 5A
INTER-5B	Interoperable Talk Group 5B (Digital)
INTER-6A	Interoperable Talk Group 6A

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Talkgroup Abbreviation	Talkgroup Name
INTER-6B	Interoperable Talk Group 6B (Digital)
INTER-7A	Interoperable Talk Group 7A
INTER-7B	Interoperable Talk Group 7B (Digital)
INTER-8A	Interoperable Talk Group 8A
INTER-8B	Interoperable Talk Group 8B (Digital)
INTER-9A	Interoperable Talk Group 9A
INTER-9B	Interoperable Talk Group 9B (Digital)
INTEROPA	Interoperable Operations Analog (Fleet Call)
INTEROPB	Interoperable Operations Digital (Fleet Call)
IP-GATE1	Internet Protocol Gateway 1
JAIL CRT	Sheriff Office Jail CRT
JAILADMIN	Sheriff Office Jail Administration
JAILSVRS	Sheriff Office Jail Services
LC IT	Information & Technology Services
LC-ADMIN	Lake County Administration
LC-COM1	Lake County Common Talk Group 1
LC-COM2	Lake County Common Talk Group 2
LC-COM3	Lake County Common Talk Group 3
LC-COM4	Lake County Common Talk Group 4
LC-COM5	Lake County Common Talk Group 5
LC-COM6	Lake County Common Talk Group 6

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Talkgroup Abbreviation	Talkgroup Name
LC-COM7	Lake County Common Talk Group 7
LCEMA-1	LC Emergency Management Agency 1
LCEMA-2	LC Emergency Management Agency 2 (Encrypted)
LCFOREST	Forest Preserve Operations (Fleet Call)
LC-GANG	Lake County Gang Unit (Encrypted)
LCG-LCS	Local Government to Lake County Sheriff
HD-DISP	Health Department Dispatch
LC-MEG	Lake County MEG Unit (Encrypted)
LC-ROPE	Lake County Rope Unit (Encrypted)
LCS-1	Lake County Sheriff Common Talk Group 1
LCS-2	Lake County Sheriff Common Talk Group 2
LCS-911	Lake County Sheriff Emergency 911 Talk Group
LCS-CID	Lake County Sheriff CID Div.
LCS-HP1	Lake County Sheriff Highway Patrol 1
LCS-HP2	Lake County Sheriff Highway Patrol 2
LCS-JAIL	Lake County Sheriff Jail Div.
LCS-OPS	Lake County Sheriff Operations (Fleet Call)
LCS-RD	Lake County Sheriff Reserve Deputy
LCS-SUP	Lake County Sheriff Supervisor (Encrypted)

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Talkgroup Abbreviation	Talkgroup Name
LCS-TAC1	Lake County Sheriff Tactical Unit 1 (Encrypted)
LCS-TAC2	Lake County Sheriff Tactical Unit 2 (Encrypted)
LCS-TAC3	Lake County Sheriff Tactical Unit 3 (Encrypted)
LCS-TAC4	Lake County Sheriff Tactical Unit 4 (Encrypted)
LCS-TAC5	Lake County Sheriff Tactical Unit 5 (Encrypted)
LCS-TAC6	Lake County Sheriff Tactical Unit 6 (Encrypted)
LCS-TAC7	Lake County Sheriff Tactical Unit 7 (Digital)
LC-SVRS1	Lake County Services 1 (Fleet Call)
LC-SVRS2	Lake County Services 2 (Fleet Call)
MAJCRM	Major Crime Task Force Unit (Encrypted)
MARINE	Sheriff Office Marine Unit
MARINE 2	Sheriff Office Marine Unit
MUNI OPS	Municipal Operations (Fleet Call)
P&DADMIN	Planning and Development Administration
P&D-COM1	Planning and Development Common 1
P&D-COM2	Planning and Development Common 2
P&D-DISP	Planning and Development Dispatch
P&D-INSP	Planning and Development Inspectors

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Talkgroup Abbreviation	Talkgroup Name
P&D-PLAN	Planning and Development Planning
PC ADMIN	Park City Administration
PC CARS	Park City Car to Car
PC INV	Park City Investigation (Digital)
PC-DISP	Park City Dispatch
PD-ADMIN	Public Defender Administration
PD-COM1	Public Defender Common1
PD-COM2	Public Defender Common 2
PT B ADM	Port Barrington Administration
PT B INV	Port Barrington Investigation (Digital)
PUBSVRS	Public Service Operations (Fleet Call)
PW-ADMIN	Public Works Administration
PW-COM1	Public Works Common 1
PW-COM2	Public Works Common 2
PW-DISP	Public Works Dispatch
PW-MAINT	Public Works Maintenance
RADICOM	Radicom Testing Talk Group
RADIO 2	Radio Maintenance Talk Group
RA-MAINT	Radio Maintenance Talk Group
SA-ADMIN	States Attorney Administration
SA-COM1	States Attorney Common Talk Group 1
SA-COM2	States Attorney Common Talk Group 2

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Talkgroup Abbreviation	Talkgroup Name
SA-INV	States Attorney Investigations (Encrypted)
SD ADMIN	Sheriff Office Administration (Encrypted)
SMC-1	Storm Water Management Talk Group 1
SMC-2	Storm Water Management Talk Group 2
SP-DTL1	Special Event Detail 1
SP-DTL2	Special Event Detail 2
SP-DTL3	Special Event Detail 3
SP-DTL4	Special Event Detail 4
SPEVENT	Special Event Operations (Fleet Call)
SPEVENT1	Special Event 1
SPEVENT2	Special Event 2
SPEVENT3	Special Event 3
SPEVENT4	Special Event 4
SPL-OPS	Special Operations (Fleet Call)
SP-SRVS	Special Services (Fleet Call)
STAPOL 1	Illinois State Police Talk Group
T LK ADM	Towers Lake Administration
T LK INV	Towers Lake Investigation (Digital)
TEAM LDR	TAC Team Leaders (Encrypted)
TECH1	Radio Technician Talk Group 1
TECH2	Radio Technician Talk Group 2
TECH3	Radio Technician Talk Group 3

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Talkgroup Abbreviation	Talkgroup Name
TECH4	Radio Technician Talk Group 4
TRNG1	Training Talk Group 1
TRNG2	Training Talk Group 2
TRNG3	Training Talk Group 3
TRNG4	Training Talk Group 4
TRANSPORT	Sheriff Office Jail Transport
TST-TRN	Test and Training (Fleet Call)
WARRANT	Sheriff Office Warrants Div.
WAUCONDA	Wauconda Fire Talk Group
WRNTTAC1	Sheriff Office Warrants Div. (Encrypted)
WRNTTAC2	Sheriff Office Warrants Div. (Encrypted)
HD-ADM	Health Department Administration
HD-1	Health Department Talk Group 1
HD-2	Health Department Talk Group 2

2.2.2 Subscriber Equipment

Below is a table indicating the current number and type of subscriber units utilized by the Lake County system (Radio models highlighted **Green** are capable of both P25 Phase1 and Phase 2 and are dual band 700/800 MHz. Radio models highlighted **Yellow** are Phase I and 800 MHz only.):

Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Animal Control	P5100	9	500M	8

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Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Coroner Office	P7250	10	500M	6
Division of Transportation	LPE-50	29	500M	117
Facilities Operations	LPE-50	28	500M	2
Forest Preserve District	LPE-200/50	72	Orion	4
	P7150	33	M7100	19
Health	LPE-200/50	34	500M	3
	P5150	20	M7300	1
	P7250	3		
	P7270	1		
	XG-75	20		
Emergency Management	LPE-200	114	Orion	2
	P7250	8		
Public Works	LPE-50	13	500M	73
Radio	LPE-200	1	500M	4
	P7150	4		
Planning, Building & Development	LPE-50	30	500M	3
State Attorney's Office	LPE-200	9	-	-

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Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Sheriff's Office	P7150	153	Orion	211
	LPE-200/50	111	M7100	16
	P7250	280	500M	7
	--	--	M7300	19
	TOTAL	982	TOTAL	495

The table below identifies the current radio units that are capable of Phase I, Phase II and 700/800 MHz.

Portable	Mobile	Phase I	Phase II	700 MHz	Quantity
P5150		Yes	No	No	20
P7150		Yes	No	No	190 ¹
P7250		Yes	Yes	Yes	299
XG-75		Yes	Yes	Yes	20
	M7100 ²	Yes	No	No	35
	M7300	Yes	Yes	Yes	20
Total					584

¹ There are total of 207 P7100 series (7100, 7150, and 7170) portable radios in the County's inventory list. There are about seven (7) units of the total that will require additional investigation to determine if they are upgradable to P25 Phase I.

² M7100 mobile is discontinued – support is provided through December 31, 2014.

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2.2.3 EDACS End-of-Life (EOL)

The County has received end-of-life (EOL) notice for EDACS products from the radio system manufacturer, Harris as follows:

Product	EOL Date:	Harris provides support and service parts through:
P5100	September 2010	September 2, 2015
M7100	December 31, 2009	December 31, 2014
Integrated Multisite Console Controller (IMC)	December 30, 2011	February 2014 IMC Boards ordered as service parts by March 2015
MASTR III station and site related equipment	December 30, 2011	December 3, 2017
Communications Systems Director (CSD)	August 2009	August 2014 through after- market distributors
C3 Maestro Radio Dispatch Consoles	December 17, 2010	March 23, 2015

2.2.4 Entities in Lake County

For information purposes, the following table indicates the entities in Lake County that operate on various networks.

Lake County Entities	Count
9-1-1 Systems	21
PSAP & Dispatch	41
County	6
Fire	33
Police	42
Municipalities	52

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Lake County Entities	Count
Township	18
Other Governmental	1
Hospital	5
Schools	51
Parks	21
Utility	3
Railroad & Transit	8
State & Federal	11
Venue	3
NFP Service Provider	3
Private	5

2.3 Summary of Major Concerns and Challenges

During recent interviews with County representatives, the following items of concern were raised by the participants:

2.3.1 Sheriff's Office – 911 Primary Dispatch Center

The major concerns of the Sheriff's Office 911 Dispatch Center are as follows:

- o Coverage
 - Intermittent dead spots in various geographical localities throughout the County
 - Unable to reach deputies inside buildings
 - Areas with limited/sporadic coverage:
 - o Inverrary
 - o Beach park

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- o Cary
 - o Deer Park
 - o Lake Barrington
- o Channel congestion (Not a radio issue)
- o Limitation on changing console desktop layout and updating the screens
- o Battery issues (batteries seem to die on portables with very little warning)

The major needs of the County Sheriff's Office 911 Primary Dispatch Center are as follows:

- o Coverage:
 - Reliable countywide Coverage
 - In-building coverage at the following facilities (Appendix A & B Contain a listing of the major facilities and schools requiring in-building coverage):
 - All hospitals (Condell, Vista Hospitals, Good Shepard)
 - o Emergency rooms
 - All schools
 - All nursing/extended care facilities
 - Trailer parks
 - Movie theaters & Hotels
 - Abbott Laboratories – Libertyville
 - HSBS – Mettawa
 - CDW – Mettawa
 - COSCO – Mettawa
 - Baxter Health Care – McGaw Park
 - Menards – Long Grove
 - Sheriff's Office County 1
 - Sheriff's Office Jail
 - Depke Juvenile Center
- o Patching and simulselecting on the radio console
- o Programmable tones
- o Manually reassigning portables to another group from dispatch

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- o Ability to add departments on other bands to Sheriff's consoles whether monitor only or transmit and monitor
- o Door monitoring
- o Paging system
- o VoIP capability
- o Portable radios
 - Earpiece compatibility
 - Battery life minimums
 - Identifiers that can be programmed with a name or unit number – to a radio that is semi-permanently assigned to the deputy

2.3.2 Sheriff's Office – Corrections

The major concerns of the Sheriff's Corrections Division in Waukegan are as follows:

- o Coverage
 - There are several dead spots including parts of the Command offices in the basement and elevators Jail facility at 20 South County in Waukegan.
- o Issues with batteries charge not lasting for the entire 8 hour shift. The officers currently share radios.
- o Issues with cable to speaker-mic-antenna constantly breaking

The major needs of the Sheriff's Corrections Division in Waukegan are as follows:

- o Coverage:
 - Reliable coverage within the jail and bullpen area and a range of 5 miles outside of the Jail building at 20 South County in Waukegan.
 - Also reliable coverage Inside the following facilities:
 - o Court Complex (18 North County, Waukegan)
 - o Community Based Correction Center (15 N. Martin Luther King Blvd., Waukegan)
- o Portable radio with speaker mic; antenna placement either on the mic or radio.
- o Currently use encryption for the Supervisors talk group. Would also like to have an encrypted talkgroup for the tactical unit.

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2.3.3 Sheriff's Office – Admin

The major concerns of the Sheriff's Admin Division are as follows:

- o Coverage
 - Lack of reliable portable coverage in District 1 (Appendix C contains a map showing the Sheriff Patrol Zones/Districts) and in buildings – hospitals and schools.
- o Channel congestion
- o Interoperability – Cannot communicate with Mundelein or Waukegan.
- o Equipment issues – Cannot change from HP1 to a desired talkgroup by clicking the talkgroup knob (requires additional steps).
- o Scan – Cannot change settings of scan with priority on the portable without reprogramming of the radio.

The major needs of the Sheriff's Admin Division are as follows:

- o Coverage:
 - Reliable coverage within all hospitals schools, government facilities, and corporate buildings in Lake County.
- o Portable radio with speaker mic; antenna placement either on the mic or radio. Prefer antenna on the portable.

2.3.4 Sheriff's Office – Patrol Division

The major concerns of the Sheriff's Patrol Division are as follows:

- o Lack of adequate coverage in Barrington, Inverrary, Buffalo Grove, Volo
- o Lack of coverage inside buildings (Hospitals, schools, corporate campuses and buildings, colleges)
- o Channel congestion

The major needs of the Sheriff's Patrol Division are as follows:

- o Reliable coverage
- o Encrypted talkgroups
- o Prefer antenna on the portable
- o Combine VHF and 800 MHz radio heads inside the vehicle into one.
- o VHF ISPERN on the 800 MHz portable radio

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2.3.5 Sheriff's Office – Marine Unit Division

The major concerns of the Sheriff's Marine Unit Division are as follows:

- o Coverage
 - Weak portable radio coverage in some areas along the shore with high hills while patrolling in waters: Bluff Lake, Channel Lake and Marie.
 - Inside buildings (the marine officers operate in pairs. It is possible that they can switch to simplex operation when entering the buildings. The current car-to-car talkgroup is repeated through the system).
 - Weak signal miles out on Lake Michigan (harbors of Lake Michigan, especially Lake Forest and Winthrop Harbor areas).
- o Interoperability
 - Lack of direct radio interoperability with fire departments. All boats are equipped with VHF marine radios. However, only two of them are capable of being programmed on fire interoperability channels such as NIFERN (the two boats have the older Motorola VHF Spectra radios).
 - Lack of direct radio interoperability with Conservation police (DNR) – They are on Starcom21.
- o Inadequate portable radio battery performance. Need to last the entire shift.
- o Audio feedback when two or more portable units in close proximity of each other (on the same talkgroup).
- o Hard to operate the volume control on the speaker-mic-antenna unit.

The major needs of the Sheriff's Marine Unit Division are as follows:

- o Coverage:
 - Reliable coverage within Northwest Lake County comprised of Chain of Lakes.
 - Reliable coverage up to 5 miles offshore of Lake Michigan boundaries.
 - Coverage inside the emergency room and EMS area of the following hospitals:
 - Northern Illinois Medical
 - Condell
 - Good Shepard

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- o All features such as interoperability must be “simple” to operate without complicated steps.
- o Portable radio with speaker mic; antenna placement on the radio.
- o The portable radio to be adaptable to using with an earpiece, so one can hear the radio over large noisy crowd and music.
- o Portable radios with “D-Clip” holster mounts.
- o Water resistant (weatherproof) and in some cases (personal watercraft) shall be submersible radios. These radio swill require an earpiece and push button microphones.
 - The microphone should also be waterproof to increase coverage reliability.

2.3.6 Sheriff’s Office – Criminal Investigation

The major concerns of the Sheriff’s Criminal Investigation are as follows:

- o Their coverage issues are the same as the Patrol Division.
- o Lack of radio coverage when their operation is outside of the County.

The major needs of the Sheriff’s Criminal Investigation are as follows:

- o Coverage:
 - Reliable coverage within Lake County as well as anywhere in Illinois and beyond border areas in Wisconsin and the St. Louis area.
- o Use of talk-around channel during their tactical operation
- o Use of two or more encrypted talkgroups
- o Covert radio equipment installations (such as inside glove compartment)

2.3.7 Sheriff’s Office – Court Security

The Court Security main operation is in Waukegan with additional operation at the following branch courts:

- o Round Lake Beach (1792 Nicole Lane) – 1 deputy
- o Vernon Hills (24647 North Milwaukee Avenue) – 3 deputies
- o Park City (301 S Greenleaf Avenue) – 2 to 3 deputies
- o Mundelein (105 E. State Route 83 - Hwys. 83/60 and Diamond Lake Road) – 1 deputy

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The major concerns of the Sheriff's Court Security are as follows:

- o Inadequate number of portable radios
- o Inadequate portable radio battery performance. Need to last the entire shift.
- o Audio feedback when two or more portable units in close proximity of each other (on the same talkgroup).
- o Issues with cable to speaker-mic-antenna constantly breaking
- o Interference to recently installed wireless alarm in Juvenile Court. It triggers the panic alarm when transmitting on radio.

The major needs of the Sheriff's Court Security are as follows:

- o Need for additional radios (there are 74 deputies and 40 radios which are assigned to the full deputies. Some of the radios are loaned to this department from the Radio Department).
- o Encrypted talkgroups
- o Prefer antenna on the portable
- o Ear phone option (a must inside the court)
- o Need coverage within 2 blocks of the Waukegan facility for escorts

2.3.8 Lake County Forest Preserve Police Department

The major concerns of the Lake County Forest Preserve are as follows:

- o Coverage inside the following buildings:
 - 1899 W Winchester Rd., Libertyville – 3-story office building housing Forest preserve General Office.
 - 19808 W Grand Ave., Lindenhurst – two story office building for Public Safety Office.
 - 1215 Green Bay Road, North Chicago – single story cultural center.

The major needs of the Lake County Forest Preserve are as follows:

- o Reliable coverage inside the specified offices.
- o Portable radio with speaker mic; antenna placement on the radio.

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2.3.9 State Attorney Office

The major needs of the State Attorney Office are same as Sheriff's Office.

2.3.10 Lake County Animal Care and Control

The major concerns of the Lake County Animal Care and Control are as follows:

- o Portables are bulky and uncomfortable to wear.

The major needs of the Lake County Animal Care and Control are as follows:

- o Reliable coverage countywide
- o Reliable coverage inside the following facilities:
 - LCACC office and kennel facility
 - Lake County Government offices

2.3.11 Lake County Planning, Building & Development

The major concerns of the Lake County Planning, Building & Development are as follows:

- o Coverage issues across the County (The Department has 17 portable radios and one control station for their base. No mobile radios).
- o Lack of features to communicate between departments (today it is performed via cellphone and other means such as email)

The major needs of the Lake County Planning, Building & Development are as follows:

- o Reliable coverage countywide
- o Reliable coverage inside:
 - large non-residential medical and industrial buildings
 - All Lake County facilities (basements included)

2.3.12 Lake County Health Department

The major concerns of the Lake County Health Development are as follows:

- o Poor reception inside some of their locations:
 - 3010 Grand Ave., Waukegan
 - Permit Facility in Libertyville

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The major needs of the Lake County Health Development are as follows:

- o Reliable coverage countywide
- o Reliable coverage inside the specified facilities.

2.3.13 Lake County Facilities Operations

The major concerns of the Lake County Facilities Operations are as follows:

- o Poor reception inside some of their locations:
 - Jail (offices in basement area) in Waukegan
 - Central Permit Facility in Libertyville

The major needs of the Lake County Facilities Operations are as follows:

- o Reliable coverage inside the following facilities:
 - Central Permits – Libertyville
 - Administration Tower – Waukegan
 - Babcox Center – Waukegan
 - Community Based Corrections Center (CBCC) (15 South Martin Luther King Jr. Ave., Waukegan)
 - Courts Complex - Waukegan
 - Depke (24647 N Milwaukee Ave., Vernon Hills, Illinois 60061)
- o Portable radio with speaker mic; antenna placement on the radio.

2.3.14 Lake County Division of Transportation (DOT)

The major concerns of the Lake County Division of Transportation (DOT) are as follows:

- o Interoperability is currently only available on certain radios on the emergency channels or through the County Sheriff's Primary Dispatch Center and only if they are monitoring the DOT's transmissions

The major needs of the Lake County Division of Transportation (DOT) are as follows:

- o The DOT needs more open and accessible interoperability with other agencies.

2.3.15 Lake County Public Works

The Lake County Public Works has no major issues with the current system. They use cellphones as their primary mode of communications.

The major needs of the Lake County Public Works are as follows:

- o Interoperability with EMA and HWY during certain events
- o Portable coverage inside their 650 and 648 buildings in Libertyville complex.
- o Portable will need to be hip mounted with holder and a speaker microphone on shoulder.

2.3.16 Lake County Coroner's Office

The Lake County Coroner's Office has five vehicles, four of which are equipped with mobile radios. There are seven deputies each with a portable radio. There are two additional portable radios as spare. There is also a desktop control station at their office at 26 N. Martin L. King Jr. Ave, Waukegan, IL 60085-4351. The deputies use cellphones as their primary mode of communications. The two-way radios are necessary in the event they need to call for backup or reach other departments on the radio.

The major concerns of the Lake County Coroner's Office are as follows:

- o Channel congestion on Lake County Sheriff's Primary Dispatch Center talkgroup (LCS1). The Department will use cellphones to contact the dispatch center in those instances when the channel is busy.
- o Poor or lack of coverage when transmitting from inside the hospitals. This can be any part of the hospital.

The major needs of the Lake County Lake County Coroner's Office are as follows:

- o Encrypted channel (currently in use)
- o Reliable coverage inside the hospitals including basement where typically the morgue is located:
 - Condell
 - Vista
 - Vista West
 - Highland Park
 - Lake Forest
 - Good Shepard

2.4 SYSTEM FUNCTIONAL OBJECTIVES

The proposed LMR system shall:

- A. Provide reliable on-street and in-building portable radio communications coverage pursuant to the standards defined in this solicitation.
- B. Replace the County's existing radio systems with no loss of present capabilities or functionality in a manner that will maximize resource sharing and interoperability among all County agencies through direct radio communications using a common P25 digital trunked 800 MHz (700 MHz capable) radio system with the following features:
 - 1) Trunked digital voice communications between all portable, mobile, control station subscriber radios and dispatch consoles in the system. Automatic fallback modes of operation in the event of network failure or compromise.
 - 2) Emergency call, individual private call, call alert paging, dynamic regrouping, priority talkgroup scan, radio inhibit/uninhibit capabilities, status/message, short message service, and PTT-unit identification from all radio units.
 - 3) Automatic unit identification with alias throughout the duration of each call upon every push-to-talk on a radio unit.
 - 4) Multiple-key encryption between suitably equipped subscriber units and dispatch consoles.
 - 5) Maximized utilization of the assigned 800 MHz frequencies.
 - 6) The capability of direct radio-to-radio conventional simplex "talkaround" communications in both P25 digital (Common Air Interface) and analog modes of operation.
 - 10) Optionally, automatic vehicle location (AVL) capability from suitably equipped mobile and portable subscriber radios.
 - 11) Optionally, the transmission and reception of text messaging between subscriber radios and the network's FNE.

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- C. Provide physical and logical redundancy throughout all of the system components such that there are no single points of failure in any aspect of the delivered system.
- D. Employ technologies to:
 - 1) Allow shared use of one or more autonomous network(s) with proposed subscriber radios. Allow shared use of proposed network with interoperability partners utilizing neighboring autonomous network(s).
 - 2) Provide for system and subscriber equipment expandability for future growth in the 700 MHz public safety band as well as additional 800 MHz frequencies.
 - 3) Support industry standards for compatible, interoperable multiple vendor subscriber hardware such as mobile, portable, and control station units.
 - 4) Support and fully employ applicable APCO Project 25 Standards for Phase 1 and Phase 2.
 - 5) Support and allow expandability of the proposed system/network to accommodate additional channels, sites and simulcast cells to support additional users, groups and coverage areas.
- E. Interface with and integrate existing equipment and subsystems as specified in this solicitation.
- F. Provide reliable and uninterrupted wireless communications in the vicinity of existing commercial wireless telecommunications facilities located within the County, as well as commercial facilities located near its borders.

2.5 MAJOR SYSTEM COMPONENTS

The major components of the Offeror's system shall include:

- A. A main dispatch control site to be located at the County Sheriff's Primary Dispatch Center at 1303 N. Milwaukee Ave., Libertyville IL as specified by the County.
- B. Remote network digital FNE RF transceiver sites with associated antennas and transmission lines required to provide in-building portable coverage as outlined in this specification.

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- C. Interfaces to integrate existing conventional analog NPSPAC ITAC, VHF/UHF/800 MHz mutual aid infrastructure for interoperability and intra-County operations.
- D. Dispatch communications consoles and a logging recorder and interface at the County Sheriff's Primary Dispatch Center referenced.
- E. A high-capacity loop microwave backbone network with associated transport equipment to connect the master control components with all associated remote FNE RF transceiver sites.
- F. Site development and improvements/modifications as required to construct the LMR and microwave backbone networks.
- G. Mobile, portable, and control station subscriber radios that meet the functional requirements of the user agencies.
- H. Control stations at assorted County facilities as specified in the solicitation.
- I. A fault management system with PC-based diagnostic clients having a graphical user interface capable of monitoring site conditions and providing network alarm information to Lake County Radio Department and remote network administrator positions.
- J. Fault-tolerant and/or redundant computers and associated server computers, as required, to control real-time trunking call processing and system database and user privileges.
- K. Network timing and synchronization equipment required to provide transport and discrete network element clocking.
- L. In-building coverage solutions (as required) to provide coverage to critical buildings as identified in the Exhibits.

2.6 SERVICES TO BE PROVIDED BY THE SUCCESSFUL OFFEROR

2.6.1 Turnkey

This solicitation and any resulting agreement require the turnkey construction, installation, testing, and delivery of a completely operational system as specified by this solicitation and any resulting agreement. The Offeror shall furnish all materials, equipment, tools, skill, engineering, and labor necessary to fully complete, in a timely manner, the requirements of this solicitation and any resulting

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agreement according to the specifications, terms, and conditions contained in this solicitation and any resulting agreement, including any Appendices and Exhibits. The Offeror assumes full responsibility for personnel, materials, and equipment employed in construction of the system and agrees to make no claims against the County for damages to such materials or equipment except for that which is caused solely by the County, its employees, or agents.

In the event that any existing towers are reused in the Offeror's network design, the Offeror's proposal also shall include as a part of the turnkey project the cost for removing any existing antennae, cable, connectors, etc. that need to be removed from operation. In the event that any existing communications facilities are reused in the Offeror's network design, the Offeror's proposal also shall include as a part of the turnkey project the cost for improving or rehabilitating the existing facilities. All surplus materials shall remain the property of the County. The Offeror shall haul away and dispose of any used materials the County does not desire to retain.

2.6.2 Inspection of Potential Network Sites

Prior to recommending any network sites, including those identified in this solicitation for the Offeror's consideration, the Offeror shall conduct a thorough review and assessment of all sites to be included in the proposed system and identify all of the required services and costs necessary to completely develop the sites. The Offeror shall perform tower loading analyses and microwave path field verifications

2.6.3 Geotechnical Site Assessments

In the assessment of potential network sites, the Offeror shall propose to provide an engineering assessment of a site's soil conditions and remediation requirements, if any. The Offeror shall certify that the site is intended to be included in the proposed design. Before any work is authorized, the Offeror shall submit a written proposal to the County stating that they intend to incorporate the site in the proposed network design. All geotechnical site assessment activities shall be included in the original contract proposal price and detailed explicitly.

2.6.4 System Design

Except as specifically noted elsewhere in this solicitation, the Offeror shall be solely responsible for the design of the County system. The Offeror shall incorporate the current and currently projected population and system usage growth requirements of the County into the proposed system design. The Offeror shall warrant, guarantee, and covenant that the system is and will be engineered, furnished, installed, optimized, tested, and warranted, by the Offeror to meet or exceed the current needs and currently projected future growth needs of the County.

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The Offeror, at the Offeror's sole expense, shall provide any and all changes in the system required due to the system's inability to meet the stated system performance criteria. The Offeror at the Offeror's sole expense shall provide any additional sites or changes in antennas which may be required to correct coverage design deficiencies because the Offeror has failed to satisfy the coverage requirements of this solicitation and any resulting agreement.

2.6.5 Integration

The Offeror shall be solely responsible for the proper installation and interfacing of all equipment provided pursuant to this solicitation and any resulting agreement. In any circumstances where existing equipment of the County is being utilized in the system, the Offeror shall warrant that the equipment provided by the Offeror will fully perform in strict conformance to the specifications and conditions incorporated in this solicitation and any resulting agreement and will be compatible with the County's existing communications system, as required by this solicitation and any resulting agreement.

The Offeror shall be responsible for a complete, integrated factory staging of the radio communications system and ancillary subsystems, with the associated microwave backbone prior to shipment of the equipment to the County for field integration. The County will witness the complete system staging and participate in a factory acceptance process which shall result in the approval of the staged system for shipment to the County.

Field integration of the radio communications system, microwave backbone, and required tower/shelter facilities shall be the sole responsibility of the Offeror. Shipment, storage, and warehousing at Offeror-provided facilities of equipment prior to site availability shall be the responsibility of the Offeror. All electrical and mechanical work necessary to commission each site for usage and testing shall be the responsibility of the Offeror. Coordination with telecommunications and electrical service providers shall be the responsibility of the Offeror.

2.6.6 Sites and Inspection

As of the date of execution of any resulting agreement, the Offeror shall have completed a site inspection by qualified personnel of each existing and proposed site comprising the system, and shall have agreed that the present condition of such sites and any existing facilities are acceptable to the Offeror and that the system can be installed in a workable condition at each site. Should the proposed site not meet the requirements of the Offeror, the Offeror shall identify with specificity the materials of all kinds needed to bring the site to the standards needed to meet all State and County building codes as well as the Offeror's own published internal quality and workmanship standards. No change orders for site preparation or remediation materials shall be accepted following the execution of an agreement between the Offeror and the County.

During the term of any resulting agreement, should it become necessary that alternative sites and facilities be substituted for other sites and facilities, the Offeror shall inspect the submitted sites and facilities and report to the County, in writing, those conditions that make substitution necessary. The Offeror shall agree to correct malfunctions, hardware defects, and failures of the system to perform in strict conformance with the specifications of this solicitation and any resulting agreement. The Offeror shall, prior to installation of the system at each site, re-inspect such site including structures located thereon and shall identify, in writing, to the County any changes in sites, materials, and facilities since the initial inspection that may affect the system. If the Offeror fails to re-inspect the sites prior to installation of components of the system, it shall thereafter be liable for any failure of the system to perform in conformance with this solicitation and any resulting agreement caused, in whole or in part, by changes at any site.

2.6.7 Installation and Alteration

Prior to installing any components of the system at any site, the Offeror shall determine and ensure that the construction and alterations required for the system to be properly installed, including the following, are present, sufficient, and appropriate at each site:

1. Access
2. Electrical power and PSTN Telco facilities
3. Wiring
4. Standards-compliant site grounding
5. Environmental controls and equipment

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6. Emergency generators
7. Towers/Lights
8. Shelter and emergency fuel tanks
9. Fencing
10. Fire Suppression
11. Console cabinets and furniture.

All of the Offeror's work shall comply with all applicable federal, state, and local codes and ordinances.

2.6.8 Permits

The Offeror shall agree to prepare and submit all necessary forms and to obtain all permits, licenses, certificates of occupancy, and clearances, as required.

2.6.9 Network Backbone

The Offeror shall agree to engineer, design, and implement a public-safety-grade, highly available (>99.9999% availability) backbone network. The Offeror shall be responsible for prior coordination notices (PCN) as well as for fully processing, on behalf of the County, the FCC license application for all microwave frequencies required to implement the system in accordance with the requirements of this solicitation and any resulting agreement. All field site survey and path walks necessary to design the microwave backbone are the sole responsibility of the Offeror.

2.6.10 FAA/FCC Regulatory Work

The Offeror is responsible for obtaining, on behalf of the County, all required FAA, FCC, and other miscellaneous licenses necessary to commission the entire radio communications system at all of the selected network sites. The County understands that it will be the ultimate signatory for all license documents, but the Offeror shall be responsible for producing all required technical analyses, coordinating all licensing activities, and processing the licensing documentation with the appropriate licensing and regulatory authorities.

2.7 OTHER OFFEROR REQUIREMENTS

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2.7.1 Property Damage

The Offeror shall neither remove any County fixture nor County property, real or personal, from County premises, nor temporarily nor permanently affix any equipment to County premises not specifically required by this solicitation and any resulting agreement without the express written consent of the County. In the event that any real or personal property of the County is damaged by any act or omission of the Offeror, or any of its employees, agents, subcontractors or servants, the Offeror shall, at the sole option of the County, either immediately repair or replace such damage to the complete satisfaction of the County, or, upon the County's presentation of an invoice, reimburse the County for the actual reasonable cost of repairing such damaged property. The Offeror shall regularly keep the County's premises reasonably clean of accumulations of rubbish or scrap resulting from the work covered by this solicitation and any resulting agreement. Upon completion of the system, the Offeror shall leave the County's premises free from rubbish or scrap material resulting from the Offeror's performance. At any time during the project if the County or its designee deems a site to be in need of trash removal due to Offeror efforts, the Offeror shall be responsible for removing the rubbish at its expense upon County notification.

2.7.2 Existing System Interruptions

The Offeror fully understands that the system will, at times, be operating in parallel with the County's current communications system. The Offeror also understands that interruptions to the existing County communications system must be minimized or altogether eliminated during the field implementation due to the commitment of the County to provide for the health, welfare, and safety of its citizens. Therefore, the Offeror agrees that at no time will its employees, agents, subcontractors or servants perform any work under this solicitation and any resulting agreement that will interrupt the existing communications system of the County or any components of such system unless coordinated in advance with the County. If an interruption is unavoidable for the Offeror to perform work under this solicitation and any resulting agreement, the Offeror shall first contact the County's Project Director and set out in writing the following:

- The nature of the work that will cause the unavoidable interruption.
- The nature of the interruption.
- The duration of the interruption.
- A detailed statement of the scope and sequence of the work to be performed during the interruption.

After giving notice and providing the written notification described above, the Offeror may proceed with the work only after receiving written confirmation from the County's Project Director that the interruption is both unavoidable and can be

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tolerated by the County. If the Offeror fails to follow the procedure described above or if the Offeror's work causes an interruption to a greater extent or duration than was set out in the writing described above, the Offeror shall be strictly liable for all actual damages arising from and caused by the interruption. In no event shall the Offeror be granted any extensions of time for performance under any resulting agreement for the time spent following the above-described procedures.

2.7.3 Factory Staging

The Offeror shall stage the entire system in or near its primary land mobile engineering/manufacturing facility. The staging shall include all new components, subsystems, ancillary equipment required to complete the entire system, microwave radio backbone, channel banks, frequency standards/GPS receivers, voting equipment, base stations, transmitter combiners, receiver multicouplers, network controllers, redundancy equipment, system management equipment, alarm systems, subscriber equipment, and all other relevant components. The components of the system shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming, and equipment configurations shall be completely integrated in the final configurations prior to shipment. No additional work shall be needed to ready the site for operation. It is understood that additional optimization (level setting, power adjustment, etc.) may be required to meet the technical requirements of this specification. The Offeror shall provide a detailed packing plan (including a checklist) that ensures the protection of all equipment prior to shipping.

UPS, battery backup equipment, and generators are not required for system staging unless they are essential to proper system function for the demonstration. At staging, equipment shall be configured as it would appear at its final installation site. The system as-built (as-staged) documentation shall be available at the time of system demonstration for County review. Simulation of any existing County equipment required for demonstrating the system in staging shall be provided by the Offeror wherever possible.

At the time that all system components are staged and are functioning as they would at final acceptance, County representatives shall inspect the equipment as it is cabled, tested, "burned in", and labeled. The Offeror shall demonstrate complete system functionality and failure scenarios to County representatives at the staging site. A list of tests to be performed and descriptions of each test shall be provided to the County for approval at least 45 calendar days prior to the demonstration date. The County reserves the right to add/delete/modify test scripts for the staging test plan at any time.

After successful completion of the staging demonstration, a County representative will approve the shipment of the equipment to the sites/field staging location(s) for

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installation. If the demonstration or staging fails to meet County's approval, another date shall be set to repeat the testing at the Offeror expense. No system equipment shall be shipped from the staging facility or other Offeror facilities without the County's prior approval. The system equipment shall be tested and shipped from the Offeror's staging facility with the latest certified and available software/hardware complement at the time of staging acceptance testing.

The County shall be responsible for the travel expenses of its personnel and consultant(s) witnessing the initial staging of equipment. The Offeror shall be responsible for all County travel and lodging expenses associated with any necessary re-testing of the staged system at its primary land mobile engineering/manufacturing facility.

2.7.4 Shipments

In accordance with the Project Schedule provided by the Offeror and approved by the County, the Offeror shall be responsible to ship all equipment and software to mutually agreeable locations for storage, for which the Offeror shall be responsible. The Offeror shall receive all materials purchased and shall receive all delivered items from Offeror at the job site or mutually agreed upon location. Any equipment or parts required to provide a complete and operational system and not specifically mentioned in the Offeror's proposal and any resulting contract shall be the sole responsibility of the Offeror without any claim for additional payment.

Deliveries shall be made in accordance with the Project Schedule, as approved by the County and mutually amended from time to time, and shall be made F.O.B. Destination to the mutually agreeable facilities, the Offeror staging facilities, warehousing facilities, or any combination thereof, which in any event shall be located in the County or other such locations as may be mutually agreed to by the parties (the "Facilities"). Subject specifically to the requirements section entitled "Factory Staging", the Offeror shall advise prior to shipment of actual destination and delivery date.

2.7.5 Title and Risk of Loss

Title to the fixed network equipment shall pass to the County upon County's final acceptance of the component(s) as reflected in the system acceptance testing criteria. Title to mobiles, portables, and control stations shall pass to each individual agency upon receipt of delivery to a mutually-agreed upon location where installation by the Offeror or issuance by the responsible agency is to occur and successful customized device programming and installation by the Offeror. Risk of loss to mobiles, portables, and/or control stations shall pass to the responsible agency upon successful programming and installation by the Offeror. Notwithstanding the foregoing, the Offeror shall retain risk of loss for all mobiles,

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portables, and control stations that it is using. Risk of loss to fixed network equipment shall pass to the County upon final acceptance of the entire system by the County. Should the system not pass all acceptance tests required by this solicitation and any resulting agreement, title shall revert to the Offeror, and the County shall retain all rights and remedies available under any resulting agreement, including, but not limited to, termination. The Offeror warrants that, at the time title passes, it shall pass free and clear of all liens, charges, security interests, and encumbrances.

2.7.6 Errors and Omissions

The Offeror shall assume full responsibility for the acts and omissions of all its agents, servants, and employees, and all subcontractors, their agents, servants, and employees, and all other persons performing any of the work required under this solicitation and any resulting agreement.

2.7.7 Testing

The Offeror shall perform all testing and re-testing as described throughout this solicitation and any resulting agreement.

2.7.8 Training

The Offeror shall conduct a comprehensive suite of training courses to instruct County personnel in the proper operation, administration, use, maintenance, and upgrading of the system as well as to instruct employees in how to train other personnel in such subjects. The Offeror shall comply with all training requirements contained in this solicitation and any resulting agreement. The County agrees to notify the Offeror promptly in the event that a date change for a scheduled training program is required.

2.7.9 Maintenance & System Management

The Offeror shall provide all labor, parts, tools, and test equipment required for the maintenance of the system through the warranty period and any extensions thereof covered by a contracted maintenance agreement. This maintenance program must include maintenance of the existing conventional base stations and repeaters. The Offeror shall provide a recommended system management plan (personnel and location) to ensure operational efficiency, monitoring, and control. The Offeror also shall provide information regarding key personnel; training/specialization; number of personnel; equipment required for analysis and troubleshooting; optimization; and schedules for preventive maintenance.

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The Offeror shall propose a yearly maintenance program for 15 years, purchasable in any increment from one to five years, and to commence after the conclusion of the system warranty period. This maintenance plan shall include parts and labor; 24/7/365 infrastructure support; 2-hour on site response for severity one issues; 4 hour response for severity two issues; depot-level board repair; analysis, annual preventive maintenance, and subscriber equipment repair.

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Severity Level	Problem Types
Severity 1	Response is provided continuously - Major System failure - 33% of System down - 33% of Site channels down - Site Environment alarms (smoke, access, temp, AC power. - This level is meant to represent a major issue that results in an unusable system, sub-system, Product, or critical features from the Customer's perspective. No Work-around or immediate solution is available.
Severity 2	Response during Standard Business Day - Significant System Impairment not to exceed 33% of system down - System problems presently being monitored - This level is meant to represent a moderate issue that limits a Customer's normal use of the system, sub-system, product, or major non-critical features from a Customer's perspective
Severity 3	Response during Standard Business Day - Intermittent system issues - Information questions - Upgrades/Preventative maintenance - This level is meant to represent a minor issue that does not preclude use of the system, sub-system, product, or critical features from a Customer's perspective. It may also represent a cosmetic issue, including documentation errors, general usage questions, recommendations for product enhancements or modifications, and scheduled events such as preventative maintenance or product/system upgrades.

2.7.10 Maintenance Documentation

The Offeror shall furnish to the County a sufficient number of equipment and maintenance manuals and customized system drawings of commercial standard with sufficient information included therein so that an average technician or engineer with basic electronic knowledge and experience, but unfamiliar with the system, will be able to define its operations and perform corrective and preventive maintenance. The manuals shall note in detail any special circuitry, special wiring, special interfacing, special tools/instruments and custom or non-standard procedures required to operate, maintain, and install any of the equipment furnished under this solicitation and any resulting agreement. All documentation shall be specifically applicable and customized to the system, except documentation for standard issue equipment which may be standard issue documentation. The Offeror shall warrant that any inability of County or subcontracted technicians or engineers to perform corrective and preventive maintenance on the scheme caused in whole or in part by the Offeror's failure to provide accurate or sufficient information in

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provided manuals will cause the Offeror to be liable for damage if such failure results in damage to or interruption of the system.

2.7.11 Project Management & Engineering

The Offeror shall assign both a full-time, exclusively dedicated Project Manager and a Communications System Engineer who are actual employees of the Offeror and are authorized to exercise technical direction of this project. Full-time and exclusively dedicated means that the Offeror's Project Manager and System Engineer shall have no other (Offeror) company assignments of any kind, except for related technical training classes that support the proposed system. The County expects that the Offeror shall propose a Project Manager and System Engineer with exceptional verbal and written communicative and technical skills as well as a thorough knowledge of the components to be installed by the Offeror and experience in project management and RF engineering (respectively). Both the Offeror's Project Manager and System Engineer are subject to initial approval and continual review by the County, which approval shall not be unreasonably withheld. The County reserves the right at any time to require the Offeror to replace the Project Manager and/or System Engineer within thirty (30) days upon written notification to the Offeror's executive management team.

The Offeror's Project Manager and System Engineer shall, at a minimum: attend weekly project meetings as scheduled by the County; generate meeting minutes within three working days of the respective meeting and in a format as approved by the County for each project meeting; produce a running log of project issues and punch list items; provide written monthly status reports in draft and final forms in a format as approved by the County not later than the fifth business day after the end of each calendar month for the draft report; and archive all project correspondence to be supplied with final system "as-built" documentation. The County shall have seven (7) calendar days to review the draft report and submit comments and/or corrections. A final monthly report shall be provided no later than fifteen (15) business days after the end of the preceding calendar month. The Project Manager shall provide written schedule updates to the County project team every two weeks, as required, using Microsoft Project conforming to the County's formatting and content requirements and transmitted to the County or County's designee in both hardcopy and disk format; and provide other reports related to the system or its implementation as reasonably requested by the County.

The Offeror shall provide its Project Manager and System Engineer with a computer for email, a projector for presentations, a vehicle for travel to/from County facilities, a cellular telephone, a wireless data device, and other communications devices that permit rapid communications between the County team and the Offeror's Project Manager and System Engineer.

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The Offeror shall implement and utilize a web-based portal for management of this project. The Offeror shall establish project access accounts for each Offeror, subcontractor, and County project team member. The Offeror's Project Manager shall upload, maintain, and keep current all project documents on the web-based management platform. The Offeror's Project Manager shall archive all project documents on the web-based management platform. The County project team members shall have continual access to all documents stored on the project's web-based management platform.

2.7.12 Site Plans

The Offeror shall prepare site plans where required for zoning or any permit approvals, as well as file and be responsible for all necessary zoning and applications for permits of any kind related to the system design and implementation. All plans shall be submitted to the County's Project Manager for review and approval prior to final submission to the appropriate regulatory body or office. The Offeror is responsible for coordinating, processing, and leading all zoning/permitting/licensing efforts (Site Plan Approval, Conditional Use Permit, etc.) on behalf of the County. Attendance and involvement at any relevant hearings or committees shall be the responsibility of the Offeror throughout the course of the project.

2.8 SERVICES PROVIDED BY THE COUNTY

The County has begun certain tasks related to system implementation. Ongoing work by the County includes:

1. Assisting the Offeror in the identification of suitable network sites.
2. Designating a County Project Manager, assisted by a professional communications consulting firm, to guide the implementation of the system.
3. Coordinating the scheduling of meetings with other political jurisdictions or relevant governmental resources.

2.9 STANDARDS OF WORK

The applicable sections or portions of the standards, regulations, and codes of the entities listed below shall apply to the Offeror for site preparation and for the installation, operation, maintenance, and service of the System by the Offeror:

- American Concrete Institute (ACI)
- American Institute of Steel Construction (AISC)
- American National Standards Institute (ANSI)

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- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- Electronics Industries Association (EIA)
- Federal Aviation Administration (FAA)
- Federal Aviation Administration (FAA) Advisory Circular
- Federal Communications Commission (FCC)
- Federal Environmental Protection Agency (EPA)
- Institute of Electrical and Electronics Engineers (IEEE)
- National Fire Protection Association (NFPA)
- National Electronic Manufactures Association (NEMA)
- National Electric Code (NEC)
- Occupational Safety and Health Act (OSHA)
- Telecommunications Industry Association (TIA)
- Underwriters Laboratories (UL)
- Any State or local ordinances and building, fire, and zoning codes

The County shall be informed in the event that the requirements of the standards, regulations, or codes differ, and that the most stringent shall apply.

3.0 SYSTEM INFORMATION

The County requires a two-way radio system consisting of radio units as specified in detail in this document. The County reserves the right to purchase user radios through a separate procurement. An additional number of agencies, both internal as well as external may also decide to utilize the County's radio system for interoperability purposes. For Grade of Service purposes, the specific number of users for this procurement is defined in the Appendix D of this document. Exact quantities shall be determined from the successful radio vendor's design and shall be dependent upon technologies and RF coverage guarantees. Any changes in subscriber radio quantities from those in the associated Appendix D will be accomplished during contract negotiations and subsequent change orders. The Offeror shall provide voice radios, antenna subsystems, and ancillary equipment as specified in the solicitation to facilitate complete on-site installation, integration, testing, and commissioning. The Offeror shall provide a completely functional two-way radio system meeting the requirements of the County.

The Offeror's solution must incorporate these issues into the system design and provide the County with a satisfactory approach to each issue and concern as represented in the following paragraphs.

A training period will follow the installation period wherein the communications officers, radio users, and communications technical personnel are to become familiar with new system operations and maintenance prior to final cutover.

The system must be designed to support the County without requiring significant reinvestment for at least fifteen (15) years following system acceptance. System size, capacity, functionality, flexibility, and coverage must be sufficient to support the County's anticipated 50% growth in system subscriber units and RF channels and changing needs throughout this period, as well as the possibility of other agencies within the County participating in the system. The design approach shall have the flexibility to accommodate additional users, additional RF sites, and the seamless addition of 700 MHz and 800 MHz channels, at a later time.

3.1 SYSTEM IN-BUILDING COVERAGE

The goal is for the system to provide 95% reliable, balanced talk-in/talk-out portable coverage throughout the County service area, with the portable radio worn on the hip in a leather swivel case using a standard lapel speaker microphone and ¼-wavelength style antenna mounted on the portable radio chassis at hip level. The RF coverage design is based upon the unique requirements of the County, TSB-88-C (most recent edition at time of Offeror proposal), signal strength testing, BER

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testing and subjective voice testing based upon the Delivered Audio Quality (DAQ) criteria of 3.4. Coverage requirements include these elements at a minimum.

- Element 1 – 800 MHz (700 MHz capable) portable On-Hip On-Street Countywide service area plus 3-miles or maximum allowed by FCC and Region 54
- Element 2 – 800 MHz (700 MHz capable) portable On-Hip 12 dB In-Building Countywide service area
- Element 3 – 800 MHz (700 MHz capable) portable On-Hip inside County facilities (See Appendix A)
- Element 4 – The County also desires to have 16 dB in-building penetration for 800 MHz (700 MHz capable) portable on-hip in the areas specified in the Appendix B maps. The Offeror must indicate if their baseline design (Elements 1 through 3) meets this requirement or if additional infrastructure is required. If it does not meet the requirement the Offeror must propose an optional system enhancement that would meet that requirement. Use the map provided in Appendix B for guidance on placing the RF sites should there be requirements for additional infrastructure. Appendix B map shows the areas requiring 16 dB of in-building coverage. Shapefiles for the 16 dB areas are provided for Offerors to download and to use with their propagation software.

Elements 1 through 4 requires a 95% service area reliability using a portable on-the-hip with 12 dB in-building loss over the entire Lake County landmass and political territory, for both talk-in and talk-out configurations. Element 3 requires that all County facilities listed in Appendix A, provide 95% or greater in-building coverage reliability throughout the building structure. Element 4, as an option, to provide higher level of in-building coverage, 16 dB, in some areas of the County as specified above as not all of the County contains buildings of that level of loss.

The radio coverage design shall take into account the current noise floor environment as well as predictable degradations for the near future.

In addition to standard considerations for environmental losses, the coverage design shall take into account the following:

- Predictable co-channel Interference near the Contour
- Potential for Portable Receiver Desensitization from Mobiles Operating in Fringe Coverage
- 8-point Body Absorption Averaging or Similar Assumptions.

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These factors shall be taken into account in the Offeror's MRSL (Minimum Receive Signal Level) figure. The Offeror shall provide a detailed signal path loss calculation in its response that reflects all assumptions and loss values.

The delivered audio quality in each area defined below shall meet or exceed DAQ 3.4 per the guidelines of TSB-88-C as defined in the following table.

DAQ (Delivered Audio Quality)	Grade of Performance
1	Unusable, Speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion.
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion.
4	Speech easily understood. Occasional Noise/Distortion.
4.5	Speech easily understood. Infrequent Noise/Distortion.
5	Speech easily understood.

Table 1 - Definitions for Delivered Audio Quality

3.2 APCO PROJECT 25 CONFORMANCE

The 800 MHz (700 MHz capable) trunked radio system architecture shall conform to the objectives, user requirements and specifications outlined in the current APCO P25 Phase 1 suite of standards (see TIA/EIA-102 family of specifications) specifically relating, but not limited to digital modulation, spectral efficiency, enhanced audio quality, conventional and trunking modes, ID methodology, and direct interoperability with equipment from other manufacturers. The Offeror's proposal shall include comprehensive detail on all subscriber and fixed network equipment P25 conformance testing for equipment being offered to County. Such conformance testing detail shall include field and laboratory test results from the ongoing NIST/SAFECOM and TIA P25CAWG compliance assessment programs. For the life of the contract and maintenance period, the Offeror shall provide on a quarterly basis, at a minimum, the results of industry-led conformance testing with the proposed system platform and subscriber base. All proprietary features and operational characteristics shall be identified to the County in writing for all proposed subscriber and fixed network equipment to identify the Offeror's deviation from the P25 Phase 1 specification.

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Because the APCO P25 specification and standards work continues to evolve, some of the features required by the County in this specification may initially be outside of the current scope of the P25 standard. The County requires the Offeror to adhere to the P25 standard for all features that are included in the P25 TIA/EIA-102 specifications, but the County will accept Offeror-specific solutions for those features currently outside of the P25 scope in order to obtain a full-featured communications network. The Offeror has the responsibility to demonstrate P25 conformance for those subscriber and network infrastructure features contained in the P25 specification, while clearly delineating those features that have been developed with proprietary solutions. The Offeror accepts the added responsibility of working openly with all qualified industry vendors to facilitate P25 interoperability for those features that may initially be offered as proprietary solutions. For those features and solutions deemed initially proprietary in nature, the County requires the Offeror to provide all of the necessary details to all sanctioned P25 working groups and committees to continue to foster a truly open industry communications solution. Through this specification, the County requires the Offeror to guarantee its commitment to further promoting the APCO P25 specification by actively and openly working with LMR industry vendors in a manner of full disclosure for all features and functionality. For the life of the contract and maintenance period, the Offeror accepts full responsibility and expense for remedying and correcting any identified P25 non-conformance issue for all affected system hardware and software.

Offeror must clearly and specifically define its state of development, migration path, and any costs associated with migration from its proposed County solution to the Offeror's solution which is compliant with P25 Phase 2.

3.3 INTEROPERABILITY

The system also shall be capable of direct conventional (analog and digital mode) and trunked subscriber radio interoperability with other local government public safety and public service agencies utilizing 700/800 MHz P25 digital trunked radio networks located in or around County boundaries, but which are not a part of County Government. This user community specifically includes, at a minimum, the public safety radio users.

The County also requires a design that includes mutual aid console and subscriber radio interoperability functionality with these agencies.

All existing infrastructure, subscriber radio, and console interoperability capabilities shall be preserved in the proposed system. The County requires NPSPAC 800 MHz mutual aid infrastructure to be integrated into the proposed system through both subscriber radio programming and dispatch console access.

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A list of current interfaced interoperability channels are as follows:

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<u>CHANNEL</u>	<u>FREQ</u>	<u>CTCSS</u>	<u>SERVICE</u>	<u>RPTR CH</u>	<u>CALL</u>
ESDA LO	45.4400	CSQ	PL	N	KNEJ960
VTAC11	151.1375	156.7	PL	N	KSA958
NIFERN (MABAS)	154.2650	CSQ	PF	N	KBNF240
VTAC12	154.4525	156.7	PL	N	KSA958
ESDA HI	155.0250	CSQ	PL	N	KNFL504
IREACH	155.0550	CSQ	PF	N	KSA958
Point to Point	155.3700	CSQ	PP	N	KSA508
ISPERN	155.4750	CSQ	PP	N	KAS958
Lake County Sheriff F2	155.6550	127.3	PP	Y/out	KSA958
Lake County Sheriff F3	155.7000	127.3	PP	Y/out	KSA958
VCALL10	155.7525	156.7	PL	N	KSA958
Lake County Sheriff FI	156.2100	127.3	PP	Y/out	KSA958
VTAC13	158.7375	156.7	PL	N	KSA958
Lake County Sheriff F3	158.8950	127.3	PL	Y/in	KSA958
Lake County Sheriff F2	158.9400	127.3	PL	Y/in	KSA958
Lake County Sheriff F1	158.9700	127.3	PP	Y/in	KSA958
VTAC14	159.4725	156.7	PL	N	KSA958
UCALL40D	453.2125	CSQ	PL	Y/out	KSA958
Lake County LOCAL GOV.	453.4500	127.3	PL	Y/out	KDS792
UTAC41D	453.4625	CSQ	PL	Y/out	KSA958
UTAC42D	453.7125	CSQ	PL	Y/out	KSA958
Lake County UHF	453.8500	127.3	PL	Y/out	KSG305
UTAC43D	453.8625	CSQ	PL	Y/out	KSA958
UCALL40	458.2125	156.7	PL	Y/in	KSA958
Lake County LOCAL GOV.	458.4500	127.3	PL	Y/in	KDS792
UTAC41	458.4625	156.7	PL	Y/in	KSA958
UTAC42	458.7125	156.7	PL	Y/in	KSA958
Lake County UHF	458.8500	127.3	PL	Y/in	KSG305
UTAC43	458.8625	156.7	PL	Y/in	KSA958
Lake County Mutual Aid 1	806.0125		YF	Y/in	WPSZ771
Lake County Trunked 1	806.2500		YF	Y/in	WPMB711
Lake County Trunked 2	806.3000		YF	Y/in	WPMB711
Lake County Mutual Aid 2	806.5125		YF	Y/in	WPSZ771
Lake County Trunked 3	806.6375		YF	Y/in	WPMB711
Lake County Trunked 4	806.6875		YF	Y/in	WPMB711
Lake County Mutual Aid 3	807.0125		YF	Y/in	WPSZ771
Lake County Trunked 5	807.1250		YF	Y/in	WPMB711
Lake County Mutual Aid 4	807.5125		YF	Y/in	WPSZ771

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Lake County Trunked 6	807.7250	YF	Y/in	WPMB711
Lake County Trunked 7	807.8125	YF	Y/in	WPMB711
Lake County Mutual Aid 5	808.0125	YF	Y/in	WPSZ771
Lake County Trunked 8	808.5625	YF	Y/in	WPMB711
Lake County Mutual Aid 1	851.0125	YF	Y/out	WPSZ771
Lake County Trunked 1	851.2500	YF	Y/out	WPMB711
Lake County Trunked 2	851.3000	YF	Y/out	WPMB711
Lake County Mutual Aid 2	851.5125	YF	Y/out	WPSZ771
Lake County Trunked 3	851.6375	YF	Y/out	WPMB711
Lake County Trunked 4	851.6875	YF	Y/out	WPMB711
Lake County Mutual Aid 3	852.0125	YF	Y/out	WPSZ771
Lake County Trunked 5	852.1250	YF	Y/out	WPMB711
Lake County Mutual Aid 4	852.5125	YF	Y/out	WPSZ771
Lake County Trunked 6	852.7250	YF	Y/out	WPMB711
Lake County Trunked 7	852.8125	YF	Y/out	WPMB711
Lake County Mutual Aid 5	853.0125	YF	Y/out	WPSZ771
Lake County Trunked 8	853.5625	YF	Y/out	WPMB711

The Offeror shall describe in detail the architecture, features, limitations, and overall compatibility that the proposed network offers in terms of maintaining and integrating the required subscriber radio and console interoperability. The Offeror shall identify any proposed network gateway infrastructure integral to the system design for interoperability. The Offeror shall address County interoperability requirements in concert with current federal, state, and regional interoperability goals and best practices.

3.4 NETWORK BACKBONE

The Offeror shall provide a high-capacity, loop microwave network backbone that provides redundant connectivity with 99.9999% availability between all network RF transmission sites, dispatch consoles, and network management components. The Offeror shall provide traffic utilization, bandwidth consumption, and overall throughput assessment baseline reports for each backbone transport and Ethernet networks upon system commissioning in the field to baseline the as-built condition for each delivered network.

3.5 CORE AND TECHNICAL/OPERATIONAL NETWORK FEATURES

This section presents basic functional definitions and system requirements that apply throughout the solicitation. These definitions are supplemental to those found in previous sections and are intended to describe operational characteristics for all radio systems regardless of the technologies, media, or any feature proposed by an Offeror.

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The Offeror shall respond to each definition by stating compliance or non-compliance as described. If the proposed technology offering differs in any way, then the Offeror must offer a complete description indicating how the proposed technology or offering provides the required system functionality.

3.5.1 Talkgroup Call

A talkgroup call is defined as a one-to-many voice transmission to members of the same organizational unit known as a talkgroup. Group calls shall be a network-wide capability and shall be fully supported by the system in all locations. Group calls shall be capable of being initiated from a subscriber radio terminal or a dispatch console. Group calls are half duplex. Late entry must be supported. Talkgroups shall be either defined in advance by system administrators or assigned dynamically by dispatch operators or system administrators.

The proposed system shall provide the ability to authorize or deny system access in real-time for an individual subscriber and/or talkgroup by remote site. The proposed system shall provide the ability to configure the maximum call duration for a specific talkgroup call as well as the hang time associated with a group call. Priority scanning of group call activity shall be permitted from any subscriber terminal. The creation of new talkgroups in the proposed system shall be straightforward using the Network Management System (NMS). By talkgroup, the proposed system shall be capable of providing the capability to queue a group call or proceed immediately with a group call based on the availability of every affiliated site to provide voice channel service to every affiliated member of the active talkgroup. All subscriber terminals and dispatch consoles shall be equipped with configurable talkgroup call functionality.

3.5.2 Talkaround (Direct Mode)

Talkaround or Direct Mode is the ability of radio subscriber units to operate unit-to-unit (direct simplex mode) without requiring the use of radio tower site transceivers. If an individual terminal loses contact with its base station due to coverage difficulties, base station failure or trunking network failure, it shall be possible to operate in talkaround, or direct, mode. The radio subscriber unit shall have the ability to transmit and receive on base repeater frequencies or other simplex frequencies not operational at the fixed radio sites. Range is limited to the power of the subscriber radio units. Talkaround allows unit-to-unit operations when out of range of the system or allows a tactical operation to exist within the system range but does not load the system talk-paths. Talkaround channels also may be utilized for vehicular repeater operations. Talkaround can be utilized in either analog or digital modes. Talkaround usage is necessary for out-of-network or fringe coverage

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such as encountered upon entering a highly attenuated building or tunnel. Talkaround usage is also envisioned for times of limited network capacity.

All subscriber terminals shall be equipped with talkaround (direct mode) functionality that can operate in any combination of 800 MHz (700 MHz capable) analog and digital conventional modes. All digital talkaround conventional modes shall be capable of utilizing the APCO Project 25 Common Air Interface (CAI) for interoperability. All talkaround modes of operation shall utilize FCC-approved channel bandwidths and, as appropriate, shall be in concert with the APCO Project 25 modulation schemes for spectral efficiency. All analog conventional modes shall utilize a radio programmable CTCSS/PL/DPL scheme to control transmit and receive functionality. All digital conventional modes shall utilize a radio programmable network access/unit identifier scheme to control transmit and receive functionality. All conventional modes shall be capable of multi-key encryption. Note that the Appendix D will delineate the specific subscriber need for secure-equipped radios.

The proposed system shall allow direct mode communications at any time without degrading normal system performance. Direct mode communications while in range of the fixed equipment shall do no more than temporarily capture receivers from possible outbound messages. Direct communication shall be possible at any time while out of range of the fixed equipment with no degradation in system performance or capacity.

3.5.3 Push-To-Talk Unit Identification (PTT-ID)/Display

In all modes of trunking operation, the proposed network and all subscriber radios shall be capable of operating in a PTT-ID mode of operation in which the programmable radio unit ID(s) are transmitted to the network upon every radio PTT for call logging and radio user recognition at the Network Management System and dispatch workstations. All radio IDs shall be capable of being alphanumerically aliased at the NMS and dispatch workstations. PTT-ID signaling shall not delay or degrade the radio transmission in any manner. All display wireless dispatch, dispatch consoles, and subscriber field radio units must display the transmitting radio unit ID and display a user alias as well.

3.5.4 Emergency Alert/Call

An emergency call is defined as a specialized talkgroup call with the highest assigned queuing priority. An emergency alert is defined as an instantaneous data service that signals the identity of the initiating unit to a dispatch console(s), dedicated network management terminal(s), and all other members of the affiliated talkgroup. Emergency calls shall be a network-wide capability and shall be fully supported by the system in all locations. Emergency calls shall be capable of being

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initiated from any subscriber terminal. The proposed network shall provide the ability to authorize or deny emergency access in real-time for an individual subscriber and/or talkgroup by subsystem. The proposed network shall provide the ability to configure the maximum call duration for an emergency call as well as the hang time associated with an emergency call.

Emergency functionality shall be configurable by talkgroup to operate in either a preempt mode or top of busy queue mode when operating under a channel busy scenario. If a second emergency call is placed while an earlier emergency call is in progress, the second call shall not preempt the first. Instead, the second emergency call should queue for available network resources. No emergency alerts/calls shall be terminated until the user clears the emergency status from the initiating subscriber terminal. All subscriber radios, dispatch consoles, and NMS workstations must be equipped with emergency alert/call functionality.

Emergency functionality shall be configurable to operate in either a tactical or revertive mode. Tactical emergency mode is defined as initiating and processing the emergency alert/call on the actively selected talkgroup mode. Revertive emergency mode is defined as initiating and processing the emergency alert/call on a pre-assigned talkgroup mode that may or may not be the actively selected talkgroup mode. Configurable duration “hot microphone” emergency (i.e., radio keys automatically for a predefined duration upon activation of emergency button or switch) capability shall be provided for all subscriber terminals. “Stay Alive” emergency (i.e., radio cannot be powered off upon activation of emergency button or switch until emergency condition has been cleared at the subscriber terminal) capability shall be provided for all subscriber terminals.

All subscriber terminals shall be notified audibly and visually when a talkgroup has been placed in emergency mode by another member of the talkgroup. All subscriber terminals and dispatch consoles also shall be capable of defeating the audible and visual alerts (i.e. clandestine or covert tactical operations) associated with emergency when a talkgroup has been placed in emergency mode by another member of the talkgroup. Emergency alert/call shall be fully operational through any vehicular repeater system operation (the dispatcher will observe the field user ID rather than the host mobile user ID connected to the vehicular repeater in use).

All proposed mobiles, portables, control stations and dispatch consoles shall be equipped with a dedicated switch or function that allows emergency notification. The switch shall be easily accessed while minimizing the chances for accidental activation. The radio emergency switch or button also shall be equipped with a configurable depress timer to adjust the length of time the button or switch must be depressed to activate and clear the emergency. Upon emergency activation, the field unit shall transmit the emergency message on a periodic basis until

acknowledged by the console operator (dispatcher). Offerors shall describe the proposed emergency functionality in detail.

3.5.5 Selective Alert

Selective Alert is the capability for one voice/data radio and/or dispatch console/NMS workstation to selectively alert or “page” a specific voice/data radio. A “source” radio or console selectively alerts a “target” radio (or console) to indicate that the target radio should return to a “Home” or predefined talkgroup for a message. No talk-path or voice resource should be assigned for a selective alert, and the command shall be completed instantaneously.

Source radios can be equipped to initiate selective alerts via a pre-programmed list(s) stored in memory or through a full radio alphanumeric keypad. Properly equipped source radios or dispatch consoles/NMS workstations can selectively alert any radio in the system by entering the specific unit ID of the desired target radio. Radios can also be “target-only,” thus only capable of receiving selective alerts. Positive or negative acknowledgement shall be provided to the subscriber terminal or dispatch/NMS console as to whether the target radio receives the individual call. All subscriber terminals and dispatch consoles/NMS workstations shall be equipped with selective alert functionality. Offerors shall describe the proposed selective alert functionality in detail.

3.5.6 Individual Call

An individual call is defined as a wide-area, one-to-one voice transmission between any combination of subscriber terminals and/or dispatch consoles operating within the network. Individual calls shall be a network-wide capability and shall be fully supported by the system. Such calls need only be half duplex. Users also shall be able to place individual calls to dispatch consoles. Identification of the calling party shall be made to the subscriber terminal in alphanumeric format. Positive or negative acknowledgement shall be provided to the subscriber terminal or dispatch console as to whether the target radio receives the individual call. The proposed network shall provide the ability to configure the maximum call duration for an individual call. The proposed network shall provide the ability to configure the real-time permission to initiate an individual call per subscriber terminal and dispatch console. All subscriber terminals and dispatch consoles shall be equipped with individual call functionality. Offerors shall describe the proposed individual call functionality in detail.

3.5.7 Selective Radio Disable/Inhibit

Selective Radio Disable/Inhibit is the ability of the system to indefinitely disable a specific subscriber radio unit or dispatch position from transmitting and receiving

talkgroup calls, emergency alerts, emergency calls, selective alerts, selective calls, telephone interconnect calls, and status/message indications and receptions. The NMS shall be capable of issuing the selective radio disable/inhibit command as an instantaneous data service not utilizing a talk-path or voice resource. Likewise, the NMS shall be capable of issuing a Selective “Uninhibit” command as an instantaneous data service not utilizing a talk-path to re-enable the previously-disabled target subscriber terminal. Positive or negative acknowledgement shall be provided to the NMS console as to whether the target radios receive the selective radio disable/inhibit & uninhibit commands. All subscriber terminals and dispatch consoles shall be equipped with selective inhibit/uninhibit functionality. Offerors shall describe the proposed selective radio disable/inhibit functionality in detail.

3.5.8 Dynamic Regrouping

Dynamic Regrouping is the ability of a radio system to create a new talkgroup(s) and automatically assign radios to that new talkgroup(s) without requiring the user to manually change the channel selector switch.

Dynamically regrouped radio units can either be forced to remain on the new talkgroup(s) (restricted mode) or be allowed to freely change talkgroups (selectable mode). Pre-defined “action plans” can be created and initiated to regroup an unlimited number of affiliated subscriber radios into a new talkgroup automatically with a minimum of keystrokes by the system manager or dispatcher.

The NMS shall be capable of issuing the dynamic regrouping command as an instantaneous data service not utilizing a talk-path or voice resource. Likewise, the NMS shall be capable of issuing a Dynamic “Unregroup” command as a data service not utilizing a talk-path to remove the target subscriber terminal from the regrouping scenario. Positive or negative acknowledgement shall be provided to the NMS console as to whether the target radios receive the dynamic regrouping and unregrouping commands. All subscriber terminals and NMS workstations shall be equipped with dynamic regrouping functionality. Offerors shall describe the proposed dynamic regrouping functionality in detail.

3.5.9 Talkgroup Patch/Merge

Multiple talkgroups are combined together providing two-way communications between all talkgroups in the patch. A talkgroup patch may involve the use of multiple talk-paths to process the specific call. Similar in functionality to a talkgroup patch, talkgroup merge involves combining multiple talkgroups into a single talk-path for the duration of the call. All subscriber terminals and dispatch consoles shall be equipped to participate in a talkgroup patch and/or talkgroup merge call. The system shall be equipped to establish any talkgroup patch/merge in both a dynamic (i.e., dispatcher can enable or disable from console position) and

permanent mode (i.e., dispatcher cannot disable), depending on specific County configuration requirements.

3.5.10 Multi-Select (Simul-Select)

A multi-select occurs when multiple talkgroups are linked together dynamically for one-way outbound communications from the dispatch console. A multi-select may involve the use of multiple talk-paths to process the specific call or also shall be configurable to regroup all target talkgroups to a common talkgroup that is broadcast by the system. The dispatch console shall simultaneously hear the audio from all multi-selected talkgroups on the select speaker of the console, but the field users only hear the dispatcher conducting the multi-select or talkgroup audio from other members of their talkgroup. All subscriber terminals and dispatch consoles shall be capable of participating in a multi-select call.

3.5.11 Priority Level Access

In a busy talk-path condition, the system shall stack or queue call service requests from users on a first-in-first-out (FIFO) basis. The system shall be capable of rearranging the queue based upon a relative priority level associated with a specific radio unit ID or talkgroup ID allowing faster servicing of higher priority (i.e., public safety) calls. By system design default, emergency calls shall have the highest priority of any other call in the busy queue. Priority levels shall be configurable by individual ID and/or talkgroup ID.

The system must have a priority structure that is supported throughout the network. This must enable the following:

- Network administrators must be able to dynamically assign different priority levels to various types of calls and radio users.
- Emergency Calls must have the highest priority and be capable of preempting lower priority calls if no channels are available.
- Channels shall be assigned on the basis of the highest priority among calls waiting.
- At least ten priority levels should be supported.
- Recent users shall be capable of giving an elevated priority to maintain continuity of conversation.

Offerors shall describe the proposed priority scheme in detail. All subscriber terminals and dispatch consoles shall be capable of participating in the proposed multiple priority access level scheme.

3.5.12 Busy Processing/Queuing

If no talk-paths or voice channel resources are available, radios requesting channels for new conversations should be placed in a busy queue. Users of the same priority should move through the queue in a FIFO sequence; however, users of higher priority should be elevated ahead of lower priority users in the queue.

When a voice channel becomes available, the radio at the top of the busy queue shall receive a channel assignment and generate a callback tone to the user. This callback tone alerts the user that a channel assignment has been made and communication is now possible on the selected talkgroup. All subscriber terminals and dispatch consoles shall be capable of providing the busy queuing/callback functionality.

3.5.13 Site Registration/Affiliation

Site registration is the ability for a subscriber unit to seamlessly roam into RF coverage of a specific site or cell and automatically transmit individual ID, current talkgroup, and other pertinent affiliation information. The network controller(s) can then dynamically manage and assign RF talk-path resources for the affiliated talkgroup/radio unit in this and other sites/cells containing other members of the talkgroup.

The proposed system must allow users to roam freely throughout all areas served by the system. It must also have the ability to restrict movement of individual terminals and/or talkgroups to specified sites or combination of sites. The proposed system shall be capable of activating a configurable deregistration timer upon a subscriber radio roaming out of system RF coverage so that channel resources are not unnecessarily keyed indefinitely.

The Offeror shall describe how its system manages mobility, roaming, and site registration/deregistration. Subscriber radio handoff between remote sites shall be seamless and without voice or data interruption to the subscriber terminal or dispatch console. Handoff/roaming algorithms, registration/deregistration parameters, and network mobility configuration control shall be explained in detail. All subscriber terminals shall be capable of dynamic site registration and wide area roaming.

3.5.14 Talkgroup Steering

Talkgroup steering is the system capability to manage and restrict the assignment of specific talkgroups to specific RF channels and talk-paths. Thus, some talkgroups may be limited to utilizing specific talk-paths while other talkgroups are limited to these and other talk-paths. Since the entire user base is made of users from different categories, the system must accommodate the network usage partitioning of these various categories. The proposed system shall be capable of multiple

levels of talkgroup steering employing any combination of talkgroups. Shared use and interoperability agreements may dictate that certain talk-paths are reserved for some talkgroups and other talkgroups are restricted from particular channel access. Talkgroup steering and associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall be capable of participating in any talkgroup steering configuration configured by the network administrator.

3.5.15 Broadcast/Announcement Talkgroup Call

The proposed system shall provide Broadcast/Announcement Talkgroup Call functionality. Broadcast/Announcement Talkgroup Call functionality is defined as the ability for a properly configured dispatch console or subscriber terminal to transmit to multiple talkgroups simultaneously using a single talk-path for the duration of the call. A broadcast/announcement talkgroup call shall be configurable to either wait for all associated transmitting talkgroup members in active calls to de-key, or the proposed system shall be configurable to interrupt calls in progress when a broadcast/announcement talkgroup call is initiated. Talkgroup membership in a broadcast/announcement talkgroup call shall be configurable at the dispatch console or NMS workstation. The proposed system shall provide the capability to create multiple, different broadcast/announcement talkgroup call resources. All subscriber terminals and dispatch consoles shall be capable of generating and participating in a broadcast/announcement talkgroup call.

3.5.16 Sub-Network (Subsystem) Call

The proposed system shall provide Sub-Network (Subsystem) Call functionality which enables dispatch consoles or properly configured subscriber terminals to issue an announcement using a single talk-path to all affiliated radios and talkgroup members at a specific RF site or combination of RF sites. A sub-network (subsystem) call shall be configurable to either wait for all affiliated transmitting talkgroup members in active calls to de-key, or the proposed system shall be configurable to interrupt calls in progress when a sub-network (subsystem) call is initiated. The proposed system shall provide the capability to create multiple, different sub-network (subsystem) call resources. All subscriber terminals and dispatch consoles shall be capable of participating in a sub-network (subsystem) call.

3.5.17 Late Entry

The proposed system must provide Late Entry capabilities. Late Entry is defined as the functionality whereby the proposed system can transmit late entry indications related to any active call thus allowing latecomer users (i.e., previously turned off radio, radio out of range, etc.) to join an active talkgroup, broadcast/announcement

group, or sub-network call. All subscriber terminals and dispatch consoles shall provide late entry functionality.

3.5.18 Transmission/Message Trunking

In all modes of trunking operation, the proposed network shall be capable of operating both in transmission trunking and message trunking modes of operation configurable by talkgroup resource. Transmission trunking refers to the ability to configure the system so that the network does not associate any hangtime with a talkgroup call so that channel resources are immediately available for reassignment following a subscriber radio or console de-key. Message trunking refers to the ability to configure the system such that the network associates a configurable-length hangtime with a talkgroup call so that channel resources remain temporarily available following a subscriber radio or console de-key on a specific talkgroup to preserve continuity of conversation. All subscriber terminals and dispatch consoles shall be capable of working in either transmission trunking or message trunking modes.

3.5.19 Audio Interruption

The proposed system shall be capable of being configured to provide Audio Interruption functionality. Audio Interruption is defined as the ability for a subscriber or a talkgroup member with equal or higher priority (relative to the transmitting unit) to interrupt an active call in progress and become the source of the talkgroup audio. Audio Interruption shall be configurable: (1) to allow interruptions based on priority levels, (2) to never permit interruptions, and (3) to always permit interruptions. Radios not permitted to interrupt an active talkgroup call shall receive a distinguishable, audible “interrupt prohibit tone” to signify the inability to interrupt an active call. Audio Interruption and associated configuration control shall be explained in detail. All subscriber terminals shall be capable of working in any audio interruption mode.

3.5.20 Scan/Priority Monitoring

The proposed system shall be capable of being configured to provide talkgroup and conventional mode scan functionality. Scan is defined as the ability for a subscriber to monitor/temporarily join active talkgroup or conventional calls (other than the talkgroup or conventional mode currently selected/tuned on the subscriber radio) in progress based on a configurable subscriber radio scan list of talkgroup and/or conventional resources. Scan functionality shall be controlled either by a configurable subscriber radio switch/button/menu item or through radio programming using auto-scan functionality configured by talkgroup or conventional modes. Scan also shall be configurable to provide talkback scan functionality meaning that a subscriber radio user could key up on an actively-scanned mode if

the subscriber radio PTT switch is activated. Scan and associated configuration control shall be explained in detail. All subscriber terminals shall provide multiple, user-configurable subscriber scan modes and lists. All subscriber terminals shall be capable of working in the various scan modes.

The proposed system also shall be capable of being configured to provide Priority Monitoring Scan functionality. Priority Monitoring Scan is defined as the ability for a subscriber or a talkgroup member to scan to an active higher priority talkgroup while involved in an active, lower priority talkgroup call. Various levels of priority shall be configurable for a subscriber terminal. Priority Monitoring Scan and associated configuration control shall be explained in detail. All subscriber terminals shall be capable of working in a priority monitoring scan mode.

3.5.21 Out-of-Range Indications

The proposed system subscriber terminals shall provide audible and visual Out-of-Range indications upon entering a service or geographic area in which trunked system RF coverage levels have dropped below an acceptable and reliable usage threshold. All subscriber terminals shall be capable of providing audible and visual out-of-range indications.

3.5.22 Console Priority

The proposed system shall provide Console Priority functionality for all dispatch consoles. Console Priority is defined as the ability for a dispatch console to assume control of a talkgroup call at any time. The audio generated at a dispatch console position shall always be broadcast to all members of the talkgroup even if a subscriber terminal is actively transmitting. If a dispatch console assumes control of an active talkgroup call and asserts Console Priority, the dispatch console should still hear the transmitting unit's inbound audio but the rest of the members of the talkgroup shall hear only the outbound dispatch console audio.

3.5.23 ID Scheme

The proposed system and subscriber terminals shall adhere to the recommended APCO Project 25 ID coding structure (i.e., subscriber IDs, network ID, system ID, subsystem/site ID, talkgroup IDs, etc.) to facilitate inter-system interoperability and mobility management. Trunked user roaming between P25 networks supplied by various P25 LMR vendors shall be accomplished per the P25 specification. The proposed network shall be equipped to manage at least 48,000 unique radio subscribers and at least 2,000 unique talkgroups. The proposed ID methodology and associated database maintenance of these IDs shall be explained in detail. All proposed subscribers shall be equipped to program and interoperate on at least 48

different P25 trunked systems for interoperability purposes. The Offeror shall define the delivered capacity and scalability of the proposed network.

3.5.24 Area (Site) Selection

The proposed system must have the ability to provide Area (Site) Selection functionality. Area (Site) Selection is defined as the ability to define areas for site control and call processing, on both a subscriber and talkgroup basis. The system shall provide the configuration capability to define a specific area/subset of sites to be used by the proposed system for establishing and processing call types. For an individual or group call, this means that called active users will not be alerted and engaged for the active call if the subscriber radio is affiliated outside the selected area or pool of valid sites for that specific call type.

3.5.25 Site Preferences

The proposed system must have the ability to provide Site Preferences functionality. Site Preferences is defined as the ability to rank/prioritize the affiliation and usage of specific sites and/or subsystems within a subscriber terminal. The system shall provide the configuration capability, at a radio subscriber level, to customize the site preferences for every proposed network site or subsystem. A “home” site or subsystem also shall be configurable for all subscriber terminals which would serve as the most-preferred (highest ranked) site or subsystem if configured. The site preferences database or configuration table governs the sites utilized by subscriber terminals for establishing and processing all call types. Multiple levels of site preference shall be provided for all subscriber terminals, and criteria such as real-time control or voice channel bit error rate (BER), received signal strength, and site channel capacity shall be used in executing the site preferences algorithms. Site Preferences and the associated configuration control shall be explained in detail. All subscriber terminals shall provide the site preferences functionality.

3.5.26 Channel Beacon

The proposed system must have the ability to provide Channel Beacon functionality. Channel Beacon is defined as the ability for a dispatch console to apply or generate a recurring, unique audible alert tone on a specific talkgroup and/or conventional resource to notify resource members of the need to refrain from using the channel or talkgroup (i.e. officer shot, stakeout in progress, working fire, etc.) while a serious event is being managed. Channel Beacon and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide the channel beacon functionality.

3.5.27 Alert Tones

The proposed system must have the ability to provide Alert Tones functionality. Alert Tones functionality is defined as the ability for a dispatch console and/or properly-equipped subscriber terminal to apply unique, audible alert tones on a specific talkgroup and/or conventional resource to notify resource members of a special situation or to preamble a special dispatcher broadcast. The system shall provide multiple (at least three) unique alert tones so that various routine situations and announcements can be associated with a specific alert tone for operational efficiency. Alert Tones and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide the alert tones functionality.

3.5.28 Ready-to-Talk Tone

The proposed system must have the ability to provide Ready-to-Talk Tone functionality. Ready-to-Talk Tone functionality is defined as the ability to configure a subscriber terminal with a unique, audible tone that signifies to the radio user that a trunked talk-path or voice channel has been assigned and is ready for use. The intent of the ready-to-talk tone is so that radio users do not begin speaking too quickly following the activation of the PTT switch creating a condition in which audio may be truncated to some degree. The ready-to-talk tone shall be configurable for all subscriber terminals.

3.5.29 Talkgroup Misdirection

The proposed system must have the ability to provide Talkgroup Misdirection functionality. Talkgroup Misdirection functionality is defined as the ability for a misdirected (i.e., inadvertent and inappropriate radio affiliation to an unselected talkgroup when user not selected to active talkgroup) subscriber terminal to be immediately removed from an active talkgroup call in which the subscriber radio should never have been a participant. All subscriber terminals and dispatch consoles shall provide the talkgroup misdirection functionality.

3.5.30 Critical/Mandatory Site(s)

The proposed system must have the ability to provide Critical/Mandatory Site functionality. Critical/Mandatory Site(s) functionality is defined as the system ability to delay the processing of a talkgroup or announcement group call until all critical/mandatory sites have talk-paths or voice channel resources available to serve the call. Critical sites must be real-time configurable in the NMS workstations. The proposed system shall provide the capability to create any permutation or combination of critical/mandatory sites by talkgroup or announcement group. Critical/Mandatory Site(s) functionality and the associated

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configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall provide the critical/mandatory site(s) functionality.

3.5.31 Call-Delay Defeat

The proposed system must have the ability to provide Call-Delay Defeat functionality. Call-Delay Defeat functionality is defined as the configurable system ability to continue the initiation and processing of a talkgroup or announcement group call despite the fact that a subset of talkgroup/announcement group members may be affiliated at network sites which have no available talk-paths or voice channel resources to immediately serve the call. Although the system should normally delay the handling of the call until all affiliated members have the necessary talk-paths or voice channels to serve the call (so as to facilitate 100% affiliated member participation), the system shall provide the configuration capability to defeat the normal call-delay algorithm so as to be able to immediately process the talkgroup or announcement group call without all affiliated members participating. Call-Delay Defeat functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall provide the call-delay defeat functionality.

3.5.32 Dynamic (Tactical) Priority

The proposed system must have the ability to provide Dynamic (Tactical) Priority functionality. Dynamic (Tactical) Priority functionality is defined as the configurable system ability for a dispatch console and NMS terminal to dynamically elevate (above its normally configured priority level) the priority level of an active talkgroup or multigroup resource. The target elevated priority level shall be the priority level just below emergency priority status. Dynamic (Tactical) Priority functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in the dynamic (tactical) priority functionality.

3.5.33 Repeat Disable

The proposed system must have the ability to provide Repeat Disable functionality. Repeat Disable functionality is defined as the configurable system ability for a dispatch console and/or NMS terminal to disable the normal repeat mode functionality of the network infrastructure so that only dispatch console positions can monitor the talkgroup and multigroup audio generated by a subscriber terminal. Although the system should normally operate in a repeat mode configuration so that field users can hear each other, the system shall provide the configuration capability to engage a repeat disable mode by talkgroup and/or multigroup so that a dispatcher can restrict sensitive or strategic communications to only being heard by dispatch

consoles. Repeat Disable functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in the repeat disable functionality.

3.5.34 Multiple Key Encryption (OPTION)

The proposed system shall include, as an option for selected subscriber units, multiple key hardware-based encryption utilizing the DES and AES encryption algorithms. No single key encryption configurations shall be proposed with this system. Security and confidentiality of system operations is a major and growing concern for some of the County public safety agencies. As a result, it is the County's objective to protect the system from eavesdropping, corruption or compromise of information, denial of service, disruption or any other type of event through the use of scanners, hacking, electronic break-ins, use of unauthorized radios, stolen radios, etc.

Select subscriber terminals (portables, mobiles, control stations) and all dispatch consoles shall be capable of a dual encryption algorithm (DES-OFB & AES) approach with the ability to store at least 16 different encryption keys per algorithm and per subscriber terminal. The network infrastructure shall be capable of processing any combination of at least 256 different encryption keys per algorithm. Dispatch consoles shall be able to decrypt any of the 256+ encryption keys per algorithm created in the system on an end-to-end basis. Over-the-Air-Rekeying (OTAR) from the NMS shall be available for key distribution to remote subscriber terminals within the coverage range of the trunked system. Manual encryption key distribution also shall be available using a handheld, battery-operated, password-protected key fill device.

Multiple Key Encryption and associated configuration control shall be explained in detail. Encryption functionality shall be available in both trunking and conventional modes on both a user-selectable or hard-coded "mode-strapped" basis for select subscriber terminals and all dispatch consoles.

3.5.35 Status & Message (OPTION)

The proposed system shall include, as a system option, Status & Message functionality. Status & Message is the capability for a source radio unit to send pre-defined status indication updates and/or pre-programmed message definitions to a dispatch console and network management terminal. Radio users shall be capable of initiating status and message indications from a pre-programmed status and message list. A source radio shall be notified if a target does not receive the sent status message. The proposed network and subscriber terminals shall be capable of processing status and message data services without the use of a dedicated talk-path

or voice channel resource. Status and message functionality should be quoted as a system option for all subscriber terminals and dispatch consoles.

3.5.36 Discreet Terminal Monitoring (OPTION)

The proposed system shall have Discreet Terminal Monitoring capabilities quoted as an option. Discreet Terminal Monitoring is defined as the service whereby a dispatch console/network control point may place a subscriber terminal into a special type of individual voice call mode whereby the target terminal begins transmitting without any action from, or indication to, the called user. The purpose of the discreet terminal monitoring functionality is for the dispatch console/network control point to discreetly listen to the activities of a field user that may be operating in a dangerous or volatile situation. Discreet Terminal Monitoring functionality should be quoted as a system option for all subscriber terminals and dispatch consoles.

3.5.37 Short Message/Alphanumeric Text Service (OPTION)

The proposed system shall have Short Message/Alphanumeric Text Service capabilities quoted as an option. Short Message/Alphanumeric Text Service is defined as the data service whereby any combination of subscriber terminals, dispatch consoles, and NMS workstations can exchange free text messages using alphanumeric characters. Alphanumeric message length shall be at least 150 characters. Users shall be capable of generating the free text messages from the subscriber terminal keypad and/or workstation keyboards.

Sent and received text messages shall be time and date-stamped in the respective source and target radios/consoles/NMS workstations. The proposed subscriber terminals/dispatch consoles/NMS workstations shall provide address book functionality so that target recipients can easily be stored and retrieved. Receipt of a message shall provide visual and audible indication to the subscriber terminals/dispatch consoles/NMS workstations. At least five messages shall be archived in the subscriber terminals on a FIFO basis and a user shall have the capability to flag a message to be saved and not deleted. Messages received and generated at dispatch consoles and NMS workstations shall be capable of being archived and printed for historical record-keeping purposes. A source radio/dispatch console/NMS workstation shall be notified if a target does not receive the sent message.

The proposed network and subscriber terminals shall be capable of processing Short Message/Alphanumeric Text Services without the use of a dedicated talk-path or voice channel resource. Short Message/Alphanumeric Text Service functionality and the associated configuration control shall be explained in detail. Short

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Message/Alphanumeric Text Service functionality should be quoted as a system option for all subscriber terminals, dispatch consoles, and NMS workstations.

3.5.38 Subscriber Tracking/GPS Location Services (OPTION)

The proposed system shall have Subscriber Tracking/GPS Location Services capabilities quoted as an option for all subscriber types. Subscriber Tracking/GPS Location is defined as the service whereby a network control point or properly equipped dispatch console may monitor the real-time location of mobile or portable subscriber terminals (within coverage range of the proposed network) on a map display using the proposed network infrastructure. Automatic network polling and/or manual user polling functionality shall be offered to provide real-time location status, and the location information shall be displayed on a map that updates at specified time intervals.

Additional triggers for location updates shall include: (1) emergency alert/call activation, (2) user PTT channel request, (3) dispatcher/administrator query, and (4) power-up/affiliation. All subscriber location change data (latitude, longitude, time of date, subscriber ID, etc.) shall be capable of being archived to a *.csv file (comma delimited file) on a designated network control point client computer/server for a period of up to 30 days on a FIFO basis. Subscriber Tracking/GPS Location Services functionality and the associated configuration control shall be explained in detail. The Offeror shall further identify and price any available API that may exist in which the subscriber GPS Location Services data may be exchanged with a third-party mapping system.

3.5.39 Telephone Interconnect (OPTION)

The proposed system shall have the optional ability to connect a mobile or portable subscriber on the system to the Public Switched Telephone Network (PSTN). Connection of a subscriber radio unit to and from the PSTN is a specialized form of selective calling that requires appropriate processes for providing outbound call placement from a source radio and inbound call reception to a target radio.

A telephone interconnect call is defined as a wide-area, one-to-one voice transmission between any subscriber terminal operating within the network and a PSTN or PABX subscriber. Telephone calls shall be a network-wide capability and shall be fully supported by the system on an optional basis. Telephone calls may be half- or full-duplex, DTMF-initiated, and provide echo cancellation. The proposed network shall support landline-to-subscriber and subscriber-to-landline call types. Identification of the calling party shall be made to the subscriber terminal in alphanumeric format. Positive or negative acknowledgement through call progress tones shall be provided to the subscriber terminal when participating in a telephone

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call. The proposed network shall provide the ability to configure the maximum call duration for telephone calls.

The proposed network shall provide the ability to configure the permission to initiate a telephone call per subscriber terminal. The proposed network shall provide the ability to authorize or deny a configurable number of telephone calls in real-time by remote site. Authorized users also shall be able to place and receive calls on PABX/PSTN networks. The system must be able to restrict calls from individual terminals from calling specific numbers, locations or PABX systems. The system must be able to restrict calls by site or network subsystem. The system shall be capable of restricting the number of simultaneous telephone interconnect calls to preserve the intended system grade of service. Individual subscriber terminals shall be capable of being assigned a unique Direct Inbound Dial (DID) number and/or being served by a pool of DID numbers in conjunction with a unique subscriber unit ID. The proposed system shall support a PSTN interface of any combination of at least six unique loop-start or ground-start lines. Telephone Interconnect functionality and the associated configuration control shall be explained in detail.

4.0 RF SPECTRUM CONSIDERATIONS

This section describes considerations for use of the RF spectrum. The Offeror shall review this section and determine the best possible technical solution for the development of the radio network based on County's requirements. Radio coverage, future expansion, system life cycle, and regional interoperability considerations are all critical design issues for the County; thus, the Offeror must give full consideration to all of these aspects when creating a system design.

4.1 RF DESIGN REQUIREMENTS

4.1.1 700 MHz & 800 MHz Operational Modes

The proposed LMR system and associated subscriber radios shall all be equipped to operate throughout the entire frequency range from 764-861 MHz (764-862 MHz once the FCC Reconfiguration process has been completed) per the FCC-outlined channel plans in each portion of the 700 MHz and 800 MHz spectrum. Required operational modes and associated modulation schemes include:

- 764-861 MHz Trunking--APCO Project 25-Compliant Digital Mode
- 764-861 MHz Conventional--APCO Project 25-Compliant Digital Mode
- 764-861 MHz Conventional--Analog Mode (with CTCSS/PL/DPL).

Equipment proposed in the 800 MHz band must comply with the National Public Safety Planning Advisory Committee (NPSPAC) Mutual Aid requirements. All voice subscriber units and national NPSPAC base stations must be capable of operating in the conventional analog FM mode with Continuous Tone Coded Squelch System (CTCSS/PL/DPL). Additionally, all 800 MHz (700 MHz capable) subscriber units must be capable of operating in both analog and digital conventional and trunked operational modes on 764-861 MHz channels.

There may be additional negotiations to add frequencies in the 700 and 800 MHz bands to the system. Subscriber terminal antennas shall implicitly be capable of operating across the entire 764-861 MHz operating band using a single subscriber antenna.

4.1.2 APCO Project 25 Conformance

The County requires a new 800 MHz (700 MHz capable) digital trunked system that meets the APCO Project 25 (P25) Phase 1 and Phase 2 requirements for modulation, spectral efficiency, and audio quality. At a minimum, the proposed system shall be equipped to operate in a 12.5 kHz channel with a 9600 bps bit rate using an FDMA access method. Subscriber terminal and fixed network equipment conformance testing results must be provided by the Offeror to demonstrate

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complete alignment with the open P25 standard. The P25 Phase 1 Common Air Interface (CAI) shall be provided for all subscriber radios and fixed network equipment.

4.1.3 RF Engineering Data

The Offeror shall provide a comprehensive level of technical RF coverage design information relative to the proposed network. At a minimum, the information to be provided by the Offeror for each proposed RF site shall include:

1. Transmit and receive antenna models noting gain, orientations, azimuths, downtilt, sidearm lengths, and antenna base mounting heights;
2. Type and length of transmission cable for transmit and receive antenna systems;
3. Insertion loss values noted in decibels (dB) for all proposed transmit combiners/cavities, receive multicouplers, filters, duplexers, RF connectors, circulators, lightning arrestors, wattmeters, RF jumper cables, attenuators, etc.;
4. Transmit power levels for all fixed network equipment base station transceivers and all subscriber terminals;
5. Net amplification gain (if utilized) of each tower top amplifier system;
6. Receive sensitivities for all fixed network equipment base station transceivers and all subscriber terminals;
7. The faded performance margin $[C/(i+n)]$ utilized per TSB-88-C for the required CPC (channel performance criterion) requirement of DAQ 3.4;
8. The portable antenna factor utilized per TSB-88-C which accounts for all body, pattern, and polarization effects;
9. The minimum usable received signal level (mrsI) for all proposed mobile, portable, and control station subscriber terminals;
10. The propagation model, diffraction model, and effective antenna model utilized in the coverage modeling for the proposed County system with actual environmental and adaptive loss parameters (i.e., land use land clutter) specified;
11. The simulcast minimum capture ratio (in decibels) and maximum delay spread (in microseconds);
12. The terrain and land use database resolution in arc-seconds for all coverage modeling, and
13. Intermodulation studies for all sites which factor in all RF equipment in use or intended for use at the specific site.

Additionally, the RF Engineering submittal must include a complete RF schematic for each transmit and receive antenna system per site noting all proposed antennas, transmission lines, tower top amplifiers, receiver multicouplers, transmit combiners, circulators, filters, RF connectors, etc. The Offeror shall indicate the effective radiated power of each site that accomplishes the coverage design for the County.

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A talk-in/talk-out RF link budget (quantifying any link imbalance) must be included for all proposed mobile, portable, and control station subscriber terminals. Color-coded talk-in, talk-out and combined (round-trip) coverage maps shall be provided in a high resolution format (1 arc-second) for Elements 1-3 from Section 3.1 and noting the following:

1. FCC/Region 54-required coverage contours,
2. Areas of simulcast (if proposed and where applicable) distortion, and
3. Expected bit error rate (BER) percentages.

Product data sheets shall be provided for all proposed antennas, transmission lines, tower top amplifiers, receiver multicouplers, transmit combiners, circulators, filters, RF connectors, attenuators, etc.

The Offeror shall provide coverage prediction maps indicating a service area reliability of 95% RF coverage for all required scenarios. Prediction maps shall indicate County borders including adjacent counties, RF base site location(s), primary roads, and areas of non-coverage. In addition, one original of each RF coverage prediction map shall be provided on “ANSI E” size paper. For each scenario and service area required, a second coverage prediction map shall be provided noting the guaranteed service area reliability with a proposed coverage test grid structure underlay per the TSB-88-C grid size guidelines.

All engineering analysis and coverage modeling shall be executed in accordance with FCC/Region 54 parameters and restrictions. The County will serve as the signatory for all licensing efforts, but the Offeror shall be responsible for provision to the County of all technical data required to properly license the proposed network.

4.1.4 RF Sites

Option 1 –The Offeror has the ultimate latitude to propose alternative sites in which to achieve the desired engineering goals and coverage requirements of the system. However, the Offeror shall note that re-use of existing sites, to the greatest extent possible, is highly preferable and should be considered the primary option to control system costs and optimize the timeframe to transition to the new system.

Option 2 – If the Offeror finds other commercial sites to be suitable for the coverage design, then the Offeror shall provide a detailed explanation of the site owner’s proposed costs, accessibility, and certification that the structure can handle the proposed load. The cost of acquiring and leasing alternatively-owned tower sites shall be included in the Offeror’s price proposal. The use of an existing commercial site shall be secondary to the goal of re-using existing County sites, but this design alternative is still preferable to the County versus constructing a wholly new tower. The County also views collocation on an existing tower a viable

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alternative to control system costs and to optimize the overall timeframe to transition to the new system.

Option 3 – A third option for the County is to construct brand new communications facilities to serve the proposed system. This specification outlines in a subsequent section how communications facilities shall be designed and implemented to meet the needs of the County. Whenever wholly new communications facilities are required and proposed, the County highly encourages the deployment of such sites on available County owned property.

In general, the County prefers to own and operate critical communications sites within its bounds. Justification includes better control of security and limited access, additional control over interference from co-locations, lower overall cost over the normal radio system life-cycle, and higher levels of reliability than typical commercial facilities. Ultimately, the County remains flexible in the site selection process for the new system as the most important design criteria for County users is the delivered RF coverage and resulting audio quality. The County requires the Offeror to thoroughly justify and explain the rationale for the proposed sites and resulting tower heights/shelter sizes.

4.1.5 FCC Licensing

The County requires the supplier to utilize any combination of the County's existing LMR and microwave frequencies to complete the network design. The supplier must realize that most of these frequencies are currently in use as part of the existing trunking system, so the necessary arrangements shall be made to craft a workable cutover plan to re-use the same frequencies in the new system design. All FCC, Region 54, and frequency coordination licensing activities will be the sole responsibility of the supplier. The County will serve as the ultimate signatory and licensee, but the Offeror is responsible for defining, designing, documenting, and providing all technical data necessary to commission a fully-functional and licensed radio system network that meets or exceeds the County specifications contained herein. If the Offeror determines that additional channels are required, the Offeror shall define, design, document, and provide all technical data necessary to obtain the additional frequencies to complete the network design. While Special Temporary Authorizations (STAs) shall be permissible during the implementation phase of the process, the County requires that all licenses be fully granted in the County's name with FCC call signs prior to final system acceptance.

4.1.6 Interference Prevention/Mitigation

The proposed radio system shall account for the current noise floor environment in the County as well as possible degradations into the near future. The Offeror is required to engineer a network that provides sufficient signal margins, in concert

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with the Interference Protection Standard guidelines specified in the August 6, 2004 FCC Report and Order on WT Docket 02-55 (FCC 04-168), throughout the County to mitigate and eliminate adjacent and in-band noise/interference. The proposed system also shall be designed to mitigate and eliminate the effects of out-of-band emissions and intermodulation products originating from CMRS, SMR, and other nearby wireless radio networks. The proposed system shall not, in any way, be degraded by self-induced interference or noise that results from the normal, daily operation of the network. In the event that the proposed system experiences interference of any kind during the deployment and warranty phases, the Offeror shall provide at no additional cost the technical resources to the County to identify, characterize, and resolve the interference issues.

5.0 RADIO SYSTEM INFRASTRUCTURE REQUIREMENTS

5.1 SYSTEM ATTRIBUTES

The County intends to implement a wireless two-way digital trunked radio communication system providing highly reliable radio service throughout the entirety of the County. The proposed radio system infrastructure shall utilize open protocols and be very scalable to allow migration and expansion as compared to existing legacy systems. The proposed network provided must allow the County the option to choose various types of subscriber equipment from multiple vendors that can be readily supported by the system.

The proposed radio system shall include portable and mobile subscriber units, base station transceivers and associated antenna systems, control stations, real-time call processing controllers, network routing and switching equipment, microwave transport and channel bank equipment, network controllers and location registers, configuration and database servers, audio switching equipment, diagnostic and troubleshooting network management subsystems, dispatch console interface equipment, mutual aid and interoperability interfaces, and all other required equipment that comprises a complete system infrastructure.

The radio system must allow shared access to system services by the agencies while restricting access by unauthorized subscriber units. The radio system must be configurable such that individual agencies can communicate on talkgroups privately within their operation, as well as to interoperate with other County agencies, as required.

The radio system shall support the use of the following types of subscriber radio and control equipment configurations:

- Mobile (vehicle-installed) subscriber units including various tiers and different mounting configurations;

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- Portable (handheld) subscriber unit including various tiers, configurations, and specialized accessories;
- Control stations subscriber units including various tiers, configurations, and remote deskset/handset-style controllers;
- Vehicular repeater subscriber configurations facilitating in-band or cross-band communications;
- Dispatch consoles providing all required features and capabilities using wireline and optional RF interfaces.

The network management system shall provide for high system availability by monitoring of the voice radio system on a continuous basis through the use of automatic alarms and diagnostics that provide an immediate interface to maintenance technicians through both integrated monitoring equipment and optional Offeror-provided central monitoring equipment. The radio system also shall provide a method for monitoring the use of the system through historical and real-time statistical reports by agency and for the entire system generated by network equipment on demand.

5.1.1 Grade of Service

Designing a mission-critical public safety system requires consideration for worst-case scenarios that may require a tremendous, rapid increase in radio traffic in any localized area of County service territory as well as an increase in radio traffic for a wide-area incident. A well-designed public safety system easily should be able to provide the channel capacity for unblocked, routine, daily County radio operations as well as to embed sufficient additional capacity to cope with crisis and disaster circumstances. In order to facilitate this balancing act, the County requires the Offeror to complete a comprehensive Grade of Service (GOS) analysis to determine the Grade of Service the County can expect when serving the quantity of subscriber units for each Department as contained in the Appendix D of this document.

The County desires a Grade of Service (GOS) metric of 1% using the Erlang-C traffic model. Using documented Offeror-assumptions and the requested number of subscriber radios, the County requires the Offeror to perform a GOS analysis to determine how closely the County can expect its Grade of Service to adhere to the County's 1% GOS target. The County requires all GOS assumptions to be clearly identified to explain the analysis and optimum channel number conclusion. To facilitate a uniform comparison, the Offerors shall utilize the following data and guidelines in the GOS analyses as a starting point:

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- 75% of the requested subscribers will be active at the busiest time
- Average call duration is approximately 6 seconds
- Number of calls per subscriber per hour is approximately 2
- Number of system talkgroups is approximately 180
- Message trunking repeater hangtime, if used, is approximately 1 second
- Maximum acceptable average wait time is 0.5 seconds
- Compute network GOS % values for the system design utilizing 7 trunked channels/talkpaths.

The Offeror shall provide a detailed explanation of its analyses, additional assumptions, conclusions, and the engineering tools utilized.

5.1.2 Throughput Delay

Throughput delay, which is defined as the mouth-to-ear transfer delay of voice information involving a calling and a called subscriber radio, shall be as follows:

- Less than 250 milliseconds in direct simplex radio-to-radio communications;
- Less than 350 milliseconds in radio-to-radio communications through a single conventional repeater;
- Less than 500 milliseconds in radio-to-radio communications utilizing the proposed trunking network.

Audio buffering shall occur so that no audio is truncated or lost between the time the radio or console PTT switch has been pressed and the actual trunked channel grant. Radios shall be equipped to deliver, via programming, a ready-to-talk tone to operationally guide radio users and adjust usage behavior.

5.1.3 Trunking Operation

The 800 MHz (700 MHz capable) trunked repeaters should be managed by the Master Network and/or Primary Site Trunking Controller(s) that manages and selects available communications channels. When a request for communications from a subscriber unit or dispatch console occurs, the controller shall acknowledge the request and assign an idle channel for communications, based on user privileges and call access control parameters. The proper talkgroup or individual call also shall be assigned to the available trunked channel by the appropriate call processing controller which communicates through a dedicated or working control channel.

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The trunking communications protocols simply organize all subscriber units belonging to a specific configurable talkgroup address to electronically merge to an electronically assigned available talkgroup RF resource under the domain of the trunked system controller network for the duration of the voice transmission. Once talkgroup communications has ended, network logic causes subscriber units to return to the system control channel awaiting further communications instructions.

The system shall allow a transmitting unit access to an available channel and unmute a receiving unit's speaker with the transmitting unit's audio, within 0.5 seconds of the transmitting unit's "Push-To-Talk" (PTT) switch activation. Should system traffic be at a level where all trunked channels or talk-paths are busy, the system will automatically give preference to higher priority units attempting access. The system shall indicate to the user that channels are busy, that the unit is placed in a busy queue, and that a requesting unit will be offered an available channel in a call back mode. The Offeror shall describe in detail the priority access scheme that the proposed system offers.

5.1.3.1 Operations within Challenging RF Environments-VRS Compatibility

The proposed network shall incorporate a high degree of in-building coverage throughout the County service area; and if necessary, the system shall support the augmentation of network coverage through the use of trunked Vehicular Repeater Systems (VRS). The compatible VRS must be capable of extending both talk-in and talk-out coverage and associated trunking features for portable radios that reside in areas of inferior coverage locations. A VRS configuration shall include a trunked system mobile radio and a properly-filtered vehicular repeater. VRSs must be designed to operate across the entire 764-861 MHz frequency bands.

Compatible VRS configurations shall offer the following features:

- Support for 764-861 MHz digital trunked communications
- Support for 764-861 MHz analog and digital conventional communications
- Capability for portable subscriber radios to remotely switch VRS talkgroup and channel modes
- Capability to extend talk-in/talk-out for encrypted conventional and trunked calls
- Capability to extend talk-in/talk-out for emergency calls and unique PTT-ID unit identifiers
- Support for multiple VRS assemblies to co-exist and operate without disruption or self-induced interference in the same localized area

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- Capability to operate in a tactical repeater or “local-only mode” when both the VRS and nearby portables have roamed out of reliable network coverage
- Capability to operate in a “re-broadcast (system extension) mode” when the VRS remains in reliable network coverage but the nearby portable subscriber radios have roamed out of reliable network coverage
- Capability to operate in a “silent mode” (non re-broadcast mode) when both the VRS and nearby portable subscriber radios remain in reliable network coverage.

The Offeror shall describe in detail the VRS features, limitations, and VRS compatibility that the proposed system and subscriber equipment complement offers. Optional VRS assembly pricing with installation costs shall be quoted as part of this proposal response.

5.1.3.2 Operations within Challenging RF Environments-In-Building System Compatibility

The proposed network shall incorporate a high degree of in-building coverage throughout the County service area; and if necessary, the system shall support the augmentation of network coverage through the use of in-building repeater systems. The compatible in-building repeater systems must be capable of extending both talk-in and talk-out coverage and associated trunking features for portable radios that reside in areas of inferior network coverage. An in-building repeater system configuration shall include all electronics, antenna systems, power supplies, cabling, connectors, suppression, grounding, and hardware necessary to provide reliable in-building coverage designed to meet the County’s requirements as outlined in this specification. In-building systems must be designed to operate across the entire public safety 764-861 MHz frequency bands.

Compatible in-building system configurations shall offer the following features:

- Emergency backup power for a minimum of 4 hours continuous, uninterrupted runtime in the event that commercial power becomes unavailable
- Support for 764-861 MHz digital trunked communications
- Support for 764-861 MHz analog and digital conventional communications
- Capability to support fiber-optic, CAT-6 twisted pair, and/or radiating coaxial cable based signal distribution (as offered or permitted at each candidate in-building system location)

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- Configurable level-setting and power output control to optimize signal levels inside the structure
- Craft interface to all configurable electronics with capability to archive and retrieve optimization/level settings
- Filtering and attenuation that eliminates out-of band emissions and interference
- Both a craft interface and discrete relay alarm/monitoring capability to remotely monitor the performance and operating characteristics of the in-building system
- Rack-mountable and/or wall-mountable electronics
- Aesthetically pleasing cabling and disguised antenna placements per building design and layout
- Comprehensive documentation that defines as-built physical, electrical, and RF designs on scaled drawings.

The Offeror shall describe in detail any required in-building system features, limitations, and system compatibility that the proposed offering includes. All proposed in-building systems included to meet the network coverage requirements shall be priced independently clearly noting all included equipment and installation costs.

5.1.3.3 Failure Mode Analysis

The entire FNE and backbone microwave systems shall be free of any single point of failure that totally disables the radio system. No failure, even the complete loss of a network control site, shall render the system totally devoid of radio coverage and basic network talk-in/talk-out functionality. Wide-area trunking communications shall be preserved and maintained throughout all failure modes as feasible, but conventional modes of operation are deemed acceptable provided wide-area communications and coverage characteristics are maintained. The Offeror shall provide a comprehensive analysis explaining how the proposed system will continue to provide radio service (noting specific coverage and functionality impacts) to the County's subscribers following the various failures of the hierarchical systems that control operation of the trunked network.

All fallback modes of communication shall be thoroughly described with an explanation of what must occur to trigger the specific fallback mode. The analysis shall consider thoroughly the impacts to coverage reliability, field subscriber trunking and conventional features, dispatch console trunking and conventional features, network management control, and interoperability. In addition, the analysis shall describe the complexities of operations restoration within the PSAP(s). In particular, the Offeror should describe how console positions controlling multiple talk groups will maintain communications with

the different talkgroups operating in a County mode during the various failure modes.

The purpose of the failure mode analysis is to ensure that the Offeror recognizes the criticality of the County's radio network infrastructure in relationship to its unique role of protecting the citizens and property of the County. The Offeror must demonstrate through its network design that the level of redundancy proposed is exceptional and engineered to continue network operations without interruption in virtually any circumstance including attacks of terrorism and natural disaster.

The County requires the Offeror to provide an extraordinary design for the electronic hardware and software as well as a separate plan to protect every aspect of the physical infrastructure supporting and protecting the network. For example, if a site is proximate to flooding or any other source of water, the design must contain strategies to protect the site from flooding and other acts of nature.

5.1.4 Simulcast Operation

The following subsections pertain to the expected simulcast system architecture to provide the wide-area coverage requirements. Wide-area coverage is defined as operation over an area that cannot be covered by a single base station transceiver site. The basic wide-area design concept for the County system shall be a P25 digital trunked system providing wide area coverage and the Grade of Service requirements described above, including a high degree of in-building coverage. Interconnection between the base station sites, console electronics and dispatch positions shall be provided by a high-capacity microwave system preferably in a loop configuration.

5.1.4.1 Transmitter Simulcast

The simulcast design shall have the capability to connect audio and data between the prime control site and remote transceiver sites via multiple DS-1 (T-1) microwave circuits. The system shall be capable of automatically adjusting the path delay and amplitude of any one or all DS-1 circuits utilized in the system. The automatic adjustment shall compensate for any change in microwave paths. The system shall be capable of maintaining a phase delay (launch time) of no more than +/- 3 microseconds and an amplitude of 0.1 dB between transmit sites. The path delays shall be dynamically adjustable to compensate for at least 60 milliseconds of inherent path delay. A simulcast design also shall be compatible with the use of leased Fiber Optic services (if necessary).

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A written response to the following items shall be included in the Offeror's response:

- Renetting Interval - The recommended interval at which the system is to be "renetted" or verified with respect to adjustment of frequency, modulating signal amplitude and phase, shall be specified.
- Simulcast Time Delay Control - Once the path delays have been measured, the method by which audio path time delay will be automatically controlled and equalized shall be specified. The maximum amount of path delay compensation shall be specified.
- Frequency Stability - The method by which the frequency of base station transmitters is maintained within the required tolerance for satisfactory simulcast operation shall be specified, and this value shall be provided. Options for enhanced frequency stability, if any, shall be identified and the cost(s) listed in the Pricing section.
- Addition of Sites - The procedure and equipment required for the addition of base repeater or receiver sites shall be specified. Also, the maximum site capacity of the system's simulcast controller(s) shall be specified.
- Addition of Channels - The procedure and equipment required for the addition of base repeater or receiver channels shall be specified. Also, the maximum channel capacity of a single simulcast "Site" or "Prime" controller shall be specified.
- Control of Sites - The Offeror shall describe the method by which the simulcast remote sites are controlled and interfaced with the trunked system controller. Link type and bit rate shall be specified.
- System Architecture - The trunked simulcast system architecture shall be described in detail, with written descriptions of all major system components and their functions. System and site block diagrams shall be provided to show the interconnection and the detailed audio/logic signal flow (e.g.; tx audio +/-, keying +/- etc.) between system elements (components/equipment racks).

5.1.4.2 Digital Comparator

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A receiver voting/comparator system shall be furnished and installed which shall allow the automatic selection of the receiver providing the lowest Bit Error Rate (BER) and Forward Error Correction coding (FEC). The voting/comparator shall pass the selected audio to the dispatch consoles and the simulcast audio distribution network for rebroadcast to other mobile, control station or portable field units. The receivers operating in the voting system shall, at minimum, be those included in the base station transceivers. The trunked system shall provide console priority. The operation of the comparator/selector shall not be evident; there shall be no clipped syllables and no noticeable delay in the selection process.

The comparator shall be radio frequency band independent. The digital comparator shall incorporate frame diversity that allows the comparator to utilize the best data frames of all the inputs to construct a better output signal than any one single input signal of the comparator. Each receiver shall generate “idle data” when it is in the idle (squelled) state. The idle data shall be transportable by a DS-1 (T-1) audio circuit.

The comparator shall provide an indication of a failed digital microwave audio circuit or input serving a receiver through loss of detection of idle data, or by other supervisory method. The receiver voting comparator shall be equipped to provide a real-time voting activity display and output. Voting activity displays shall include receiver selected, receiver unsquelled, receiver failed and receiver disabled.

The digital comparator shall provide alarms for key operational parameters, and shall provide for remote inquiry display, disablement and diagnostic functions via RS232 and Ethernet connections. Alarms shall be displayed at all NMS workstations and through craft interfaces. The digital comparator shall provide high-level diagnostic information through front-panel LEDs and relevant indicators so that a technician or network administrator can quickly gauge the severity of a digital comparator fault by looking at the digital comparator. The digital comparator shall provide both alarm messages and fault conditions using Simple Network Management Protocol (SNMP) and discrete Form-C relays. At a minimum, the digital comparator shall provide Critical, Major, and Minor relays which may be connected to a separate alarm subsystem. All digital comparator alarm information shall be time/date stamped in synchronization with the master network clock. All comparator ports shall be uniquely labeled and identified on the comparator chassis so as to highlight the specific receiver sites.

5.1.5 Digital Encryption

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The proposed system shall be capable of supporting and providing digital voice encryption calls. All properly-equipped subscriber units with multiple key encryption shall be able to scan between and converse on encrypted and clear talk groups. All dispatch positions shall be capable of end-to-end multiple key encrypted voice operations. The coverage range and reliability of the system in encrypted mode must equal the range of the system in the clear, unencrypted mode.

The encryption process shall not degrade the required delivered audio quality of the system. Encryption shall be available in trunked, conventional and talkaround modes. Encryption shall be available in all proposed fall-back modes of communication. AES and DES encryption algorithms shall be supported by the proposed system. The Offeror shall state the number of encryption algorithms available in its system and the encryption algorithm capacity of all proposed radio units. Multiple keys must be provided in the fixed equipment and the subscriber units. The system shall be capable of re-keying the encryption algorithm for all properly-equipped subscriber radios over-the-air. The Offeror shall fully discuss the encryption scheme in the proposal response.

5.1.6 Over-The-Air Subscriber-Provisioning

The system shall offer the ability to provide over-the-air subscriber provisioning to download complete subscriber radio personality configuration changes. All subscriber radios shall be capable of being uniquely addressed and receiving, in real-time, over-the-air subscriber provisioning data using the proposed trunking system infrastructure. All data contained in the subscriber radio personality shall be reconfigurable in an over-the-air exchange, and the personality data shall be transmitted in a discreet, protected mode to stymie eavesdroppers.

From a dedicated over-the-air subscriber provisioning workstation or network management terminal, a network administrator shall be able to download all or any subset of the radio personality data to one or multiple field subscriber radios that are actively affiliated with the trunked network. The over-the-air subscriber provisioning tools shall provide the same user functionality, user feedback, dialogue messages, and historical programming data as a traditional hard-wired programming configuration (i.e., laptop with required radio programming software, interface cables, adapters, etc.).

Target radios shall provide positive or negative acknowledgment as to the success of the intended over-the-air provisioning transaction. An over-the-air subscriber provisioning transaction shall take place in real-time and the transaction time shall be commensurate with the bit rates offered by the proposed network. Compression techniques are encouraged to reduce the necessary duration of an over-the-air subscriber provisioning transaction. The Offeror shall fully discuss the over-the-air

subscriber provisioning capabilities, methodologies, and limitations in the proposal response, to include batch provisioning.

5.1.7 Call Sign (Base Station) Identifier

The proposed system shall be equipped to automatically generate and transmit all of the FCC-assigned call signs in International Morse Code format every 30 minutes at a minimum per FCC §90.425 guidelines. Every channel shall be capable of transmitting the appropriate call signs, so that in the event of a specific channel failure, the FCC call signs are assured to be transmitted without any manual intervention required. The proposed system shall offer the ability to easily modify/change all of the FCC call signs through a craft interface without the need to generate new hard-coded PROMS or “codeplug”. The proposed system also shall provide the ability to change the timing between automatic call sign identifiers from the NMS (e.g., set the timer to every 15 minutes). The call sign shall be properly synchronized and phased with other call sign transmissions between sites so as not to cause distortion or a heterodyne effect in any possible overlap coverage areas.

5.1.8 Interference Control

The proposed system shall be designed to be resistant to interference from co-channel, adjacent-channel, and intermodulation effects in a manner that is minimally as effective as Continuous Tone Coded Squelch System (CTCSS) used today in conventional radio systems, trunking connect tone, network ID, or equivalent. The proposed system also shall be immune to intra-system interference and cross-talk caused by frequency re-use, intermodulation, or other relevant system design characteristics. Proper system/subscriber RF filtering as well as subscriber and system equipment configuration control shall be provided to minimize and eliminate the effect of interference on system performance.

System receivers must be capable of detecting interference such that this interference is logged with a time/date stamp within the network management and diagnostics subsystem. Furthermore, the interfered channel must be temporarily shut down so that assignments on the interfered channel are not granted by the network controller until the interference condition is resolved. The proposed system shall be configurable such that the continuous duration and signal levels of the interfering carrier can be specified before the network controller deactivates the channel from availability. The interfering carrier timer shall be configurable in seconds up to at least three minutes in time, and the interfering signal level threshold shall be configurable in dBm up to a minimum level of -120 dBm.

The Offeror shall fully discuss the interference control capabilities, methodologies, and limitations for both fixed network equipment and subscriber units in the proposal response.

5.1.9 Access Mode (FDMA and/or TDMA)

All proposed fixed network equipment (FNE), subscriber terminals, and dispatch consoles shall be equipped with FDMA, and optionally 2-slot TDMA, trunking system access mode functionality in compliance with the APCO Project 25 specification.

5.1.10 Inter-System Connectivity

The Offeror shall provide a network that easily provides for future subsystem integration to expand coverage areas and add other candidate, compatible P25 networks without the need to overhaul or replace the proposed infrastructure. While the County network initially will serve County and its associated internal agencies, the County requires the proposed network and subscriber fleet to be architected so that additional simulcast or multi-cast trunked subsystems could be integrated in the future for greater interoperability. The County requires that the proposed system be architected in congruence with the APCO P25 specification which necessitates that RF subsystems from any manufacturer must be interconnectable into a wide-area system, using the P25-defined RF ISSI (Inter Sub-System Interface) standard.

The Offeror shall describe the proposed scalability and expandability of the system and subscriber fleet in detail. The Offeror shall thoroughly define its conformance to the P25 RF ISSI requirements and cite several examples of successful P25 trunking system interoperability in 800 MHz (700 MHz capable) as references.

5.1.11 System Roaming

If applicable, the proposed system should enable mobile and portable subscriber radios to roam over a wide coverage area with automatic connection and affiliation as the unit enters a new site coverage area within any radio subsystem. The system must provide for registration and authorization control over subscriber units and talkgroups roaming between radio subsystems. Manual and automatic roaming capabilities shall be provided between radio subsystems. The proposed network shall provide network controller functionality that tracks the real-time subscriber unit locations and affiliations through the use of Home and Visitor Location Register databases. Subscriber unit handoff between remote sites shall be seamless and without voice or data interruption to the subscriber terminal or dispatch console.

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The Offeror shall describe the wide-area roaming and mobility functionality being offered with the proposed network. Handoff/roaming algorithms shall be explained in detail.

5.1.12 Network Synchronization

Offerors shall propose a comprehensive design for master network timing and synchronization of the County radio communications system. All network elements and transport equipment shall be synchronized to the master timing source(s). The master timing source(s) shall be GPS-based with high stability, hot standby backup crystal oscillators. Redundancy shall be designed into the master timing source design to the greatest extent possible. Network synchronization shall be alarm monitored.

Stratum 1 timing should be provided for the system and transport infrastructure. All system DS-1/Fiber Optic links shall be capable of deriving clock from the master timing source. Network element equipment clocks shall be synchronized to the master timing source time/date clock for synchronization of diagnostic and failure tracking for internal equipment status logs. All proposed system network/fault management, dispatch consoles, and infrastructure network elements shall derive time/date from the master timing source so that troubleshooting and diagnostic status logs are synchronized system-wide. The master timing source(s) shall provide several additional timing ports for additional synchronization of County network elements such as CAD/RMS, 9-1-1 telephone, logging recorder, mobile data, display clocks, etc. should the County so desire.

5.1.13 Integrated Network Security and User Authentication

The County requires the Offeror to integrate reliable and adaptive network security and user authentication mechanisms into the proposed system to maximize system availability. The proposed system shall be hardened against such network breaches as viruses, worms, malware, spyware, denial of service attacks, and file corruption. The proposed network shall be equipped to quickly update virus definitions and security policies to rapidly prevent, adapt, and cope with malicious network outbreaks. Quarantine and remediation techniques also shall be utilized to prevent and minimize network outbreaks. Firewalls and authentication servers shall be utilized to restrict unauthorized network access while detecting, preventing, and responding to network attacks. Configuration techniques shall be implemented on all computing systems to prevent end-users without supervisor or administrator privileges from loading software or reconfiguring settings in any manner. The Offeror shall provide all passwords and authorization codes for every computing system in a comprehensive list as part of the as-built documentation package.

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The Offeror shall describe the integrated network security and user authentication functionality being offered with the proposed network as it pertains to all client workstations within all proposed subsystems.

5.1.14 Centralized Network Infrastructure Software Distribution

The proposed system shall be equipped with the functionality to download network element upgrades and configuration profiles from a centralized location so as to eliminate the need for technicians and administrators to visit each remote site to deploy enhancements, patches, bug fixes, and configuration modifications. All core network elements, controllers, servers, and transceiver devices shall be equipped to receive software updates and configuration changes from a centralized location. Target network elements shall provide positive or negative acknowledgment as to the success of the centralized software download transaction. A centralized software download transaction shall take place in real-time and the transaction time shall be commensurate with the network throughput offered by the proposed system. The target network elements shall be equipped to run either the existing software or updated software as decided and controlled by the network administrator. The updated network element shall always provide the ability to utilize the previous version of software in the event that the software update was corrupted or contained defects.

The Offeror shall describe the centralized network infrastructure software distribution functionality being offered with the proposed network.

5.1.15 Platform Roadmap/Network Supportability

The County intends to maximize and protect its system purchase investment. The Offeror is required to provide vendor support for the proposed system offering for a period of not less than fifteen (15) years from the date of final system acceptance. The offering consists of all hardware, software, cabling, and services rendered to implement the proposed network.

Offeror support is defined as the ability of the Offeror, without system redesign, to remedy to County satisfaction any hardware and/or software problem with any equipment and services provided as part of this offering. Offeror support will take the form of a 24x7x365 technical support hotline, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or spare/replacement equipment for the proposed offering for not less than fifteen (15) years from the date of final system acceptance.

The County requires the Offeror to provide a comprehensive system platform and subscriber roadmap (noting timetable of initial release through end of Offeror supportability) for the proposed network defining the product life cycles of all FNE,

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major network elements, software operating systems, software applications, subscriber units, dispatch consoles, subsystems, and ancillary network components. The County further requires the Offeror to define the OEM status of all FNE, major network elements, software operating systems, software applications, subscriber terminals, dispatch consoles, subsystems, and ancillary network components. Throughout the manufacturer support period, the County shall be entitled to receive at no charge the appropriate quantities of any software/hardware upgrade kit(s) that addresses an identified product defect or bug fix.

5.1.16 Mobile Data Optimization(Optional)

The County requires the proposed system to be optimized for mobile data communication services in alignment with the APCO P25 standard (as defined in the most recent version of the TIA/EIA-102.BAEA specification).

Radio-to-FNE, Radio-to-Repeater, and Radio-to-Radio configurations shall be supported with any combination of Physical (i.e., RS232, USB) and Link Layer (i.e., SLIP, PPP) interfaces. The proposed system also shall offer an Application Programming Interface (API) and physical connectivity for the County CAD system to transfer future mobile data information in both directions (i.e., Radio-to-CAD, CAD-to-Radio). The Offeror shall fully describe the delivered mobile data functionality and capabilities being offered with the proposed network.

The County is very interested in the following types of mobile data applications for its law enforcement and first responder workforce: data dispatch, unit status and history inquiry, NCIC/LEADS/DMV database access, real-time messaging and email, RMS access, AVL, and incident reporting. A complete description shall be offered by the Offeror as to what mobile data functionality exists initially with the proposed network/subscribers and what optional features, hardware, and licensing must be purchased to achieve completely integrated voice and mobile data services on the proposed network. The County requires the Offeror to identify any system limitations or constraints that should be expected with the proposed offering as it relates to a mobile data subsystem. The County requires the Offeror to identify and price as an option all ancillary system and subscriber equipment and configuration changes necessary to implement a complete mobile data subsystem providing the aforementioned applications.

5.2 MASTER NETWORK CONTROLLER SUBSYSTEM INFRASTRUCTURE

5.2.1 General Requirements

The Master Network Controller (MNC) subsystem comprises all system-level, subsystem-level, and associated site controller(s) required to deliver mission-critical digital trunking call processing and features in real-time. The design shall provide

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for high availability under the most extreme operating conditions and redundant network controllers or fallback designs are required when feasible. General tasks to be performed by the MNC and/or associated site controllers include: receipt and decoding of digital data from mobile/portable/control station radios, selection and efficient assignment of available radio channels, transmission and encoding of digital data sent to mobile/portable/control station radios, control of base repeaters, transmission of station identification required by the FCC, authenticating and controlling radio system access, maintaining affiliation and subscriber location databases, mobility management, control of switching subsystem infrastructure, and monitoring of alarm functions.

5.2.2 Availability/Reliability Requirements

The County requires a digital trunked system that will not suffer the loss of trunking capability as a result of the failure of a single system component, in particular the MNC subsystem. Should any component of the MNC subsystem fail, sufficient redundancy shall be incorporated in the system design so that full trunking operation continues without interrupting existing communications. Trunking capability is defined in this context as the ability of the proposed system to assign voice channels to independent talkgroups, as required, and the ability of the system user groups to remain functionally independent (i.e., full APCO 25 trunked feature set with no loss of features). A single controller failure that reverts the proposed system to a non-APCO 25 trunked feature set operation is not acceptable.

In the case of redundant MNC subsystem controllers, both controllers shall remain online continuously with parallel updating and mirroring of all system database(s) to ensure no interruption or degradation of trunking service in the event of failure of an active or standby MNC controller(s). Switching from active to standby controller operation shall be fully automatic, with audible and visual indication of the switchover provided to all network fault management workstations and supervisory dispatch console terminals. Manual switching functionality between the active/standby MNC controller(s) also shall be provided from the network management terminals. The Offeror shall identify the amount of time to switch between the active and standby MNC controllers. The Offeror shall provide both MNC controller SNMP alarm diagnostic information and discrete MNC alarm relays to the network management and diagnostic terminals.

The County requires the proposed system and the MNC controller(s) to be designed to provide 99.9999% or greater availability. Any system component enclosure or power distribution design that could render the system or 20% of its trunked channel resources useless or unavailable for communication from a single point of failure, shall incorporate redundancy to eliminate this vulnerability. This vulnerability elimination may be in the form of a redundant component/enclosure or a distributed redundant design that distributes single points of failure among

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multiple card cages, cabinets or housings each operating on its own dedicated power circuit.

Switching between MNC controllers (manually or automatically) shall not cause radio subscriber units to attempt to roam away or de-affiliate from the site or subsystem at which they are currently affiliated. Subscriber units shall not have to re-affiliate with a site or subsystem after any type of MNC controller switch has occurred.

If an Offeror's design requires an additional site or subsystem controller to serve and report to the MNC, then the MNC shall have complete control of wide-area call processing and channel assignments until its failure or failure of another critical network component. At that failure time, the site or subsystem controller should assume trunking control, utilizing the same systemwide subscriber radio user database and functionality without user intervention or interruption to trunking communications.

The Offeror shall fully define any hierarchical network controller relationship that exists to facilitate normal and fallback communications on the proposed system. The Offeror shall fully explain all redundant and hot-standby functionality integrated into the design to achieve the highest system availability. The Offeror shall fully identify the host network controllers/servers for critical call processing databases, mobility and location registers.

The Offeror shall state in the response the procedure and time required for switchover to a reduced functionality or conventional operating mode in the event of the failure of all trunked controller equipment. The proposed system must suffer multiple system element failures before a conventional or reduced capability operating mode is encountered. Offerors are nonetheless required to describe all such failure modes, regardless of how unlikely the occurrence.

5.2.2.1 Physical Separation of Critical MNC Components

The County prefers that all critical MNC and network management components be of a design that permits physically/geographically diverse installations whenever practical. Offerors are encouraged to design the proposed network in a manner that employs physical diversity of installed components whenever practical; however, when such a design technique is employed, the Offeror shall ensure that security measures designed to protect the network are equivalently maintained at all locations in which components have been installed.

The Offeror shall fully identify the required network backbone transport and topology requirements to facilitate the proposed trunked system and MNC subsystem. For example, the nature of site interconnection (i.e., star network, mesh network, loop network, etc.) shall be thoroughly defined. The Offeror shall fully

define all site interconnection bandwidth and throughput requirements to support the proposed MNC infrastructure and system as a whole. The network backbone timing and switching requirements shall be fully defined. The Offeror shall define the proposed system's compatibility with various types of site interconnection media: microwave radio, fiber, satellite, broadband cable, etc.

5.2.3 MNC Features and Functions

Software and firmware to provide trunking functions and features described shall reside in the MNC subsystem and associated computer software/hardware. The controller(s) and its associated computer software/hardware shall provide the following functions:

- Alarm Monitoring and Diagnostic Functionality - Monitoring of the operational status of all system devices and providing alarms when individual subsystems fail. Diagnostic functions shall allow an operator to view current status and status history of the system. It also shall allow for diagnostic tests to be performed on network devices (i.e. site controllers, base stations, comparators, routers/switches, etc.) to verify component and path integrity.
- Signaling (Control) Channel Backup/Rollover - Automatic transfer of signaling functions to another channel in the event of transmitter or receiver failure or interference on the signaling channel. The system shall have one active and a minimum of three backup signaling channels. Backup is defined as a channel of different frequency. Hot-standby backup of a signaling channel to a station of the same frequency is not acceptable. The Offeror shall define its control channel methodology.
- System Signaling & Special Functions
 - Signaling (Control) Channel Updating - The signaling channel shall continually transmit the current channel assignments of the system. This feature is intended to ensure that radios "signing on", coming into range or switching talkgroup modes, are directed to calls in progress on their selected talkgroup.
 - Voice Channel Embedded Signaling - Embedded signaling shall be transmitted on assigned voice channels in order to prevent subscriber units from being misdirected or allowed to transmit on an improperly assigned channel.
- Disabling of Failed Voice Channels - Automatic disablement of defective or degraded voice channels due to subsystem failure. Failures must be

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detected prior to the channel being assigned by the controller. Subsystem failures to be detected shall, at a minimum, include:

- o Low forward power
 - o High-reflected power
 - o Frequency drift
 - o Unidentified carrier on unassigned voice channel
 - o Signaling interface failure between base and controller
 - o Audio and/or data circuit/packet failure between controller and base
 - o Receiver failed/disabled
 - o Voter failed/disabled.
- System Usage Reports - Collection and processing of data with regard to system usage. Offerors are to describe how the data is parsed for displaying at the NMS workstations. All reporting functions shall be easily exported into real-time, standardized, spreadsheet and word processing formats for easy retrieval and custom report formatting.
- Talkgroup Steering – Talkgroup steering shall allow talkgroup and individual calls to be directed or steered to a single or group of channels. This steering capability shall not prohibit any group from being allowed access to all channels. Talkgroup steering shall be definable at the “subsystem” level. Subsystem steering means that if multiple subsystems are networked together by a Master Network Controller/Switch, that partitioning “tables” shall be defined in each subsystem.

5.2.4 Wide Area Scalability

The proposed network infrastructure and MNC subsystem shall have the capability, despite no immediate County plans, to network to other regional MNC subsystems in a higher-tier form of wide-area radio system networking (i.e., capability to have multiple MNC nodes within a larger regional system) per the APCO P25 ISSI standard. Networking or interfacing in this case means the linking of systems at the highest possible level to allow seamless radio roaming (assuming the same frequency band) and equivalent trunking functionality within a larger regional network. The proposed system shall not preclude the networking of separate, additional, compatible trunked systems, procured at some possible future date, but shall enhance such expansion designs wherever possible.

The MNC shall support authorized roamers from compatible P25 digital systems for interagency assistance. The site (or RF subsystem) location of all subscriber units, including authorized roamers, shall be maintained by the MNC. Calls shall not require resources at sites that do not contain affiliated subscriber units (unless specifically provisioned by the network administrator to do so). RF subsystems

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shall contain all the control intelligence to support full feature provisioning, call processing, access protection and track unit location and roamers within the RF subsystem.

All RF subsystems shall support standard signaling and communications interfaces to be flexibly linked into wider-area networks via private or public networks.

5.2.5 MNC Minimum Equipment Specifications

- Power Supply – Redundant, independent circuit 120 VAC/60 Hz power supplies to be protected by an uninterruptible power supply (UPS) that will prevent accidental shutdown of the MNC subsystem controller(s). Optionally, a secondary -48VDC power supply is encouraged to enhance the probability of maintaining MNC operations during a major commercial power failure. The MNC controller(s) shall be designed with an interlocking style power switch, protective cover, or secure cabinet so as to prevent an accidental, unintentional power-down. In the event of complete power failure, the MNC shall be capable of an unattended, automatic graceful shutdown to prevent the corruption of database files and real-time operating systems. Power cabling interfaces to/from the MNC controller(s) shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring. The Offeror shall be responsible for all required electrical and alarm wiring to commission the MNC subsystem. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all Offeror-provided equipment to the single point grounding system.
- Environmental – The Offeror shall identify the environmental operating characteristics of the proposed MNC subsystem. The MNC controller(s) and any auxiliary site controllers required at remote base station transceiver sites shall be designed to operate under the following conditions:

Temperature: -30 degrees Celsius to +60 degrees Celsius.

Humidity: 90% non-condensing.

RF Fields: Equipment shall be properly shielded to allow proper, uninterrupted operation in equipment rooms or buildings occupied by base station transmitters/control stations/microwave radios generating strong RF fields. The MNC equipment also shall be designed to suppress its own spurious emissions in concert with FCC Part 15 guidelines so that no detrimental interference is caused by the MNC subsystem to the larger system.

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EMP: Electromagnetic pulse shielding is also desired as a network defense against possible acts of terrorism.

- Duty Cycle – All proposed online and standby equipment shall be rated for continuous duty operation.
- Hardware/Software Platform – The MNC controller(s) shall be rack-mountable in standard 19- or 23-inch wide by 7.5-ft high EIA-style steel relay racks or in a 2-ft wide x 2-ft deep x 7.5-ft high standard computer server vented steel cabinet. Modular construction of the MNC using plug-in circuit cards and blade-style servers is preferred. The MNC controller(s) chassis shall be NEBS (Network Equipment Building System) compliant. The Offeror shall define the proposed MNC hardware and software platform(s) and list the OEM Offeror for all key components and applications/operating systems. The Offeror shall define the product roadmap and upgradeability for all proposed MNC controller(s). The County requires the Offeror to meet or exceed all supportability and product lifecycle requirements for the MNC subsystem as outlined throughout this specification.
- Data/Control Interfaces - All necessary interfaces with base repeaters, peripheral computer hardware, and the radio interconnect system shall be provided by the Offeror. Interfaces shall include cabling, networking equipment, and modems, all of which shall be identified in the Offeror's functional system diagrams. Cabling interfaces to/from the MNC controller(s) shall be supported from above using either overhead/aerial cable tray or from underneath via raised computer access flooring. The Offeror shall define all electrical and physical interfaces between the MNC and other system components in the required system functional diagrams. Cabling and equipment interfacing shall be executed in a manner to eliminate the MNC and peripheral equipment from being susceptible to RF and electromagnetic interference (EMI) from collocated equipment. Proper cable shielding and design shall be used to ensure that the MNC will not experience performance degradation due to collocated system equipment. Plenum-rated cabling shall be supplied whenever required by local code or system application.
- Craft Interfaces – The MNC controller(s) shall support two distinct and independent types of craft interfaces for remote and local provisioning and troubleshooting. The MNC controller(s) shall support an RS232 (VT100) style craft interface for a local or remote (if proper modem is utilized) terminal session craft interface to enable a technician or network administrator to provision or troubleshoot the controller(s). The MNC controller(s) also shall support an Ethernet style craft interface for a local or

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remote (if network connectivity exists) TCP/IP craft interface to enable a technician or network administrator to provision or troubleshoot the controller(s). The ability to provision or troubleshoot the MNC controller(s) through either interface shall not be dependent on the other interface being available. All craft interfaces shall provide password protection security. The MNC controller(s) shall be equipped to receive software upgrades/patch fixes through the craft interfaces, and the MNC controller(s) shall be capable of being upgraded without having to degrade or disturb the real-time call processing functionality provided by the MNC. The MNC controller(s) shall provide archive functionality for all configuration, provisioning, and troubleshooting parameters using standard storage media such as CD-R/W, DVD-R/W, DAT, etc. In the event of complete MNC controller(s) failure, the restoration and/or commissioning of new, replacement MNC controller(s) shall be accomplished using archived provisioning/configuration images rather than requiring a technician to completely re-construct the configuration database from scratch. The Offeror shall fully define the provided capabilities with respect to the MNC controller craft interfaces.

- Radio Channel/Site Expansion Capabilities - The MNC controller(s) and any auxiliary site controllers shall provide at each site for expansion to 24 channels or 30 unique radio talkpaths of operation at a minimum without hardware modifications. The MNC shall be equipped to interface to a minimum of four additional MNC controller(s) or “peer network” compatible P25 regional systems in the event of integration of a larger regional network.
- Local Site Control – Depending on the Offeror’s MNC network controller architecture and hierarchy, local site controllers (if utilized) shall maintain a localized system database in the event that the MNC controller is severed from the local controllers. This local database shall be updated in real-time and shall be accessible locally and remotely via a craft interface. The local database shall contain all of the system access and functionality privileges to ensure a consistent level of system access and integrity during a MNC controller outage.
- Alarms and Diagnostics - The MNC controller(s) and associated site controllers shall provide alarms for key operational parameters, and shall provide for remote inquiry display, disablement and diagnostic functions via RS232 and Ethernet connections. Alarms shall be displayed at all NMS workstations and through craft interfaces. The MNC controller(s) shall provide high-level diagnostic information through front-panel LEDs and relevant indicators so that a technician or network administrator can quickly gauge the severity of an MNC fault by looking at the MNC. The MNC

controller(s) shall provide both alarm messages and fault conditions using SNMP and discrete Form-C relays. At a minimum, the MNC controller(s) shall provide Critical, Major, and Minor relays which may be connected to a separate alarm subsystem. All MNC alarm information shall be time/date stamped in synchronization with the master network clock.

5.3 SWITCHING & NETWORK MANAGEMENT SYSTEM (NMS) INFRASTRUCTURE

5.3.1 General Requirements

All subsystems, authorized radio subscriber units, and dispatch consoles that comprise the proposed radio system must be under the control of a unified switching and network management system (NMS) infrastructure. The scope of the unified NMS scheme includes the five basic elements of network management:

- Configuration Management
- Fault Management
- Security Management
- Performance Management
- Accounting Management

The NMS must be a comprehensive suite of software and hardware, supported by embedded network intelligence and expertise needed to incorporate system information into a complete, single, unified network management tool. The NMS shall be developed with an emphasis on customizable graphical displays and simplified interfacing to the various proposed subsystems.

Management of all system components, software levels, configuration databases, authorization parameters, system usage, and fault management information shall be able to be performed from a single, unified network management terminal. This shall be accomplished in such a manner that an entry change to one database will automatically change all other associated databases without further user action. Overall system management shall be able to delegate vertical partitioning management to an organization/agency responsible for the operation of the partition.

The NMS must be of a modular structure providing end-users with the capability to expand the subsystem as the need arises. The software supporting the NMS must respond to network expansion by enabling modifications to the NMS as new devices are added or deleted. A single client workstation shall be provided that allows for the management and configuration of all proposed radio communication system subsystems.

The NMS shall be provided as an integrated subsystem. The Offeror must provide all software and hardware, coordinate the entire installation, create customized

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graphical representations of the proposed network, perform acceptance tests, and conduct NMS subsystem administrator and end-user training. The Offeror shall populate all system and subscriber databases to fully commission the network in concert with the final defined version of the County fleetmap.

5.3.2 Subsystem Monitoring

The proposed switching and NMS system shall be equipped in such a manner as to allow alarms and control functions from the various subsystems to be passed to all NMS client workstation(s) that shall monitor the entire integrated radio network. The Offeror shall provide detailed information describing NMS functionality with respect to the various subsystems and the required connection/access between the subsystem element manager systems.

At a minimum, the NMS subsystem shall provide the capability of automatic monitoring on a 24/7/365 basis for the following infrastructure components:

- Communications Links to all Sites/Network Nodes
- Base Stations/Transceivers
- Comparators
- Antenna Subsystems
- Microwave/Transport Infrastructure
- Multiplexers/Channel Banks
- Timing/Frequency Reference Standards
- Dispatch Consoles
- Logging Recorder
- Remote Terminal Units/Site Environmental Alarms
- MNC/Radio Network Site Controllers/Base Station Controllers
- Audio/Data Switches
- Telephone Interconnect
- Network Gateways
- LAN/WAN Networking Equipment (Gateways, Routers, Switches, etc.)
- Client Workstations/Servers
- Power Equipment (Generators/UPS/DC Plant).

5.3.3 NMS Services

At a minimum, NMS services shall include the following:

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- Common client/server workstation platform to provision infrastructure and subscriber assets, diagnose/troubleshoot system faults, track real-time and historical network usage/utilization and availability by infrastructure and subscribers, and establish network and NMS access privileges
- Automatic system infrastructure component fault and failure detection and alarm generation
- Audible and visual alarm operator alerting
- Diagnostics for isolating and troubleshooting real-time faults and alarms including all communications links and link equipment
- Message volume statistics per hour of radio network controller, audio switch(s) and consoles(s)
- Message volume statistics by radio channels per hour
- Message volume statistics by base stations per hour
- Message volume statistics by subscriber units per hour
- Dynamic radio commands for all subscriber radios such as radio regrouping, inhibiting, affiliation monitor, status/messaging
- Control of critical network time-out and operational parameters (e.g., emergency hang-time, interfering carrier timer, fade timer, etc.)
- Real-time channel, talkgroup, user, and RF site activity monitoring
- Retrievable and printable alarm history log file(s)
- Remote dial-in and networked service support capability
- Customizable report generation and graphical display for real-time and historical system utilization/fault management/alarm history/dynamic radio commands information

5.3.4 NMS Features and Performance Requirements

The following section describes requirements of the NMS as it pertains to features, functionality, and performance. The Offeror must supply a NMS that can interface with and support different systems and elements.

The NMS shall be equipped to enable users to quickly detect, evaluate, and respond to changing network conditions. Manager and agent modules must manage network devices, and the system must automatically respond to the alert messages generated by all network devices. All reported network problems shall be entered into the NMS trouble tracking system, and problem history records shall be stored for each NMS user.

A point-and-click mouse operation shall provide access to detailed menus and update data fields on any window. The NMS also shall incorporate a feature that graphically illustrates network trends and statistics. The NMS shall provide accurate information in a format most useful for network management. The NMS shall monitor all network operations and conditions.

5.3.4.1 NMS Features and Functionality Requirements

The following list represents the minimum functionality, performance, and quality requirements that shall be included in the NMS. The list is not necessarily totally inclusive of all requirements since the Offeror may offer additional functionality in its standard NMS offering. The following section briefly defines the required functionality, performance, and quality of the specific requirements in this list.

- Use of open system standards (e.g., SNMP, OSI CMIP, etc.)
- Use of client /server architecture
- Message and alarm processing
- Terminal reach-through
- Use of relational database(s)
- User-friendly
- Network management reports
- Graphical User Interface (GUI)
- Modular/upgradeable software
- Application Programming Interface (API)
- Redundant and fault-tolerant design
- Network time synchronization for correlation of system events and call transactions
- Security and user partitioning (Offerors to identify number and capabilities of partitions)
- Historical information storage/archive capabilities.

5.3.4.2 NMS Functionality Requirement Descriptions

The following list of functional requirements and requested information establishes The County's requirements for the network management system. Intended functionality for the NMS is defined in the following paragraphs. The Offeror assumes responsibility to ensure it completely understands the

relationship and impact of the NMS and all functional requirements as related to each of the subsystems.

The NMS hardware architecture shall provide multiple levels of computing power based on the size of the network being managed. The NMS system shall be a multi-tasking system capable of simultaneous access and control from multiple users, each having a unique access level, operational capabilities, and information set as configured by a network administrator/superuser.

5.3.4.3 Use of Open System Standards

The NMS must be developed using industry-proven, open systems standards (e.g. SNMP, OSI CMIP, etc.) in order to provide maximum flexibility and scalability of the NMS. This functionality will also allow for easier enhancements from other compatible software/hardware providers. The NMS shall be provided with the capability of managing devices and elements through the use of different interfaces. The Offeror shall describe the type of interfaces that are available in the response offering. The County is requesting information on standard interfaces such as HP OpenView, Tivoli NetView, CA Unicenter, BMC Patrol, etc.

The Offeror shall fully define the proposed NMS platform and its alignment with industry standards for open standards. The Offeror also shall define the compliance and overall readiness of the proposed NMS subsystem with respect to the APCO Project 25 E_n Network Management End System interface.

5.3.4.4 Use of Client/Server Architecture

The Offeror shall provide a true multi-user/multi-tasking NMS, utilizing a client/server architecture which is capable of supporting at minimum 10/100 Mbps Ethernet connectivity with TCP/IP addressing for all network nodes. Client terminals shall be off-the-shelf Windows-based client workstations with the ability to remote from the server location using microwave T1, ISDN, 802.11a/b/g Wi-Fi, or dial-up/VPN connectivity. The operating system, coupled with standard programming languages such as C, C++, and SQL, shall allow for compatibility across many hardware platforms. The hardware architecture shall provide multiple levels of computing power based on the size of the network. The Offeror shall define the operating system programming language and platforms that are used to develop the proposed NMS. The Offeror shall define all bandwidth and timing requirements for each remote and local NMS workstation relative to each concurrent software application that may be launched at the client workstations.

5.3.4.5 Message and Alarm Processing

The NMS subsystem shall process messages sent by the network elements and other element managers to the NMS server(s) and associated client workstations. These alarm messages may be transported over the transport overhead and/or traffic channel, system LAN/WAN, wireline modem or RF modem. The selected transport mechanism for alarm messages should not be susceptible to a single-point failure which would create an inability to properly provision/diagnose/troubleshoot a remote network element in the event of a system failure. Fault-tolerance and/or redundancy should be incorporated into the design of the NMS alarm message transport mechanism. Critical, major, minor and all other types of messages must be processed in real-time and made available for use by all NMS users.

All alarms and messages shall be automatically recorded to a relational database in real-time. The NMS shall be capable of processing each individual message from each managed element. The Offeror shall provide detailed information, which should thoroughly define and describe, the message processing functionality of the proposed NMS. Additionally, the Offeror shall describe the capabilities of interfacing and transferring alarm messages and call transaction information to/from the proposed NMS to compatible APCO P25 network management systems.

5.3.4.6 Terminal Reach-Through

The NMS shall allow authorized users access to all network elements, element management systems, and other support systems.

5.3.4.7 Relational Database(s)

The NMS shall be supplied with an industry-standard SQL relational database such as SQL Server, Informix, Oracle or equivalent. The Offeror shall indicate manufacturer and software versions as part of the response proposal. All database entries shall be user-restricted and password-protected and all transactions shall be logged and tagged by user names. Other required features of the database and NMS software are:

- Capability to store objects and their relationships
- Capability to use other databases across the network.

Software tools shall be provided to automatically update both the database and the graphical network depiction as the County network expands or modifies.

5.3.4.8 User-Friendly

The NMS system shall be developed in a logical manner allowing the user to understand the conceptual layout of the application software as related to the overall network. The design shall allow for comprehensive on-screen help menus and prompts that provide direction and assistance to facilitate the learning process. These learning tools shall be able to be placed in the background after user efficiency is achieved. Training and user manuals shall contain the same information provided by help screens and prompts. In conjunction with generic NMS object descriptors, the proposed NMS shall be customized with County-defined network element descriptors and user tags that facilitate a quick understanding and recognition of system failures.

5.3.4.9 Network Management Reports

The NMS shall be capable of performing time-based analysis and generating customized system statistical reports based on alarm and radio usage events/transactions. The system shall be able to retain report formats, layouts and schedules for future use, and report data shall be able to be routed to a retrievable file, printer, or screen. Alarm-related data shall be reported as text reports, spreadsheets, charts or line graphs and be used to depict network performance by various categories. At a minimum, all retrievable system data shall be equipped to format data in *.CSV (Comma Separated Value) and/or tab-delimited format so that external applications can also manipulate the specific information independent of the NMS.

5.3.4.10 Graphical User Interface

The NMS shall allow the user to access configuration data, utilization data, and alarms/messages in both graphical and text format. The graphical user interface (GUI) and its display shall be fully integrated and independent of Offeror or protocol components. The GUI shall support the following features:

- Object-oriented
- Provide real-time updating of events
- Support industry standard graphic interfaces
- Provide multiple views hierarchically
- Provide point-and-click methodology
- Support customer network layouts (locations, equipment, geographic configurations, etc.)
- Provide a library of icon symbols and be expandable using edit tools
- Provide the capability of utilizing scanned-in graphic images

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- Provide the capability of customizing all scenes with color, graphic symbols and linking
- Navigation shall be made through menus, dialog boxes and buttons
- Provide the capability to assign hot keys
- Provide the capability for prioritizing alarm indications
- Provide the capability of user-defined colors
- Provide a hierarchical view of objects in a network topology representation
- Provide the capability to display all event details and status in text
- Provide events in a scrolled list format
- Provide the capability to color code the events by priority and frequency of occurrence
- Provide the capability to attach messages to events
- Provide sorting of events by different categories
- Provide a unique fault tracking mechanism for each event/transaction
- Provide both audible and visual mechanisms for user alert and feedback.

5.3.4.11 Modular/Upgradeable Software & Hardware

The NMS shall be designed to support a suite of all available network management software applications, software/hardware interfaces, communications, and other software capabilities in a modular, licensable fashion. The proposed NMS shall be equipped to facilitate any number of concurrent NMS users running any combination of proposed applications concurrently on any combination of client workstations. The Offeror shall describe how the proposed system is configured to meet this requirement and explain the overall upgradeability of the proposed NMS subsystem. The proposed NMS shall be designed to facilitate hardware upgrades in the form of more powerful server and client computers to realize greater efficiencies and throughput. The proposed NMS shall be designed to easily integrate additional NMS client workstations as the network expands without causing the active network to be taken offline or disrupted in any manner. The Offeror also shall distinguish between core operating system, third-party software, and custom software while providing a comprehensive description of technical support provided for all software and hardware proposed. The

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Offeror shall define all NMS licensing requirements and application usage constraints.

5.3.4.12 Application Programming Interface (API)

The NMS subsystem shall provide a comprehensive API and be capable of supporting custom applications with functions and library files to access the NMS directly for call processing, fault management, and configuration management purposes (e.g., CAD call processing and dynamic radio command interface, airtime billing/usage interface, logging recorder interface, etc.). As part of this response, the Offeror shall provide an explanation, pricing, and details regarding the available API(s).

5.3.4.13 Redundant and Fault-Tolerant Design

The NMS shall ensure uninterrupted network provisioning, administration, and monitoring through support of multiple, redundant network management stations and remote background communications processing. The redundant and fault-tolerant architecture shall enable each network management station to operate independently in the event of equipment failure. The proposed NMS and associated network elements shall be equipped to indicate and capture a discrete network alarm or change of state even in the event of loss of power to the network element (i.e., absence of power to a network element shall trigger a change of state which is captured by the NMS).

The NMS shall be supplied with backup server(s) and associated equipment in order to support a failed primary NMS server or any component of the server network which will cause a system failure. Switching between primary and backup server(s) shall be transparent to the end-user and shall not interrupt any ability to provision, administer, monitor, and archive network management information. The County requires the proposed NMS subsystem to be designed to provide 99.9999% or greater availability. The Offeror shall thoroughly describe the NMS architecture as well as any fault-tolerant equipment offered as a response to the RFP specifications.

5.3.4.14 Time Synchronization

The proposed NMS shall be time synchronized using a common timing reference scheme for the entire network (i.e., GPS, NTP, WWVB, etc.). All call transactions and network alarm events shall be time/date stamped with the master system clock for accurate NMS diagnostic and troubleshooting. All network elements with internal status/error logging capability shall be synchronized to the same master system clock for accurate diagnostic and troubleshooting and correlation to NMS alarm data information. In the event of master clock failure, the NMS shall provide a free-running clock which is

originally disciplined from the master system clocking reference. The Offeror shall define the time synchronization methodology for the proposed NMS subsystem.

5.3.4.15 Security and User Partitioning

The NMS shall support multiple levels of access that are protected in a manner allowing users to control, monitor and use software applications that have been partitioned and provisioned for specific use by the end-user. The Offeror shall provide a detailed description of this capability by defining the levels of partitioning and security, total number of end-users, the total number of simultaneous users with independent views, and the method used to achieve this requirement.

End-users shall be located at different locations such as dispatch centers, offices, maintenance facilities, and other remote sites. Therefore, this user partitioning feature must be provided to remote locations in order to allow restricted access to the overall radio network. User functionality and passwords must be configurable through a network administrator/superuser (root level) login. Superuser (root level) login and password must be re-configurable in the event of a network security breach. The NMS shall provide the administrative functionality to disable in real-time specific client workstation(s) and user login(s) as necessary in the event of malicious or unwanted activity.

5.3.4.16 Historical Information Storage/Archive Capabilities

The NMS shall be equipped to provide up to one year's worth of data for all call processing, fault management, and network utilization data from any client workstation. All historical NMS data shall be written to fault-tolerant server disk drives and/or RAID-5 hard drive arrays (or superior level) so that a single failure does not cause the loss of any historical data. NMS data shall be written to these hard drives on a FIFO basis. For the entire year period, historical NMS data shall be retrievable from a client workstation with the same granularity/level of detail as data is presented to the NMS client workstations in real-time.

The NMS shall provide a mechanism to store/write the NMS data at any time to such storage media as CD-R/W, DVD-R/W, and DAT drives. Both automated and manual NMS data archive techniques shall be provided with the proposed NMS system so that the archiving of NMS data can be handled routinely or as necessary. A visual warning or dialogue box shall be provided to the end-user and network administrator if/when NMS data, that has not been externally archived, is subject to being permanently overwritten. NMS data shall be archived in a format that is recognizable and capable of

being utilized in both the core applications NMS and off-the-shelf industry standard spreadsheet/database/word processing applications.

The Offeror shall define the historical NMS information and archive capabilities for the proposed NMS subsystem. The Offeror shall define all databases that are capable of being archived and retrieved.

5.3.5 Monitoring and Control of Subsystems

The NMS shall be equipped to control and monitor each and every subsystem contained in the integrated radio communication system. The Offeror shall be responsible for all required electrical and alarm wiring to fully commission and test the NMS subsystem. A list of elements and alarms is provided as a conceptual starting point in the development of the proposed NMS. These systems shall include, but not limited to, the items listed below:

- Radio Infrastructure/Fixed Network Equipment
- Dispatch Consoles/Logging Recorder
- Legacy/Existing Mutual Aid Radio and Shelter Subsystem Infrastructure
- Network Management System
- Microwave Transport/Multiplex/Switch Infrastructure
- DC Power Plant
- In-Building Systems
- Shelter Systems (HVAC, Fire Suppression, TVSS, Leak Detection, Fuel)
- Emergency Generator/Transfer Switch
- Uninterrupted Power Supply
- Tower Lights

Each of these items and subsystems shall be monitored and controlled for specific management and diagnostic reasons. The Offeror shall define the entire NMS architecture and methodology utilized to capture diagnostic and control data from every proposed network element.

5.3.5.1 Monitoring of Tower Lighting System Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Beacon on (Red and/or White)
- Beacon off (Red and/or White)

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- Side marker(s) lamp failure
- Photoelectric cell failure
- Loss of power
- Beacon failure (Red and/or White)

5.3.5.2 Monitoring of Shelter Subsystem Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Fire/Smoke Detector
- Intrusion (Door/Cabinet) Alarm
- High Temperature Alarm
- Low Temperature Alarm
- TVSS Surge Suppressor Failure
- Fire Suppression Agent Heat Detector
- Fire Suppression Agent Smoke Detector
- Fire Suppression Agent Discharge
- Fire Suppression On Battery
- High Humidity Alarm
- Leak Detection
- HVAC Equipment Failure
- Loss of Commercial Power

5.3.5.3 Monitoring of Emergency Generator/UPS System Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Utility Power Failure Alarm
- Generator Running
- Generator Failure to Start
- Generator Overcrank Shutdown
- Generator Overspeed Shutdown

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- Generator High Coolant Temperature
- Generator Low Coolant Level
- Generator Low Oil Pressure
- Generator High Engine Temperature
- Generator Low Fuel
- Generator Battery Charger AC Fail
- Generator Battery Charger High/Low Current
- UPS Mains Failure
- UPS Low Battery Voltage
- UPS Static Bypass
- UPS Output Voltage (above/below threshold)
- UPS Overload
- UPS Battery Charging Failure
- Transfer Switch Normal Mode
- Transfer Switch Emergency Mode

5.3.5.4 Monitoring of Transport/Microwave Subsystem Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Mod/Tx A
- Mod/Tx B
- Demod/RXU A
- Demod/RXU B
- Mux Tx A
- Mux Tx B
- Mux Rx A
- Mux Rx B
- APC on/off A
- APC on/off B
- Pwr Amp on/off A

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- Pwr Amp on/off B
- Radio Minor
- Radio Major
- BER A
- BER B
- RFU PSU Alarm
- SP PSU Alarm
- TXU Alarm
- RXU Alarm
- Modulator Alarm
- Demodulator alarm
- ATDE Alarm
- Mux Alarm
- ACU Alarm
- OWU Alarm
- Summary Alarm A
- Summary Alarm B
- M12 Alarm (for each M12 card, if utilized)
- M12 Standby On-Line (for each M12 card, if utilized)
- Ring Switch/Loopswitch Working On-Line
- Ring Switch/Loopswitch Protected On-Line
- Dehydrator Low Pressure
- Dehydrator Summary Alarm
- Multiplexer High BER
- Multiplexer Loss of Synchronization
- Multiplexer AIS (Yellow and/or Red Alarms)
- Multiplexer Card Failure(s)
- Multiplexer Critical
- Multiplexer Major

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- Multiplexer Minor
- Multiplexer Loss of Power
- DC Power Supply Loss of Power
- DC Power Supply On Battery
- DC Power Supply Low Voltage Disconnect
- DC Battery Failure

External Controls: NMS shall provide control outputs for the following functionality:

- Mod/TXU A switch
- Mod/TXU B Switch
- RXU/Demod A switch
- RXU/Demod B switch
- Mux/Tx A switch
- Mux/Tx B switch
- Mux/Rx A switch
- Mux/Rx B switch
- APC on/off switch
- Pwr Amp on/off switch A
- Pwr Amp on/off switch B
- DS1 and Ethernet Loopback (for each DS1 and Ethernet facility available).

5.3.6 Remote/Mobile NMS Client Access

The proposed NMS subsystem shall be equipped to provide remote client access through dial-up and/or VPN network connectivity. A laptop computer shall be provided which is equipped with all necessary software and hardware to remotely connect to the NMS subsystem through both commercial dial-up and VPN broadband connections. The real-time functionality and application equipage of the proposed mobile NMS client shall be exactly the same as all fixed NMS client workstations.

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This mobile client computer and NMS system also shall be configured to enable NMS access from any RF transceiver site, transport site, or switching site utilizing the core infrastructure network connectivity (versus commercial services when away from the network). For example, a technician utilizing the mobile NMS client shall be able to execute all NMS functionality from any RF transceiver node, network switching node, or transport node to fully maintain and troubleshoot the network without having to work in tandem with an NMS user at a fixed client workstation. Network connectivity and mobile NMS client application performance at any RF transceiver, network switching, or transport node shall be equivalent to any fixed NMS client workstation.

The Offeror shall define all bandwidth, service, and timing requirements necessary to establish remote client connectivity in the variety of required forms to the NMS subsystem.

5.3.7 Over-the-Air Trunked System Monitoring (Optional Purchase)

The proposed NMS subsystem shall include an over-the-air trunked system channel monitoring and activity logging diagnostic tool to augment the networked NMS clients, to be purchased at the option of each entity. The over-the-air diagnostic tool shall be equipped to monitor the active control channel(s) while in all trunking modes to present real-time channel activity and call processing messages (i.e., call type, busy queue, active talkgroup, transmitting unit, call duration, affiliations, emergency activations, individual alerts, etc.) as defined on the RF signaling and/or control channel(s). The over-the-air diagnostic tool shall be equipped to log all control channel and system activity to an internal or external hard drive for historical archiving purposes. The over-the-air diagnostic tool shall not rely on the availability of any MNC or NMS server to monitor and log call processing information transmitted on the active control channel.

The over-the-air diagnostic tool shall run on a standard Windows-based PC client interfaced to a network subscriber radio and be capable of external timing synchronization (i.e., NTP, WWVB, IRIG, etc.). Unit pricing for over-the-air diagnostic tool/interfaces shall be provided. The Offeror shall thoroughly define the capabilities of the proposed over-the-air diagnostic tool and any available options.

5.3.8 NMS Client Workstation Locations

The County requires two fully-functional NMS client workstations with a minimum 21" flat-screen LCD monitor with associated laser printer. One at the County Radio Department and the other at the County Sheriff's Primary Dispatch Center.

5.3.9 NMS Alphanumeric Paging/Text Messaging

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The proposed NMS subsystem shall be equipped to generate alphanumeric text messages and/or pages using commercially available paging/text messaging services for on-call network administrators, dispatch center operators and technicians to alert of system faults and error conditions. The severity of individual alarm and fault messages shall be customizable so that text messaging and pages can be filtered based on severity for a variety of interested personnel. The alphanumeric paging/text messaging application shall enable group pages/text messages as well as individual pages/text. The length of the alphanumeric page/text message shall be customizable and constrained by the commercial service and not the NMS paging application. The Offeror shall define all bandwidth, service, timing, and interface requirements necessary to establish NMS alphanumeric paging/text messaging.

5.3.10 NMS Design

The Offeror shall provide the following NMS design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams
- Network Topology with Proposed Connectivity (LAN/WAN)
- Network Traffic Baseline/Utilization Baseline
- System License Matrix/Structure
- Equipment Layouts and Physical Dimensions
- Equipment Electrical and HVAC Requirements.

5.3.11 Optional Features

The Offeror shall provide a detailed list of optional features that can be supplied for review and understanding. The Offeror shall provide a complete listing and explanation of all available NMS options.

5.4 BASE STATION TRANSCEIVERS

5.4.1 General Requirements

The Offeror is to provide base station transceivers which fully support the radio subscriber units on the radio network in all modes of voice/data communications. All base station transceivers shall be FCC type-accepted for transmission of the proposed digital modulation, RF channel bandwidths, frequencies, and appropriate emission masks. The base station transceivers shall be designed for the purpose of APCO P25 digital voice/data communications. Each base station transceiver and/or

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network controller must be capable of providing automatic station identification compliant with FCC Base Station Identification specifications. At a minimum, all base station transceivers shall be capable of operating at 100 Watts in both the 700 MHz and 800 MHz public safety voice spectrum allocations in concert with FCC channel plans and requirements.

Each base station transceiver shall be capable of operation in a full-duplex mode in a both clear and encrypted format: sending an outbound transmission while simultaneously receiving an inbound transmission from a subscriber unit. Repeater operation with microwave/fiber connectivity to the County primary dispatch console system is required. The equipment shall meet or exceed specified EIA/TIA standards for transmitters and for receivers. The equipment shall contain all the necessary base station transceiver control/interface circuitry and software to meet or exceed County specifications.

The base station transceivers shall be flexible in design and software provisioning to work seamlessly in all primary and fallback modes of communications without the need for technician intervention or reprogramming. The base station transceivers shall operate in any proposed mode of trunking and conventional voice/data communications (i.e., single site, multi-cast, and simulcast). In the event of loss of trunking control, the base station transceivers shall be equipped and wired to function in both wide-area and localized repeater mode depending upon the specific failure scenario. The Offeror shall define the various modes of operation for the proposed transceivers and identify any limitations/constraints with the proposed equipment.

5.4.2 Electrical & Mechanical Characteristics

The transceiver equipment shall be rated for and be capable of continuous duty RF transmission operations in an operating environment with temperatures ranging from -30 degrees Celsius to +60 degrees Celsius. The physical and electrical architecture of the transceivers shall be such that the future addition of additional functionality shall not require the addition and/or replacement of circuit card shelves and/or chassis assemblies. The Offeror shall be responsible for all required electrical and interconnect wiring to fully commission the base station transceiver subsystem. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all Offeror-provided equipment to a single point grounding system.

The transceiver equipment shall be modular in design utilizing a card cage or chassis that facilitates replaceable boards or modules (e.g., power amplifier, exciter, transmitter, receiver, transceiver control module, high stability oscillator, power supply, etc.) in the event of component failure. The transceiver equipment subsystem shall be field-expandable up to at least 24 channels per RF site.

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The base station transceiver equipment shall be frequency synthesized and field programmable to operate on any channel within the 700 MHz and 800 MHz public safety voice spectrum. The base station transceiver equipment shall be capable of providing a high-stability internal frequency reference (<.1 PPM) or receiving frequency and timing signals from an external high-stability reference to meet or exceed FCC operating requirements.

To the greatest extent feasible, all transceiver equipment assemblies and subassemblies shall be shielded to minimize and eliminate electromagnetic interference which may be caused to/by electrical equipment co-located and/or adjacent to the transceiver. The base station transceiver equipment shall provide the necessary filtering and preselection to mitigate the presence of an interfering carrier or unwanted interference. After configurable time duration, the transceivers shall work in conjunction with the MNC subsystem and/or internal station control circuitry to remove a channel from service that suffers from continuous interference.

If microprocessor-based equipment is provided, firmware or software used to determine the various functions to be performed shall be field programmable and configurable through the use of Electronically Erasable Programmable Read Only Memory (EEPROM) circuits. Power loss or electrical surges shall not alter/modify the repeater software or configuration parameters in any manner. In the event of upgrade and/or bug fix scenarios, the base station transceiver shall be capable of storing two versions of software/firmware to facilitate a seamless transition between existing and upgraded station code. Software downloads to the base station transceivers shall be accomplished from both a local craft interface and a centralized software download server.

The base station transceiver equipment shall be designed for 12.5 kHz narrowband operation, but the County strongly encourages the integration of transceiver equipment that offers a straightforward migration path to 6.25 kHz or 6.25 kHz-equivalent operation.

The Offeror shall thoroughly define the architecture and software complement for the proposed base station transceivers and identify the modules/components that are field replaceable with spares. Spare board kits or modules shall be available and one fully-functional, complete spare base station transceiver shall be provided for every two RF transceiver site(s). All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

5.4.3 Power Supply

The power supply shall be of completely solid state design and shall operate primarily from a nominal 120 VAC/60 Hz single phase (with grounding) power supply source. All stations shall be protected by an uninterruptible power supply (UPS) system to ensure uninterrupted operations. Optionally, a DC power system can be provided, which is protected by an emergency battery system. The electrical connection from the power supply to the shelter facility electrical service shall be protected and secured to prevent accidental transceiver power loss. Power cabling interfaces to/from the base station transceivers shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring.

The base station transceiver shall be designed with an interlocking style power switch, protective cover, or secure cabinet so as to prevent an accidental, unintentional power-down. In the event of complete power failure, the base station transceivers shall be capable of an unattended, automatic graceful shutdown to prevent the corruption of configuration files and real-time operating systems.

5.4.4 Equipment Housing

Repeaters shall be permanently housed in an EIA/TIA standard 19"-wide steel relay rack or 19"-wide stationary steel cabinet in each site shelter. Station equipment size shall allow for mounting of at least four (4) 100-Watt stations per 90"-high rack. The base station transceiver shall provide a grounding lug or grounding buss connection that facilitates a single point grounding methodology within the RF site shelter. The base station transceivers shall provide front and rear access for cabling and service purposes.

5.4.5 Diagnostics/Alarm Interface

Central metering, alignment, programming and diagnostic information of all essential circuits/modules shall be provided through both a local and centralized (off-site location) craft interface for all base station transceivers. This functionality shall be accessible and adjustable electronically by service personnel via both an RS-232 connection and Ethernet interface utilizing a PC laptop. The craft interface connections shall be accessible without the need to remove RF chassis shields or equipment circuit boards. Any external configuration software, hardware and/or interface cables needed to perform these functions shall be specified and provided on a per site basis (not to include a PC). The base station transceivers shall offer a mechanism to archive the configuration/service alignment parameters for quick restoration in the event of module failure or transceiver restoration.

The base station transceivers shall provide an internal diagnostic log of alarms and fault conditions that is stored locally in the transceiver as well as reported to the NMS subsystem. The internal base station transceiver logs shall be time/date synchronized to the master network timing source for correlation of alarm events

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with the NMS subsystem. Internal station transceiver logs shall be archiveable and printable in ASCII text format at a minimum. Alarm log information shall be written to internal station transceiver buffers on a FIFO basis with a minimum of 500 alarm events stored at any one time. The base station transceivers shall offer independent, front-panel LEDs to quickly gauge normal or abnormal station operation when on-site. The base station transceivers also shall offer independent discrete alarm relays (e.g., Form-C relays for fundamental station alarms) to connect to the NMS subsystem for remote alarm monitoring.

5.4.6 Base Station Transceiver Accessories

All primary base station transceiver circuits shall be fed by individual breakers.

Each base station transceiver site shall be equipped with an external wattmeter or directional coupler for each transmit combiner output port that provides a reading of the forward and reflected power of each transmitter. This power monitor shall be installed in series with the combiner transmit output.

For local control operation and for servicing, each base station shall be provided with a monitor speaker. The audio output level shall be rated at not less than ½ watt, and be provided with a volume control. Each base station transceiver site shall be provided with one (1) test microphone which can be used to test or service any repeater at the site.

5.4.7 Base Station Transceiver Antenna System Requirements

5.4.7.1 General

The Offeror shall furnish and fully install all antenna subsystem equipment. This includes, but is not limited to, the following equipment: antennas, transmit combiners, receiver multicouplers/amplifiers, transmission line, all mounting hardware (i.e., hangers, hoists, and mounting clamps, sidearm brackets, etc.), surge suppressors, lightning arrestors, jumper cables, grounding straps/cabling, transmission line boots, RF connectors and all ancillary items required to complete the installation at a shared radio site meeting industry-standard, good RF engineering practices. The Offeror is solely responsible for the due diligence and engineering analysis necessary to accommodate the proposed antennae & transmission line loading for any existing or new tower utilized in the final network design.

The antenna system design shall be specified by the Offeror to provide for balanced FNE system ‘Talk-Out’ & subscriber ‘Talk-In’ communications. At the network sites, separate antennas shall be used for transmit and receive purposes. The Offeror shall try to minimize the use of transmit and receive network antennas to

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minimize tower loading, but the antenna system shall be architected to provide a high-level of redundancy and fault tolerance with respect to the antenna system design.

The Offerors have the option to select any antenna configuration to reduce the potential for intermodulation or receiver desensitization, while providing the required coverage within the constraints of the FCC license and the requirements of NPSPAC Region 54. Additionally, the Offeror shall provide all necessary filtering to prevent interference and receiver desensitization in the new base station transceiver equipment. Shielding and radio frequency filters also shall be provided as necessary.

All model numbers referenced in this section are merely representative of the performance and quality desired. Offerors shall propose models and equipment that are equipped for the channels proposed at each site and are field expandable.

The antenna systems shall be provided with all necessary lightning and power surge protection devices. The Offeror shall supply the necessary sidearm brackets and antenna mounts customized for the specific antennas at each site. Sidearms shall be compatible and rated for each applicable tower leg to eliminate drift and sway, and each sidearm shall be designed to offer not less than 6-foot separation from the tower. Offerors shall state the manufacturer and model number of all antenna system equipment being proposed for each site. A minimum of one spare antenna for each unique antenna type utilized in the system shall be provided in addition to the required number of network antennas. All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

5.4.7.2 Transmission Line & Accessories

The Offeror shall provide low-loss coaxial antenna transmission lines appropriate for the design. The Offeror shall state the size and type of transmission line being proposed at each site as well as the loss characteristics of the proposed transmission line.

All connectors used shall be state-of-the-art characteristic while exhibiting the least loss. Connectors must be of non-ferrous construction and of similar metallic composition to avoid an oxidation effect. No splices or adapters shall be used except as specifically authorized by the County for special “in-building” or similar installations. However, it is permissible to utilize different connectors on opposite ends of a cable to avoid the use of adapters. When transforming from one diameter cable to another, it is acceptable to use flange reducers, so long as the cable V.S.W.R. specification is not changed. The Offeror shall state the size and type of all connectors/jumpers/suppressors/etc. being proposed at each site as well as the

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loss characteristics of all proposed connectors/jumpers/suppressors/etc. The Offeror shall provide a comprehensive copy in both hard copy and electronic formats of its most current standard, field-tested communications system installation guidelines that will be used to govern all field installation work. The Offeror shall perform line sweeps for all transmission line systems and provide the comprehensive sweep and return loss data as part of the field as-built documentation package.

5.4.8 Transmitter Combiner

The Offeror shall design an appropriate number of transmitter combiners (and circulators if required) for all radio transceiver sites by optimizing the insertion loss characteristics, available number of antenna mounting locations at each site, and system availability requirements. The proposed combiners must be capable of accommodating and sized appropriately to include all NPSPAC conventional mutual aid channels currently licensed at specific sites throughout the Region.

Combiners shall have no frequency-sensitive interconnection cabling and shall have no requirement for channel assignments in numerical order.

The Offeror shall state the manufacturer and model number of the transmitter combiner(s) at each site and provide complete specifications and feature documentation.

5.4.9 Receiver Multicoupler

The Offeror shall provide a multi-channel receiver multicoupler system for all radio transceiver sites. The County requires a receiver multicoupler design that is field-ready for the integration of all County trunked channels plus all NPSPAC conventional mutual aid channels currently licensed at specific sites throughout the Region. Ultimately, the proposed receiver multicoupler system shall be capable of expanding to at least 16 channels to maintain alignment with the required number of trunked channels offered by the network.

The Offeror shall state the manufacturer and model number of the receiver multicoupler system being proposed at each site and provide complete specifications and feature documentation. The specifications shall include information on filtering used for this configuration.

5.4.10 Receiver Pre-Amplifier

The Offeror shall provide equipment that utilizes low noise tower-top-mounted amplifiers, if needed, to provide for a balanced system. Redundant amplifiers and

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window filters shall be used in the tower-mounted assembly. The system shall have the following features:

- A. Amplifier Bypass - the system shall be equipped to bypass around the amplifier system such that the main line, jumper assemblies, and antenna may be tested.
- B. Hot-Standby Amplifier - the system shall be equipped with at least one hot-standby amplifier.
- C. Automatic Switchover - Automatic switchover to the standby amplifier(s) shall be provided, and the means to accomplish the switchover shall be described in the response. Any performance degradation as a result of switchover shall be explained. Manual switchover also shall be provided at the control panel with indication of the amplifier in use.
- D. Test Port - the system shall be equipped with a test port and test line to allow the frequency performance of either amplifier to be tested from the equipment shelter.
- E. Alarming - the system shall be equipped to provide complete system operation alarming for all modes of operation to both the NMS and local on-site service technicians. The base unit of the pre-amplifier shall offer independent, front-panel LEDs to quickly gauge normal or abnormal station operation when on-site.
- F. Variable Attenuation - the system shall be equipped to provide variable attenuation capabilities to uniquely optimize the receive performance characteristics at each site in the context of overall balanced system performance.
- G. Power - the system power supply shall be of completely solid state design and shall operate from nominal 120 VAC/60 Hz single phase (with grounding) to be protected by an uninterruptible power supply (UPS). Optionally, a secondary DC power supply is encouraged to enhance the probability of maintaining receiver pre-amplifier during a major commercial power failure.

The Offeror shall state the manufacturer and model number of the tower-top amplifier system being proposed at each site. One (1) spare tower-top amplifier assembly shall be provided for every unique tower-top amplifier configuration within the proposed network. All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

5.4.11 Base Station Transceiver Design

The Offeror shall provide the following base station transceiver design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams
- Base Station Transceiver Architecture
- Site Topology with Proposed Connectivity and Interfaces (MNC, NMS, timing reference, multiplexer)
- System License Matrix/Structure
- Equipment Layouts/Racking and Physical Dimensions (Size, Weight, etc.)
- Equipment Electrical, Grounding, and HVAC Requirements.

5.4.12 Base Station Transceiver Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the base station transceiver subsystem that can be supplied for review and understanding.

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6.0 DISPATCH CONSOLE REQUIREMENTS

6.1 GENERAL REQUIREMENTS

The Offeror shall provide a complete primary radio dispatch console subsystem for the County Sheriff's Primary Dispatch Center. The County requires a total of eight (8) new radio console positions that are networked and integrated with the proposed County radio communications system.

Each console position shall be fully interchangeable and field reconfigurable through the NMS and a corresponding centralized dispatch subsystem configuration database. The County requires a comprehensive suite of dispatch console features, as defined in this section and in previous sections, to interoperate with and manage the entire subscriber fleet.

The Offeror shall review the existing County dispatch consoles and entire complement of legacy equipment to be controlled by the new dispatch consoles. The County requires a state-of-the-art communications console subsystem that is highly available and "user-friendly," incorporating radio control in a manner that shall provide for efficient and simple operation by the dispatchers in any combination of functions available including the use of wireless headsets. The proposed console equipment shall provide all of the necessary functions to control and monitor County radio system and related subsystems. No loss of functionality shall be experienced upon migration from the existing dispatch console platform to the proposed dispatch console platform.

For testing and demonstrations, the Offeror shall provide eight (8) compatible headsets that interface with E-9-1-1 call taker phone system and radio consoles.

The console system shall utilize TCP/IP over Ethernet in a client/server architecture to the greatest extent possible for maximum network flexibility, configurability, and expandability. All consoles shall be equipped to transmit and receive with console priority on every trunked and conventional resource accessible to the console. Every dispatch console shall be equipped to transmit and receive on clear and encrypted resources (using any combination of encryption keys or algorithms deployed in the subscriber radios). Every dispatch console shall be equipped with instant call playback functionality for reviewing previous conversations and transmissions. Any console shall be equipped to intercom another console in a half-duplex or full-duplex mode. The proposed NMS subsystem shall provide complete administration and fault management control over the entire dispatch console subsystem. Radio subscriber unit assets and dispatch consoles shall utilize a common APCO P25 ID scheme and a common alphanumeric alias ID database. The Offeror is responsible for populating all subscriber unit and console

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configuration and asset databases per the final County fleetmap prior to system cutover.

The Offeror's proposed console subsystem shall be entirely IP-based. Based on County functionality and feature requirements, the Offeror shall determine what platform meets or exceeds these County specifications. However, the County requires the Offeror to provide complete supportability and upgradeability for fifteen years after final system acceptance as defined throughout this specification, so the Offeror shall not propose any console product that is at the end of its product life cycle roadmap.

The Offeror shall provide a comprehensive matrix of standard and optional features associated with the proposed console subsystem. The Offeror shall provide comprehensive detail on the proposed console system architecture and any feature licensing structures all in the context of the console product life cycle roadmap. The Offeror shall define all limitations and operational constraints with the proposed console system architecture. The Offeror shall provide a detailed list of any special requirements needed for the installation and operation of the dispatch console equipment as deemed necessary. The Offeror also shall define the compliance and overall readiness (down to the feature level) of the proposed dispatch console subsystem with respect to the APCO Project 25 Console Subsystem Interface (CSSI).

6.2 INTERFACE TO VOICE RADIO SYSTEM

The Offeror shall integrate the dispatch console subsystem with the radio system fixed infrastructure through highly available (99.9999% availability) microwave and/or fiber optic transport interfaces. The Offeror shall fully identify the required network backbone transport and topology requirements to facilitate the proposed dispatch console subsystem. The Offeror shall fully define all site interconnection bandwidth and throughput requirements to support the proposed dispatch console subsystem. The network backbone timing and switching requirements shall be fully defined. The Offeror shall define the proposed dispatch console subsystem's compatibility with various types of site interconnection media: microwave radio, fiber, PSTN leased line, satellite, broadband cable, etc. Private or leased telephone lines as a means for primary connectivity are not desired unless the Offeror and commercial carrier can jointly demonstrate an extraordinary level of reliability relative to the operation of the PSTN circuits including the delivery of a service level agreement (SLA) that guarantees system availability at not less than 99.9999%.

Stand-by or backup radio control stations shall be incorporated into the design to ensure the ability to transmit and receive on all 700 MHz and 800 public safety voice spectrum allocations and all trunked talkgroups and conventional resources in

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the event of a console subsystem failure. The backup control stations shall be integrated with the dispatch console electronics and equipped with both headset and handset functionality for dispatch flexibility and shall provide either a digital or tone remote control interface. PTT unit ID and alias information shall be provided to the dispatcher in all modes while operating the backup control stations. Trunking signaling information and advanced functionality tones (i.e., emergency, unit paging, individual call, etc.) shall be provided to the dispatcher in all modes while operating the backup control stations. The dispatcher shall be equipped to access all clear and encrypted trunking and conventional resources in any mode while operating the backup control stations. Backup control stations shall be able to be physically remotored from the dispatch console position while the handset and headset interfaces are available at the dispatch console position. One backup control station and associated accessories/peripherals shall be provided for each dispatch console position. Backup control stations shall be installed in a manner consistent with the installation of all other fixed network infrastructure (i.e., single point grounding, lightning/surge protection, plenum-rated cable as required, RF shielding, etc.) and the backup control stations shall have antennas mounted to reliably access the County network from multiple RF sites in any communications mode. All backup control station audio shall be logged at the logging recorder for all positions.

6.3 DISPATCH CONSOLE FEATURES AND PERFORMANCE REQUIREMENTS

In addition to the suite of features and functionality outlined in earlier sections, the Offeror shall provide the following features, characteristics, and functionality with each proposed dispatch console and the entire subsystem:

- High quality, reliability, and availability to meet 24/7/365 continuous duty public safety dispatch standards (e.g. redundant power supplies, redundant processors, etc.)
- Meets or exceeds all FCC, EIA/TIA, IEEE and APCO standards
- Conform to local PSTN requirements as necessary
- State-of-the-art design with distributed processing and multi-tasking capability
- Redundant and fault-tolerant configuration/network server(s) with mirrored databases
- Equipment to interface with base stations and/or radios having non-IP based control capability
- Continuous and automatic console diagnostics interfaced to proposed NMS and separate craft interface

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- Digital audio processing with adjustable AGC level settings on an individual console basis
- Modular construction throughout
- Main/Standby 120VAC/60 Hz power source(s) for all common infrastructure
- Gooseneck microphone
- Dual headset jacks (for training purposes) each with integrated telephone answering capability (switchable and independent headset interface for telephone/radio)
- Dual-pedal footswitch
- 12/24-Hour clock/month/day/year status synchronized to master network clock
- Select and Unselect speakers with adjustable volume controls for individual resources
- Physical or software-based VU meter to gauge audio levels
- 19" (minimum) color flat panel touch screen monitor at dispatch positions and complete mounting compatibility with the proposed console furniture
- Mouse and keyboard
- Internal and external paging encoders and single icon/button capability that provides current VHF paging and group paging functionality with industry-standard paging formats (Quik-Call, Plectron, etc.)
- Auxiliary input/output interfaces (minimum combination of 16 inputs/outputs per position)
- Monaural, noise-cancelling, over-the-head Plantronics-style (or equivalent) wireless headsets with integrated PTT switch and ability to switch between radio and telephone (Qty eight (8) total for compatibility test)
- Compatibility with Headsets in use at the County Primary Dispatch Center Remote dispatch position capabilities for expansion to other facilities
- User-friendly, field-reconfigurable independent GUI interface(s) for each console position
- Password-protectable console positions with comprehensive event log to note specific dispatcher time/date usage
- Full interoperability between IP-based, digital trunked and conventional subsystems
- Interface to all proposed single and multiple site trunked and conventional systems (as required based on design)
- Fully-equipped individual conventional channel and talkgroup controls
- Access to any combination of clear/encrypted digital system talk-paths/resources

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- Access to any combination of clear/encrypted conventional analog and digital system talk-paths/resources
- Interface to new logging recorder as defined in this specification (e.g. trunked, conventional, and telephone resources)
- Access and control of single and multi-frequency base stations
- Console-enabled cross-patch function between trunked digital talkgroups and digital/analog conventional stations (permanent and dynamic patch equipped)
- Patch and Multi-Select with and without group regrouping
- Console-enabled announcement group functionality
- Console-enabled emergency activation/acknowledgement/reset functionality definable by talkgroup resource
- Console-enabled multiple alert tone generation (at least three unique tones)
- Alphanumeric aliasing of all individual radio subscriber unit and console ID's
- Console-to-console intercom and console-to-base station transceiver site intercom
- Message history display of at least 50 previous time-stamped call transactions/events
- Console-enabled transceiver repeat-enable and repeat-disable functionality for trunked and conventional resources
- Full-duplex audio (console outbound transmit capability while receiving inbound audio from subscriber unit)
- Parallel operator usage status visual indication on each resource (i.e., busy indicate)
- Acoustic and RF cross-mute capability
- Call activity indication
- Configurable supervisory position takeover and individual position enable/disable functionality
- Independent inbound audio receive visual indication on each console resource
- Configurable time duration all-mute capability of all unselected resources
- Support for main/standby conventional resource interfaces with on-screen console switching mechanism
- General and instant transmit functionality
- PTT relay and wiring from each console position to turn on/off individual, external County-provided console activity lights
- Support for integrated PSTN-to-console interface (at least one analog phone line) so that console resources can be patched to PSTN

resources and console dispatcher can utilize PSTN resources through dispatch console electronics.

6.4 DISPATCH CONSOLE CONFIGURATION AND INTERFACE REQUIREMENTS

The Offeror shall provide a centralized console subsystem configuration management database that is integrated with the proposed network infrastructure and radio subscriber configuration database(s). The console subsystem shall consist of a client/server architecture that facilitates a single, common database entry (i.e., unit IDs, aliases, network access privileges, GUI/screen configurations, etc.) for radios, infrastructure, and consoles that is propagated throughout the communications network in real-time. All configuration, administrative, and alias changes shall take effect in real-time without propagation delay and/or data buffering.

The dispatch console subsystem shall be equipped to provide maximum flexibility and interchangeability for all dispatch consoles. Dispatch consoles shall be field-reconfigurable through a common configuration management application that defines GUI/screen layouts, overall subsystem functionality, console privileges, and subscriber databases. No hard-coding of functionality or features shall occur for an individual console so that each position remains flexible enough to serve any operational role in the event of crisis or console position failure. At a minimum, access to the centralized configuration management application(s) shall be provided to each dispatch facility within the County radio system with the proper administrative logon(s).

The dispatch console GUI shall provide adequate screen resolution and useable window “real-estate” to provision all County trunking and conventional resources (i.e., mutual aid stations, paging, etc.) across multiple active folders, tabs, etc. for organizational and layout purposes. Each console position layout shall be equipped to permit/deny a dispatcher to reorganize (in real-time) console resources across organizational groupings within a pre-defined screen layout template. Console layout templates shall be password-protectable (as required) to ensure that only authorized personnel have access to specific resources (i.e., encrypted resources).

Client dispatch consoles shall be equipped to function equivalently while networked to the redundant/fault-tolerant configuration management server(s) and/or while severed from the network using console layout templates and alias databases archived locally on the dispatcher client workstation. Client switching between the redundant/fault-tolerant configuration management server(s) shall be seamless and require no user intervention in the event of an online server failure. All configuration and alias databases shall be mirrored on redundant and/or fault-

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tolerant configuration management server(s) for maximum console subsystem availability and failure preparedness.

Each console position shall provide real-time audible and visual feedback as to the networked status of the console and overall mode of system communications. All fallback modes of system communication shall be communicated to each dispatch screen in real-time so that a dispatcher's operational behavior can be adjusted as necessary to stay in constant communications with all field users.

Per logon ID, client dispatch consoles shall be equipped to disable all computer applications deemed irrelevant to the real-time voice dispatching mission. The County requires the ability to deactivate miscellaneous computer applications (e.g., embedded games, productivity applications, network explorer, etc.) as required upon field installation so as to increase dispatch position availability and prevent dispatchers from becoming distracted while performing the real-time voice dispatching mission. A software-based instant recall recorder (IRR) application shall reside on all console positions and shall be implemented in a manner for easy dispatcher access in time of crisis. The IRR application shall be accessible through the standard windows minimize/maximize utility and also shall be configurable to reside in an unobtrusive stay-top configuration for immediate dispatcher access.

All distinct console functionality shall be defined and accessible through intuitive icons and/or user menus for quick access to necessary functionality. Each console position shall be equipped to provide the dispatcher with an embedded "Help" application that utilizes a search engine/topic index. The "Help" utility shall be configurable to turn on or off as the network administrator deems appropriate (i.e., training purposes).

Each dispatch console position shall be equipped to log the unique transaction data (i.e., time, date, resource ID, PTT-ID, alias, channel assigned, encryption status, start of call, end of call, length of call, call type, assigned infrastructure resources, console ID, etc.) associated with every talkgroup and conventional conversation made from that console position. This transaction data shall be archived in *.csv (Comma Separated Value) or equivalent format to local and/or network repositories. The Offeror shall define the availability of any dispatch console subsystem APIs that will facilitate the customization and retrieval of real-time console transaction information.

6.5 CONSOLE POSITIONS AND COMMON ELECTRONICS

6.5.1 Description

If proposed, common console electronics shall be housed in open, 19"-wide steel relay racks or vented cabinets in the County Radio System Sheriff's Primary

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Dispatch Center Equipment Rooms. Adequate space for front and rear servicing shall be provided. The Offeror shall provide the recommended floor space and the minimum footprint, to scale, for the proposed electronics equipment and associated hardware as well as all environmental considerations for the entire dispatch console subsystem (i.e., power requirements/consumption, heat load, physical dimensions, weight, etc.).

The console electronics shall contain the various microprocessor trunked base station transceiver and conventional mutual aid interfaces, console interfaces, auxiliary input/output functions, and other interfaces needed for proper and efficient system operation.

To minimize dispatch operator confusion and subsequent errors, operators shall be able to perform all dispatch operations by either looking only at the LCD touch screen or with a screen-coordinated keyboard. The touch screen interface shall be designed to expose the operators to the minimum number of controls necessary to operate the console efficiently. The touch screen interface shall be implemented by a combination of a mouse and a keyboard.

6.5.2 Reliability

The console system shall be designed such that no single failure point of any module or component results in a catastrophic failure, or disables more than one operator console or channel simultaneously. Reliability may be achieved through a distributed architecture, redundancy, or a combination of both. Any duplication of circuits, or multiple level redundancies, required to attain this level of performance shall be provided.

6.5.3 Power Supply

Electrical power losses or surges must not affect system operations or alter the system software or operating parameters at the radio dispatch positions. External power to the console shall be a nominal, single phase 120 VAC/60 Hz. AC power for all remote dispatch equipment in the dispatch centers will be backed up with a UPS and emergency generator system to be provided by the County. The Offeror shall provide a detailed HVAC (BTU) and AC power load calculation matrix for all proposed electronics with its proposal.

The power subsystem for the console servers shall include hot standby power supplies. The transition from the primary to the hot standby power supply(s) shall not cause the consoles to lose and/or reset any functional and/or operational capabilities.

Console operators shall be alerted of the transition to the standby power supply(s) through the NMS and also shall be alerted of the failure of the standby power when the primary power supply(s) is in use.

6.5.4 Auto Diagnostics/Self Healing and Diagnostic Features

Due to the critical nature of the 9-1-1 communications services provided by the dispatchers, a high degree of reliability of the dispatch console equipment is required. The system shall be equipped with a self-diagnostic application which shall continuously monitor and verify the correct operation of the console system, including each operator position. Diagnostic capability shall be distributed among independent and redundant subsystems and shall not rely on one central diagnostic circuit.

Each message on the console system shall include a Cyclic Redundancy Check or its functional equivalent. All data messages between the common console electronics equipment and individual dispatch positions shall include checksum security measures.

The console electronics shall periodically run audio diagnostics to confirm proper operation and network connectivity. Both the NMS and individual console workstation shall be notified through audible and visual alerts. Fault-minimizing routines shall be automatically activated and diagnostic information shall be logged. Diagnostic messages shall be presented in an easy-to-read text format, which shall enable non-technical dispatch personnel to intelligently evaluate the situation and minimize disruption to normal operations. Diagnostic systems that require the dispatcher to cross-reference an error code to a fault message are not desired.

A high degree of modularity is required to reduce the number of subsystems affected by a single component failure. Repair of subsystems without totally disabling the console system shall be required, as continued console operation is necessary during repair. The console system shall be interfaced with the NMS terminal to supply statistics and diagnostics identifying console subsystem failures and for the purpose of making service-related inquiries.

6.5.5 Sub-system Statistics

The NMS terminal shall provide the following performance statistics on console activity by stored or ad-hoc queries:

1. Number of PTTs by position and by talkgroup/channel
2. Total transmit time by position and by talkgroup/channel

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3. Total receive time by position and by talkgroup/channel
4. Number of emergency alarms/calls by position and by talkgroup/channel
5. Number of individual calls by position and by talkgroup/channel
6. Number of telephone interconnect (as provided) calls by position and by talkgroup/channel
7. Number of system busies by position and by talkgroup/channel
8. An average of all of the above
9. List the above by hour of the day.
10. Number of Fire/EMS pages by position.

The Offeror shall describe the retention time and granularity of detail the proposed system will provide for items 1-10 above.

6.5.6 Grounding

The County requires that all Offeror-provided dispatch console equipment be connected to a common single-point ground system for all communications equipment. Exothermic welding and/or mechanical bonding shall be used to connect all equipment grounds to the single point grounding system. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all equipment to the single point grounding system installed or utilized.

6.5.7 Dispatch Console Design

The Offeror shall provide the following dispatch console subsystem design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams
- Network Topology with Proposed Connectivity (LAN/WAN)
- Network Traffic Baseline/Utilization Baseline
- System License Matrix/Structure
- Equipment Layouts and Physical Dimensions

- Equipment Electrical and HVAC Requirements

6.5.8 Dispatch Console Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the dispatch console subsystem that can be supplied for review and understanding.

6.6 OTHER REQUIREMENTS

Specific cable lengths and routing configurations will differ from each dispatch console location. The Offeror shall inspect the existing dispatch center (or architectural plans as available) to investigate all requirements to ensure a fully functional dispatch console subsystem.

6.6.1 Cabling

The following subsections highlight the cabling requirements for console and related equipment. The Offeror shall utilize this and any information obtained during the site visits (or plan review) to determine specific requirements. Most, if not all, cabling within the County Sheriff's Primary Dispatch Center will be routed under raised computer flooring in cable troughs. Cabling shall be riser or plenum rated as required by the installation.

The Offeror shall be responsible for the design and installation of all required electrical, alarm, and interface wiring to commission the dispatch console subsystem. Such design shall be submitted to the County for approval prior to installation. All cabling between the common electronics, other system components, microwave transport/multiplexers, PSTN, and control lines shall be connected at a demarcation point or patch panel consisting of an integrated or pre-wired connectorized panel (e.g., ADC Telecommunications, AMP, Ortronics, etc.) where feasible. Primary and secondary surge suppression shall be provided for all interface and demarcation cabling. All telephone circuits shall be equipped with surge suppression to prevent accidental damage to radio communication system and dispatch console subsystem equipment.

Circuit identification (i.e., to/from, purpose, etc.) shall be provided on all connectorized panels and cabling. All cabling shall be terminated with appropriate connectors for ease of field installation and shall be terminated to the nearest 1-foot length. All cabling used for system interconnection shall be tested during factory staging of the system. A description and detailed wiring diagram of each cable, adapter, and connectorized panel utilized shall be provided. All cabling shall be accounted for in a detailed matrix for each site and network node. All cabling shall be labeled at each end.

6.7 LOGGING RECORDER (Optional Purchase)

The Offeror shall provide pricing for a new computer-based, networked digital logging recorder system to be installed at the County Sheriff's Primary Dispatch Center . The new logging recorder system shall provide the ability to log all radio and telephone traffic in real-time. Both trunking and conventional radio traffic shall be logged by the new recorder. All dispatch console select audio and backup control stations also shall be logged by the new recorder. All call-taker 9-1-1 and administrative telephone traffic shall be logged by the new recorder. The proposed logging recorder system shall be equipped to archive radio and telephony audio traffic to various storage media: internal, redundant hard drive(s), CD-R/W, and/or DVD-R/W devices. The proposed logging recorder system shall store the real-time audio in a variable bit rate, industry-standard, digital format (i.e., WAV, AAC, MP3, AIFF, WMP, etc.) that can easily be transferred over an Ethernet-based computer network for easy playback.

6.7.1 Logging Recorder Capacity

The dispatch console subsystem shall provide logging recorder audio outputs for monitoring and logging dispatcher/radio traffic on a conventional radio channel basis, trunked user group basis, individual call basis and on an individual operator position basis. All recorder audio modes shall consist of transmit and receive audio for a particular radio channel/user group regardless of selected channel status of operator console. Dispatch console position audio shall consist of the operator's transmit audio and selected receive audio. The recorded audio outputs shall be free of any control and functional tone signals.

A minimum recording capacity of any combination of 255 simultaneous sources of audio (i.e., dispatch console, trunking resources, individual calls, conventional resources, 9-1-1 telephone, administrative telephone, ringdowns, etc.) shall be provided. RAID Level 5 (or greater) hard drive storage methodology shall be utilized to provide fault-tolerant audio/data storage. The logging recorder system shall be sized to provide online and immediately accessible storage of at least 15,000 channel-hours before external storage/archival required. This storage threshold must be expandable to higher storage capacities and the Offeror shall define storage options and upgrade strategies to enable greater future capacity.

6.7.2 Logging Recorder Network

The new logging recorder system shall be of a client/server architecture that facilitates the access, playback, and transfer of digital audio files across a TCP/IP-over-Ethernet computer network. All of the new lookup/playback workstations shall be networked. The logging recorder subsystem also shall be designed to

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facilitate a number of County-intranet client workstations to access the archived audio through a properly provisioned firewall or security appliance.

The County requires two (2) fully-functional logging recorder client lookup/playback workstation(s) and/or software. The two will be provided at the County Sheriff's Primary Dispatch Center and located at the dispatch director's discretion. At minimum, the fixed logging recorder client playback workstations shall be equipped with 21" flat-screen LCD monitor.

The client workstation requires the comprehensive ability to lookup, playback, and write to transferable media. The County also requires the ability for up to ten (10) additional simultaneous County-intranet users (existing County computers) to have remote access/lookup/playback functionality through a secure logging recorder gateway. This will provide access at each dispatcher location as well as two additional.

All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices. The Offeror shall propose optional incremental expansion of recorder audio outputs and simultaneous recording capacity in the design proposal. The Offeror shall be responsible for fully testing and configuring all spare equipment for any of the proposed subsystems.

6.7.3 Logging Recorder Features and Performance Requirements

The following list represents the minimum functionality, performance, and quality requirements that shall be included in the logging recorder system. The list is not necessarily totally inclusive of all requirements since the Offeror may offer additional functionality in its standard logging recorder offering. The following section briefly defines the required functionality, performance, and quality of the specific requirements in this list:

- High quality, reliability, and availability to meet 24/7/365 continuous duty public safety dispatch standards (e.g. redundant power supplies, redundant processors, etc.)
- Meets or exceeds all FCC, EIA/TIA, IEEE and APCO standards
- Conform to local PSTN requirements as necessary
- State-of-the-art design with distributed processing and multi-tasking capability
- Redundant and fault-tolerant configuration/network server(s) with mirrored databases
- Capability for any combination of client workstations to access the logging recorder simultaneously for real-time monitoring or historical playback

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- Capability for each dispatch position to instantly play back from their positions the most recent 60 minutes of telephone and radio audio from their respective positions.
- Access workstations capable of running Microsoft Windows-based operating system and archiving to CD-R/W or DVD-R/W
- Multiple search and playback techniques: console position, subscriber/console unit ID and/or alias, emergency call, talkgroup, multigroup/announcement group, individual call, telephone interconnect call, encrypted call (as required), time/date, call length, channel resource, site resource, ANI/ALI data, annotations, etc.
- Capability to package a group of independent, specific calls into a consolidated call sequence for documenting/describing a situation or event
- Capability to activate data compression to maximize data storage
- Redundant internal/mirrored hard drives or suitable automatic backup scheme to prevent loss of data
- System notification to user and network administrator that storage threshold is close to being exceeded to prompt permanent archiving
- FIFO overwrite when storage threshold is exceeded
- VOX-activation and/or ability to set audio level threshold for recorder activation to tailor recording style per channel/track
- Redundant 120 VAC/60 Hz power supplies for all common and core equipment
- Synchronized to master system clock
- Capable of logging any combination of system talkgroups and conventional resources per the ultimate system fleetmap
- Capability to annotate specific calls and/or call sequences using free text
- Capability to lookup call annotations for specific calls and/or call sequences
- Capability to add audible time/date stamping using a pre-recorded voice watermark
- User-friendly, field-reconfigurable independent GUI interface(s) for each lookup/playback position
- Password-protectable lookup/playback positions with comprehensive event log to note specific authorized user time/date usage
- Full interoperability between IP-based, digital trunked and conventional subsystems.

6.7.4 Logging Recorder Interfaces

The proposed logging recorder system shall provide the necessary radio and telephone interfaces to concatenate comprehensive call processing data (both radio

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and telephone) with the specific audio calls. Time synchronization of the logging recorder system with the master system clock and the telephone system is required so that all call sequences can reliably and accurately be re-constructed. The logging recorder system shall be equipped to receive real-time call processing data from the radio communications system and the County Sheriff's Primary Dispatch Center Call-Taker Telephone System for advanced call lookup/playback functionality based on lookup criteria such as: talkgroup, channel, time, date, call length, radio/console unit ID, radio/console alias, specific call type, assigned network resources, annotations, ANI/ALI information, etc.

Logging recorder audio demarcations from the radio and telephone networks shall be made in the County Sheriff's Primary Dispatch Center equipment rooms via wall-mounted or rack-mounted punchblocks. The Offeror shall provide all necessary logging recorder cabling and connectors to/from the demarcation punchblocks. The Offeror shall provide all necessary radio communications system cabling and connectors to/from the demarcation punchblocks. The County will provide all necessary telephone cabling to/from the demarcation punchblocks. The Offeror shall provide all surge suppression, grounding leads, and connectors/lugs of sufficient gauge to properly bond all logging recorder equipment to the single point grounding system.

6.7.5 Logging Recorder Management/User Partitioning

The logging recorder subsystem shall support multiple levels of access that are protected in a manner allowing users to control, monitor and use software applications that have been partitioned and provisioned for specific use by the end-user. The Offeror shall provide a detailed description of this capability by defining the levels of partitioning and security, total number of end-users, the total number of simultaneous users with independent views, and the method used to achieve this requirement.

End-users shall be located at different locations such as dispatch centers, offices, maintenance facilities, and other remote sites. Therefore, this user partitioning feature must be provided to remote locations in order to allow restricted access to the overall radio network. User functionality and passwords must be configurable through a network administrator/superuser (root level) login. Superuser (root level) login and password must be re-configurable in the event of a network security breach. The logging recorder subsystem shall provide the administrative functionality to disable in real-time specific client workstation(s) and user login(s) as necessary in the event of malicious or unwanted activity.

6.7.6 Time Synchronization

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The proposed logging recorder subsystem shall be time synchronized using a common timing reference scheme for the entire network (i.e., GPS, NTP, WWVB, etc.). All call transactions and network alarm events shall be time/date stamped with the master system clock for accurate logging recorder call archiving. Any logging recorder internal status/error logging capability shall be synchronized to the same master system clock for accurate diagnostic and troubleshooting and correlation to NMS alarm data information. In the event of master clock failure, the logging recorder subsystem shall provide a free-running clock which is originally disciplined from the master system clocking reference. The Offeror shall define the time synchronization methodology for the proposed logging recorder subsystem.

6.7.7 Equipment Housing

The logging recorder common equipment shall be permanently housed in an EIA/TIA standard 19"-wide steel relay rack or 19"-wide stationary steel cabinet in the County Sheriff's Primary Dispatch Center equipment room. All logging recorder equipment shall provide a grounding lug or connection that facilitates a single point grounding methodology within the County Sheriff's Primary Dispatch Center. The logging recorder equipment shall provide front and rear access for cabling and service purposes. Power, audio, and data cabling interfaces to/from the logging recorder shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring.

6.7.8 Diagnostics/Alarm Interface

Service alignment, level setting, programming and diagnostic information of all essential logging recorder circuits/modules shall be provided through both a local and centralized (off-site location) craft interface. This functionality shall be accessible and adjustable electronically by service personnel via both an RS-232 connection and Ethernet interface. The craft interface connections shall be accessible without the need to remove chassis shields or equipment circuit boards. Any external configuration software, hardware and/or interface cables needed to perform these functions shall be specified and provided. The proposed logging recorder subsystem also shall be interfaced via SNMP and discrete alarm relays to the NMS subsystem for comprehensive diagnostic and troubleshooting through the unified NMS terminal.

6.7.9 Logging Recorder Design

The Offeror shall provide the following logging recorder subsystem design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams

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- Network Topology with Proposed Connectivity (LAN/WAN)
- Network Traffic Baseline/Utilization Baseline
- System License Matrix/Structure
- Equipment Layouts and Physical Dimensions
- Equipment Electrical and HVAC Requirements.

6.7.10 Logging Recorder Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the logging recorder subsystem that can be supplied for review and understanding.

6.8 DISPATCH CONSOLE SUBSYSTEM MANUFACTURING SUPPORT AND DOCUMENTATION

6.8.1 Factory Testing

The console system shall undergo extensive integrated factory testing with a staging and customer witness prior to shipment. This testing shall encompass all parts of the console equipment.

6.8.2 Dispatch Console and Logging Recorder Operator's Instruction Tutorial

A customized dispatch console and logging recorder operator's instruction tutorial with associated embedded video demonstrations shall be clearly written and illustrated to instruct radio dispatch personnel in the proper use of all provisioned features available at the consoles. County-specific drawings and/or photographs shall show the location of all operator controls and tools. This manual shall be provided in addition to all other installation and training manuals furnished.

A quantity of 15 dispatch console and logging recorder operator's instruction tutorials shall be furnished. These instruction books shall be provided in both original file format (e.g., MS-Word, PowerPoint, Visio, Macromedia, etc.) and in *.PDF (Portable Document Format) format to be readable with the Adobe Acrobat Reader software. Three (3) DVD-ROM copies and 12 paper hard copies shall be supplied at least one month prior to individual dispatcher training. There shall be no copy restrictions or licensing requirements for information provided as a system reference or used for training purposes.

6.8.3 Installation and Maintenance Manuals

The installation and maintenance manuals shall be clearly written and illustrated to instruct a radio technician skilled in the trade to unpack, assemble, and interconnect

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the various system components to prepare the system for operation. All base station site/console interconnect wiring, console and auxiliary function wiring shall be customized and included as part of this manual and its attachments.

The maintenance manual shall be written and illustrated such that a radio technician skilled in the trade can service any portion of the system to the component level, if desired. The manual shall include the theory of design for each unit, a schematic diagram of each assembly, assembly drawings of each circuit board, detailed part numbers where applicable, the description of each component used and the name and part number of the original component manufacturer to facilitate locating parts locally. The manual and its attachments shall include complete system configuration data, programming data, and customized as-built drawings. Where applicable, such information also shall be supplied for any items furnished as part of the system but not manufactured by the Offeror. A quantity of six (6) installation/maintenance manuals shall be furnished in complete, bound paper format and three (3) in CD-ROM electronic format. These instruction books shall be available in a *.PDF (Portable Document Format) format to be read with the Adobe Acrobat Reader software. There shall be no restrictions or licensing requirements for information provided as reference or used for training purposes.

The console and logging recorder manufacturer (if other than the Offeror) shall maintain a complete set of original, customized County reference documentation for the system, to be supplied upon request as individual replacement sheets or complete replacement manuals. The manufacturer shall certify that this support will be available.

Prior to system acceptance and subject to field review, the Offeror shall provide customized "As-Built" drawings for all radio dispatch and logging recorder subsystem equipment supplied in response to this specification. Six (6) sets of documents with reproducible drawings shall be supplied. Three (3) CD-ROM copies shall be supplied with all as-built files provided in both original file format (e.g., MS-Word, Excel, Visio, AutoCAD, etc.) and in *.PDF format (Portable Document Format). There shall be no restrictions or licensing requirements for information provided as reference or used for training.

7.0 BACKBONE TRANSMISSION SYSTEM REQUIREMENTS

The Offeror shall provide a turnkey, high capacity, redundant interconnecting backbone network to connect all system radio sites and dispatch centers into an integrated communications network. Such a system may make use of the existing County tower facilities as deemed feasible.

The Offeror shall provide the most cost-effective solution to the County, providing that such a solution meets the reliability and availability criteria of a public safety communications system. The transmission network shall be designed with the maximum redundant path capability, such as path diversity or loop switching, etc., to ensure the highest levels of availability. A loop topology and loop switching is the County's preferred methodology.

The transmission network shall employ the industry standard digital hierarchy. The Offeror shall provide all necessary interface equipment and cabling to interconnect the transmission network. This interface equipment shall include any channel banks and multiplexers if required. The Offeror shall indicate the multiplex and channel bank capacity requirements at each of the proposed sites, i.e. 1 T-1, 8 T-1, etc.

The Offeror shall research the County's existing microwave backbone in order to determine which of its existing microwave and facilities, if any, can be re-used in the deployment of the new microwave backbone. The Offeror shall specify which components of its existing microwave backbone, if any, can be re-used or upgraded in the new system deployment. Further details on the existing backbone can be obtained during the site visits.

The Offeror shall provide itemized unit pricing, design methodology, system solutions, and microwave path design calculations for the purpose of allowing the County to compile information and solutions in order to support the final radio system design. The Offeror shall interconnect the radio communications system with microwave and/or fiber optic facilities. The systems shall support ring redundancy or hot-standby redundancy, alternate routing, and future growth. The County expects that the Offeror will propose the backbone infrastructure that provides the greatest amount of redundancy and reliability while meeting the capacity requirements of the network.

The Offeror shall describe the entire interface, capacity, operational, and performance requirements to allow the microwave system and/or the fiber optic system to support the proposed system. The Offeror also shall describe the interconnection requirements between the radio system with both the microwave and associated fiber optic systems. Items such as bit error rates, synchronization, switch timing, alternate routing, delay requirements, and any other topics that shall

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affect the performance of the radio systems must be discussed and conclusively defined as part of the Offeror's response.

Offerors shall provide detailed path profiles and path availability calculations for all proposed microwave paths. The Offeror is responsible for proposing all tower site selections in order to meet 1) County two-way radio coverage specifications, and 2) microwave path integrity and reliability.

7.1 DIGITAL MICROWAVE NETWORK

7.1.1 General

The requirements stated herein represent a functional specification for a new or upgradable multi-band, packet IP or hybrid packet IP and TDM, digital microwave communications network to support the County radio system as specified elsewhere in this document.

The Offeror shall be responsible for the design, upgrading and delivery of the microwave system, as well as for installation, optimization, and performance verification testing of the complete network.

This section defines the technical requirements for the major equipment items comprising the digital microwave network. Minor equipment and hardware including wiring, connectors, cabling, fuses, circuit breakers, brackets, fasteners, power supplies, converters or conditioners, and other items which are necessary to provide a complete and fully functioning system shall also be furnished and installed by the Offeror.

All equipment furnished by the Offeror shall be new, meet the requirements of this specification and the manufacturers' published specifications, comply with all Federal, State, and County laws, rules, regulations, and ordinances, be in operable condition at the time of delivery, be finished (painted or surface treated in accordance with manufacturers' standard practices), reflect high quality workmanship throughout, and be suitable for the intended purposes delineated herein.

7.1.2 System requirements and configuration

7.1.2.1 Topology

Offeror shall design the microwave system by optimally using existing communications towers, equipment, buildings and other structures as may be useful and economically desirable. Offeror may also propose new towers as needed, provided that the proposed project schedule appropriately considers potential delays

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in their permitting and construction and the reality that in some jurisdictions local permits may not be attainable.

The topology of the microwave system shall be designed by the Offeror to efficiently achieve the connectivity required by the proposed land mobile radio system. Full connectivity of all traffic shall be provided at the radio system master network controller site.

Although some spur paths may be required, ring protection shall be used to the maximum extent practical to provide the greatest reliability and protection against catastrophic equipment failure or complete site loss. Fiber optic cable is used in the current system and may be required for connectivity to the County Sheriff's Primary Dispatch Center . Fiber optic cable may be incorporated into the microwave network design and implementation to the extent that 1) it meets all other requirements for connectivity, quality, reliability and availability and 2) its use is approved by the County.

7.1.2.2 Frequencies, bandwidths, licenses and technical parameters

The Offeror shall develop a system layout and frequency plan which will provide the most reliable propagation using available frequencies, while appropriately considering rain fading characteristics of the various frequency bands in the area of operation.

Applications for frequency coordination and FCC (Federal Communications Commission) licensing for the microwave radio paths shall be prepared and filed by the Offeror . The results of the required frequency engineering analysis and the applications for FCC authorization shall be provided to the County for review and execution prior to filing with the FCC. The Offeror shall be responsible for the cost of microwave frequency coordination and any FCC filing fees that may be imposed.

The RF paths planned for the digital microwave network shall utilize FCC Part 101 frequencies assigned for full-period service in available 6, 10.7-11.7 or 18 GHz frequency bands.

To the greatest extent possible, consideration shall be given to minimizing differences in product lines and equipment types while maximizing availability and performance.

Split system microwave radios are forbidden (NOT ALLOWED) in the following areas 1) anywhere a climbing certification is required for craft personnel to legitimately access the equipment 2) on rooftops and buildings that high winds can restrict access 3) anywhere special equipment (cranes, lifts, extension ladders, climbing gear, etc.) is needed to access the outdoor equipment 4) anywhere access to the outdoor equipment requires climbing through windows, crawl spaces or over other equipment.

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Split system microwave radios are allowed to the extent that 1) the outdoor RF equipment can be accessed by craft personnel not requiring a climbing certification 2) the outdoor RF equipment can be accessed by no more than a six (6) foot step ladder 3) a flat working surface large enough to accommodate the step ladder, craft person, tools and other equipment is located no more than eight (8) foot below the outdoor RF equipment 4) access to the outdoor equipment is by typical pedestrian stairs and foot path 5) the outdoor equipment location does not fall into the forbidden category above.

Where ring protection is achieved, non-redundant radios may be provided, so long as the specified network availability requirement is met.

Wherever ring protection is not provided, frequencies subject to rain outage shall be minimal. and radios shall be configured as monitored hot standby (MHSB) or MHSB with space diversity, as required. Spurs shall be limited to no more than two (2) hops in any one linear spur and must meet the specified network availability requirement.

In the case of highly critical sites connected by a spur a fiber connection must be designed and installed to provide alternate route protection.

The system shall be designed with sufficient capacity to accommodate the traffic requirements of the radio system plus a minimum of 25 percent growth to each site. Offeror shall provide a detailed connectivity map for the microwave system, including equipped but unused ports for future expansion.

The system shall support data rates to efficiently use the available spectrum and bandwidth, while meeting the capacity requirements of the radio system plus interfaces with any additional base radios, network control equipment and any other additional components or network resources that may be identified by the County.

The “network” consisting of one or more of the following; microwave star configuration, microwave backbone configuration, microwave loop configuration, microwave spurs, telco connections, fiber links, etc.) must be designed for an overall minimum of 99.999% availability.

Network availability calculations must include; 1) Mean time between failures on all critical components (microwave equipment, fiber equipment, power systems, etc.) 2) mean time to restore failure for each critical component 3) path reliability 4) maintenance schedules 5) be calculated using the appropriate formulas found in TeleSciences Microwave reference guide titled Reliability Analysis of Microwave systems See Appendix E.

7.1.2.3 Path Design

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Path design data shall be provided to the County for all proposed paths. This shall include path profiles, reliability calculations, radio and antenna details, and all other supporting data.

Offeror shall include a tree growth factor of 20 ft. to be added to measured tree heights at critical points along all microwave paths. Path profile data sheets included with final path engineering documents shall clearly denote the tree growth factor used at each critical point.

All paths in the system, including rings and spurs, shall be designed for a minimum two-way path reliability of 99.9999% per year using the Vigants model in TIA TSB-10-F. The $10E-6$ BER receiver threshold specified for full modulation shall be used as the outage point calculation. Path reliability must be calculated without adaptive modulation.

All paths in the system, including spurs and rings, shall have a required long-term, unfaded RBER (residual bit error rate) of $<10E-11$.

All paths in the 11 GHz and 18 GHz bands and any band where rain outage is a significant factor, shall be designed for a minimum rain availability of 99.9999% per year, using Crane 96 rain rates appropriate to the area. Offeror shall be responsible for the complete design of all microwave paths. If criteria other than those defined in this paragraph are proposed, Offeror shall provide in the proposal a discussion of all specific differences and why those are being suggested in place of those following. For calculating path clearances on non-diversity paths or top dishes on space diversity paths, the worst case of $0.3 F_1 @ K=2/3rds$ and $F_1 @ K=4/3rds$ shall be used. For diversity paths (top to bottom dishes) clearance shall be as provided for in ITU-R Rec. P.530-11.

7.1.2.4 Physical Path and Site Surveys

The Offeror shall be responsible to perform physical path surveys to locate obstructions on the paths and to ensure that proper path clearances are maintained in the design. Offeror shall guarantee the paths clear of any and all obstructions.

The Offeror shall be responsible to provide all personnel, maps, proper instrumentation and any other equipment or material necessary to perform the physical path and site surveys. In executing the path surveys, if a particular location along the path is already developed with existing structures not likely to be rebuilt or extended/expanded, the shall state the pre-existence of these objects. Also, Offeror shall search for existing construction plans, permits, etc. for proposed structures along the projected path. If new structure(s) are proposed, the Offeror shall take the new construction into account in the microwave path calculations.

The Offeror shall provide results of the physical path surveys of every path. These submittals shall provide, as a minimum, the following information:

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- Verified site geodetic coordinates in NAD83 formats
- Verified ground elevations along paths
- Obstruction heights along microwave paths
- Path profile characteristics, vertical and horizontal path clearances at critical points along the path, potential vertical and horizontal reflection points and natural/manmade shielding along the paths are to be identified /noted and discussed in detail

The Offeror shall provide results of physical site surveys of every site. These submittals shall provide, as a minimum, the following information and material:

- Verified site geodetic coordinates in NAD83 formats
- Verified site elevations
- General site characteristics: access, nearest utility power location, soil conditions, surrounding land features, and optimum positioning for new towers
- Location map plotted on USGS 7.5 min map
- Proposed plot plan

7.1.3 General Equipment Requirements for All Sites, specifically including NOC

All materials, design, and construction procedures shall be in accordance with all applicable federal, state, county and local building codes.

Redundancy of radios and all other equipment shall be provided such that no single failure will disrupt more than a single Ethernet or TDM port, assuming normal ring availability and operation.

Equipment to be used at all of the remote sites and in the County Sheriff's Primary Dispatch Center shall be provided in racks to the maximum extent practical, except for alarm and control computers and video monitors, which may be better suited for desk-top placement.

Shielding and filtering shall be provided to prevent interference from, or to, other radio frequency equipment installed near or in the vicinity of the proposed equipment. The equipment shall meet or exceed spurious frequency emissions, conducted or radiated, as outlined in Part 15 of the FCC Rules and Regulations,

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Subpart J, Class B Computing Devices. Equipment shall be operationally compatible with the types of equipment located in the typical operational environment.

Installation of all electrical equipment, power distribution, lighting and outlet assemblies, alarm and grounding systems, including associated wireways, and wiring, shall comply with the most recent edition of the following requirements:

National Electrical Code (NEC),

National Fire Protection Association (NFPA),

Occupational Safety and Health Administration (OSHA).

All electrical equipment and devices shall be listed, approved, or certified by Underwriters Laboratories (UL), or other Nationally Recognized Testing Lab (NRTL).

All microwave system equipment, microwave path design and construction shall comply with the latest editions of the following applicable rules, regulations, standards, and specifications:

Federal Communications Commission (FCC)

Rules, Part 2

Rules, Part 15, Subpart B for Class A devices

Rules, Part 101, Fixed Microwave Services

Bellcore Technical References and Advisories and Compatibility Bulletins:

GR-1089-CORE – Electromagnetic Compatibility and Electrical Safety
General Criteria for Network Telecommunications Equipment

TR-NWT-000063 – NEBS Generic Equipment Requirements

TR-TSY-000332 – Reliability Prediction Procedures for Electronic
Equipment

TR-TSY-000499 – Transport Systems Generic Requirements (TSGR)
Common Requirements, Issue 2

TA-TSY-000752 – Microwave Digital Systems Criteria

TR-TSY-000009 – Asynchronous Digital Multiplexer Requirements and
Objectives

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American National Standards Institute (ANSI), EIA/TIA and other standards:

- T1.105 – Digital Hierarchy Optical Interface Rates and Formats Specifications
- T1.106 - Digital Hierarchy Optical Interface Specifications (single mode)
- T1.102 – North American Digital Hierarchy – Electrical Interfaces
- T1.313 – Electrical Protection for Telecommunications Central Offices and Similar Type Facilities
- T1.333 – Grounding and Bonding of Telecommunications Equipment
- T1.334 – Electrical Protection of Communications Towers and Associated Structures
- T1.403 – Extended Superframe Format Interface Specification
- ANSI-J-STD-607-A-2002 - Commercial Building Grounding and Bonding Requirements For Telecommunications
- TIA/EIA-222 (latest version) – Structural Standards for Steel Antenna Towers and Antenna Supporting Structures
- RS-252- (latest version)– Standard Microwave Transmissions Systems
- TSB-10-F – Interference Criteria for Microwave systems
- EIA-195 (latest version)– Electrical and Mechanical Characteristics for Terrestrial Microwave Relay System Antennas and Passive Reflectors
- EIA- 210 (latest version)– Terminating and Signaling Equipment for Microwave Communications Systems
- EIA-310 (latest version)– Racks, Panels, and Associated Equipment
- IEEE 1588 (latest version) - Precision Clock Synchronization Protocol for Networked Measurement and Control Systems
- C37.90.1 – Surge Withstand Capability Tests
- C37.90.2 – Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

7.1.4 Equipment Requirements for Microwave Sites

7.1.4.1 Common

All indoor equipment intended for operational microwave sites shall be provided in 7 foot tall, EIA standard, 19” equipment racks.

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Each rack shall have a separate fuse panel with alarm and a ground bar.
Redundant equipment shall have dual, independent power feeds from separate circuit breakers and power panels to ensure that no single point of failure will cause a disruption of service.

All indoor microwave site equipment shall operate within the full specification requirements over a temperature range of 0° to 55° C with up to 95% humidity (non-condensing).

7.1.4.2 Microwave Radio Specifications

The equipment shall be designed and manufactured for continuous duty operation in a fixed station application, be of all solid state design, and have an expected operational service life of at least 15 years with proper maintenance and service.

All radios shall be compliant with FCC Rules and Regulations, Part 101 and type-accepted for its intended use, specifically including spectral density requirements.

MHSB (monitored hot standby) receivers shall be provided with an asymmetrical RF directional coupler having less than 1 dB loss to the preferred receiver and 7-10 dB to the non-preferred receiver.

Switching between redundant receivers in MHSB or SD (space diversity) configurations shall employ hitless switching, causing no errors in the data throughput.

Microwave radios configured as MHSB shall have the capability to automatically switch far end transmitters via a control signal through the reverse path when the BER of both receivers exceeds 10E-5.

Radios configured for space diversity shall include an adjustment for Differential Absolute Delay Equalization (DADE) to account for different waveguide lengths for space diversity antennas.

Minimum additional functional requirements for each microwave radio shall include:

Forward error correction (FEC)

Time domain and slope equalizer (ATDE)

Automatic Transmitter Power Control (ATPC)

Radios shall be designed for traffic consisting either fully of IP packets or a hybrid mix of TDM and IP packets.

7.1.4.3 Service Channel and Orderwire

The digital service channel shall employ radio overhead or payload overhead to permit a minimum of one voice circuit and two independent RS-232C data transmission circuits between all sites without consuming payload capacity.

The service channel shall be interconnected between radios to prevent loss of channel connectivity in the event of loss of any single spur or ring radio.

Each site shall be equipped with a complete orderwire / voice maintenance channel unit with selective call and “all-call” features, and including a speaker, ringer, and DTMF handset.

A PBX station interface shall be provided at the MNC to allow any orderwire station on any (assuming multiple independent rings) orderwire system to be interconnected with other PBX station users. Interface shall be capable of both inbound and outbound calls.

7.1.4.4 Radio Control and Monitoring Functions

All microwave radios shall have local, on-site provisioning, control, and monitoring capability via a keypad, craft interface terminal or simple computer terminal provided at each site. This capability shall:

- allow configuration of software-programmable radio parameters, monitoring of radio status and faults, and observation of various traffic performance measurements,
- provide access to the same information from any other radio at any site in the system, and
- Operate independently of the centralized SNMP network management system (NMS), specified elsewhere in this RFP.

Offeror shall supply a list of alarms, programmable parameters, and manner of access for each type of microwave radio.

At least 32 external alarms and at least 8 external control points (for environmental alarm and control) shall be provided for each site, in addition to those internal ones employed for radio and routers/switches alarm and control. Each external alarm or control interface shall use a dry contact interface.

Radio status and performance information shall also be made available via a network management system (NMS), specified elsewhere in this RFP.

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7.1.4.5 Traffic interfaces and access

Where MPLS is used it shall provide automatic traffic rerouting around an equipment failure and/or unavailable path(s) and restore affected connections in 50 msec or less (Fast Reroute (FRR) or MPLS local protection).

A minimum of 4 Quality of Service (QoS) classes shall be provided throughout the network.

All Ethernet interfaces shall be via front-panel RJ-45 jacks with auto-negotiating ports.

If any DS-1 interfaces are required by the traffic plan, a DSX access panel shall be provided at every affected microwave site and shall serve as the demarcation point between the microwave network and the radio system. The DSX panel shall provide access to every DS1 circuit dropped at the site, whether subsequently connected to a DS1 interface to another microwave radio, to a radio system base station, to a channel bank or to a router. Jacks for line, equipment and monitor shall be provided for each circuit, allowing for isolating and testing in either direction.

Sufficient quantity and stability of precise timing sources shall be provided and employed to ensure synchronization of all nodes in the system, sufficient for the needs of the LMR system and other traffic. Offeror shall explain in detail and show in a timing diagram where clock sources will be employed and how system synchronization will be achieved.

The traffic interface router/switch equipment shall have a network management system (NMS), specified elsewhere in this RFP, independent of, but similar to, the radio NMS.

Loopback test capability shall be provided at each site for each connection port. Loopback shall be controllable locally and from the remote end of a circuit, as well as from its NMS master.

7.1.4.6 DC Power System

All microwave site equipment (i.e., radios, alarm and routers/switches and except for the waveguide dehydrator) shall be powered by a positive-ground, 48-volt battery system furnished by Offeror. Each system shall include batteries, battery rack or mounting hardware, float-type battery charger, low voltage disconnect, and DC load center.

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The entire DC power system shall be sized to accommodate the number of electrical circuits and the electrical load of the equipment specified in this project plus a future growth of 50% of load and circuits.

Each battery charger shall:

Be modular and sized to power the full load (including the future growth identified above), as well as recharge a fully discharged battery in less than 24 hours.

Have sufficient filtering and regulation to power all or any portion of the load without the need for batteries.

Be provided with dual AC input circuits and circuit breakers (such that there will be no single point of failure), DC circuit breaker, DC voltmeter, DC current meter, current limiting and high voltage shutdown circuitry and continuous float voltage adjustment.

Have separate dry-contact alarm points for, as a minimum, low voltage, high voltage, charger failure and loss of AC input.

Operate from 120 VAC and served by two different phases, as appropriate to the site installation.

Employ redundant rectifier modules, provided on a 1:N basis, such that no single failure shall overload the remaining system, even including the future growth, as defined above.

Each battery system shall:

Be modular and of the stationary, sealed, valve-regulated, maintenance-free type

Be designed for a minimum 20-year life expectancy

Have sufficient capacity to provide a minimum of 8-hours operation of the Offeror-furnished microwave station equipment including the future growth identified above.

Include secure mounting rack or facilities and include protection from ruptured battery cells.

Not require venting facilities or a special battery room.

A rack-mounted DC load center with circuit breakers shall be provided with the DC power system to provide protected DC distribution to all -48 VDC-powered equipment, including future growth.

An automatic low-voltage disconnect shall be provided to protect the batteries from over discharging.

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7.1.4.7 Network Management Systems (NMS)

Two separate but parallel NMS functions shall be provided, one for the radio network and one for the IP router/switch interfaces. Each NMS shall terminate at the MNC and may either be integrated into the NMS for the LMR radio system or be fully independent, so long as the functionality is provided.

All available alarms from ancillary and environmental alarms shall be wired to NMS remotes and configured into the NMS master for appropriate display and functioning. These alarms shall include, but not be limited to:

- Loss of AC power,
- Low battery voltage,
- High battery voltage,
- Loss of waveguide pressure,
- Fuse alarm for each rack,
- Door open,
- Tower light controller failure, if applicable,
- High temperature building,
- Low temperature building,
- Smoke detector alarm

7.1.4.8 Antenna System Requirements

Microwave antennas shall be selected by Offeror and be FCC-Part 101-Category “A” compliant, parabolic dishes.

All microwave antennas, regardless of size and frequency band, shall be provided with protective radomes, standard four-inch pipe mounts, dual side struts and ice shields.

Antennas, side struts, ice shield mounts, transmission lines and grounds shall be attached to the tower in accordance with the manufacturer’s instructions and relevant EIA/TIA standards.

Antenna systems shall use standard waveguide sizes and rectangular flanges of a consistent type to the maximum extent practical, so as to minimize sparing and tool costs.

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All transmission lines shall be either pressurized, jacketed, copper elliptical waveguide or jacketed, copper coaxial cable in continuous lengths without splices and shall be installed in accordance with manufacturers' specifications.

Where transmission lines consist of elliptical waveguide, it shall be of premium quality, use pre-tuned connectors, and include rigid (if required) and flexible waveguide sections that provide a measurable return loss equal to or greater than 23 dB, as measured at the antenna port of the radio. Flex waveguide shall not be used outdoors.

Each waveguide shall be uniquely and permanently identified at each site at 4 points: the radio, the wall feedthrough (both inside and outside), and the bottom of the vertical run.

An AC-powered, automatic dehydrator of the mechanical, non-desiccant type, and all accessory equipment, including line monitoring for each waveguide and an overpressure relief valve, shall be provided for every microwave site with a pressurized feedline.

The dehydrator shall provide the necessary capacity for all of the waveguides and feedhorns with an anticipated leak rate of 1%, and provide sufficient capacity to maintain a stable pressure during a 19°C (35° F) temperature drop in 60 minutes.

All dehydrators shall provide dry contact alarms for at least low pressure, high humidity and excess run time alarms.

7.1.5 Testing and Inspection Requirements

7.1.5.1 General

The ultimate acceptance for the microwave system shall be its functional suitability to meet the operational requirements of the mobile radio system, which it was designed to support. That being the case, despite any testing, reviews, or demonstrations of the microwave system, acceptance or approval of it may be withdrawn or superseded at any time if operational requirements of the radio system are found unfulfilled by the microwave system. Those requirements may necessitate additional equipment or modification of the microwave system at any time that then-current system is found lacking. Offeror shall make any and all such changes, as may be required at no cost to the County.

Within 60 calendar days after final radio system design, for every piece of equipment provided, the Offeror shall provide six (6) paper copies and six (6) soft

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copies, e.g., .pdf files on CD-ROM, of the following items for review by the County:

- Manufacturer's Product Literature,
- Manufacturer's Performance Data Sheets,
- Manufacturer's Published Standard Warranty,
- Samples of all relevant manufacturer's standard factory test and inspection forms,
- Complete Set of System Configuration Drawings, including an index listing,
- Final Design Equipment List, organized by site,
- Final Design Equipment List, organized in a sortable, Excel spreadsheet format with equipment line items as rows and site designations as columns.
- The microwave system acceptance process consists of several steps itemized as follow:
 - Review final equipment list for each site, including description, OEM name, model number, quantity, software revision number,
 - Review relevant manufacturer's standard factory test data sheets,
 - Determine specifications to test or demonstrate and where each should be performed,
 - Develop field test procedure,
 - Perform field test procedures until confirmation of compliance is obtained,
 - Determine compatibility and similarity with current microwave system.

Assuming that manufacturer's quality assurance program satisfies the County's requirements, redundant verification of manufacturer's standard production test measurements will not be required. However, some sampling, as directed and observed by the County, may be required and shall be accommodated by Offeror.

7.1.6 Microwave Field Testing

Complete documentation of Field Test results shall be provided by the Offeror upon completion of testing.

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The following tests, in addition to other standard manufacturer's test procedures, shall all be performed:

Antenna system:

- Each path shall be aligned and tested to conform with engineering design and path survey calculations,
- Each antenna waveguide shall be swept and plotted in accordance with manufacturer's specifications. Measured return loss shall be a minimum of 23 dB across the entire frequency band as defined by manufacturer.
- Antenna waveguide shall be pressurized in accordance with manufacturer's specifications and leak down tests will be performed to ensure the leak rate does not exceed manufacturer's specifications,
- Verify waveguide pressure alarm to NMS master,
- Verify the correct antenna sway brace and ice shield configurations,
- Verify proper grounding and waveguide support
- Verify proper labeling of each waveguide at each required point

Power Plant:

- Measure and record individual cell and power plant total output voltages
- Set and verify alarm thresholds on battery charger in accordance with manufacturer's specifications. Verify alarm indication on NMS

Radios:

- Transmitter: Measure and record transmit power and frequency; verify operation of ATPC, if and where used.
- Receiver: Measure and record RF receiver local oscillator frequency; verify MHSB, and/or space diversity error-less receiver switching and operation of reverse path protection, as applicable
- The fade transmit margin shall be measured to the 10E-6 threshold and relevant AGC voltages and RSL readings recorded. Results shall be tabulated, compared with calculated predictions, summarized, and signed by Offeror's test team and submitted to the County for approval.
- RFC 2544 Ethernet testing must be performed for all radio hops utilizing Ethernet connectivity.

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Overall RF system:

- A zero (0) BER test shall be performed for 24 hours on each microwave hop. The test may be conducted as an overall network test but must be broken down to the hop level if there is a bit error reported at the end of the test.
- RFC 6349 Ethernet testing must be conducted across the network if Ethernet is used.

NMS:

- Verify each environmental alarm from each site, specifically including: open door, AC power failure, high temperature, low temperature, smoke detector, battery charger failure, low waveguide pressure, tower light alarm, and fuse panel alarm, as applicable.
- Verify reporting and proper display, acknowledging, logging and storage of all alarms by alarm system.

Routers/switches, timing and synchronization:

- Verify proper connectivity and operation using Ethernet (EN) or TDM DS-1 (as appropriate) test set at demarcation points on a loopback basis, as well as a point-to-point basis from each site to ensure absence of timing problems.
- Verify proper automatic, alternate-route ring switching in all rings and that connections are maintained on each equipped connection, as applicable
- Verify operation of timing network in normal and backup (failed master clock module) modes in all ring configurations

Total microwave system availability test: After completion of installation and all other testing, a 7-day period shall begin during which all equipment must perform failure-free.

8.0 SUBSCRIBER RADIO EQUIPMENT (OPTIONAL PURCHASE)

Offerors shall propose and provide pricing for various types of radio subscriber equipment and devices for the different agencies and participants on the County radio communications system. On an indefinite delivery and indefinite quantity basis, County members intend to procure radio subscriber units that require a variety of different features and options depending on the various user departments and their respective operational needs. The County encourages the Offeror to recognize a logical distinction in the tier and pricing of proposed subscriber radios along a public safety and non-public safety agency basis.

Public safety radios shall, in general, be of a higher tier and include a larger suite of features, functionality, and overall design to withstand the harsh operating environments encountered by the first-responder community. Non-public safety radios also shall be of high quality and design, but, in general, a non-public safety class of radio shall not require as advanced a feature set and overall capacity as a public safety radio. The County also recognizes a further distinction between high-tier and mid-tier subscriber units based on the overall mode capacity of the radio. The County requires the Offeror to provide a matrix of features, functionality and capacity of various radio tiers as part of their response. Assumptions have been made as to the availability of specific accessories for the various radio configurations, and no equipment availability assumption shall be interpreted to imply the preference of any specific Offeror. The Offeror assumes responsibility for mapping and categorizing the proposed subscriber radios to address the County's organizational strategy of low-, mid-, and high-tier radios in mobile and portable radio families. The Offeror shall thoroughly describe the features and functionality provided with each proposed subscriber unit.

Subscriber units are required in a variety of different configuration packages: mobiles, portables, control stations, vehicular adapters, remote desksets, and optional vehicular repeater systems (as necessary). Offerors shall provide all cables (antenna, battery, control head[s], chargers, etc.), mounting hardware, antennas, fusing facilities, installation and programming services, and accessories to provide a completely functional subscriber unit. Offerors are responsible for assessing and delivering all programming and installation services necessary to deploy and commission all radio subscribers obtained through this procurement.

8.1 GENERAL REQUIREMENTS

The subscriber radio equipment shall consist of an integral radio set, capable of frequency synthesis of multiple RF channels, with automatic channel switching under the control of external channel(s) and/or internal channel switching logic. Additionally, the radio shall include such other items as are necessary for a

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complete, highly reliable, two-way analog and digital radio suitable for communications in a multi-channel trunked and conventional system.

All radio subscriber system parameters (programming personality) shall be software configurable without the need to replace internal components for parameter configuration. In addition to the suite of features and functionality outlined in previous sections, the Offeror shall provide all features, characteristics, and functionality with all proposed radio subscriber equipment necessary to meet or exceed County radio system specifications. The units shall be feature and function compatible with all fixed equipment supplied under this contract. The Offeror shall provide a comprehensive feature and functionality matrix for each proposed subscriber unit by type.

All radio subscriber internal software shall be downloadable from a programming device (i.e., laptop, PDA, etc.) without the need to replace internal components for new software versions. Offerors shall propose radio subscribers equipped for over-the-air reprogramming of both system configuration parameters and internal operating software to be purchased at the option of the County. The Offeror is responsible for developing, implementing, and documenting the comprehensive County programming fleetmap to utilize in the provisioning of radio subscriber, dispatch console, and NMS configuration databases. The Offeror shall populate all required databases with final County fleetmapping and ID information to fully commission the radio communications system. Any equipment programming changes required to make the subscriber equipment, console, MNC, and NMS databases match the final version of the system fleetmap shall be executed at the expense of the Offeror.

The subscriber units shall be of current hardware and software production at the time of final system acceptance, and shall be capable of withstanding the harsh environment associated with use in emergency service vehicles. At a minimum, the mobile and portable equipment shall meet or exceed the MIL-STD-810E "Environmental Test Methods and Engineering Guidelines" specification, with some of the criteria noted as follows:

- Method 506.3 Rain - Procedure I - Blowing Rain
- Method 509.3 Salt Fog
- Method 510.3 Sand and Dust Procedure I - Blowing Dust
- Method 514.4 Vibration Procedure I, Category 10 - Minimum Integrity Test (3 axes)
- Method 516.4 Shock Procedure I - Functional Shock

All subscriber radio equipment also shall meet or exceed the requirements of the latest version of TIA/EIA-603 "Land Mobile FM or PM Communications

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Equipment Measurement and Performance Standards" when operated in the analog mode.

The radio subscriber units shall support all analog and digital communications within this system and compatible systems operating in the 700 and 800 MHz frequency bands. The subscriber units shall provide FM analog communications within this system when involved in a call from an analog unit on conventional mutual aid repeater and/or simplex channels.

The radio subscriber units shall be equipped to concurrently priority scan both conventional channels and trunked talkgroups (at least 8) in both clear and encrypted voice. The radio subscriber units also shall be equipped to concurrently scan between trunked talkgroups on compatible trunked systems in both clear and encrypted voice. Channel or trunked mode scanning shall be completed in the minimum time necessary to reliably deliver audio traffic to the radio subscriber. The Offeror shall provide the maximum scan time required between trunking and conventional reception. The scan shall be a selectable priority which means that the transmitter channel or talkgroup selected by the user is configurable to be the priority channel or talkgroup.

The subscriber units shall provide an ESN (Electronic Serial Number) for lookup and validation purposes by the fixed network infrastructure. The subscriber units shall provide a multi-point data port to multiple external peripherals. The subscriber units shall provide the functionality to be placed in a listen-only mode (no transmit capability) from the network management system on a dynamic basis. While in the listen-only mode, the receiver would still be capable of receive operation but the radio would not be capable of transmitting in any mode.

Audible and Visual Signaling

The subscriber units shall support audible and visual signaling to and from subscriber units for functions as described below. Radio users also shall be able to select and unselect audible and visual signaling (i.e., surveillance, covert operations, etc.) or any or all of the default types of signaling described below. The mandatory default audible and visual signaling shall include the following standardized signals and the Offeror shall thoroughly define the nature and characteristics of each type of signaling scheme:

- Emergency Activation/Reception
- Dynamic Regrouping
- Individual Call
- Telephone Interconnect Call
- Selective Alert
- Console Alert Tone(s)

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- Subscriber-Generated Evacuation Tone
- Mode Announcement (voice directory for programmable radio modes)
- Failure Modes (e.g., loss of trunking control, loss of wide area communications, etc.)
- Trunks Busy
- Callback
- Battery Life Indication
- Charging Mode Indication
- Transmit and Receive Indicate
- Programming Mode Activation
- Software Upgrade Mode Activation
- Feature Acknowledgment
- Channel Beacon
- Voice Communications Mode
- Data Communications Mode
- Priority Scanning
- Home Mode Activation
- Talkaround/Direct Mode
- Ready-to-Talk
- Vehicular Repeater Mode.

8.1.1 FCC Regulatory Compliance

All proposed subscriber equipment shall be type accepted under current FCC Rules and codified regulations in concert with the APCO Project 25 specification. The Offeror shall define the Type Acceptance designation and FCC Emission Designators for all proposed radio subscriber equipment. The Offeror shall provide detailed performance specifications for all proposed radio subscriber equipment.

8.1.2 Electrical & Mechanical

The subscriber radio equipment shall be state-of-the-art, frequency synthesized, and microprocessor based. All configurable operating parameters shall be stored in electrically-alterable, non-volatile memory technology. All radio operating frequencies, features, functions and other operating parameters shall be field-configurable via PC-based programming equipment. The physical and electrical architecture of the equipment shall be such that addition of user features and/or functions at future dates shall not require the addition and/or replacement of circuit cards within the proposed radios.

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To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference which may be caused to/by electrical equipment co-located and/or adjacent to this equipment. Similarly the radios should be capable of shielding from electromagnetic pulse radiation (EMP) resulting from the detonation of a nuclear device or other pulse generating device.

Power loss and/or replacement of the portable unit's battery shall not alter the operating software and/or configuration parameters. Radios shall be equipped to operate with Nickel-Cadmium, Nickel-Metal Hydride, and Lithium Ion battery technologies. The County requires any proposed radio and battery technology to optionally meet the Factory Mutual rating for intrinsically safe operation. The County requires the Offeror to supply the highest capacity battery that operates within the County operating environment, for each proposed variety of subscriber radio.

The unit shall perform a self-diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters and internal hardware. At the conclusion of a successful test, no operator intervention shall be required. A self-diagnostic test that is unsuccessful shall notify the operator with an error message or fault code.

The radio housing shall completely integrate the radio transmitter unit(s) and receiver unit(s). All subscriber units shall be designed so that they are protected from damage if power is applied in reverse polarity or pins of connecting cables are shorted together.

Access and ease of operation are critical to the users and the maintenance personnel. Offerors are to provide information and details on all vehicular mounted equipment, particularly equipment mounted in the passenger compartment. The equipment housings shall be suitable for mounting on vertical or horizontal surfaces. The equipment housings shall be suitable for trunk mount and dash mount vehicle configurations. Remote mounted transceivers for mobile radios shall be interconnected to their respective control heads through a weatherproof, control cable connectorized at both ends.

Mobile transceiver radios shall support weatherproof dual control heads, siren/PA assemblies, and motorcycle configurations. The radio cabinet(s), control heads, and ancillary installations must be a package that can be mounted inside or outside of the vehicle without restricting the use of the front seat by a driver and one passenger or interfere with air bag deployment. Mobile and portable transceiver radios shall be inherently compatible with optional handheld control heads and vehicular repeater assemblies as required.

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The Offeror shall describe variations for shock mounting, stabilization, tilts and swiveling with locks, and customized mounting for different vehicle models and types. Prior to the deployment of any radio subscriber equipment, the Offeror is responsible for developing County-approved installation prototype(s) for each unique radio configuration. The Offeror is solely responsible for providing all of the necessary labor and services associated with the installation and programming of all subscriber radios. The Offeror is solely responsible for all subscriber equipment installation, programming, and flash upgrading required to remedy any hardware or software defect or bug encountered at any time throughout the project implementation. All radio installation and programming activities shall be performed in a facility approved by the County to simplify equipment and deployment logistics. The Offeror is responsible for the removal and inventory of all legacy County subscriber units following a successful system cutover and reliability test period as defined by the County. The Offeror shall separately delineate the costs of installation per radio and the costs of de-installation/removal per vehicle.

8.1.3 Subscriber Operational Characteristics

All proposed subscriber radios shall be equipped to operate on all 700 MHz and 800 MHz public safety voice spectrum allocations per FCC and P25 channel spacing requirements.

Communications modes shall include P25 digital trunking and conventional operations. Communications modes also shall include analog/digital conventional operations. Trunking modes shall be half-duplex in normal mode. Conventional modes shall include both half-duplex and simplex as programmed. All programmable modes shall function in either clear or encrypted mode as programmed. All modes of operation shall be programmable.

Squelch modes provided by the equipment shall include: carrier, continuous tone coded, and continuous digital coded squelch. Squelch modes shall be “field programmable” by channel.

Unit identification modes shall include on a standard basis for all display radios: Unit ID upon Push-To-Talk, Emergency Unit ID, Selective Alert, Telephone Interconnect (optionally), and Alphanumeric Text Messaging (optionally).

All subscriber units shall be programmable for a variable duration transmit time-out-timer for continuous activity to prevent stuck microphone, dead key or abusive key-up scenarios.

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All mobile and control station subscriber units shall be programmable for a minimum variable RF Output Power between 5-30 Watts across the entire frequency operating range.

All portable subscriber units shall be programmable for a variable RF Output Power between 1-3 Watts across the entire frequency operating range.

Mobile speaker audio output shall be 10 Watts, minimum.

Portable speaker audio output operating in a vehicular adapter shall be 5 Watts, minimum.

Handheld radios, not operating in a vehicular charger or adapter, should provide not less than 500 milliWatts of audio output.

Specialized radio accessories to support motorcycles, special weapons teams, bomb technicians, and other first responder specialists shall be made available. The Offeror shall provide a comprehensive list of compatible accessories with unit pricing for all proposed radio subscriber units.

All proposed subscriber radios shall be equipped with a button or switch that activates a programmable “Home” mode or preferred channel with a single key, button press, or switch change.

All proposed public safety “mid-tier” subscriber radios shall be equipped with not less than 256 modes or total channel capacity. All proposed public safety “high-tier” subscriber radios shall be equipped with not less than 512 modes or total channel capacity. All proposed “non-public safety-low-tier” subscriber radios shall be equipped with not less than 64 modes or total channel capacity.

All proposed subscriber radios shall be equipped with a button or switch that activates the emergency mode.

All proposed portable subscriber radios shall be less than 1.5 lbs in total weight with attached battery (not to include external accessories).

All proposed portable subscriber radios shall be equipped to provide a minimum duty cycle of 12 hours using a 5/5/90 (5% Transmit/5% Receive/90% Idle) operational behavior model.

The Offeror shall offer portable subscriber radios with both ¼ and ½ wave antenna options.

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All proposed subscriber radios shall be equipped to provide both transmit and receive audio control to customize the equalization and audio gain control associated with the subscriber radios to optimize the overall subscriber audio quality. The Offeror shall identify the appropriate subscriber audio gain control and equalization settings as part of the overall system design and fleetmapping process.

All proposed subscriber radios and associated accessories shall be equipped to operate consistently and reliably according to manufacturer and system specifications in environmental conditions ranging from -30 degrees Celsius to +60 degrees Celsius at a 90% non-condensing humidity level.

All proposed subscriber radios with display capabilities shall utilize a hardened LCD display capable of withstanding non-abusive vibration and direct impact encountered in the normal daily radio use without being rendered inoperable. The LCD displays shall provide configurable contrast levels to enable proper usage in direct sunlight and low-light operating conditions. All display radios shall provide user-enabled backlighting for nighttime and low-light usage.

All proposed non-public safety tier (low-tier) portable subscriber radios shall be capable of using a standard noise-cancelling, remote speaker microphone.

All proposed public safety tier (mid-tier and high-tier) portable subscriber radios shall be capable of using noise-cancelling, remote speaker microphones that provide an emergency button, discrete volume control, rotary channel selector knob, and audio earpiece jack.

All proposed portable subscriber radios shall be equipped with a personal, desktop-style single battery charger and spare battery of the same type and duty cycle rating as the primary battery provided with the radio.

All proposed portable subscriber radios shall be equipped with a standard belt clip in addition to any accessories that may be requested by the County for use with the portable radios.

All proposed subscriber radios shall be equipped with a configurable button keypress timer to optimize the intended activation and clearing of emergency mode. The timer shall range from 0-to-3 seconds.

All proposed subscriber radios shall be equipped to mute all radio tones and/or audio when operating in covert or sensitive tactical situations (e.g., surveillance, SWAT, etc.).

All proposed portable subscriber radios shall be equipped to provide an audible and visual battery status indication to warn of battery depletion and need to charge.

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All proposed subscriber radios shall be equipped to provide a configurable minimum and maximum volume setting for the radio so as to be able to customize audio levels for various operating environments.

All proposed subscriber radios shall be equipped to provide configurable button, switch, and menu layouts to customize the radio operational characteristics for the various users and agencies. All buttons, switches, and menu items that are labeled or inscribed shall match the programmable functionality so as not to confuse the radio operators.

All proposed subscriber radios shall be equipped to provide multiple configurable groupings of talkgroups and channels to uniquely organize the available modes programmed into each radio. Each grouping shall be accessible through any defined combination of button, switch, or menu item setting. Trunking and conventional channels shall be capable of being interleaved within a programmable grouping.

All proposed subscriber radios shall be equipped to provide user-definable, priority scan functionality for all systems and channels programmed into the radio. Radio scan lists shall include at least eight (8) talkgroups or members each. Any combination of talkgroups and conventional channels shall be definable in a scan list.

All proposed subscriber radios equipped for encrypted operation shall provide both infinite key retention capability and volatile key retention modes of operation which must be configurable in the individual radio programming.

All proposed subscriber radios shall be equipped to provide a keypad lock functionality to prevent inadvertent mode or switch activation.

All proposed subscriber radios shall be equipped to provide password-protection (on a configurable radio programming basis) to gain access to the radio for normal system usage.

All proposed subscriber radios shall be equipped to provide selective radio disable/inhibit, uninhibit, and dynamic regrouping functionality in conjunction with the system NMS and dispatch consoles.

All proposed subscriber radios shall be flash-upgradeable.

8.1.4 Mobile Subscriber Units

8.1.4.1 Power Supply

The equipment shall operate from an external negative ground primary power source supplying a nominal 12 VDC.

All power circuits shall provide for reverse polarity protection and each power cabling assembly shall be properly fused and grounded.

Mobiles shall be equipped to operate in both a continuous mode (always powered on) or in a switched mode (powered down with an ignition sense) as required on an individual basis by the County.

There may be a limited number of units requiring positive ground kits as determined at time of installation. Unit costs related to these kits shall be clearly and individually identified in the pricing section of the Offeror's response. If there is also an incremental installation cost related to the positive ground vehicles, the costs also shall be clearly and individually identified in the response.

8.1.4.2 Mobile Equipment Housing

The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment.

Palm microphones, external speaker housings and transceiver housings shall be constructed of high impact polycarbonate plastic or other suitable high impact material.

Trunk-mounted transceiver housings shall be equipped with a base plate. The base plate shall allow for the removal of the transceiver from its mounted location for replacement or servicing. Removal of the transceiver from the base plate shall not expose its internal circuitry.

8.1.4.3 Mobile Radio Features

All mobiles shall be equipped with a backlit, alphanumeric character LCD display providing at least 12 characters to identify the operating folder/zone and trunked talkgroup and/or conventional channel mode. As a standard option, keypad configurations shall conform to the North American telephone keypad standard numerical and symbol layout.

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The LCD display shall provide contrast adjustment and its brightness shall be user adjustable. The LCD display shall be equipped for dimming and complete turn-off for surveillance and covert operations.

Mobiles shall be offered with the capability of interfacing to the following accessories and ancillary assemblies as required by the County: horn and lights activation relays, siren/PA control head, status/message control head, external emergency switch or button, motorcycle assembly, dual control head-single radio, multi-band radio-single control head, handheld control head/keypad microphone, and a stationary mobile control station.

All mobiles shall be equipped with an external data port for connection to test equipment, radio programming devices, mobile data devices, etc.

On dual control head units, the switch to enable or disable scanning shall be field programmable or designated by the user.

On dual control head units, each control head shall be equipped with a switch to takeover control of the unit.

On dual control head units, transmit and receive audio shall, at all times, be available from both front and rear positions regardless of the position of the takeover control switch.

8.1.4.4 Mobile Radio Accessories

The units shall be equipped with a palm type microphone with coiled cord. The microphone shall be of the modular connector, plug-in type. Remote units for outside vehicle use shall have, at a minimum, a weatherproof rating.

Each unit shall be equipped with an in-vehicle speaker. The speakers shall be of the modular connector, plug-in type. Remote speakers for outside vehicle use shall have, at a minimum, a weatherproof rating.

Dual control heads shall be available for specialized fire apparatus, EMS ambulances, and other unique applications as defined.

Most mobile radios shall require the installation of a weatherproof, center-of-the-roof-mounted, low-profile 3dB gain type antenna operational across the entire 764-861 MHz frequency range per current FCC requirements. The Offeror shall work with the County at the time of radio installation to define the re-use of an existing hole for antenna installation and possible temporary use of a magnetic mount antenna for the legacy radio to facilitate the cutover process and minimization of

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holes cut into the vehicle, as well as for low profile antennas where necessary. The Offeror shall define the unit cost for a magnetic mount antenna with associated cabling operational across the entire 764-861 MHz frequency range per current FCC requirements.

Mobile radios shall be offered which are compatible with the installation of common fire/emergency services apparatus headset intercom systems (e.g., David Clark, Firecom, etc.). The Offeror shall completely integrate and wire all new subscriber radios with the various headset interfaces in use or intended for use as required to fully complete a vehicle installation.

8.1.4.5 (Option) Installation of Mobile Radios

As an option, the Offeror shall describe the requirements for the installation of mobile radios in vehicles of all types (cruisers, sedans, utility vehicles, fire apparatus, ambulances, etc.). This information shall include a description of any certifications required by the installation technician that ensures the mobile radio will be installed appropriately with all warranty/maintenance requirements protected.

8.1.5 Portable Subscriber Units

8.1.5.1 Power Supply

The equipment shall operate from an internal battery power source. All power circuits shall provide for non-destructive reverse polarity and overcharge protection.

8.1.5.2 Portable Radio Equipment Housing

The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment. The housing shall be constructed of high impact polycarbonate plastic or other suitable high impact material.

Removal of the battery from the unit shall not expose its internal circuitry and all battery leads/external connection points shall be properly sealed and covered to prevent any internal moisture damage to the radio.

8.1.5.3 Portable Radio Features

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All portables shall be equipped with a backlit, alphanumeric character LCD display providing at least 8 characters to identify the operating channel grouping and trunked talkgroup and/or conventional channel mode. As a standard option, keypad configurations shall conform to the North American telephone keypad standard numerical and symbol layout.

The LCD display shall be top or front-mounted.

The LCD display shall provide contrast adjustment and its brightness shall be user adjustable. The LCD display shall be equipped for dimming and complete turn-off for surveillance and covert operations.

All portables shall be equipped with a top-mounted rotary volume control knob.

All portables shall be equipped with a primary, top-mounted trunked talkgroup or conventional channel selector knob.

All portables shall be equipped with an external data port for connection to test equipment, radio programming devices, mobile data devices, etc.

All portables shall be equipped with a user-operated, color-coded switch or button to activate the radio's emergency status mode.

Portables shall be offered with the capability of interfacing to the following accessories and ancillary assemblies as required by the County: man-down emergency activation switch, public safety speaker microphone (i.e., elevated antenna at shoulder height), multiple unit charger/conditioner, surveillance headsets/earpieces, Bluetooth accessories, RF adapter switch for vehicular mobile adapter assemblies, GPS-speaker microphones, bone microphones, and temple transducers.

8.1.5.4 Portable Radio Accessories

All portables shall be equipped to operate in a tri-chemistry, ruggedized, pocket-style vehicular mobile charger that does not cover up the LCD display. The vehicular charger shall operate from the vehicle's battery, and provide a charger/conditioning system for the portable radio battery. The charger shall be mechanically configured to provide electrical contact to the radio battery upon insertion of the radio or separate battery into the charger. Rapid battery charging shall be possible whether the battery is out of or attached to the radio. The proposed vehicular charger shall be compatible with every proposed portable radio type, and different vehicular chargers shall not be required based upon the radio or battery type.

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All portable batteries shall be equipped to operate in a tri-chemistry, pocket-style vehicular mobile travel charger. The vehicular travel charger shall operate from the vehicle's cigarette lighter/accessory connector, and provide a charger/conditioning system for the spare portable radio battery. The proposed travel charger shall be compatible with every proposed portable radio type, and different travel chargers shall not be required based upon the radio or battery type.

Portables shall be offered with the capability to operate in a tri-chemistry, ruggedized, pocket-style portable vehicular adapter that converts the portable radio into a quasi-mobile radio configuration as required by the County. The portable vehicular adapter shall operate from the vehicle's battery, and provide: an external, roof-mounted antenna system, external mobile-style audio speaker, handheld microphone, and battery charger/conditioning system for the portable radio battery. The charger shall be mechanically configured to provide electrical contact to the radio battery upon insertion of the radio or separate battery into the charger. Rapid battery charging shall be possible whether the battery is out of or attached to the radio.

All portables shall be equipped to operate in a tri-chemistry, ruggedized, pocket-style 120VAC multiple unit charger that can simultaneously charge/condition a minimum of six portable batteries of any chemistry type. The proposed multi-unit charger shall be compatible with every proposed portable radio type, and different multi-unit chargers shall not be required based upon the radio or battery type.

8.1.6 RF Control Stations

The County requires wireless access to the trunked system from various fixed facilities throughout the County. The Offeror shall be responsible for assessing, deploying, testing, and documenting all control station installation efforts. Control station installation efforts shall include: all mounting, 120VAC electrical and power supply wiring, grounding, surge suppression, antenna and transmission line cabling, connectorization, attenuation, audio and accessory cabling, radio programming and optimization necessary to fully commission each control station.

All control station radios shall meet all mechanical, electrical and operational requirements previously specified for "Mobile Subscriber Units." All control stations, with the exception of the dispatch center backup control stations or specialized digital remote control deskset interfaces, may be of an adapted mobile configuration with dedicated desktop microphone. The Offeror shall be responsible for coordinating control station installations with the respective user agencies.

The control stations throughout the County shall be integrated to mimic the functionality that currently exists at each facility and shall provide continuity of

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operation throughout the cutover period. Each control station also shall be equipped with control station desktop and handset-style remote control unit if currently utilized.

8.1.7 Subscriber Unit Inventory

The Appendix D of this specification identifies quantities of subscriber units for the intended user agencies of the proposed trunked system. Offerors are required to study the enclosed inventory in order to properly quantify and price the necessary equipment for this proposal. The quantities described relate to those radios that may be purchased by the County or member localities. In addition to radios acquired by the County, the Offeror should anticipate that an additional, yet unknown number of radios will likely be purchased by other governmental agencies interoperating within the County network.

8.1.8 System Programming

The Offeror shall provide six (6) complete sets of programming hardware and software for all subscriber equipment initially ordered. This equipment complement shall include all hardware and software necessary to program, troubleshoot, and flash upgrade each proposed subscriber unit type. Any system-specific programming keys and/or software authentication files shall be included so that the County can uniquely provision its entire subscriber unit fleet internally following final system acceptance.

Prior to final system acceptance and at the County's determination, the County requires the Offeror to program the most current County fleetmap information and flash upgrade all radio subscriber units purchased as part of this procurement so that the radio software/firmware is consistent with subscriber units shipping from the manufacturer's factory at that time. Throughout the fifteen-year manufacturer support period, the Offeror shall produce a semi-annual product bulletin for each proposed subscriber unit type that thoroughly defines the available flash upgrades and notes all product enhancements/bug fixes contained in the specific flash upgrade. Throughout the manufacturer support period, the County shall be entitled to receive at no charge the appropriate quantities of any subscriber unit flash upgrade kit that addresses an identified product defect or bug fix.

8.2 SUBSCRIBER RADIO DESIGN

The Offeror shall provide the following radio subscriber fleet information and documentation details based upon County requirements and specifications:

- Fleetmap/Programmable ID Plan
- Subscriber Unit Fleet Inventory by Serial Number, Part Number, Options

- Provisioning Databases/Radio Personalities/Firmware Versions
- Subscriber Unit License Matrix/Structure
- Installation Prototypes
- Control Station Configuration/Antenna Orientation
- Equipment Layouts and Physical Dimensions
- Equipment Electrical, HVAC, and Floor Loading Requirements.

8.3 SUBSCRIBER SOFTWARE/HARDWARE ROADMAP

The County intends to maximize and protect its subscriber radio purchase investment. The Offeror is required to provide support for the proposed subscriber unit fleet offering for a period of not less than fifteen (15) years from the date of final system acceptance. The offering consists of all hardware, software, cabling, and services rendered to implement the proposed radio subscriber unit fleet.

Offeror support is defined as the ability of the Offeror to remedy to County satisfaction any hardware and/or software problem with any subscriber equipment and services provided as part of this offering. Offeror support shall take the form of a 24x7x365 technical support hotline, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or spare/replacement equipment and software for the proposed offering for not less than fifteen (15) years from the date of final system acceptance.

The County requires the Offeror to provide a comprehensive product roadmap (noting timetable of initial release through end of Offeror supportability) for the proposed subscriber unit fleet defining the product life cycles of all major components and ancillary accessories. The County further requires the Offeror to define the OEM status of all of all major subscriber unit components and ancillary accessories.

8.4 SUBSCRIBER RADIO OPTIONAL FEATURES

The Offeror shall provide a detailed list (with associated pricing) and explanation of optional features and accessories for all proposed subscriber radios that can be supplied for review and understanding.

8.5 EXISTING SUBSCRIBERS

The County currently owns a large quantity of subscriber radios that are capable of being upgraded to P25 operation. The Offeror shall provide unit pricing for all software and services required to provide this upgrade and shall ensure that the

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upgraded subscriber units are properly programmed to operate on the proposed P25 system. In addition, the Offeror may propose trade-in credits/discounts for replacement subscriber units. Subscriber unit types and quantities are addressed in the Appendix D of this document.

The Offeror shall ensure that all upgraded subscriber units include all features and functionality of current, pre-upgraded subscriber units on the County system.

9.0 REDUNDANCY AND BACKUP CONSIDERATIONS

All critical components of the proposed system infrastructure shall be designed with extraordinary redundancy and fault tolerance in order to provide a high system availability of 99.9999% for the County users. System Availability shall be defined by the following equation:

$$\text{System Availability} = 100 * \left(1 - \frac{\text{Unavailable Time}}{\text{Total Time}}\right)$$

where ‘UNAVAILABLE Time’ is the total time in which any simulcast cell or multicast site experiences a Severity 1 failure as defined in Section 2.7.9 of this document. In accordance with this definition, the Offeror shall provide its approach and method for calculation of the unavailable time.

At a minimum, the proposed system shall include the necessary redundancy as feasible for all core components, radio network controllers, base station transceivers, networking equipment, switching infrastructure, servers, backbone infrastructure, console electronics, power supplies, etc. to maintain the high system availability and trunking operations. In the event that the proposed system design and architecture does not lend itself to hot-standby or fault-tolerant redundancy, the Offeror shall identify and include pricing for an appropriate spares complement to quickly remedy a system problem. Single point failures shall be addressed in the proposed design and the Offeror maintains responsibility for guaranteeing, through a comprehensive single point failure analysis that no such system vulnerability exists.

Such redundant equipment shall be in a hot-standby mode until such time as a failure requires that the redundant components be enabled. Enabling or switching over of redundant radio network controllers and subsystem components shall be automatically performed by the proposed radio system upon failure detection. The physically diverse distribution of redundant key components, whenever practical, is desired by the County. The Offeror shall provide MTBF and MTTR data for the proposed system network elements and provide performance metrics from actual customer and development systems that support the ability to achieve the system availability required by the County.

9.1 INFRASTRUCTURE REQUIREMENTS

Critical infrastructure and subsystem components of the radio system infrastructures shall be designed with redundancy in order to provide high system availability and dependability. The Offeror shall offer fault-tolerant, distributed processing and hot-standby equipment configurations as feasible. The County requires a system that

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will not suffer a loss of wide-area, County trunking functionality resulting from the failure of a single system component or network element. Sufficient redundancy and fault tolerance must be designed and provided so that fully-functional trunking operations will continue without interruption to existing communications.

The County further requires that any system component, cabinet, or power distribution design, that could render the system or 20% of its channel resources useless or unavailable for communication from a single failure, shall incorporate redundancy sufficient to eliminate this vulnerability and to maintain at least 80% of its channel resources useful and available for communication. The County also requires redundancy and fault-tolerance to be implemented in the design so as to guarantee that a single network element or component failure does not render more than two dispatch operator positions inoperable simultaneously. The County requires the necessary redundancy and loop transport topology so that a single network element/component failure or path fade does not orphan a network node or RF site and diminish radio coverage. The system shall provide the necessary redundancy and fault-tolerance to ensure that two-way digital voice communications remain operational even in the event of the loss of any individual site (although it is understood that coverage may be slightly diminished around the failed site if a specific site has been rendered totally inoperable). The vendor shall include in its failure analysis the effect on coverage of a loss of each RF site. This effect shall be stated in terms of the percentage of coverage area lost for a portable on-hip, in a swivel case, talk-in/talk-out, at the required reliability.

For redundant system controllers, both controllers shall remain on-line in continuous duty operation with real-time, parallel updating of static and dynamic system data so as to provide minimal disruption of service in the event of a failure of the active (as opposed to standby) controller equipment. Switching from active to standby operation shall be fully automatic, with audible and visual indication of the switchover provided to the NMS workstations as well as to the supervisory dispatch console positions. The Offeror shall specify the amount of time it will take between primary controller failure and backup controller switchover. Remote switching functionality from main to standby controller operation shall be provided at the NMS clients and supervisory console as a manual override to automatic switchover. The Offeror also shall specify the period of time required and the procedure for manual switchover to redundant system controller(s). No loss of system functionality shall be experienced during the transition from an active to a standby network controller. Subscriber radios and dispatch consoles shall not be forced to re-affiliate or re-register with the network upon transitioning from active to standby network controllers.

Real-time notification and current system operating status information shall be made to all dispatch consoles and NMS client workstations when the system has entered any degraded mode of system communications so that operational user

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behaviors may be modified to work around the specific failure. All user radios also shall be presented in real-time with audible and visual alerts that indicate the current mode of system communications if any system failure mode has been instantiated.

In the extremely unlikely event that failures shall cause system users to operate in conventional mode until trunking operation recovery can be made, the Offeror shall describe the failure logic in complete detail, the mode of operation during such conditions, as well as the recovery process in the proposal responses. All failure modes shall be designed such that wide-area coverage and dispatcher connectivity are maintained throughout the County. Despite the possible loss of trunking functionality, the system fallback modes of operation shall deliver conventional talk-and-listen digital voice functionality throughout the County. Feature sacrifices shall be described in detail for infrastructure, consoles, and subscriber units for all primary and fallback modes of communication. As a last resort, individual sites shall be equipped to provide repeated conventional digital voice functionality throughout the coverage area delivered by that respective site.

The Offeror shall design and implement the County fleetmap to take advantage of all failure modes of communication so that voice communications are preserved to the greatest extent possible. The Offeror shall describe the redundancy and preventive measures built in to the system design so that high availability and dependability levels can be met. The County considers this detail extremely important in the analysis and evaluation of the Offeror's proposal.

9.2 COMPREHENSIVE REDUNDANCY DESIGN

The Offeror's design for redundancy shall be comprehensive and incorporate support for every component required for network operation. The power systems required to support network components must include a comprehensive redundancy plan that prohibits failure to power the network's components. Infrastructure support elements such as system performance monitoring, HVAC, and structure security must also be supported.

9.3 INTERCONNECTION LINKS

The Offeror shall describe all levels of link redundancy supported or required by the system and define the point-to-point link capacity impact on the microwave system.

9.4 PHYSICAL SECURITY AT NETWORK SITES

In addition to proposing a design that provides network redundancy, the Offeror also shall consider the issues of physical security and redundancy in alarms, etc. employed to protect the system from abuse or external attack. Proximity, intrusion, and other alarms shall incorporate a design to minimize the potential of damage

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from the disablement of any single alarm device. In the transmission of network alarm data, redundancy in the network used for signaling alarms and fault events to the NMS client workstations is desired.

10.0 COMMUNICATION SITE FACILITIES/SITE IMPROVEMENTS

10.1 SCOPE OF WORK

The Offeror shall be responsible for the following:

- As necessary, the deployment of new tower and shelter facilities equipped with commercial and emergency backup power to support the proposed radio system plus specified expansion margins.
- As necessary, the refurbishment or enhancement of existing tower and shelter facilities equipped with commercial and emergency backup power to support the proposed radio system plus specified expansion margins.
- Design, procurement, manufacturing, shipping, installation, and testing of all materials and equipment necessary to complete the site readiness work.
- As necessary, the design and preparation of all proposed sites in accordance with all applicable ordinances and regulations.
- Submittal for approval of all details, cut sheets, and drawings of proposed equipment and control systems.
- Disposal and removal of debris and refuse from each site, as the result of performing any work, including any components removed from towers as authorized by the County.
- All Federal, State, County and local municipality permits, licensing and required authorizations of any kind including, but not necessarily limited to: NEPA, State Historic Preservation, Zoning/Planning, FAA, FCC, DOT, NFPA, OSHA, etc.
- Compliance with all codes, safety regulations, and ordinances in accordance with the requirements set forth in the specifications.

10.2 GENERAL SITE WORK

The following requirements are specified for the communication facilities at all new and existing sites proposed by the Offeror for use as part of the County radio communications system.

10.2.1 Summary of Work

- Site work includes: all clearing and earthwork; geotechnical analysis, excavating and backfilling; compacting and grading; stone surfacing and

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fencing; drainage and landscaping; and tower/shelter/generator foundation work. Further site and communication facility work required by the County may include:

- Design and implementation of 100-foot x 100-foot (as feasible) site compounds including fencing, stone surfacing, and access road. (New sites only)
- Design, manufacturing, delivery and installation of pre-fabricated, hardened concrete shelters.
- Design, manufacturing, delivery and installation of self-supporting towers and ice bridges.
- Design and installation of all foundations including required soil exploration and geotechnical analysis.
- Design, manufacturing, delivery and installation of generators and associated fuel tanks.
- Design and implementation of single point grounding system for entire site.
- Coordination of electrical power and utilities to the site.
- Permits and approvals required for site work.
- Coordinate telephone line service as required.
- Provide security hardware to protect sites.
- Documentation of all construction efforts.

10.3 EXISTING FACILITY UPGRADES

To support the proposed system, the County anticipates the ability to re-use some or all of the current shelters and system infrastructure, including sites that are leased by the County, that serve the current network. Re-use of any of the existing infrastructure may require facility enhancements, site owner approvals and/or upgrades to adequately support the new network. Site upgrades shall be implemented in a non-intrusive manner so that the existing network experiences no system disruption while commissioning the proposed system in parallel. The Offeror shall be responsible for thoroughly identifying, documenting, and implementing all required upgrades, approvals, modifications, and enhancements necessary to fully commission the proposed County radio communications system at existing facilities.

The Offeror shall be responsible for all site surveys, structural analyses, and feasibility studies to determine the complete suitability of existing and candidate tower/shelter locations to serve the proposed network. To minimize the

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proliferation of towers within the County, the Offeror is encouraged to identify any existing commercial towers and sites which could be used to support the Offeror's proposed design.

10.4 GENERAL REQUIREMENTS

The Offeror shall engineer, furnish, and install complete and fully operational RF and microwave sites necessary to support the proposed radio system. If new or upgraded sites are proposed by the Offeror, all site design work shall conform to these specifications and be stamped by a professional engineer with an active State of Illinois certification. An Illinois-registered land surveyor or civil engineering firm shall prepare all site plans.

The Offeror shall be responsible for a complete and fully operable installation in accordance with the latest version of the National Electrical Code, local building codes, environmental laws, zoning and planning regulations or ordinances, land use restrictions, Federal Aviation Administration and Federal Communications Commission rules and regulations, Illinois Department of Transportation regulations governing road access and entry, and all other applicable local, state or Federal codes, regulations, laws and/or ordinances. In the event of conflicting requirements the most stringent interpretation shall apply except as permitted by the County.

Materials furnished by the Offeror shall be new and of first quality as defined in industry standards. The Offeror shall not make substitutes unless prior approval has been obtained from the County Project Manager.

The Offeror assumes full responsibility for materials and equipment employed in construction of the project and agrees to make no claims against the County for damages to such materials and equipment except for those, if any, caused by the County, its employees or agents. The Offeror shall be responsible for storage of all materials purchased and turned over to the Offeror by the County and shall receive all delivered items by contractors at the job site or at a staging area to be furnished by the Offeror.

On a daily basis (or sooner if directed by the County Project Manager), the Offeror shall clean up and remove from the work site all rubbish and construction debris, resulting from project work. The Offeror shall supply a dumpster or similar trash storage/removal device wherever a substantial amount of construction debris is generated. Upon completion of work, the entire job site areas shall be left clean and free of trash, debris, mud, dirt, dust, scrap materials, and excess materials. Construction work zone signs, tape, and pedestrian barriers shall be utilized at all times to prevent unwarranted site access.

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Radio equipment shelters and equipment rooms shall be thoroughly cleaned (including walls and floors) to the satisfaction of the County Project Manager upon completion of installation and construction work.

The Offeror shall coordinate the work of all the trades under its responsibility to ensure that interference between electrical conduits, cable support trays, grounding wire, structural, and the radio system components shall be avoided so that the project is completed within budget and schedule.

The Offeror shall keep current, marked-up prints of all Project Drawings. Markings indicating changes to the drawings shall be red or green and clearly visible. Six (6) complete sets of Final Site Facility "As-Built" drawings (containing all construction and design drawings for: towers, shelters, electrical, site plans, foundations, mechanical, fire suppression, site photos, alarm systems/annunciators, test results, permits, etc.), free of all field mark-ups, shall be furnished to the County Project Manager at the completion of the project. Original Project Drawings also shall be supplied on three (3) separate CD/DVD RW disks in native file format(s) (i.e., MS-Word, MS-Excel) as utilized so that drawings may be modified at some point in the future by County system management personnel.

10.4.1 Stone Surfacing

The Offeror shall install stone surfacing to a minimum depth of three (3) inches within the fenced in site area. Material shall be ¾-inch broken stone with 10% binder material. Two layers of polypropylene liner shall be installed under the stone for foliage suppression. Prior to the laying of any surfacing material, an EPA-approved defoliant or herbicide shall be applied over the area to eliminate the proliferation of weeds and unwanted foliage.

10.4.2 Fencing

For all newly-proposed sites, the Offeror shall provide hot-dipped galvanized, 8-foot high chain link security fencing with top-mounted razor wire around the entire site compound perimeter (as determined by the ultimate site plan which ideally will be approximately 100-foot x 100-foot in area) with both a 16-foot vehicular gate and a 4-foot pedestrian gate. Fencing shall be not less than a 9 gauge, 2-inch zinc coated diamond mesh. Corner, line posts and gateposts (2½-inch, 2-inch and 4-inch diameters respectively) also shall be hot-dipped galvanized. Top rail (1¼", 17 gauge), brace rails (1¼-inch, 17 gauge), and tension wire (7 gauge) at bottom of fence to touch grade are required. Truss rods (3/8-inch) with turnbuckles shall be integrated as required to strengthen each individual fencing section design.

- The mesh fencing material shall be secured to terminal posts using stretcher bars and steel bands and line posts using wire clips.

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Individual fencing sections shall be no wider than 10-foot before a line post, gate post, or corner post is required.

- The top of the fencing shall have razor wire with 45-degree extension arms pointed outside the fence area. The bottom of the fencing shall be a knuckled finish and touch the finished grade of the compound being pulled taut enough so that no compound intrusion can be gained from the bottom of the fence.
- Gates shall be provided with a positive-type latching device needed for padlocks. A plunger rod and catch are also required to secure gate in the open position with a mushroom cap at the base of the plunger rod. Gates shall expose no more than 4 inches between the opening to prevent intruder access.
- All fence posts shall be secured using minimum 30-inch deep by 1-foot wide footers set in a suitable concrete mix for fence stability.
- Fence posts shall be bonded to the site grounding system using an exothermic welding process (Cadweld).
- The Offeror should propose a design that affords maximum protection to the site based upon experience in other high security environments.
- Combination locks, with County-specified codes, shall be provided for all gate entrances.

10.4.3 Grounding Systems

All power feeders and branch circuits shall contain an equipment grounding conductor which shall have green-colored THWN/THHN insulation or green identifying tape at both ends and which shall be suitably terminated to an equipment ground bus or device screw terminal at both ends.

At any site at which building structural members are used for grounds, connections to those main structural steel members shall be made with exothermic ("Cadweld", Burndy, or equivalent) type connectors. Any paint or fire-retardant material shall be scraped away down to bare metal (for good metallic contact) before applying the connection. Surface preparation recommendations for the exothermic welding process to be used shall be followed.

All connections to ground halos shall be made as straight as possible with a minimum number of bends. Minimum bending radius of any ground wire shall be one foot.

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A ground ring consisting of a #00 AWG tinned, bare copper wire shall be installed in a trench at a depth of not less than 30" below final grade or below the frost line (whichever is lower) at a maximum distance of 2 feet from the foundation of the equipment building where the equipment is installed.

If soil conditions allow, the ground ring shall be supplemented with copper clad steel ground rods. The ground rods shall have a minimum length of 10 feet and a minimum diameter of 3/4 inches. The use of ground rods will ensure contact with unfrozen soil during the winter season. All ground rods and ring shall be interconnected (including AC power service and telephone ground rods) to form a single, electrically contiguous site ground ring grid of 5 ohms (or less) resistivity. Megger ground testing shall be performed on the final installation with test results supplied to the County and the results shall read a resistivity of 5 ohms or less. At least two grounding system inspection wells shall be provided at each tower/shelter facility.

The following requirements shall govern the deployment of the single point grounding system for the communications facility:

The minimum requirements for the quantity of ground rods shall be based on the following: (1) at least one ground rod at each corner of the shelter shall be installed; (2) the maximum distance between ground rods shall be 16 feet; (3) at least one ground rod shall be installed directly below the transmission line entry port; (4) the top of ground rods shall be 30" below grade; (5) the ground rods shall be bonded to the external shelter ground ring using an exothermic welding process, for example, Cadweld; (6) the Offeror has the discretion to determine the type of connector to use in the welding process.

An anti-oxidant compound shall be applied to a bonding connection point after the bond is completed.

All connections to the ground ring shall be such that the ground wires are as straight as possible avoiding sharp bends.

- The exterior ground ring shall be bonded to the copper strap or grounding wire descending from the shelter's bulkhead panel.
- The internal ground ring (halo) shall consist of #2 AWG (or larger) tinned bare solid or stranded copper conductor, running continuously along the shelter wall, at a maximum of 6 inches below the ceiling. Insulated mounting standoffs shall be installed every 18 inches or as required to accommodate bends and avoid sag. The internal shelter halo shall contain an intentional break of approximately 4-6 inches to prevent a grounding loop.

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- The transmission line entry port shall be installed directly beneath the internal ground ring (halo) at a point to be mutually agreed upon between the Offeror and the County.
- The ice bridge shall be installed between the tower and equipment shelter to protect all transmission line and equipment interconnected between the tower and shelter. All ice bridge equipment shall be grounded to the exterior single point ground.
- An internal and external copper ground buss bar (that is electrically contiguous) shall be installed such that it is located directly beneath the transmission line entry port. The ground bars shall be wall-mounted on insulators, and shall be pre-drilled to provide adequate internal and external ground connections for each incoming coaxial transmission line. The ground bar may be integrated with a cable entry panel or other special fabricated panel, which will support gas tube surge arrestors for each coaxial transmission line to be installed. The internal ground bar shall be directly connected to the internal ground ring using an insulated #2 AWG (or larger) stranded conductor.

The following connections shall be made directly to the internal ground ring (halo) using green jacketed/insulated #6 AWG or greater stranded copper wire (except where noted):

Ventilation louvers and sheet metal duct-work.

Metal doors shall be grounded to the door frames using flexible copper conductors, and door frames shall be connected to the internal ground ring (halo) with green insulated #2 AWG stranded conductor.

Air conditioning and heating units.

Fire suppression equipment and piping.

Tower lighting system equipment and controls.

Telephone terminal block enclosure, Telco repeaters and line surge protectors (#6 AWG is recommended).

All microwave and radio system infrastructure equipment racks/cabinets, shelves, annunciator panels, and cable trays.

Generators may have a separate ground system that ultimately must be connected to the single point ground system via the external ground ring.

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All exterior (building entry) metallic conduit feeds (i.e., telco service, electrical service, tower lighting, etc.) that enter the shelter.

Coaxial transmission line, microwave waveguide, and lightning arrestors.

All power distribution equipment such as breakers panels, disconnects, transfer switch, surge suppressors, conduits, UPS, battery racks shall be bonded to the grounding system. All power distribution neutral cabling shall be individually bonded to the ground as feasible.

- All connections made to the bulkhead panel(s) shall use non-oxidizing material. The type of connectors to be used to ground the equipment to the internal ground ring (halo) shall be of the split-bolt, bronze mounting lug, and the parallel connector types, for example, BURNDY KSU or equal. These connecting wires shall be such that sharp bends are avoided.
- The shelter external and internal ground rings shall be bonded together with #2 AWG bare solid tinned copper wire. The entrance to the equipment shelter ground system shall be made through a 3/4 inch PVC pipe terminated with bushings 6 inches above the finished floor (AFF) and 6 inches below finished grade (BFG). The PVC pipe shall follow the contour of the foundation. Each ground wire shall terminate at the corner ground rods and shall be bonded. The ground wire shall run vertically along the wall supported by 2-inch insulated standoffs similar to T&B, TY-RAP nylon standoff brackets (short). The PVC pipe shall be sufficiently filled with a duct sealing compound, O-Z/GEDNEY DUX1 or equivalent, through the interior side of the shelter (this compound shall act as a water stop and moisture barrier). Alternatively, the Offeror may use a Polyphaser Earthed Entrance Panel which will connect to the ground ring with copper strap, to which may be attached the halo and other internal building ground connections.

10.4.4 Ground Resistance Testing

A component of the system acceptance test plan to be completed by the Offeror shall be the testing of all existing grounding systems and any grounding systems installed, or utilized, for equipment associated with this procurement. This includes grounding at all base stations, dispatch centers, control stations and microwave terminal/repeater sites associated with this procurement.

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All grounding systems shall be tested using an AEMC, or equivalent, clamp-on ground resistance tester and Biddle 500V Null Megger or equal (3-terminal fall-of-potential method). The resistance to ground shall measure 5 ohms or less.

Ground tests shall be conducted in the presence of a County installation representative and results shall be recorded on a form approved by the County Project Manager. These forms shall be included as a part of the acceptance test documentation and are a component of final acceptance of the radio communications system.

10.4.5 Lightning Protection

The County requires the Offeror to significantly reduce possible system damage and failure due to lightning strikes or induced currents. The Offeror shall adhere to current best engineering practices in providing maximum protection to sensitive electronic equipment. At a minimum, the Offeror shall comply with the following lightning practices. The County requires the Offeror to supply, in electronic format, its current internal Site Installation Best Practices Guidebook(s) and/or Communications Site Installation Standard manual(s) for review by the County Project Manager.

10.4.5.1 Tower Lighting Control

Tower lighting controls shall be equipped with gas tube surge arrestors which will prevent a lightning strike to the tower or lighting system from back feeding into the electrical distribution system of the equipment shelter. This device shall shunt surges to the tower grounding system, and shall protect the tower lighting controller. An acceptable protector is Polyphaser IS-7WFU (single flasher unit) or IS-12WFU (dual flasher unit).

10.4.5.2 Radio Frequency Transmission Lines

Each transmit transmission system shall be protected by coaxial surge/lightning protectors, Polyphaser IS-CT50HN or equivalent, between the transmitter combiner output and the antenna. Lightning arrestors shall be grounded to the bulkhead panel or interior ground bar as appropriate.

On each receive transmission system with a tower mounted amplifier, a Polyphaser IS-DC50LN series lightning arrestor, or equivalent, shall be installed in the transmission line.

Control stations shall be equipped with a coaxial lightning arrestor, Polyphaser IS-50NX-C2 or equivalent. These lightning arrestors shall be grounded to a 5/8-inch x

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8-foot driven ground rod by a #2 AWG tinned solid copper wire attached to the rod using a bronze transition clamp.

Each transmission line shall be grounded at a point above the bend required to exit the tower-mounted cable ladder to the ice bridge leading to the radio equipment shelter or room. Each transmission line system also shall be grounded to the exterior shelter grounding buss bar near the shelter waveguide feedthrough/bulkhead leading to the radio equipment shelter or room. Each transmission line system also shall be grounded to the interior shelter grounding buss bar near the shelter waveguide feedthrough/bulkhead exiting the radio equipment shelter or room. These grounds shall be installed in accordance with the manufacturer's specifications, and shall be sealed against entry of moisture at any location where the outer sheath of the transmission line has been cut or removed.

10.4.5.3 AC Power Supply for Electronic Equipment

All AC-powered equipment to be installed in equipment shelters or rooms shall be equipped with a surge arrester, (MOV/SAD/gas tube combination), in addition to any surge protection equipment which may be installed across the shelter/room power mains.

10.4.5.4 Telephone Circuits/Low Voltage Wiring

All telephone company circuits or other twisted pair cable that may enter an electronics equipment room or shelter shall be protected with gas tube surge arrestors. These arrestors shall be intrinsic to the punch blocks being used and shall be grounded to the equipment shelter/room ground ring.

10.4.5.5 GPS Receivers

If GPS receivers are used as frequency/time references in the proposed system, the antenna line shall be equipped with a gas tube surge arrester, Polyphaser IS-MR50LNZ+6 or +15, or equivalent.

10.4.6 Wiring and Devices

Power conductor insulation shall be color coded (with tape at each termination end). Identification shall be by color tape (e.g., black-phase A, red-phase B, blue-phase C, white-neutral and green-ground). Branch circuit conductors shall be labeled (using Brady or approved equivalent wire markers) at each end with the appropriate circuit numbers. Generator set and A/C unit control wiring shall be labeled with the terminal numbers corresponding to the Offeror's wiring diagrams furnished with the equipment.

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All outlet boxes shall be surface-mounted metallic and suitable for the quantity of devices enclosed. Faceplates shall match the outlet boxes and identified circuit per building scheme. The outlet boxes shall be marked with the associated circuit numbers which shall follow the same numbering convention utilized in the breaker panel(s).

Radio equipment power feeds (from UPS power panel) shall contain separate identifiable white neutral conductors. Common or shared neutrals for these protected loads are unacceptable.

All wire for power, lighting, control and grounding systems shall be stranded copper with UL THWN/THHN 600V insulation, sizes as indicated. Minimum size for power shall be #12 AWG and minimum size for controls shall be #14 AWG.

Electrical equipment, such as UPS, generator, A/C (air conditioning units), heater, etc. shall be wired in accordance with manufacturer's wiring diagrams furnished with the equipment.

10.4.6.1 Commercial Power

The County will assist in arranging for commercial power installation to the meter at each base station/microwave radio site; however, the Offeror has ultimate responsibility for coordinating electrical service and any other commercial facilities necessary to fully commission the site. The Offeror has the discretion to select single-phase or three-phase electrical service as required by the proposed system design, but the County encourages the use of at least 200 Amp single-phase service where feasible (and 400 Amp service if required to meet expansion requirements). The County requires the Offeror to size the incoming commercial service to at least double the channel capacity of the proposed system without the need to modify the proposed service. The County requires the Offeror to identify the required service, factoring in the expansion requirements, for each new or existing site in the proposed network.

The Offeror is responsible for supplying one service meter, as deemed sufficient by the electrical service provider, for County usage. The site compound meterboard shall be weatherproof, consist entirely of galvanized steel construction (no plywood to be used), and be capable of withstanding sustained winds of up to 95 mph. The location of the meterboard shall be at the front of the site compound nearest the vehicular gate in a logical, unobstructing location with close proximity to the incoming electrical service.

The Offeror is responsible for all power installation services past the service meter bay. Power feeds shall be buried and shall enter the building through minimum 4-inch conduits (Schedule 40 PVC is suitable) and an elbow described in the

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equipment shelter specification. All conduits feeding the equipment shelters shall be completely waterproof with gaskets and designed not to allow any water to ever enter the shelter. If a main cutoff switch is required outside of the shelter, this disconnect switch shall be padlocked with a Best lock (or equivalent) keyed to County's specification.

10.4.6.2 Conduits and Raceways

All wiring inside of the building/shelter shall be enclosed in EMT (electrometallic tubing) with compression type fittings (setscrew type fittings are unacceptable). EMT shall be surface-mounted in a neat, professional manner and done so as not to create an effective ground loop that undermines the functionality of the internal grounding halo. UL-approved locknuts and grounding bushings (or EMT box connectors) shall be used at boxes and equipment enclosures.

- All wiring outside of the building/shelter shall be enclosed in heavy wall galvanized rigid steel conduit with gasketed fittings. Weatherproof grounding type hubs shall be used at boxes and equipment enclosures.
- All wall penetrations shall be sealed with weatherproof compounds and 20-year silicon caulk, or equivalent. Empty, future use conduits that are exposed to exterior shall be sufficiently capped and waterproofed.
- Telephone company cable(s) shall be enclosed in GRS conduit.
- Flexible metallic conduit (UL "Sealtite" or approved equal) with UL fittings shall be used as final connections to all mechanical vibrating/rotating machinery (A/C units, heaters, motors, transformers, UPS and generator set, etc.).
- All new conduit routings shall be horizontally and vertically straight, neat in appearance, indicative of professional workmanship and conform to existing conduit routings. Where existing conduit supports are adequate, there shall be used. If new supports are required, these shall be installed at intervals in accordance with the NEC. Only structural members suitable for conduit supports shall be used; piping, HVAC ducts etc. shall not be used for conduit supports. Conduit support intervals shall be based on the NEC Table 346-12.
- Minimum size conduit shall be ½-inch diameter NPT trade size.
- Pre-fabricated equipment distribution panels are acceptable for providing AC power to individual pieces of equipment. All

electrical circuits shall be uniquely labeled at breaker panel and at connection point closest to equipment connection.

- All unused or future use conduit shall be provided with nylon pull rope to facilitate cable pulling.
- Quantity two (2) 4-inch buried Telco Schedule 40 PVC conduits shall enter the equipment shelter at a point near the shelter entrance and connecting back to an area near the electrical service meterboard that will serve as the PSTN distribution point for the entire site compound. The Telco conduit shall be provided with nylon pull rope to facilitate cable pulling and both ends shall be capped and waterproofed initially.
- All buried conduits for commercial service, exterior generator, and/or tower lighting controls shall be of Schedule 40 PVC or equivalent and sized to accommodate any extra cabling necessary. All buried conduit shall be sealed with weatherproof compounds and 20-year silicone caulk, or equivalent.

10.5 EQUIPMENT SHELTER SPECIFICATIONS

10.5.1 General Description

For each site proposed by the Offeror that does not involve an upgraded or refurbished equipment shelter, the Offeror shall deliver in turnkey fashion a pre-fabricated, bullet-proof, high-wind resistant, concrete electronic equipment shelter with associated concrete foundation and ancillary equipment. The specifications included herein relate to minimum requirements and the Offeror shall thoroughly define all features, options, and specifications related to the proposed pre-fab concrete shelters.

10.5.2 Reference Standards

Unless otherwise modified herein, materials, design and construction procedures shall be in accordance with ANSI/NFPA-70, National Electrical Code, all federal, state and local building codes.

10.5.3 Submittal

The Offeror shall prepare and submit for approval, six (6) sets of engineering drawings of each shelter depicting its overall dimensions, electrical layout, equipment materials list, and general floor plan. These construction drawings shall be used, as required, for obtaining zoning/planning and building permits.

10.5.4 Design Specifications

10.5.4.1 Dimensions/Construction

For all new sites, the County requires the minimum equipment shelter to be sized at 12-foot (W) x 28-foot (L) x 10-foot (H), but the proposed shelter shall be sized at an area of not less than is required to house all newly-proposed equipment plus the future space for a minimum of 100% system equipment racking expansion. All shelters shall provide a minimum of 9.5-foot interior ceilings. The building and generator foundations shall be rebar-reinforced, concrete slabs installed in compliance with local building codes and meeting or exceeding a minimum compressive strength of 3000psi at 28 days. All above grade concrete work shall be formed and finished with a ¾-inch chamfer at all exposed edges. The foundation design shall be of a type to prevent the entry of rodents and pests into the shelter. A 40-inch (W) x 48-inch (L) x 12-inch (D) concrete entrance pad/stoop shall be installed at the entry door. The Offeror shall provide a detailed description of the equipment building being proposed.

Shelter construction shall be exposed, washed concrete aggregate exterior with several coats of waterproof stain. The roof shall be a troweled surface exhibiting a 2-to-3-inch overhang around the perimeter of the building. Roofing shall be designed to prevent penetration by ice falling from the tower at the site. The roof shall be sloped to prevent accumulation of water and large accumulation of snow. The base of the shelter that sits on the foundation shall be caulked around the perimeter with an exterior grade 20-year caulk that matches the color of the exterior finish. Interior walls shall be designed to allow mounting of electrical and electronic equipment using standard fasteners. Interior walls and ceiling shall be constructed of not less than 5/8-inch thick plywood with covered paneling. Interior walls and ceiling shall be insulated at a minimum with 1.5-inch thick R-11 grade foam insulation. Interior flooring, ceiling, and walls shall be reinforced with steel rebar as necessary to meet or exceed the proposed system design equipment loads. Interior flooring shall be covered with static-dissipative white industrial grade vinyl tile applied in 1-foot square tiles, mounted over the concrete subflooring. Base cove moldings of 4-inch or greater size shall be installed around all perimeter walls for a finished look that matches the chosen tile color scheme.

10.5.4.2 Design Loads

The shelter shall be minimally designed to withstand wind speeds of 150 miles per hour (mph). The shelter roof shall be designed to minimally withstand a load of 150 pounds per square foot (psf). The shelter floor shall be designed to minimally withstand a load of 300 pounds per square foot (psf) while factoring in all anticipated equipment floor loading for each site. The shelter shall be minimally

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designed to meet seismic performance categories A-E. As a minimum ballistic protection requirement, the shelter should meet Underwriter's Laboratory Standard 752 Level Eight (8) related to rifles and Level six (6) relative to shotguns.

10.5.4.3 Doors

One 40-inch (W) x 84-inch (H) door shall be provided for entry in to the equipment room. The exterior door shall be of steel/aluminum design with a solid core. Doors shall be equipped with a Best mortise lockset and a single cylinder deadbolt lock. The lockset shall be protected on the exterior by an anti-prying plate. Hinges shall be tamper resistant to prevent removal of the pins from the outside of the shelter. The exterior doorway entrance and stoop shall be protected by an overhang or drip awning/canopy affixed to the exterior of the shelter to prevent water entry into the building. Doors shall be sealed using adjustable weather stripping and an adjustable saddle.

10.5.4.4 HVAC

Low ambient temperature air conditioning/heating equipment shall be provided. Electric heat strips or other devices shall be provided which will maintain the interior temperature of the shelter between 55 and 85 degrees Fahrenheit when outside temperatures are -20 degrees Fahrenheit or greater. Relative humidity shall be maintained at a level acceptable to the equipment to be furnished in this procurement. Redundant, exterior vertically wall-mounted HVAC units shall be utilized (or acceptable equivalent) to provide air conditioning/heating reliability in each shelter. The shelter shall provide an adjustable thermostat and the HVAC units shall provide a standard lead/lag switch control unit. Separate circuit breakers for each unit shall be installed in the main load panel. The outside portions of the units shall be weather-, rodent-, and tamper-proof. Air handling returns shall automatically louver and close in the event of a fire suppression activation so that a fire suppression agent discharge is not dissipated to the exterior. The HVAC units shall be designed to facilitate easy technician maintenance and preventive maintenance access for filter, compressors, etc. The HVAC unit shall be sized to meet the equipment loads specified in the proposal plus excess future capacity to support 100% system equipment racking expansion of the same equipment type. All HVAC equipment shall be supported by the emergency power generator. The HVAC system shall provide dry closure alarm relay indications to the site alarm system and the NMS when a failure of either HVAC unit has occurred.

10.5.4.5 Power

A 120/240-VAC Single Phase service of not less than 200 Amps shall be provided under normal conditions to all equipment shelters unless specific site design criteria necessitates 3-Phase service. The AC service shall be sized to meet the specific

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equipment loads specified throughout the proposal plus excess future capacity to support 100% system equipment racking expansion of the same basic equipment type. AC power shall enter the shelter through a waterproofed, entrance elbow, which can be rotated to accommodate connection to conduit from the power company feed. A main fused cutoff/disconnect switch shall be provided outside the shelter with a provided enclosure lock, followed by a primary interior load center distribution panel backed up by emergency generator power which provides a minimum of forty (40) branch circuit breakers each rated for 20 Amps or greater.

The shelter shall be equipped with a properly-sized, interior uninterruptible power supply (UPS) and compatible exterior backup emergency generator configuration to support all of the shelter equipment in the event of loss of commercial power. The shelter shall be equipped with one or more wall-mounted UPS sub-panel(s) physically located in a logical fashion to minimize conduit runs and bends in order to serve rack-mounted equipment situated in the shelter. Each individual UPS sub-panel shall provide a minimum of thirty (30) branch circuit breakers each rated for 20 Amps or greater.

The shelter power distribution scheme shall provide for an emergency generator automatic transfer switch that switches between commercial and generator power. Generator power shall be supplied by a properly-sized external liquid propane generator with a below grade fuel tank sized to provide three (3) days of continuous backup power. The shelter also shall be equipped with a pre-wired, exterior, mobile genset receptacle in the event that the primary generator is rendered inoperable and a mobile, transportable generator assembly needs to be connected to the shelter. The shelter UPS shall be equipped with a UPS Bypass Switch and cutoff for service mode and/or maintenance purposes.

The interior equipment room AC power shall be distributed in minimum ½-inch EMT conduit with cable-tray or rack-mounted distribution panels over top of each equipment rack footprint with enough outlets to independently serve each piece of AC-powered equipment. Each outlet shall be served on separate circuits with each neutral separately grounded to the single point grounding system. Two (2), non-UPS but generator-fed wall-mounted duplex outlets at a height 2-feet above the finished floor shall be located on each wall separated in a logical fashion to easily facilitate technician testing anywhere inside the facility. The string of wall-mounted duplex outlets shall be served by one primary 20 Amp breaker. Two (2), non-UPS but generator-fed wall-mounted, enclosed GFCI duplex outlet at a height 2-feet above the foundation shall be centrally located on each exterior wall separated in a logical fashion to easily facilitate technician testing anywhere outside the facility. The string of wall-mounted exterior GFCI duplex outlets shall be served by one primary 20 Amp breaker. One (1) wall-mounted, UPS-fed quad outlet shall be located near the shelter Telco service entry wall at a height of three (3) feet above the finished floor for PSTN power requirements. All -48 VDC

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rectifier and power supply circuits shall ultimately be connected to the primary load center (with properly sized breakers as defined in the system design) backed up by the emergency generator, and each -48VDC rectifier/charger shall be interconnected to the load center from overhead using Seal-Tite flexible conduit or equivalent. The primary load center also shall be sized to accommodate the tower lighting control equipment, a wall-mounted microwave dehydrator, the fire suppression control equipment, the HVAC system, UPS, and all lighting requirements.

An all-mode surge arrestor device shall protect AC power mains. All electronic equipment in the shelter shall be protected by transient voltage suppressors. The primary suppression system shall be silicon avalanche diode type, with MOV backup (Northern Technology Model TCS250BL or equivalent). The TVSS units shall include a dry closure alarm relay, which shall be connected to the site alarm system and NMS.

All electrical equipment supplied shall be UL listed. The entire electrical installation and wiring shall be in strict compliance with the latest approved edition of the National Electrical Code and all state, County and local codes and ordinances.

10.5.4.6 Waveguide/Transmission Line Entry

One (1) 16-port, 4-inch diameter waveguide feedthrough assembly (or greater) with opening caps shall be installed at the opening of the shelter adjacent to the waveguide/ice bridge from the tower, and in alignment with interior cable ladders arranged over the equipment rack space (e.g., Microflex B1447, Polyphaser Earth Entry Port, Andrew part number 204673-8, or equivalent). The feedthrough plate shall be equipped with rubber boots and with galvanized clamps to seal the coaxial transmission line to be supplied pursuant to this procurement. Blank cable boots shall be used to seal all unused entry ports (Andrew or Microflex). A quantity of sixteen such blanks shall be shipped installed on the waveguide entry panel to prevent entry of birds, insects, or rodents during shipping or installation of the equipment shelter. The waveguide entry port shall be attached to the exterior ground ring by #2 AWG solid copper wire or by copper ground strap.

10.5.4.7 Cable Tray/Ladder

A minimum 24-inch wide cable tray ladder shall be installed over all equipment rack spaces, and to the telephone equipment panel, and to any future equipment expansion space in the shelter. Two (2) cable bridge sections shall be included to link each distinct ladder assembly above each equipment racking row to facilitate minimal inter-racking cable runs. Cable tray sections shall be bonded to one another and to the building ground halo by #2 AWG copper wire and compression

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fittings. The cable tray ladder shall be suspended from the ceiling using a unistrut style hanging fastener and the ladder design shall support all equipment and power cabling to support the proposed system plus the stated expansion requirements. Corner clamps and bolts shall be used all cable ladder connection points to stabilize the entire ladder configuration. The ladder configuration shall be no lower than 8.5-feet above the finished floor and shall be designed not to obstruct any overhead lighting, fire suppression, or power cabling.

10.5.4.8 Lighting

The shelter shall provide sufficient interior lighting to provide a level of 75 foot-candles at 3 feet above the floor. Light shall be provided by fluorescent fixtures using two standard four-foot tubes per fixture. The switch for the light fixtures shall be located inside and next to the entry door. Light fixtures shall be installed to the front and rear of electronic equipment racks to provide sufficient lighting for service personnel to perform equipment maintenance. In the event of loss of shelter power, the shelter shall be equipped with an battery-powered emergency exit sign and lamp to guide an individual safely out of the shelter. The emergency light fixture shall automatically sense the loss of shelter power and immediately activate.

Exterior lighting shall be provided adjacent to the entry door to the shelter and on the far side of the equipment shelter opposite the entry door to illuminate as much of the shelter area and site compound as possible. A photoelectric switch that allows automatic illumination and extinguishment at twilight and sunrise shall control this exterior lighting. Exterior lighting shall be rated at 100 Watts (or greater), heavy-duty, shatter, and tamper-resistant. All interior and exterior lighting shall be backed up by the emergency generator.

10.5.4.9 Fire Suppression

Each new shelter shall be equipped with a complete FM-200 fire suppression system. Per NFPA guidelines, the FM-200 fire suppression system shall be engineered to discharge enough suppressive agent in the proper timeframes to extinguish a fire caused by the equipment associated with the new system as well as the future shelter racking expansion requirements. The Offeror shall conduct field testing of the FM-200 system to demonstrate that the engineered FM-200 system contains enough agent to dissipate a fire in the specified shelter volume within the NFPA-specified timeframes. The FM-200 fire suppression system also shall include: an interior and exterior horn and strobe assembly to warn/notify of discharge, ionization smoke detector, photoelectric smoke detector, abort station, manual release, pre-alarm bell, annunciator control panel with battery backup, and agent cylinder with associated piping. Other co-located environmental systems such as HVAC air flow systems, fuel control systems and ventilation systems shall be automatically coordinated with the activation of the fire suppression system to

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ensure expedient suppression of fire conditions per NFPA standard guidelines. The FM-200 system shall be backed up by the emergency generator. The FM-200 system shall be interconnected to the NMS system for remote monitoring and control.

10.5.4.10 Shelter Alarms

At a minimum, the following alarm inputs shall be installed and connected to a centralized shelter alarm punchblock which feeds the radio alarm system and NMS with individual alarm indications. The Offeror is responsible for identifying the alarm type (i.e., Normally Open, Normally Closed, etc.), interconnecting, and testing every shelter alarm point with the proposed system NMS.

- Tower Light Alarms (Strobes, Marker Side Lights, Power Fail)
- Fire/Smoke Suppression (Activation/Discharge, Power Fail, Smoke Detector, On Battery, Heat Detector)
- Intrusion (Door Entry) Alarm
- High Temperature Alarm
- Low Temperature Alarm
- High Humidity
- Commercial Power Failure Alarm
- TVSS Failure
- Automatic Transfer Switch (Normal, Emergency)
- Generator Alarms (Engine Run, Low Fuel, Oil Pressure High/Low, Overcrank, Overspeed, Engine Temp, Coolant Levels, Coolant Temperature High/Low, etc.)
- Leak Detection/Water on Floor
- HVAC Alarms (Compressor Fail, Power Fail, etc.)
- UPS Alarms (Summary Alarm, On Bypass, Battery Status Normal/Low, Normal On/Inverter, etc.).

10.5.4.11 Miscellaneous

The proposed shelter also shall include the following miscellaneous equipment: CO2 fire extinguisher, dry chemical fire extinguisher, leak detection, document holder for as-built manuals, eye wash station with integrated water catch basin, interior and exterior RFI and FM-200 warning placards, tower ASR number sign, contact information sign, and wall-mounted tower lighting control boxes.

10.6 TOWER SPECIFICATIONS

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10.6.1 New Tower Facilities

The County anticipates that the Offeror will be required to provide a number of new communications towers as part of the proposed design. The County prefers the use of self-supporting, lattice-style steel towers to minimize the site compound footprint, but properly-supported guyed towers shall be acceptable if the proposed tower meets all design requirements and if enough land is available. The Offeror shall provide a structural load analysis for all proposed structures. All new towers shall be designed to fully support the proposed system design antenna load (RF and microwave) including all transmission cables, miscellaneous appurtenances, amplifiers, ice shields, lightning rod, mounts, etc. For all new towers proposed, a structural load analysis is required to be compliant with TIA/EIA-222 (latest revision) factoring in as-built and future load considerations.

10.6.1.1 Structural Load Analysis – Existing Sites

For County-owned towers currently used in the existing radio system, a structural load analysis is required prior to deploying any additional load on the structure, either temporarily or permanently. For all other towers proposed in the above listed categories, a structural load analysis is required, compliant with TIA/EIA-222 (latest revision) to identify the baseline and future load capacities.

10.6.2 Reference Standards

Unless otherwise modified herein, materials, design and construction procedures for any towers proposed by the Offeror shall be in accordance with the latest version of Electronic Industries Association (EIA) standard EIA-222, Federal Aviation Administration (FAA) Advisory Circular AC 70/7460-1 (latest version), ACI/ASTM concrete standards and all applicable local codes.

10.6.3 Submittals

The Offeror shall prepare and submit to the County for approval, scale drawings of the tower depicting its overall height, the number and height of sections, the horizontal spread of each section, guy points (if applicable), antenna loading at specified heights, engineered failure points (if applicable), and obstruction lighting details.

For each tower, the Offeror shall submit to the County for approval a profile view of the tower containing structural details and engineering notes as well as a comprehensive tower foundation design with a supporting geotechnical analysis. Any documentation on the tower needed by the County for planning approvals shall be supplied. Drawings shall be sealed by a registered professional engineer (structural) licensed in the State of Illinois.

10.6.4 Antenna Towers

10.6.4.1 Height

Tower heights, excluding appurtenances, shall be as specified by the Offeror to meet or exceed the specified system coverage performance levels.

10.6.4.2 Materials

All galvanized steel materials used in the construction of the towers shall be new, and shall conform to the provisions of EIA-222 (latest version) with respect to physical properties, manufacture, workmanship and factory finishes.

10.6.4.3 Loads and Stresses

The design of the tower shall take into account dead and live loads induced by the structure itself and all appurtenances, and all stress applied to the tower and its appurtenances by wind forces. The minimum safety factors listed by EIA-222 (latest version) shall apply under the most severe combination of dead load plus live loading. The proposed tower design shall factor in all applicable strength limit states and serviceability limit states as defined by the current version of EIA-222. Towers shall properly be categorized and reliability requirements determined appropriately per EIA-222 for each structure incorporating the relevant environmental loads for the County such as wind, ice, seismic, and foundation loading.

Wind loading and wind gust load factors shall be calculated per EIA-222 (latest version), with all appurtenances installed plus the required future system growth factor. The structures also shall be designed per EIA-222 (latest version) to withstand additional horizontal wind pressures and dead loading produced by the accumulation of radial ice. Each tower shall be designed to meet twist, sway and displacement specifications for all loading conditions as recommended by EIA-222 (latest version) for the antennas proposed by Offeror.

10.6.4.4 Appurtenances

The proposed self-supporting towers shall be designed to support all required immediate and future appurtenances. Appurtenances include, but are not limited to, the following: antennas, antenna mounts, antenna platforms, microwave antennas and radomes, lighting, transmission line, transmission line hangers, cable ladder, climbing ladder and safety device, lightning rods, conduit, waveguide bridge,

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lighting control, amplifiers, and ice shields. The tower shall be equipped with an integrated lightning rod as necessary.

10.6.4.5 Antenna and Transmission Line

The towers shall be designed to support, at minimum, the antennas and transmission lines proposed by the Offeror plus a future use growth factor. All transmission line assemblies shall be grounded to a copper grounding buss bar at the base of the tower at the junction between the waveguide ice bridge and the tower waveguide ladder. The copper grounding buss bar shall be affixed to the base of the tower to facilitate this grounding interconnection. All transmission lines shall be installed with a proper drip loop or bend radius at the tower base transition so as to prevent the flow of water into the shelter.

10.6.4.6 Transmission Line Support

A 24-inch wide waveguide transmission line cable ladder pre-drilled, for universal snap-in hanger kits shall be installed along each face of the tower and each ladder assembly shall extend the entire height of the tower (as feasible). The cable ladder shall be of galvanized steel construction, and shall have mounting hardware of stainless steel or galvanized steel construction. No drilling of the tower legs or cross bracing shall be required to install the cable support device.

Transmission lines shall be attached to the transmission line cable ladder using stainless steel hangers and adapters of the appropriate size for the transmission line supplied. Hangers shall be Andrew models 43211, 42396A-1, 2, 4, 5, 9, or equivalent. Andrew E Angle Adapter, or equivalent, kits shall be used to attach the hangers to the transmission line support ladder. Hoisting grips also shall be used as necessary to properly support and install the transmission line assemblies.

Transmission line shall be supported on the cable ladder or ice bridge at intervals of not more than six feet, or as recommended for 100 mph wind with ½ inch radial ice. (Andrew LDF5-50A, if used, shall be supported at intervals of 5.5 feet or less; LDF4-50A should be supported at intervals of three feet or less).

A 12-foot high waveguide bridge/ice shield shall be installed between the tower and the equipment room/shelter to support transmission lines and to protect them from ice falling from the tower or antennas. The waveguide bridge shall be designed to accept support devices to properly attach the transmission lines at the intervals specified above. The waveguide bridge shall be supported by galvanized steel pipe columns if any horizontal span is 10 feet or greater, or if so required by local building codes. Galvanized steel construction shall be used for the entire

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waveguide bridge and its ancillary components. A 48-inch wide grip strut grating type of waveguide bridge is required to reduce snow accumulation. The Offeror shall provide the necessary suspended hanger kits for use with the waveguide bridge to properly secure all transmission line and tower cabling at maximum interval spacings of no more than 3-feet between the tower and shelter. Microflect waveguide cushions, hangers, and crosses are the preferred method of attachment to the waveguide bridge. The waveguide bridge shall be properly secured with concrete footers or piers of a depth not less than 30 inches, and every post of the waveguide bridge shall be bonded to the site single point grounding system.

10.6.4.7 Lighting and Controls

The towers shall be lighted and/or marked in accordance with the applicable chapters of FAA Advisory Circular AC 70/7460-1G, or latest revision, as required by the particular Aeronautical Study performed by the FAA for each tower.

Activation of any required lighting systems shall be via a redundant light-sensitive, photoelectric type switch and controller which will activate the lights at dusk (or other cloud-darkened condition) and extinguish the lights at sunrise. If a dual lighting system is required at any site, the controller shall automatically switch from red lights at sunrise to strobe lights, and back to red lights when the sky darkens.

Wiring for the tower lighting shall be enclosed in rigid galvanized steel conduit, which shall be vented sufficiently to eliminate condensation buildup. Wiring and conduit shall be provided and installed in conformance with the tower manufacturer's specifications and in accordance with local electrical codes. Tower lighting control and electrical cabling shall be affixed with hanger kits to the tower waveguide ladder in the same manner as transmission line.

The tower lighting control system shall be equipped to provide Form-"C" dry contact closure alarm indications of bulb failure for strobes, marker side lights, and power failure which shall be connected to the NMS system. The tower lighting control system also shall provide dial-up telco connectivity with a modem for remote diagnostics of the tower lighting system. All tower lighting control equipment shall be wall-mounted and installed inside of the pre-fabricated shelter in a manner so as not to obstruct any of the useable racking footprints. The Offeror shall properly ground all tower lighting control boxes and equipment to the facility single point grounding system. All tower lighting control equipment shall be backed up by the emergency generator power system.

10.6.4.8 Ice Shields

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Each tower shall be equipped with steel mesh ice shields to be installed above each of the microwave antennas to fully protect parabolic dishes, microwave antennas, and waveguide from falling ice. The ice shield shall cover the width and length of the dish, microwave antenna and cabling it is intended to protect.

10.6.4.9 Climbing Ladder

Each tower provided shall be equipped with an OSHA-approved climbing ladder with safety climbing cable with belt that extends the entire length of the tower (as feasible).

10.6.4.10 Grounding

The Offeror shall bond all tower legs to the site compound single point grounding system using a minimum #2 AWG bare tinned copper wire which shall be bonded exothermically (Cadweld) to the site ground ring. The entire perimeter of the tower foundation shall be surrounded by a ground ring using ¾-inch x 10-foot copper clad ground rods spaced a maximum of 16-feet apart and interconnected using a minimum #2 AWG bare tinned copper wire. The tower ground ring shall be interconnected with the ground rings that surround the exterior generator and shelter to create a single point site compound grounding system. All grounding of the tower shall be in conformance with the specifications provided in ANSI/IEEE Std 142-1982, and the guidelines contained in this specification.

10.6.5 Scope of Work

10.6.5.1 Offeror Responsibility

The Offeror shall be responsible for: obtaining all permits/authorizations; designing and installing suitable tower foundations for all associated hardware and appurtenances; designing, manufacturing, shipping, and erecting the towers, for providing all project management, construction management, testing, and installation services necessary for tower erection and for site restoration/cleanup. The Offeror shall be responsible for ensuring that the tower meets or exceeds all design criteria, labor services, guarantees and installation requirements contained in these specifications, or in national or industry standards to which this specification refers.

10.6.5.2 County Responsibility

The County will provide an installation representative as necessary to coordinate field installation activities and to act as a liaison between the Offeror, and the property owner (if the County is not the property owner).

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10.6.5.3 Scope

The work to be performed under this section of the specification shall include: site preparation, tower erection, installation of antennas, transmission lines, lighting systems, ice shields, climbing ladders, cable ladders, waveguide bridges, antenna support brackets, platforms, tower foundations, tower lighting controls, lightning rods, grounding systems, guy anchors (if applicable), and touch-up of any nicks in the galvanizing or paint. The Offeror is responsible to dismember and remove any existing antennae and support cables as required by the County if the re-use of a County tower is determined by the Offeror. The Offeror is responsible for all site/tower enhancements to existing facilities.

10.6.5.4 Construction

Soil Analysis: The Offeror is responsible for geotechnical exploration at the locations of each tower leg, tower foundation or guy anchor point. A geotechnical engineer licensed in the State of Illinois shall be used to perform soil exploration and analysis. A copy of the soil reports prepared by the geotechnical engineer shall be furnished to the County by the Offeror prior to commencement of work.

Foundation Design: The proposal price for the foundation design will be assumed to be based on presumptive soil conditions as defined by the latest version of the EIA-222 standard. The County recognizes that the final foundation design and price shall be determined when the geotechnical report is provided to the Offeror. At such time as the geotechnical report is available for each site, presumptive soil conditions shall be compared to the actual soil conditions to adjust (positively or negatively) the final foundation design price.

The Offeror shall meet or exceed the requirements outlined in the latest editions of ACI301 and ACI318 as it pertains to workmanship and materials. Concrete test cylinders shall be properly cast with copies of all test reports being provided to the geotechnical engineer for review and analysis. The Offeror maintains complete construction management and engineering responsibility for ensuring that the foundation and tower design(s) have been met and are in compliance with geotechnical reports during the tower foundation and erection process. All field certification and reports shall be provided to the County as performed.

Site Plan: A site plan shall be prepared for the County for site plan and conditional use permit approval at each site at which construction of a tower or installation of an equipment shelter is required. The Offeror shall install the tower and shelter in conformance with the site plan. The Offeror shall note that regardless of its size at the base, the tower shall be installed such that a minimum 10-foot spacing is maintained between the building and the tower face nearest the building.

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Power: The Offeror shall be responsible for connecting to the commercial AC power at the meter. Temporary power may be required for the obstruction lighting on the tower during construction. The Offeror is responsible for arranging and installing this temporary power. Temporary obstruction lights shall be installed while the tower is being erected.

FAA Notification: The Offeror is responsible for meeting all FAA required notifications and preparing, on behalf of the County, the Antenna Site Registration (ASR) for the location.

10.6.5.5 Painting

If the FAA Aeronautical Study requires any tower to be painted, the paint shall be applied at the factory with touch up painting to be completed at the site. Touch-up galvanizing, if needed, shall be done in dry weather. Galvanizing shall not be applied over wet surfaces. The County highly encourages the Offeror to avoid communication sites that require tower painting to minimize long-term maintenance costs.

10.6.5.6 Site Landscaping

The Offeror shall be responsible for landscaping, grading, and seeding of the disturbed soil. The Offeror shall adhere to any buffer zone and landscaping requirements as outlined in applicable local or State ordinances. The Offeror shall use fescue grass seed at all tower sites. The Offeror shall restore the site to its original condition and properly address all grading and drainage requirements to County satisfaction.

10.7 GENERATOR SPECIFICATIONS

The Offeror shall furnish standby emergency power generators where required and upgrade existing generators as required to meet the backup emergency power requirements for each site facility.

10.7.1 General Requirements

The Offeror has the responsibility to design, provide, install, and test a complete and operable standby, heavy-duty propane-powered generator designed for continuous operation over a multi-week period with associated automatic transfer switch inside each electronic equipment shelter used in the network. Equipment shall be factory tested new at 0.8 power factor for 3 hours, and shall be installed in a standard outdoor cabinet placed above an elevated steel fuel tank on a concrete pad foundation in the radio site compound. Generators provided by the Offeror shall be

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designed for the intended use of network support and shall include all necessary shielding to protect the network from electrical noise, if any, caused by the generator. The generator must be of a size as to fit within the shelter compound and provide sufficient room around the entire unit for technicians to perform maintenance on and fuel the device while it is in operation.

10.7.1.1 Type of Generator

Generators shall be an exterior-housed, weatherproof, liquid propane-fueled four-cycle, engine-driven set with a low reactance brushless generator. Generator sets shall be equipped with a temperature compensated automatic voltage regulator with underspeed/overspeed protection function, a control panel, and high ambient temperature cooling system.

The County reiterates the importance of providing a heavy duty generator designed for continuous operation over a multi-week period. As has been learned following major storms and other events of nature, electrical outages can last for protracted periods of time calculated in weeks instead of days. The proposed generators should be designed to continuously operate under full load for a period of up to fourteen days with a fuel tank capacity for seven days of continuous duty at full load.

10.7.1.2 Ratings

Output power rating of the generator shall be based on the load requirements of the Offeror's proposed system equipment complement and shall provide for 100% excess expansion load capacity (above immediate site load requirements). The generator shall be capable of full single-phase output @ 1.0 pf.

Site conditions include the following:

Voltage Regulation: +/- 2% of rated voltage for constant load between no load and full load.

Frequency Regulation: .5% from steady state no load to steady state rated load.

Single Step Load Pickup: 100% of rated output power, less applicable de-rating factors, with the engine-generator at operating temperature.

10.7.1.3 Generator Set Control/Alarms

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The generator shall be a remote start type compatible with the automatic transfer switch to be supplied pursuant to this procurement. Manual starting and stopping also shall be provided from the generator control panel.

Specific generator control functionality shall include the following:

Cranking Control: Generator shall provide a minimum of three cranking cycles of at least 15 seconds before lockout and activation of an overcrank alarm condition.

Generator Protection Controls: (per NFPA 110). The generator shall shut down and lock out upon: (1) failure to start (overcrank), (2) overspeed, (3) low lubricating oil pressure, (4) high engine temperature/low coolant.

Alarms: Individual alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre-warning, high coolant temperature pre-warning, low coolant temperature, low coolant level, utility power failure, generator overcrank shutdown, generator overspeed shutdown, low fuel and an alarm indication when the generator set is running. These individual alarm contacts shall be wired into and shall be reported to the NMS system being supplied pursuant to this procurement. All generator alarm wiring and sensor points shall be implemented and tested by the Offeror to both the interior shelter alarm punchblock and NMS system.

Meters: Meters shall be provided to indicate output voltage, output current, running time, frequency/RPM. An AC rheostat shall be supplied for voltage adjustment.

10.7.1.4 Fuel Supply

The Offeror shall provide a below grade, painted and galvanized steel propane fuel tank for the generator near the equipment shelter and which is easily accessible for refueling. The fuel tank shall provide sufficient fuel to provide not less than three (3) days continuous operation of the generator set at full load under low ambient temperature (0 degrees Fahrenheit). The tank shall be filled completely at the time of final system acceptance. The fuel tank shall provide a visual analog fuel gauge meter or display to identify the available propane fuel level.

The fuel tank and its lines shall be below grade and all fuel lines shall be insulated to reduce condensation at the regulator. Above grade components shall be protected from manmade assault or act of nature. All necessary

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regulators, drip pots, piping, meters, or other supplies needed for an installation which meets local fire and building codes shall be furnished and installed. The Offeror shall provide a full fuel tank at all sites at the time of final system acceptance. The fuel tank and generator shall both be bonded to the site compound single point grounding system using an exothermic connection (Cadweld) of #2 AWG tinned bare copper wire.

10.7.1.5 Exhaust System

A residential grade exhaust silencer shall be installed on the generator for noise suppression.

10.7.1.6 Battery and Charger

A lead acid starting battery rated for the engine type to be supplied shall be furnished and installed with the generator set. This battery shall be float charged by a 10-amp voltage regulated charger, which is powered by 120 volts AC. Float, taper and equalize charge settings shall be provided.

Form-C alarm contacts shall be provided and connected to the shelter alarm and NMS system to report loss of AC power, low fuel level, status of battery charger, and power on conditions.

10.7.1.7 Cooling System

A radiator-cooled engine is required. The radiator shall be filled with a water and coolant mixture in accordance with the engine manufacturer's recommendations. A thermostatically controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations.

10.7.1.8 Housing

The housing/mounting assembly shall be equipped with the proper bushings, springs and anchoring to properly support the generator while actively running. The weatherproofed generator housing shall provide the appropriate exterior screening and shielding to provide rodent control and eliminate rodent/pest access. The complete generator housing shall be bullet-resistant. The generator control panel and all access doors shall be secured by a key lock mechanism to prevent unintended generator access. The generator housing shall provide sufficient protection to the generator and internal electronics in the event of driving rain, hail, and blowing snow conditions.

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10.7.1.9 Foundation

The Offeror shall supply an exterior concrete pad foundation for the generator assembly in close proximity to the prefabricated equipment shelter. A minimum 6-inch concrete slab (or greater) rated at 3000 psi at 28 days installed over compacted soil shall be provided as the design load specifies for the generator. The proposal price for the generator foundation design shall be assumed to be based on presumptive soil conditions. The final foundation design and price shall be determined when the geotechnical report is provided to the Offeror. The Offeror shall meet or exceed the requirements outlined in the latest editions of ACI301 and ACI318 as it pertains to workmanship and materials. Concrete test cylinders shall be properly cast with copies of all test reports being provided to the Offeror's geotechnical engineer for review and analysis. The Offeror maintains complete construction management and engineering responsibility for ensuring that the generator foundation design has been met during the generator deployment process. All field certification and reports shall be provided to the County as performed.

10.7.1.10 Documentation

The following documentation shall be supplied to the County for each generator set and transfer switch supplied or upgraded:

- Specification and data sheets for the exact type and model generator and transfer switch supplied pursuant to this procurement, including all options and accessories
- Manufacturer's certification of prototype testing
- Manufacturer's warranty documents
- Shop drawings showing plan and elevation views of the equipment
- Interconnection wiring diagrams showing all external connections required; with field-wiring terminals marked in a consistent point-to-point manner
- Manufacturer's installation instructions
- Operator's and maintenance manuals that outline routine maintenance and troubleshooting procedures
- Transfer switch manual and wiring diagrams.

10.7.1.11 Warranty

A no-deductible warranty, which provides for on-site 24x7x365 service by a factory-authorized service contractor, shall be provided. This warranty shall provide coverage against all defects in materials and workmanship for a

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period of two years from the final acceptance date of the radio communications system.

10.7.1.12 Start-Up Service

A factory authorized service representative shall provide initial start-up service and shall conduct acceptance testing at each site at which generator equipment is installed. All testing shall be witnessed by the County and test records shall be furnished to the County.

10.7.2 Transfer Switch

An automatic transfer switch, which provides switching of the equipment shelter electrical load between commercial power and generator power, shall be supplied and installed for each generator set. The transfer switch shall be completely factory-assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources. Permanently-attached manual handles also shall be installed on the transfer switch. The switch shall provide positive mechanical and electrical interlocking and mechanically held contacts. Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.

The transfer switch shall be installed in a key-locking, UL-listed, wall-mounted NEMA cabinet. The transfer switch shall be fully wired and integrated with both the stationary exterior engine generator set and the mobile generator hookup receptacle (in case temporary genset has to be placed in service at site) in accordance with local electrical and fire codes.

All transfer switches and accessories shall be UL-listed and labeled, tested per UL Standard 1008 and CSA Approved.

10.7.2.1 General Specifications

Transfer switches shall be double-throw electrically and mechanically interlocked and mechanically held in both positions.

Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.

Form-C contacts shall be provided in each position for alarm reporting purposes to the shelter punchblock and NMS system. These contacts shall be connected and tested to the network alarm system for NMS reporting transfer status.

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The transfer switch shall be continuously rated for operation in ambient temperature ranges of -30 to +60 degrees Celsius. Transfer switches shall be rated to carry 100% of the rated current in the enclosure.

10.7.2.2 Automatic Controls

Transfer switch control shall be solid state and designed for a high level of immunity to power line surges and transients. The device shall be tested in accordance with IEEE Standard 587-1980 (or latest revision). Controls shall have optically isolated logic inputs and isolation transformers for AC inputs. Relays shall be installed on all outputs.

Solid state undervoltage sensors shall simultaneously monitor all phases of the standby power source and the commercial power source. Pick-up and drop-out voltage settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase.

Controls shall be provided with solid-state overvoltage sensors, adjustable from 100-130% of nominal input voltage to monitor the source. An adjustable time delay shall be provided.

Automatic controls shall signal the engine-generator to start upon signal from normal source sensors. A time-delay start, variable from 0 to 5 seconds, shall be provided to avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts, which have been factory wired to a field wiring terminal block.

The switch shall transfer when the emergency source reaches the set point voltage and frequency. A time delay shall be provided for transfer, which is variable from 0 to 120 seconds.

The switch shall retransfer the load to commercial power after a time delay retransfer. This time delay shall be variable (adjustable) from 0 to 30 minutes to avoid short engine run times. The retransfer time delay shall be immediately bypassed if the emergency generator fails.

A control shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting on return to commercial power.

Power for transfer operation shall be from the source to which the load is being transferred.

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Diagnostic indicators shall be provided to allow the last successful step in the sequence of control functions to be pinpointed. The present status of the control functions also shall be indicated. These functions, at a minimum, shall include:

- Source 1 OK
- Start generator set
- Source 2 OK
- Transfer timing
- Transfer complete
- Retransfer timing
- Retransfer complete
- Timing for stop.

10.7.2.3 Front Panel Control Devices

A key-operated selector switch shall be provided which will provide the following functions:

Test - to simulate commercial power loss to allow testing of the generator set with or without transfer of the load

Normal - leaves the switch in its normal operating position

Retransfer - a momentary position, which will provide an override of the retransfer time delay and cause immediate return to the commercial power source (if available).

10.7.2.4 Exerciser Clock

The transfer switch shall be equipped with a digital, electronic exerciser clock which allows setting the day, time and duration of a generator set exercise/test period. Tests under load or with no load shall be selectable.

10.8 UNINTERRUPTIBLE POWER SUPPLY (UPS) SPECIFICATIONS

UPS systems shall be furnished by the Offeror for each of the proposed base station transceiver sites. There shall be no potential for single point failure in the UPS design.

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The proposed UPS system shall have minimum 4-hour battery back-up time assuming the initial and future expansion load criteria and shall incorporate single-phase input and output over current protection and maintenance bypass switch. The system shall be "on-line" ferro-resonant transformer technology or an alternate static Pulse Width Modulated (PWM) technology. The proposed UPS shall be UL 1778 and 1449 listed. Acceptable vendors are Powerware/Best, Liebert, APC, or an approved equivalent. The proposed UPS system shall be capable of battery backup expansion through the insertion of additional battery cabinets or modules.

10.8.1 General Requirements

The Offeror shall design, provide, install, and test a complete and operable UPS system for each electronic equipment shelter to be supplied pursuant to this procurement. Equipment shall be new, compatible with the proposed generators, and factory-tested with all results supplied to the County.

10.8.1.1 Ratings

The proposed UPS shall employ the latest, state-of-the-art, solid-state components incorporating microprocessor based Pulse Width Modulated (PWM) technology or ferro-resonant transformer design. The UPS system shall consist of free-standing cabinets consisting of a rectifier section, inverter section, batteries, isolation transformer, manual synchronized make-before-break bypass switch and input and output over current protective devices. The UPS also shall include all status and alarm displays, a remote interface communicator (typically RS-232 type), control devices, meters, components, cabling and connectors. Alarm monitoring and wiring shall be fully interconnected to both the shelter alarm punchblock and the NMS system.

The UPS and associated components shall be housed in heavy-duty reinforced steel freestanding finished cabinets requiring front access only. Batteries shall be housed within the UPS or, if necessary, matching cabinetry.

The UPS rating shall be based on the load requirements of the Offeror's proposed equipment and shall provide for 100% excess expansion load capacity (above immediate site load requirements). The proposed UPS shall be designed and field-tested by the Offeror to work in concert with the proposed generator equipment so that no power oscillation and unstable load transfer occurs due to UPS/genset incompatibilities.

10.8.1.2 Description and Operation

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The capacity of the UPS solid state rectifier section shall be sufficient to maintain the battery in a fully-charged condition and continuously supply the required load through the inverter while floating the battery.

The proposed UPS system shall not include any switching device or devices which will interrupt the continuity of power in any way.

The output voltage of the UPS shall be maintained within $\pm 3\%$ over the nominal output voltage under any load conditions within UPS rating and ambient temperature range specified.

The UPS sine wave output shall have a maximum of 5% total harmonic distortion over the entire range of output voltage at any load or power factor.

The UPS Automatic Frequency regulation shall maintain the output frequency to within ± 0.1 Hz for all combinations of temperature, input voltage variation and load variation. The UPS output shall not follow the reference source beyond $\pm 0.3\%$ Hz of nominal frequency. When input returns to normal, the UPS shall automatically synchronize to the line frequency.

The UPS components shall be selected to provide sufficient voltage capability and ample current-carrying capacity to furnish reasonable margin for handling over-currents and minor voltage variations. In no case shall components be operated at greater than 80% of the device's maximum steady state rating.

The UPS shall be capable of withstanding, without failure, short circuit currents and surges of magnitude and duration in accordance with ANSI/IEEE Standard C62.41, categories A and B.

The UPS shall be capable of carrying 100% of the rated UPS output current continuously and shall be capable of carrying 150% of rated output current for approximately 10 minutes.

The UPS system transient response shall be $\pm 5\%$ from nominal peak voltage for 100% load step. Voltage recovery shall be within 4 msec. to $\pm 3\%$ of nominal voltage.

The UPS battery system shall be of the lead acid maintenance-free sealed, non-gaseous type with a minimum twenty (20) year life.

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The UPS rectifier shall maintain a DC output voltage regulation of $\pm 1\%$ with a maximum of 2% RMS ripple. The rectifier shall be of the solid-state full-wave SC bridge design to limit AC wave-shape distortion on the power system.

As a minimum, over-current protection (10KAIC circuit breakers or 100 KAIC C. L. Fuses) shall be provided for:

- AC Input
- Rectifier Input
- Inverter Input
- AC Output
- Battery Input.

10.8.1.3 Accessories

The following items shall be mounted on the instrument panel of the UPS cabinet via microprocessor-based LED or equal display (including lights/meters) for the following characteristics:

- Mode Select Switch (UPS Normal, UPS Bypass & Battery Modes)
- Input AC Voltage
- Battery DC Voltage
- Rectifier DC Voltage
- Output AC Voltage
- Output AC Amperage
- Output AC Frequency
- Synchronizing verification
- Low Battery DC Voltage Indication
- Static Switch Position Indication
- Manual bypass Mode Indication
- Float-Equalize Switch/Timer DC Circuit Indication
- % Rated Load Indication
- Battery back-up time available in Minutes.

The following conditions shall have audible and visual alarms in addition to dry contacts to be integrated by Offeror with the County NMS system:

- Low & High Battery Voltage
- Automatic By-pass operation
- Emergency Operation (UPS on Battery)
- Rectifier/Inverter Failure

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- Common Summary Alarm (Form "C").

All external power and control connections shall be terminated on terminal blocks and identified clearly on wiring diagrams for the County's external connections. The UPS shall provide the ability to monitor the battery voltage and overall health of individual batteries/cells with an integrated battery monitoring system to easily identify compromised batteries.

The UPS cabinet and battery cabinet (if not in UPS cabinet) shall be provided with a ¼-inch x 1-inch copper ground bus with mechanical type lug connector to interface to the County's single point grounding system. The UPS manufacturer shall indicate on applicable drawing(s) requirements for neutral-ground bonding per UL Listing qualifying as "Separately Derived System" per NEC Art. 250.

10.8.1.4 Remote Alarms

At a minimum for each UPS, the following alarms also shall be remotely and individually wired and tested by the Offeror to the shelter alarm punchblock and NMS system:

- Over-voltage
- Frequency
- Load Drain
- Battery Normal
- Battery Low
- Summary Alarm
- On Bypass
- Normal/On Inverter.

10.8.1.5 Documentation

The following documentation shall be supplied to the County for each UPS supplied:

- Specification and data sheets depicting dimensions, weight, location of conduit entry, grounding, and wiring requirements and details for bolting assembly frames to floor
- Schematic wiring diagrams showing input and output protective devices and field connections, battery connections, interconnect wiring, controls and instruments
- Manufacturer's certified standard factory test data
- Manufacturer's warranty documents

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- Manufacturer's installation instructions
- Manufacturer's Operating and Maintenance Manuals.

10.8.1.6 Warranty

A no-deductible warranty that provides for on-site 24x7x365 service by a factory authorized service contractor shall be provided. This warranty shall provide coverage against all defects in materials and workmanship for a period of one (1) year from the acceptance date of the radio communications system. All batteries shall be warranted for twenty (20) years on a prorated basis from the acceptance date of the radio communications system. No batteries shall be shipped and installed until the UPS system can be properly integrated into the equipment shelter and commissioned for use/charging.

10.8.1.7 Start-Up Service

A factory authorized service representative working on behalf of the Offeror shall provide all electrical wiring necessary to commission the UPS, conduct an initial start-up service, and shall conduct acceptance testing at each site for which a UPS is installed. A complete load test of the UPS system shall be required which identifies actual field runtimes that meet or exceed manufacturer's specifications for the rated loads. The Offeror also shall conduct field testing of the UPS and generator under full rated load to ensure that complete compatibility between the UPS and generator equipment. All test records shall be furnished to the County.

11.0 SYSTEM ACCEPTANCE TESTING

The Acceptance Testing Procedure (ATP) for all systems shall consist of a series of tests, inspections, and verifications that are generally defined in this section. System acceptance testing shall be conducted at several distinct junctures in the project as the integration effort unfolds. Much of the proposed network shall be tested with County witness both in a factory staging environment as well as the ultimate field environment prior to final system acceptance. A subset of the equipment (e.g., generator, UPS, tower, antennas, fire suppression, tower lighting, transmission line, etc.) shall only be tested with County witness in the ultimate field environment as practical, but all manufacturer factory test data shall be supplied to the County in conjunction with the final field testing.

The ATP testing process shall cover all factory and field testing procedures and those inspections that shall be made in order to show Offeror compliance to the solicitation specifications as well as to define each and every required subsystem interface. All ATP test scripts and testing methodologies are subject to the ultimate approval of the County prior to the conducting of any customer witness testing. This section briefly defines some of the testing requirements, but the final test plans shall not be limited to the guidelines contained in this document. At least forty-five (45) days prior to the conducting of any contractual factory or field functionality testing, the County and Offeror shall finalize the ATP for the equipment or systems under test. Based on field integration developments and scheduling, The County reserves the right to require the Offeror to test or verify the required performance of any subsystem or piece of equipment at any time as deemed necessary by the County. The County requires the Offeror to provide a comprehensive matrix of acceptance test scripts with explanation for factory staging, field staging, and coverage testing phases as part of this response to fully illustrate the depth at which the Offeror typically conducts acceptance testing to guarantee quality.

The County's team and Offeror's representatives shall conduct these acceptance tests and inspections as defined. The results of the tests and the associated punchlist of outstanding items to be completed or re-tested shall be signed by both parties and forwarded to the County for review and acceptance. The outstanding items shall be resolved within seven (7) business days and these items shall be re-tested at no additional expense to the County. If the outstanding items have an effect on other previously performed tests, then re-testing of those tests also shall be included. Final acceptance of each individual subsystem shall include, but not be limited to, the list of tests and inspections contained in the following sections.

11.1 DETAILED DESIGN

The County requires the Offeror to perform a comprehensive detailed design prior to the commencement of any manufacturing or field integration work. The County

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Project Manager will actively participate in the detailed design review of the system implementation with the Offeror, and the County shall provide signature signoff upon completion of this work effort to trigger the manufacturing and field integration process. Completion of the detailed design review process shall take place upon mutual agreement between the Offeror and the County. Detailed design documents shall be supplied to the County in both electronic (e.g., original native file format-MS Word, MS-Excel, AutoCAD, etc.) and paper format. The Offeror shall supply six (6) copies of the detailed design document in paper format and three copies in electronic (CD-ROM) format. The detailed design must include, at a minimum, the following items for every affected County site and network node:

- Network and Subsystem Block Drawings
- Line Item Equipment and Pricing Lists
- Infrastructure, Console, and Network Element Programming Parameters
- Console and MNC/NMS Database Parameters/Design
- Fleetmapping Parameters (Talkgroups, Radio Configuration Personalities, IDs, Features, Templates, GOS, etc.)
- Transport Requirements (Design, DS0, DS1, DS3, STS-n, OC-3 Channelization, Switching Parameters)
- Racking/Floorplan Drawings
- Physical Site Requirements/Facilities/Tower Design
- Power and HVAC Requirements
- MNC and Switch Layouts/Configurations
- Channel Bank and Multiplexer Layouts/Configurations
- Final Coverage and Site Configuration Design
- Final Microwave Path Design and System Availability/Reliability Calculations
- Software Version Control/Equipment Hardware and Software Roadmaps
- Network Timing Requirements/Design
- Antenna Subsystems
- Feature and License Matrices
- Failure Mode Analysis/System Availability
- LAN/WAN Design
- TCP/IP Network Addressing Scheme
- Preliminary Factory and Field ATPs
- Final Coverage ATP
- Preliminary Cutover Plan/Migration Strategy/Downtime Requirements
- Subscriber Equipment Installation Prototypes
- Revised Statement of Work (if modified)

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- Operations, Administration, Installation, and Maintenance Manuals for all subsystems
- Change Orders
- Spares Equipment List and Pricing Matrix.

11.2 SYSTEM STAGING

Any proposed system equipment that is reasonably capable of being integrated in a factory, laboratory staging environment shall be configured and installed in a manner conducive to testing hardware and software prior to being released to the field from the Offeror for installation and optimization. At a minimum, the staging of this equipment shall include: the labeled and pre-cut interconnect cabling, configured and certified software, completed configuration and provisioning databases, operational network backbone connectivity supporting all of the subsystems mentioned in the solicitation specifications, and all interfaces operational to demonstrate a working and fully integrated system.

11.2.1 Factory Staging

The Offeror shall provide comprehensive staging of the proposed equipment at or near the radio Offeror's primary land mobile engineering/manufacturing facility. The factory staging effort shall include all new components, subsystems, certified system software, and ancillary equipment required to complete the entire system, including but not limited to: microwave backbone, channel banks, frequency standards/GPS receivers, voting equipment, base station transceivers, transmitter combiners, receiver multicouplers, controllers, redundancy equipment, MNC and switching infrastructure, networking equipment, dispatch consoles, logging recorder, system management equipment, NMS, alarm systems, programming equipment, interconnect equipment and cabling, simulated legacy equipment, power supplies, etc. A pair of each type and tier of proposed County subscriber radios purchased shall be provided for staging and testing.

At staging, all equipment shall be set up in its ultimate configuration, as it will appear in the designated installation site. The system shall be tested in the staging area in such a manner as to minimize the actual installation and optimization time in the field. The final County system staging as-built documentation shall be available at the time of system demonstration and customer witness. Simulation of any existing County equipment required to demonstrate the system in staging shall be provided wherever possible.

As part of the Offeror's proposal, a sample-staging document defining proposed staging tests shall be provided for County review. This document shall be considered for use in the development of the final factory acceptance test document which shall cover all subsystems, interfaces, required functionality, Offeror

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responsibilities, County responsibilities, staging requirements, test procedures, and documentation required for field release. The staging ATP documentation shall be made available to the County's project manager forty-five (45) calendar days prior to the date of the staging test for County review and refinement.

An example of the topic areas to be analyzed in depth shall include, but not be limited to, the following testing areas which must show conformance to all of the specifications contained in this document:

- Subscriber equipment functionality and performance
- Dispatch console and logging recorder functionality and performance
- MNC Controller and Switching infrastructure functionality and performance
- NMS functionality and performance
- Base station transceiver functionality, optimization, and performance
- P25 and interoperability conformance
- Microwave/fiber backbone functionality and performance
- Failure mode analysis and fallback/reliability testing.

11.2.2 Equipment Cabling

The Offeror shall determine cable lengths between all interconnected equipment and cut cables to length to aid in field installation. Specific cabling shall be plenum rated as determined by site surveys and field analysis. Circuit identification shall be provided on the modular panels and the cabling using customized, circuit-specific labels that are consistent with all as-built documentation.

The use of any conventional, industry-standard type punch block is acceptable. All cabling shall be terminated with appropriate connectors for ease of field installation and shall be terminated to the nearest 1-foot length. All cabling used for system interconnects shall be tested during factory staging of the system prior to shipment to the field. All cable pinouts shall be provided with the staging as-built information.

All cables shall be clearly labeled on both ends with pre-printed (not hand-written) adhesive labels with "To-From" information to clarify interconnection for field installation and maintenance. Cable label information shall directly correlate to system documentation/drawings that define or depict the interconnecting cables (i.e. cable label text shall match drawing text). Cables that are not staged initially but installed in the field shall be equipped with the same cable label information as provided for every cable in staging. Cables that are modified or rearranged in the field shall be equipped with the same cable label information as provided for every

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cable in staging. A spare set of cable labels shall be provided with the final site documentation package as prepared in the field. Hand-written cable label markups is not acceptable.

A description and detailed wiring diagram of each modular panel and wiring adapter utilized shall be provided. The remote site equipment of the system shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming, and equipment configurations shall be completely integrated in the final configuration prior to shipment. Upon arrival to the final destination, the hookup of racks, external power, grounding and antennas to the site equipment should complete the physical integration of the sites and allow the sites to be "on-air" ready. No additional work should be needed to ready the site for operation.

Offerors are to describe in detail the manner in which the entire system shall be factory staged. The County's Project Team shall visit the Offeror's staging facility for the purpose of examining the system and witnessing a comprehensive factory acceptance test. The Offeror shall develop a functional test plan in the prescribed timeframes and schedule this factory visit at the appropriate time prior to field delivery. The County's project manager, prior to the actual test, shall approve the functional test plan. Final system drawings, cabling diagrams, interconnect cabling matrices, rack profiles, as-built photographs, level setting diagrams, software version control matrices, equipment programming and provisioning data, equipment jumpering and strapping, and interconnect diagrams shall be part of the staging as-built documentation and be available for viewing at time of factory staging visit.

11.2.3 Hardware Testing

Each hardware component shall be inspected and tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

11.2.4 Software Testing

Each software feature and version shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

11.2.5 Factory Acceptance and Shipping

At the time that all equipment and subsystems are functioning as designed, the County shall inspect and witness the testing of the equipment as it is staged, cabled, tested, and burned-in per the agreed-upon factory ATP. At the successful completion of the staging demonstration and ATP, a County representative shall approve the shipment of the equipment to the County sites for installation. If the factory demonstration or staging effort fails to meet County's expectations, another

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date for re-testing and customer witness shall be set to repeat the event solely at the Offeror's expense which includes all transportation and lodging costs for the original County project team back to the staging facility. No system equipment, subsystem, or components shall ship from the staging facility without the County's express approval. Shipment can also be delayed if the project schedule has changed and the County requests a shipping delay.

Prior to shipment from the staging facility, all software/firmware version numbers, jumper configurations, and equipment programming data shall be recorded by the Offeror and recorded in the staging as-built documentation for verification in the field. An as-built manual shall be produced for each network site or node. Any changes to the system following shipping shall be properly recorded and updated in the final field as-built documentation in a manner consistent with the original staging as-built document. The use of hand-written labeling on equipment firmware is unacceptable.

11.3 FIELD ACCEPTANCE TESTING

At the time that all equipment and subsystems are functioning as designed in the field, the County shall inspect and witness the testing of the equipment as it is field-installed, cabled, tested, and burned-in per the agreed-upon field acceptance ATP. If the field ATP fails to meet County's expectations, another date for re-testing and customer witness shall be set to repeat the event solely at the Offeror's expense which includes all logistical costs to reproduce the field ATP. The County's team and system Offeror's representatives shall conduct these acceptance tests and inspections as defined.

The results of the tests and the associated punchlist of outstanding items to be completed or re-tested shall be signed by both parties and forwarded to the County for review and acceptance. The outstanding items shall be resolved within seven (7) business days and these items shall be re-tested at no additional expense to the County. If the outstanding items have an effect on other previously performed tests, then re-testing of those tests also shall be included. Final acceptance of each individual subsystem shall include, but not be limited to, the list of tests and inspections contained in the following sections.

The acceptance testing for all systems shall consist of a series of tests, inspections, and verifications that are highlighted in this section. The ATP shall cover all field testing procedures and those inspections that shall be made in order to show Offeror compliance to the solicitation specifications as well as define each and every required subsystem interface.

All system equipment that comprises the proposed network shall be configured and installed in a manner conducive of testing hardware and software prior to beginning

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the field ATP. All optimization procedures shall be executed prior to conducting the field ATP and the final as-built documentation shall be complete and ready for County review.

An example of the topic areas to be analyzed in depth in the field shall include, but not be limited to, the following testing areas which must show conformance to all of the specifications contained in this document:

- Subscriber equipment functionality, programming, and performance
- Dispatch console and logging recorder functionality and performance
- Legacy mutual aid interface infrastructure functionality and performance
- MNC Controller and Switching infrastructure functionality and performance
- NMS functionality and performance
- Base station transceiver functionality, optimization, and performance
- Antennas and transmission line functionality and performance
- Coverage design verification
- Site facilities functionality and performance (e.g., generators, UPS, tower lighting, HVAC, shelter alarms, fire suppression, grounding, etc.)
- P25 and regional interoperability conformance
- Microwave/fiber backbone functionality and performance
- Failure mode analysis and fallback/reliability testing.

11.3.1 System Testing Acceptance Sequence

Field system testing acceptance shall take place in the following sequence:

- Notification by the Offeror that the field installation is complete and site as-builts ready for review
- Completion of inspections by the County Project Manager
- Notification by Offeror that final punchlist is resolved and approved by the County and field acceptance tests can commence
- Microwave transport system testing
- Hardware functionality and performance acceptance tests
- Software functionality and performance acceptance tests
- Interconnect testing
- Coverage acceptance test
- All testing punchlist and re-test items corrected and resolved by Offeror
- 45-day system reliability performance test

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- Offeror provides draft system acceptance test report
- Acceptance test results approval granted by the County Project Manager
- All project deliverables and final as-builts received by Offeror
- All implementation phase punchlist items resolved to County satisfaction.
- System testing acceptance granted by County.

11.3.2 Hardware Testing

Each hardware component shall be inspected and tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

11.3.3 Software Testing

Each software feature shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

11.3.4 Interconnect Testing

Interconnects are defined as the electrical connections between two subsystems; for example, the connection between a channel bank and the microwave multiplexer. Each system interconnect shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

11.4 MICROWAVE TESTS AND INSPECTION

The acceptance testing for all microwave backbone system equipment shall consist of a series of tests, inspections, and verifications that are highlighted in this section. The County's representative and the Offeror's representative shall conduct these tests and inspections as defined in the ultimate Acceptance Test Plan (ATP).

The microwave factory acceptance testing shall include simulated system conditions for hop-to-hop and end-to-end BER measurements and availability calculations. The field acceptance testing shall consist of actual path measurements to ensure compliance with system design requirements. Factory NMS testing shall simulate conditions of operational systems. The field acceptance testing shall consist of actual operational conditions. The tests and inspections listed in the following paragraphs shall be performed. Final Acceptance of each individual microwave line, section, and path shall include, but not be limited to, the following list of tests and inspections.

11.4.1 Microwave Factory Acceptance Testing

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The following tests, in addition to other standard manufacturer's test procedures and any County-required tests, shall be performed. Complete documentation of factory acceptance testing shall be delivered with each microwave terminal.

11.4.1.1 DC Power Supply Checks

Verify all DC power supply voltages in accordance with published specifications.

11.4.1.2 Perform/Verify Complete Terminal Provisioning

Provision microwave terminal and associated multiplexer in accordance with proposed County network.

11.4.1.3 Receiver Checks

- Frequency
- Sensitivity
- AGC Calibration
- Alarm Adjustments/Verification

11.4.1.4 Transmitter Checks

- Frequency
- Power

11.4.1.5 Transmission Tests

- Orderwire Levels
- Modem Alignment
- Elastic Store Alignment
- Reverse Channel Switch (MHSB only)
- Alarms/Protection Switching
- Trunking System/Ring Switching Interconnection & Timing

11.4.1.6 DS1 Data Transmission Tests

Utilize a BER test set to verify minimal 24-hour error-free operation of every OC-3, DS1, and Ethernet facility.

11.4.1.7 Burn-In

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Following the completion of all preliminary testing, the Offeror shall perform temperature cycling tests of each complete radio hop in accordance with manufacturer's published procedure.

11.4.1.8 *Post Burn-In Tests*

- RF Power Adjustment and APC Calibration
- Transmit Insertion Loss
- PA Monitor Calibration
- APC Hop Tests
- Receiver RSL Threshold and Voltages, AGC Curve Generation
- Receiver Switching Tests
- Common Loss Switching Tests
- Alarms Checks
- Local and Remote Terminal Monitor Operation
- Radio Command Path Operation
- Orderwire Check
- NMS Integration and Diagnostic Functionality

11.4.1.9 *Final Adjustments*

- Label Verification
- LO Frequency Adjustments
- Strapping/Configuration Verification

11.4.2 *Microwave Field Acceptance Testing*

The following tests, in addition to other standard manufacturer's test procedures, must be performed. Complete documentation of field acceptance test results shall be provided to the County upon completion of testing.

11.4.2.1 *Path Alignment*

- The Offeror shall be responsible to perform microwave dish alignments for all microwave paths
- Dishes shall be aligned for maximum AGC level
- The Offeror shall provide all material, equipment, and personnel required to perform path alignments in accordance with path design criteria.

11.4.2.2 *Installation Inspection*

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Inspection of the completed microwave network equipment installation shall be performed to ensure compliance with standards set forth in final contract.

11.4.2.3 Sweep Waveguide

- Antenna waveguide shall be swept and plotted in accordance with manufacturer's specifications
- Measured return loss shall be a minimum of 23 dB.

11.4.2.4 Waveguide Pressurization Verification

- Antenna waveguide shall be pressurized in accordance with manufacturer's specifications
- Waveguide leak down tests will be performed to ensure leak rate does not exceed manufacturer's specifications.

11.4.2.5 Power Plant Tests

- Measure and record individual cell and power plant total output voltages
- Measure specific gravity of wet cell systems
- Set float and equalize voltages on charger
- Set and verify alarm thresholds on charger in accordance with manufacturer's specifications.

11.4.2.6 DC Power Supply Voltage Checks

Verify all DC power supply voltages in accordance with published specifications.

11.4.2.7 Transmitter Checks

- Measure and record Transmit Power
- Measure and record Transmit Frequency
- Verify operation of APC
- Compare measured values to Factory Test Records.

11.4.2.8 Receiver Checks

- Measure and record RF receiver local oscillator frequency
- Measure and record IF frequency
- Verify error-less receiver switching
- Verify space diversity receiver switching as applicable

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- Compare measured values to Factory Test Records.

11.4.2.9 Protective Switching Tests

- Verify protective switching operation, as applicable, for associated module failure
- Verify operation of reverse path protection, as applicable
- Measure reframe time and frame-lost seconds.

11.4.2.10 Alarm Checks

- Verify individual alarm reporting for module faults, as applicable.

11.4.2.11 Radio Loop Back Checks

- Verify radio loopback capabilities, as applicable (local and remote IF, local and remote RF, etc.)
- Loopbacks shall be performed with a BER test set for 15 minutes and results recorded.

11.4.2.12 Fade Test

- Simulate path fade by use of a variable attenuator and BER test set
- Measure and record AGC voltages and RSL at BER thresholds of 10^{-6} and 10^{-3}
- Compare measured values to Factory Test Records and Path Calculation sheets
- Measure and record T/I ratios in both directions on each path.

11.4.2.13 Bit Error Rate

- BER test is to be performed for 24 hours on each microwave hop
- Test to be performed 12 hours on A side and 12 hours on B side, if applicable
- Unfaded RBER shall be $<10^{-13}$
- Record results.

11.4.2.14 Multiplex Checks

- Verify OC-3, DS1, and Ethernet facility operation using BER test set at DSX demarcations at origination and termination points
- Verify that synchronization is maintained on each facility equipped or unequipped.

11.4.2.15 Synchronization

- Verify operation of synchronization network in normal and backup operating modes
- Measure timing jitter on a representative number and length of DS1 paths
- Inject timing jitter into a representative number and length of DS1 paths to verify input jitter accommodation in accordance with Bellcore TR-TSY-000499.

11.4.2.16 Delay Measurements

- Delay measurement testing to be performed following integration of microwave and RF radio systems
- Tests to be performed on a representative number and length of DS1 and/or DS0 paths.

11.4.2.17 Alternate Route Tests

- Verify automatic alternate route switching with uninterrupted radio system traffic.

11.4.2.18 Audio Quality

- Audio quality measurements shall be performed following integration of microwave and RF radio systems per the RF radio manufacturer
- Tests shall be performed on a representative number and length of DS1 and/or DS0 paths.

11.5 RF COVERAGE ACCEPTANCE TEST PLAN

The purpose of this RF Coverage Acceptance Test Plan (CATP) is to verify, through in-place testing, that the delivered radio system meets the performance specifications required under this solicitation. This section establishes the requirements with a generic, Offeror-independent methodology. The Offeror shall submit the appropriate and source-peculiar details in its offering to permit evaluation of compliance with this section.

Successful passing of the coverage portion of the ATP shall consist of a talk-out/talk-in (TO/TI) audio quality evaluation in addition to a minimum signal strength measurement. For all proposed service areas and operational characteristic/attenuation settings, both audio quality and signal strength tests must pass for each test location/grid to be considered a “Pass.” This coverage testing

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shall only pertain to the primary 800 MHz (700 MHz capable) trunking radio system and every associated transmission system. Grids with in-building tests must also satisfy the in-building testing requirements as defined below for the grid to be considered a “Pass.” Consistency of performance amongst all site transmission systems shall be tested and verified.

This CATP shall not only verify compliance with the RF coverage requirements but also shall concentrate on the identification of locations where coverage does not meet the requirements. CATPs are generally developed to validate the accuracy of the Offeror’s propagation model and utilize statistical methods that do not take into account in-band interference levels similar to those found in the County. With the knowledge of the locations where coverage is not compliant with the solicitation, the County can take alternative action to have the Offeror enhance coverage within these locations or document those locations and provide this information to the emergency personnel responsible for those areas.

The CATP shall consist of the following tests for all proposed antenna systems utilizing the specified behavioral and operational guidelines of radio usage as defined previously in this specification:

OON-STREET TESTING INCLUDES:

- Appropriate On-street Signal Strength Levels
- TO/TI Audio Quality Test
- Continuous Audio Quality Monitoring Test
- Continuous Receiver Desensitization Test
- Noise Floor Measurements.

IN-BUILDING TESTING INCLUDES:

- TO/TI Audio Quality Test for all Critical buildings
- In-building Signal Levels for all Critical Buildings appropriate for the system proposed
- Signal Levels and TO/TI Audio Quality Test with attenuated portable for the specified in-building coverage service areas described in 3.1.

11.5.1 Test Teams

The test teams shall consist of County representatives and Offeror representatives. There shall be at least one test team located at the County Sheriff’s Primary Dispatch Center and multiple test teams in the field. The County shall provide the

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drivers for the vehicular testing as well as participants for the critical in-building testing process. The driver shall only be responsible for the proper and safe operation of the vehicle and shall not participate in the audio quality testing. All navigation directions shall be the responsibility of the Offeror's representative and is expected to be provided via the automatic computerized signal measurement system.

Each member will classify a transmission as a "Pass" or "Fail". Then the test team must reach a consensus as to whether the test point is a "Pass" or a "Fail" in the event the message classification is not unanimous. When the talk-out test is conducted, the dispatch operator will state the following message: "*Dispatcher to Portable Team. Grid Number #.[Random Test Language]. Grid number #, How do you copy grid number #?*" When the talk-in test is conducted, the portable operator will state the following message: "Portable Team to Dispatcher. Grid Number #. [repeated Random Test Language]. Grid number #, How do you copy grid number #?" Each team member will then classify the message as "Pass" or "Fail". The speakers shall speak the test messages as clearly as possible and occasionally incorporate voice inflections characteristic of typical police and fire emergency transmissions. Tests may be repeated at any or all grids as determined by the County to reflect any differences between male and female voice characteristics.

The test language to be used shall be mutually agreed upon between the County and the Offeror prior to testing. The County shall provide a list of potential test messages representing commonly used dispatch language, void of acronyms, and not to exceed 10 seconds in length, for evaluation. From the potential list of messages, one hundred shall be selected as the pseudo-random messages to be used for testing purposes. The phrase to be used during each test will be determined by the speaker. The final list will be determined prior to testing.

11.5.2 Test Equipment and Apparatus

The basis for this RF coverage design is a portable-on-street and portable-in-building design. Therefore, the Offeror shall execute the RF Coverage Test utilizing the *portable radio operating configuration* specified in this solicitation. It is understood that de-rating of the test portable is required to simulate the portable-on-street and portable-in-building design criteria for the appropriate test locations. The Offeror shall thoroughly describe and quantify any required de-rating of the test portable for accurate simulation, and the Offeror shall field verify, with County witness, all intended attenuation settings to demonstrate consistency between the intended de-rating and actual in-building loss conditions with the chosen operating configuration.

The Offeror shall be required to provide all test equipment associated with the CATP processes including all portable and mobile radios. These test radios shall

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ultimately be transferred to the County as part of its subscriber unit inventory. The radio equipment shall be configured with the most current software and firmware available at the time of testing. For in-building testing, this equipment shall include a test backpack system or mobile cart system, as appropriate. For on-street testing and simulated County 12 and 16 dB in-building testing, this equipment shall include any materials and equipment required to modify a standard vehicle such as DC to AC power inverters and the test equipment cabinet. The Offeror is required to install all test equipment and apparatus in the test vehicles with no damage and restore the vehicles to reasonable condition upon completion of testing. The Offeror shall verify proper calibration for all equipment utilized during the CATP and all test records and relevant data shall be provided to County in both paper and electronic format.

11.5.3 Test Vehicle

The County shall provide all vehicles required for the coverage testing. It is anticipated that the standard test vehicle shall be sufficient to hold the test cabinet and equipment as well as team members plus sufficient room for occasional observers. The same vehicle types and equipment installation configuration shall be used throughout the CATP so that a consistency of data is ensured.

11.5.4 Continuous Receiver Desensitization Test

The Offeror shall perform a continuous receiver desensitization test to identify any excessive interference or noise floor degradations that would impact the coverage margin requirements. This test can be used to identify intra-system interference, inter-system interference, co-channel interference and the more prevalent interference from in-band cellular systems. *The results or the impact of this test is not a part of the pass/fail acceptance criteria.* Since the impact of this interference is only applicable to receiver operation on the street, this data will only be accumulated for the on-street portion of this CATP. In the event that interference is revealed that is in excess of the Offeror's system design margins and assumptions, the County and Offeror shall investigate the source in order to mitigate the impact. The Offeror is required to assist the County as required in order to identify, characterize, and isolate the source of interference at these locations. The test data shall include the following information for each location measuring receiver desense greater than 6 dB. Only information available, on-site signage, and other methods of identification from outside the facility fence shall be required. No other effort need be expended in order to obtain the following information:

- Location Information (Latitude/Longitude by GPS)
- Basic Geographical Address
- Basic Information on any cell sites in close proximity
- Wireless Carriers co-located on site

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- Site Owner or Operator Identification
- Desired Signal Strength in dBm
- Measured Receiver De-sense in dB
- Three channels 500 kHz apart.

11.5.5 RF Signal Level Measurement and Bit Error Rate (BER) tests

The signal measurements test portion of the CATP is required in order to verify that the Minimum Received Signal Level (MRSL) is present in the specified number of test tiles, thereby proving that the coverage prediction model for each service area is accurate. This test verifies the Service Area Reliability of 95%+ for all required service areas, operating conditions, and County requirements.

The test shall utilize a GPS-based computer automated signal measurement system tuned to channels keyed on every transmission system at each site that will average the carrier signal over a 40 wavelength sample, one sample per test tile. This test shall be utilized for both on-street, 12 dB and 16 dB service area testing. The testing of all Critical buildings shall not require GPS based signal measurement. BER data also shall be collected for information purposes for every transmission system at each site utilizing the GPS-based computer automated signal measurement system. The signal strength and BER data for each transmission system under test shall be collected, archived, and provided to the County on a daily basis during the CATP for each test location/grid in a *.csv (comma separated value) file format noting specific channel number, mean Lat/Lon, median Lat/Lon, grid number/coordinate, mean SSI in dBm, median SSI in dBm, mean and median BER, and SSI standard deviation.

11.5.5.1 Determination of Number and Size of Test Tiles

The Offeror shall ascertain the statistically correct number and size of test tiles. Consistent with this section, the County clearly requires square or rectangular grids or tiles to be defined. Tile sizes shall be 1/4 mile x 1/4 mile in dimension or greater.

The product of these computations will be a test tile definition as to number and size for the coverage area. In all cases, consistent with TSB-88.3-C §5.2.1, Estimate of Proportions, a confidence level not less than ninety-nine percent (99%) shall be utilized. The Offeror shall provide the proposed grid maps and overall number of grids for all respective service areas that form the basis for the Offeror's methodology to be utilized during the CATP.

11.5.5.2 Reciprocity and System Balance

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Under normal circumstances, a 800 MHz (700 MHz capable) system that is properly designed with high-gain tower-top amplifier systems and effective receiver voting will be talk-out limited in performance, that is, a portable that can “hear” the system will likely be successful in accessing the system. With this in mind, a talk-in RF signal measurements test would not be cost-effective. In order to eliminate this portion of the test, the Offeror shall provide a TO/TI signal analysis followed by field verification with this proposal which shall prove that all radio sites are indeed balanced from a TO/TI perspective. The tower-top amplifier analysis shall include a Noise Figure Calculation and multicoupler Inter-Modulation Rejection (IMR) Performance Calculation. This analysis is critical to show system design balance is feasible without sacrificing receiver sensitivity or exposing the receiver to intermodulation interference. A signal flow diagram is required that will outline the signal flow from base station transmitter to portable receiver port and portable transmitter to base station receiver port. All gains and losses along the path are to be shown. If the Offeror utilizes other signal processing that results in overall improvement in audio or signal quality, these enhancements should also be characterized and included in the calculations.

11.5.6 Talk-Out and Talk-in Audio Quality Test

“The delivered audio quality (DAQ) for digital and analog units must meet or exceed the DAQ 3.4 as per TIA Standard TSB-88-C, which is defined as “Speech understandable with repetition only rarely required. Some Noise/Distortion”.

“Rarely” shall be quantified as not greater than 10% re-test. This means that a maximum of 10% of all the grids to be tested for that service area shall be allowed a repeated transmission within three feet of the original test location and shall be identified as a “pass-retry”. If the message meets or exceeds this criterion, as agreed by a majority of the test team, it shall be considered “passed”. If the message does not meet this criterion, as agreed by the majority of the test team, it shall be considered “failed”. The Offeror may then move no more than three feet in any one direction and repeat the audio test once. If this re-test meets or exceeds the original criterion, the tile is considered a pass and is recorded as a “retry-pass”. The test team may then move to the next test point. System access shall be reliable and per specified channel access timeframes within each test grid for the grid to be considered “passed” throughout all CATP service areas under test.

11.5.7 In-Building Tests

11.5.7.1 Critical Buildings

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As part of the initial system design and proposal response, the Offeror shall conduct a predictive analysis of all Critical Buildings based on the Critical Building List contained in the Appendix A of this document. Critical Buildings are all of those facilities that require mandatory 95% or greater coverage reliability on the ground floor and all above ground floors and in some cases floors below the ground floor. The Offeror shall test all Critical Buildings for signal strength and for talk-out and talk-in audio quality during the CATP. The specification requires all Critical Buildings to provide 95% or greater in-building coverage reliability for both signal strength and audio quality. Should a Critical building fail to demonstrate adequate communication in 95% or more of its interior test locations, then that building shall be identified as a “failed” building.

The number of test points on each floor shall be agreed to by both the County and Offeror to validate the 95% coverage criteria. At a minimum, the four corners of each floor plus the center of each floor shall be tested. Stairwells, elevators, and below-grade areas are to be included in the testing methodology, but elevators and below-grade test points are not subject to be counted in the building reliability calculation.

The Offeror shall take corrective action to meet the in-building coverage requirements of the failed building and re-test the building. In order to constitute acceptance, no Critical Buildings tested shall fail. Corrective action, system redesign, or the deployment of in-building solutions to remedy and re-test a coverage deficiency of a Critical building shall be at no cost to the County.

The Offeror shall take corrective action to meet the in-building coverage requirements of the failed building and re-test the building. In order to constitute acceptance, no more than 5% of the area of any critical building tested throughout the County shall fail. This corrective action shall be at no cost to the County, for corrections or re-testing of the coverage ATP.

11.5.8 Inaccessible Test Grids

Grids that are considered inaccessible by the test vehicle shall be discarded from the reliability calculations for RF coverage acceptance and neither counted as neither a pass nor a fail.

11.5.9 CATP Submittal

The Offeror shall prepare and submit a detailed outline of the CATP with its proposal. This outline shall conform to the specifications set forth herein and shall

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be in sufficient detail that it may become a definitive section of the resulting contractual agreement once agreed to by the County.

11.5.10 Forms of Testing

The CATP shall consist of multiple forms of testing generally described as Automated Signal Strength ("Automated"), Talk-Out/Talk-In Delivered Audio Quality ("DAQ"), Continuous Audio Quality ("Audio Quality"), Noise Floor, and Subscriber Receiver Desense ("Desense") testing. Successful completion of all forms of testing is required as a part of system acceptance testing. In each and every instance, however, DAQ testing and BER testing shall prevail as the determining criteria in the derivation of specific service area coverage reliabilities in order to gauge the Offeror's compliance with the coverage specifications and shall constitute coverage acceptance.

11.5.11 Schedule

Coverage acceptance testing shall be scheduled by mutual agreement as soon as practical following commissioning and testing of the Fixed Network Equipment ("FNE" or "Backbone"). All contractual coverage testing shall occur while the forestation in the coverage area exhibits a full foliage condition (beginning of May through September).

11.5.12 Coverage Testing as a Part of Final System Acceptance Testing

RF Coverage Testing is a subset of total final system acceptance testing. Once the Offeror has completed testing in accordance with the approved CATP and the CATP results are accepted by the County, the Offeror shall have satisfied all RF system CATP elements required for final system testing acceptance so long as the requirements set forth in this section continue to be met.

11.5.12.1 FNE Integrity

The FNE must remain essentially unmodified from the configuration which existed at the time of CATP, continuing through successful completion of final system acceptance testing.

11.5.12.2 RF System Configuration

The RF system actually tested must remain essentially unmodified from the configuration which existed at the time of CATP, continuing through successful completion of final system acceptance testing.

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11.5.12.3 Documentation

The Offeror shall provide all CATP test data in final report fashion to the County for review. The final CATP test report shall include all measured data in paper and electronic format, final coverage maps noting Pass/Fail for each test location/grid for all transmission systems and service areas, final coverage maps indicating retry metrics, In-Building test reports and test log sheets, final map noting all inaccessible grids according to the coordinate grid structure, final coverage maps noting SSI and BER data according to the coordinate grid structure, final coverage maps noting receiver desense and noise floor data according to the coordinate grid structure, and final talk-out/talk-in coverage modeling maps using measured field data to calibrate or discipline the original modeling projection to portray as-built coverage conditions for each transmission system and service area.

11.5.13 Remedies For Coverage Failure

Remedies for coverage failure shall address the entire problem area and not be limited to correcting a portion of the failed area. Remedies may not degrade areas of coverage that were previously accepted. A retest of coverage shall be conducted in any area (previously failed or not) potentially affected by the remedy in order to verify that the composite coverage is maintained. All remedies must meet the performance, feature-functionality, and reliability requirements of the specification. These remedies may include the following:

- Modification of antenna or transmitter configurations, as long as those modifications comply with regulatory and zoning restrictions placed on the County, at no additional cost to the County.
- Complete integration of remote simulcast sites or multi-cast sites, at no additional cost to the County.

11.6 45-DAY RELIABILITY PERFORMANCE TEST

Upon completion of cutover, a complete system performance reliability test shall be executed that will consist of 45 consecutive days of uninterrupted system operation. During this test period, the Offeror shall keep detailed records of any failures or adjustments of the system or subscriber units.

The specific parameters governing the pass/fail criteria of the 45-day reliability test shall be determined by mutual agreement between the Offeror and the County at least ninety (90) days in advance of the reliability test period. The test shall be considered a failure if any of the following events occur and the test will be repeated from the beginning, at the discretion of the County at the sole expense of

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the Offeror. At a minimum, the proposed system or any subsystem experiences a significant failure that results in:

- Failure or loss of any 25 features, functions or capabilities
- Failure of MNC system control equipment
- Failure of site control and transport equipment
- Failure of 20% of the channel assets anywhere in the system
- Failure of two or more dispatch console positions
- Failure of logging recorder
- Loss of coverage due to orphaning of site
- Failure of same device two or more times during the reliability performance test
- Failure to restore a non-critical failure, as defined in the warranty section of this solicitation, according to the contracted response time.

11.7 AS-BUILT DOCUMENTATION

The County requires the Offeror to deliver a comprehensive as-built design package prior to the final system acceptance process. Completion of the system documentation process shall take place upon mutual agreement between the Offeror and the County. As-built design documents shall be supplied to the County in both electronic (e.g., original native file format-MS Word, MS-Excel, AutoCAD, etc.) and paper format. The Offeror will supply six (6) copies of the as-built design document in paper format and three copies in CD-ROM electronic format. The as-built design documentation must include, at a minimum, the following items for every affected County site:

- Network and Subsystem Block Drawings
- Comprehensive Equipment Lists/Inventory
- Infrastructure, Console, and Network Element Programming Parameters
- Console and MNC/NMS Databases/Provisioning Parameters
- Fleetmapping Parameters (Talkgroups, Radio Configuration Personalities, IDs, Features, GOS, etc.)
- Transport Requirements (Design, DS0, DS1, DS3, STS-n, OC-3 Channelization, Switching Parameters)
- Scaled Racking/Floorplan Drawings
- Physical Site Requirements
- Power and HVAC Requirements
- MNC Controller and Switch Layouts/Configurations
- Channel Bank and Multiplexer, Multiplexer, Layouts/Configurations
- Channel Bank and Network Element Programming Images/Scripts/Configurations

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- Network Timing Requirements/Design
- LAN/WAN Design
- TCP/IP Network Addressing Scheme
- Network Traffic Utilization/Bandwidth Consumption/Throughput Assessment for Each Network/Quality of Service/Packet Loss Metrics
- Completed Testplans and Results
- Final RF Propagation Coverage Maps for all Configurations
- Antenna and Transmission Line Mounting Locations/Azimuths/Tower As-Built
- Equipment Configuration, Installation, Administration, Maintenance, Troubleshooting Manuals (both OEM and Offeror equipment)
- Password Matrix for all Network Elements and Equipment
- Level Setting and Optimization Documents/Procedures
- Equipment Jumpering/Switch Setting/Board Version Documentation
- Software Version Control Matrix
- Cabling/Interconnect Wiring Matrices and Spare Cable Labels
- Punchblock Wiring Matrices
- PSTN Circuits/Interfaces
- Training Guides
- Change Orders
- Meeting Minutes
- Spares Equipment List.

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12.0 SYSTEM SHIPPING AND INSTALLATION

The Offeror is responsible for the shipping, unloading, permitting, storage, and installation of all proposed equipment. The following paragraphs describe the details of the Offeror's logistical responsibilities.

12.1 SHIPPING

The Offeror is responsible for providing safe and legal transportation and delivery of all materials provided within this specification from the place of origin to designated locations within the County. No equipment shipments shall be made without the approval of the County.

All packaging of material shall conform to good packing practices to protect against any possible shipping damages. Deliveries shall be made to ensure that the system is installed to meet the County's critical dates as defined in the final implementation schedule.

The Offeror shall indicate how equipment or systems shall be delivered (i.e. identifying the carrier and method of transport) and will notify the County's Project Manager of shipping dates. The County's Project Manager shall be informed of any changes in shipping dates. All bills of lading and shipping information shall be archived and provided to the County Project Manager. The Offeror shall create a comprehensive system inventory database of all equipment and associated serial numbers to supply to the County in both native electronic file format and paper copy.

Title to and ownership of the equipment shall remain with the Offeror until the equipment is delivered, successfully installed, operational, tested for use at the radio site as characterized in the Acceptance Test Plan, and accepted by the County.

Charges for freight express, cartage, or packing shall not be allowed or paid by the County unless otherwise expressly stated by the County. Every package, bill of lading, shipping memorandum, and invoice must be marked with a purchase order number of the purchaser. An itemized delivery ticket, bearing the County's purchase order number must be left with the goods to ensure their receipt. If a carrier makes delivery, an itemized delivery ticket must be attached to the outside of the package.

12.2 RADIO SYSTEM SHELTER/EQUIPMENT ROOM INSTALLATION

All installation work performed shall be in accordance with laws, regulations, and ordinances of all state, county, local, and federal agencies. The Offeror shall provide all the necessary personnel, tools, equipment, and transportation for the

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successful installation of all equipment provided under this solicitation procurement.

The Offeror (and any subcontractors) performing the installation shall be required to provide a Certificate of Insurance indicating the coverage limits as outlined by the County. The Offeror shall bear responsibility for the safety of its workers and all others during the implementation phase of this solicitation contract.

The Offeror is responsible and shall provide all the hardware, training, and supplies necessary for the proper and complete installation of their equipment. The Offeror bears sole responsibility for providing a turnkey installation of all proposed equipment. Optimization, troubleshooting, and adjustment of each subsystem shall be the Offeror's responsibility. This responsibility includes any changes and/or additions to the systems in order to meet performance criteria. Any additional equipment required after the proposal is awarded to meet the system performance criteria of the defined standards and/or specifications will be at the sole expense of the Offeror unless the County authorizes a change order.

All existing radio communications systems shall remain fully operational during installation of the new radio systems and until the County decides to decommission legacy gear. Because existing systems support public safety operations, interruptions in service due to Offeror or Offeror activities cannot be tolerated. If interruptions in service are deemed by the Offeror to be unavoidable, written notification detailing the nature and duration of such interruptions shall be provided in advance of the disruption to the County for review and approval.

Equipment shall be installed in a neat and highly professional manner, in accordance with good practice, by competent technicians or mechanics. Personnel designated by the County shall provide inspection and approval of all installations. Such approval shall be limited in scope to the specific subsystem physical installation, and shall not be construed to imply full acceptance of the system or subsystem.

Subcontractors performing installations of any equipment or any subsystem shall be identified in the Offeror's response. All subcontractor installation experience and qualifications (with at least three different customer references) to perform the tasks associated with this procurement shall be outlined in the proposal response.

Notwithstanding the details presented in these specifications, the Offeror bears responsibility to verify the correctness of the material lists and suitability of devices proposed to meet the intent of the specifications. The Offeror shall be responsible for providing or arranging for all parts necessary for the equipment and its installation, up to and including final system acceptance.

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The Offeror, without any claim for additional payment, shall provide any equipment or parts required to provide a complete and operational system, and not specifically mentioned herein. It shall be understood that the final contract and agreement contemplates and requires the "turnkey" construction and installation of a completely operational system, which meets the standards of the County. In concert with all specifications and functional requirements outlined in this specification, the Offeror shall deliver the appropriate intra-system physical, logical, and functional interfacing necessary to deliver a complete and fully functional network.

12.2.1 Equipment to be Installed

At a minimum, the Offeror shall install the following system equipment on and into the appropriate equipment shelters and equipment rooms:

- Radio Base Station Transceivers
- Antennas and Transmission Systems
- Combiners and Multicouplers
- Radio Switching and Routing Equipment
- MNC, Controller, and NMS Equipment
- Dispatch Consoles/Logging Recorder/Furniture
- Channel Bank Equipment
- Microwave Backbone and Multiplexer Equipment
- Power Supplies
- Environmental Control Equipment
- Emergency Power Systems
- Equipment Racks
- Interconnect Cabling/Demarcation Blocks/Equipment
- Lightning and Surge Protection/Grounding Connections to Site Ground.

All equipment racks shall be mechanically bonded to the equipment shelter's internal ground system using green insulated stranded copper wire. All ground connections are to be made with minimum length conductors and vertical or horizontal runs where possible. Ground conductors shall have a minimum-bending radius of eight (8) inches. Ground conductors routed in cable trays parallel with transmission lines, telephone lines, power lines, etc., shall be separated by a distance of more than 6 inches. End-to-end cable routing diagrams shall be supplied for all shelter and equipment room installations.

The Offeror shall install any additional equipment not included in the list above that is required for a complete and fully functional system. The Offeror shall coordinate

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with any landlords/site owners for all installations in shelters or equipment rooms not owned by the County.

12.3 DISPATCH CONSOLES

12.3.1 General

The installation of the new dispatch consoles and associated equipment shall be provided by the Offeror at all designated locations. The Offeror shall supply and install all required punchblocks, terminal strips and interconnect cables needed to interface the new console electronics to the new or existing facilities such as radio equipment, telephone equipment, logging recorder equipment, and auxiliary function and control circuits.

All new console cabling, including those which are to terminate at the existing punchblocks, shall be labeled with pre-printed adhesive cable labels. The markers shall be placed at each cable end, adjacent to the connector or plug. All cables and/or cable bundles shall be hidden from view and will be neatly secured by means of plastic tie wraps. End-to-end cable routing diagrams shall be supplied for all shelter and equipment room installations.

All cabling to the operator positions and to console electronic equipment shall be provided with sufficient slack to permit movement of at least ten (10) feet in any direction, especially as it pertains to console workstation furniture capable of being raised or lowered by a dispatcher.

12.3.2 Physical Interface Requirements

At a minimum, the Offeror shall be responsible for all physical interface(s) between the radio system, communications consoles, and ancillary equipment.

The physical interfaces are expected to include, at a minimum, the following:

- Wire connections from telephone company provided circuit termination block(s) to the appropriate console punchblock(s)
- Wire connections from logging recorder circuit termination block(s) to the appropriate console punchblock(s)/terminal strips
- Wire connections from audio and NMS circuit termination block(s) to the appropriate console punchblock(s)/terminal strips
- Wire connections from headset and footswitch circuit termination block(s) to the appropriate console punchblock(s)/terminal strips
- Wire connections to the corresponding terminal and source locations on the voting comparator (if utilized), audio distribution network, interfaces and the consoles

- Proper termination of all used and unused I/O ports on the voting comparator (if utilized) and audio distribution network.

12.3.3 Functional Interface Requirements

At a minimum, the Offeror shall be responsible for the functional interface(s) between the radio system, communications consoles, and ancillary equipment.

The functional interfaces are expected to include, at a minimum, the following:

- Adjustments and optimization of the input and output signal level(s) between dispatch consoles and the audio distribution network/voting comparator (if utilized)
- Adjustments and optimization of the output signal level(s) from the consoles to the audio distribution network and/or voting receivers to the comparator (if utilized)
- Adjustments and optimization of the input and output signal level(s) between the corresponding conventional channel interface and dispatch consoles
- Optimization of the necessary base station control format(s) (e.g., tone, DC, relay, etc.)
- Optimization of all data interfaces for NMS and API control (e.g., SNMP, TCP/IP, RS232, RS485, etc.).

12.4 MOBILE/VEHICULAR AND CONTROL STATION RADIOS

The Offeror shall perform all mobile radio installations and de-installations in locations within the County that shall be subject to County approval. Pricing shall include all of the appropriate installation costs including mobile radio antenna (typically center-mounted in roof but subject to specific installation conditions). The Offeror shall work with the County at the time of radio installation to define the re-use of an existing hole for antenna installation and possible temporary use of a magnetic mount antenna and associated transmission line for the legacy radio to facilitate the cutover process and minimization of holes cut into the vehicle. The Offeror shall define the unit cost for a magnetic mount antenna and RF cable operational across the entire 764-861 MHz frequency range per current FCC requirements.

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The Offeror shall inspect all existing mobile installations to develop an Installation Guideline Manual for all common and specialized vehicles and apparatus as well as control stations. The manual shall include digital photographs with detailed explanations to ensure consistent, high-quality installations across the entire fleet. The manual shall discuss the existing radio system installations, the units to be removed and the units to remain (if any). This manual shall be supplied to the County at least six weeks prior to commencing any mobile and control station installation activities.

The mounting assembly, which may consist of the mounting tray, radio control head, and its external interfaces (i.e., roof-mounted antenna, logic unit, etc.) shall be configured such that all testing, diagnostic, and alignment ports (including antenna connectors) are easily accessible. The finished assembly shall be secured and remain in a fixed and motionless position under all operating conditions, excluding physical vehicle accident.

All coaxial cable connectors shall be soldered to its cable or to its interface circuitry. Crimp-style connectors for this application are acceptable. Low loss Teflon antenna cable is preferred. Cabling internal and external to the vehicle shall be dressed in flex loom where feasible with all cabling neatened and secured to prevent damage or disturbance to the vehicle operator. Weatherproofing of all exterior connections shall be provided to maximize the lifetime and performance of the entire vehicular radio assembly. All antenna assemblies and connections shall be tested for adherence to manufacturer's specifications and operating guidelines.

All wiring shall be appropriately dressed and connectorized in accordance with good engineering practices. All main power leads shall be connected as close as practical to the battery using approved methods and hardware. Each main power lead shall be attached to its own in-line fuse rated for the maximum current drain of the associated circuit. Obtaining power by connecting to existing radio equipment or any other device is unacceptable. All ground connections shall be provided from the main battery. Bonding to the vehicle frame is not acceptable.

All cabling that is exposed shall be dressed with a flexible tubing and secured to the vehicle frame by tying to any stationary support element using solid copper wire or fasteners. Plastic tie wraps should be used within at least 2 feet of the end connection points in areas not directly exposed to the weather.

The cable length shall allow repositioning the equipment within a radius of 5 feet to allow for changing operating conditions. A representative from each County subscriber agency shall inspect the first installation of equipment. A County representative will inspect each vehicular installation. Each vehicular installation shall successfully complete an operational performance test and shall be approved via signature of the County inspector. The Offeror is responsible for the removal

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and inventory of all legacy County subscriber units following a successful system cutover and reliability test period as defined by the County.

The mobile assembly shall be positioned on a mounting assembly. The mounting plates, base plates, brackets, etc. shall be a minimum 18-gauge steel construction. The support bar, of similar high steel gauge construction, bolts, support plates, etc., shall be coated with a high quality black matte finish. The finished assembly shall be secured and remain in a fixed and motionless position under all operating conditions, excluding physical vehicle accident.

13.0 SALVAGE OPERATIONS

The Offeror is responsible for removing all existing or legacy equipment no longer required to remain in operation in order to meet the performance requirements of this specification. All removed or de-installed equipment shall be properly stored at a location provided by the County. The Offeror shall provide the County with a detailed inventory list of all equipment including model number, serial number and location of removal. The County encourages the Offeror to offer a salvage credit in its proposal for the Offeror to take possession of any desired salvaged material.

14.0 WARRANTY MAINTENANCE AND SYSTEM SUPPORT

The Offeror guarantees that all equipment supplied pursuant to this solicitation will be new and of first quality throughout. The system warranty shall commence on the day that the County grants final system acceptance.

All items (material and labor) shall be warranted for a minimum of one (1) year after the date of final system acceptance, unless otherwise specified in the specification. This warranty shall include repair or advanced replacement of any defective equipment, system, subsystem, hardware and/or software which becomes defective through normal wear and usage or is deemed as such between the County and the Offeror. The Offeror shall guarantee an on-site, two-hour response time to any County site, network node, or subscriber radio installation to remedy a failure during the system warranty and maintenance period.

When parts under warranty are replaced, the County requires that the replacement part also be new and not factory-refurbished. The Offeror shall fully integrate and test all spare parts prior to final system acceptance. No replacement parts shall be integrated that provide less functionality or diminished capacity than the original equipment to be replaced. A new twelve-month warranty period should begin when a new part is installed as a replacement to a defective part under warranty. All warranty and maintenance issues shall be tracked by the Offeror and its service organization using an electronic database that the County can query at any time.

Offeror support is defined as the ability of the Offeror to remedy to County satisfaction any hardware and/or software problem with any equipment and services provided as part of this offering. Offeror support shall take the form of a 24x7x365 technical support hotline, two-hour on-site response time, advanced board replacement, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or equivalent spare/replacement hardware and software equipment for the proposed offering for not less than fifteen (15) years from the date of final system acceptance. Equivalent spare/replacement hardware and software provided during the entire support timeframe shall not necessitate any platform upgrade or subsystem reconfiguration.

14.1 SYSTEM SOFTWARE AND HARDWARE WARRANTY

The equipment supplied pursuant to this solicitation and any subsequent agreement is warranted by the Offeror to be free from defects in materials, workmanship and otherwise for one year from final acceptance of the proposed system unless otherwise provided in this solicitation and any subsequent agreement.

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The Offeror shall warrant that the system and each component of the system shall perform in strict accordance with the requirements of this solicitation and any subsequent agreement and shall be completely free of system defects, including latent defects for at least one year after the date of final system acceptance. Unless otherwise provided herein, all equipment shall be warranted for a period of one year after the date of final system acceptance. The warranty period for non-Offeror manufactured equipment is as specified by its manufacturer, but not less than one year after the date of final system acceptance. The Offeror maintains sole responsibility for settling and coordinating all warranty issues with OEM Offerors on behalf of the County throughout the entire warranty and maintenance period.

The proposed system release/platform being offered shall not be the last of its type or version with regard to future software and hardware compatibility. The next software release compatible with the system shall not require new hardware to support the existing functions of the system. In the event that parallel system software development has been undertaken by the Offeror, and the software release in the County's system is abandoned (no further development or support) or obsoleted, the Offeror shall completely upgrade the County's system to the surviving software release at no expense to the County.

At no additional cost to the County, the Offeror shall provide and completely integrate all hardware, firmware, software releases or patches that are required to correct any latent functionality or software defect that may exist in the proposed system (including system failures resulting from software problems, functionality fixes, and software upgrades to the County's system), for a fifteen (15) year period from the date of final system acceptance. This responsibility is to include any upgrades to fixed network equipment, system management systems and subscriber units. For the life of the contract and the contract maintenance period, the Offeror shall provide, at a minimum, the opportunity to refresh software for all system and subscriber equipment on a semi-annual basis to take advantage of enhancements and defect resolutions.

In the event a defect is found in another customer or field system that utilizes the same or similar release as the County's system, the Offeror shall notify and advise the County of the defect and when a new hardware, firmware, software release or patch will be available to correct the problem. At such time, the County shall decide whether it will require an upgrade prior to observing the defect. Notification should occur regardless of whether the County is currently affected by this defect. The Offeror shall be responsible for providing monthly product quality bulletins for all Offeror and OEM equipment and software contained in the proposed network in electronic fashion to the County Project Manager and System Manager during the course of system implementation and the entirety of the warranty and contract maintenance phases.

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The software release in the County's system at the time of final system acceptance shall be the latest version available at the time of shipment from the Offeror's development and manufacturing facility. The Offeror assumes responsibility for all equipment and services to implement the latest system and subscriber equipment software versions prior to final system acceptance. Under all warranties provided, all parts shall be replaced free of charge including labor. The Offeror may replace equipment, software or components rather than repair them, at the Offeror's option.

Whenever defective work (and damage resulting from such a remedy) has been corrected, removed, or replaced under warranty, the warranty period with respect to such defective work shall be extended for an additional period of one (1) year after such correction or removal and replacement has been satisfactorily completed.

14.2 EQUIPMENT SUPPORT

The Offeror shall warrant support in the form of replacement parts for all system and subscriber hardware and software equipment for fifteen (15) years from the last date of manufacture of the product. The Offeror shall use commercially-reasonable efforts to identify and to obtain replacement parts to meet or exceed the County's specific maintainability requirements. The Offeror shall electronically issue all product cancellation notices to the County Project Manager and System Manager throughout the entire system implementation and maintenance periods. The Offeror shall provide product cancellation notices within two weeks of the official announcement. These cancellation notices serve the basis for the fifteen (15) year support guarantee. The Offeror is responsible throughout the project implementation and contract maintenance period for remedying and re-designing, at no cost to the County, any system design affected by the cancellation of equipment or software which reduces the fifteen (15) year product support guarantee. Prior to final system acceptance, no equipment or software shall be included with the system offering that has been identified or announced for cancellation.

14.3 SPARE PARTS INVENTORY

The cost for replacement parts shall be quoted as part of the Offeror's proposal. Parts pricing shall be in the form of a standard discount off of the OEM or Offeror's list price equivalent to those provided to dealers or Offeror-authorized service shops. This discount level shall be part of the attached pricing sheets. The Offeror also shall provide a comprehensive pricing matrix or book defining the OEM and Offeror list prices for all relevant hardware and software for the proposed system platform. This comprehensive pricing matrix shall serve as the definitive ordering guide for all future system and subscriber equipment purchases. The parts pricing level shall remain intact for a period not less than fifteen years following final system acceptance.

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Spare parts required for this system shall include sufficient parts, modules and components to restore the system to full redundancy during a system or subsystem failure. The Offeror shall fully integrate and test all spare parts prior to final system acceptance. When not specifically addressed in this specification, the Offeror shall recommend and price accordingly the spares necessary to maintain the required availability levels for the various subsystems.

14.4 WARRANTY MAINTENANCE PERFORMANCE LEVELS

Normal, non-critical warranty maintenance shall be performed during normal business hours of 8:00 am-5:00 pm M-F. Some equipment and subsystems deemed critical by the County shall be protected by warranty and extended maintenance that provides guaranteed response and restoration times on a 365-day by 24-hour basis. The following lists identify response and maintenance performance level required for the various subsystems:

24-hour by 7-day – 30-minute phone response, 2-Hour On-Site Response, 2-Hour repair:

- Voice Radio System Infrastructure
- NMS System Infrastructure
- Microwave Backbone/Transport
- Dispatch Console/Logging Recorder Infrastructure
- Tower/Shelter Subsystems
- Emergency Power Infrastructure

10-hour by 5-day – 4-Hour On-Site Response, 8-Hour repair:

- Subscriber Units (Mobile, Portable, Control Stations)
- In-Building Systems (if utilized)
- Vehicular Repeaters (if utilized)
- Alternative Support Systems and Specialized Equipment.

Malfunctions that cannot be immediately or unequivocally diagnosed and pinpointed to a certain item of equipment or service shall require the immediate participation of all service Offerors until responsibility for the problem has been established. In no instance shall the failure to resolve the issue of responsibility relieve any of the Offerors of the mutual obligation to restore system operability with the least impact on the availability of the system to the end-users. The Offeror shall be the sole point of responsibility to resolve any and all maintenance matters to the satisfaction of the County. The Offeror shall guarantee that the turn-around time for all subscriber equipment repairs requiring factory depot involvement shall be no more than 7 calendar days.

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Proposals shall provide a complete description of the intended preventive maintenance methodology and shall specify the frequency of preventive maintenance required for all proposed equipment and systems. Preventive maintenance shall be performed according to a schedule that is mutually acceptable to the County and the Offeror. The Offeror shall include in its proposal an example of an actual, completed preventive maintenance regimen representative of what will be provided with the proposed system and corresponding maintenance phases. The schedule shall be consistent with the operation requirements of the County and shall be based upon the specific needs of the equipment being maintained. The Offeror and/or service provider shall be responsible for collecting failed subscriber units and delivering repaired subscriber units to a location designated by the County on as-needed basis.

The Offeror shall include in its proposal a description of any remote administration and maintenance service arrangements that will be provided with the proposed system. The qualifications and individual resumes (noting years of experience, training, schooling/degree, customer references, etc.) of all proposed maintenance service provider staff shall be provided in the Offeror's proposal response. All service providers may be required to submit to routine background investigations conducted by the County to ensure system integrity in concert with security policies and initiatives. In the pricing response, the Offeror shall quote the annual costs for comprehensive, turnkey system and subscriber equipment maintenance for all proposed equipment for a period of fifteen (15) years following final system acceptance noting all available discounts, incentives, and economies of scale. The Offeror also shall include a standard contractual service agreement and associated comprehensive, detailed statement of work with the maintenance quotation.

14.4.1.1 Warranty and Maintenance Service of FNE, Mobile, and Portable Radios

The Offeror shall indicate the name and address of the factory authorized repair and service facilities proximate to the County. The Offeror shall indicate the level of support that can be provided by these facilities in support of warranty and maintenance requirements for the FNE, mobile, portables, consoles, microwave, and other components to be provided under this solicitation.

The Offeror shall complete the following table to provide information relative to the factory authorized center(s). The Offeror also shall provide at least three customer references with contact information for each of the qualified service facilities listed below so that the County may independently assess the customer satisfaction levels achieved by these firms. The Offeror also shall provide the number of local service personnel available to respond during non-business hours to a major outage.

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Item	Service Facility #1	Service Facility #2	Service Facility #3
Name			
Address			
City/State			
Number of available technicians trained in proposed system platform			
Years of operation for service facility			
Number of 800 MHz trunked systems supported by the service facility			
Guaranteed on-site emergency response time to the County			

The Offeror shall provide 24/7/365 remote system monitoring by personnel located in a continuously staffed system monitoring center, which center shall operate 24 hours per day, 365 days per year. The Offeror shall provide in its response a detailed description of the remote system monitoring center and shall allow a tour of this Center should the County so desire.

14.5 WARRANTY MAINTENANCE PERFORMANCE REPORTS

The Offeror shall furnish the County with a monthly report of all system and subscriber equipment maintenance requests and resolutions during the warranty and contracted maintenance periods. The Offeror's proposal must include information that will be provided in their reports as well as actual sample warranty maintenance report forms used for other active Offeror customers. At a minimum, the following data is required:

- Date and time notified
- Date and time of arrival on site
- Description of equipment and malfunction reported
- Original equipment manufacturer (OEM)
- Diagnosis of failure and corrective work performed
- Root cause analysis
- Date and time failure was corrected
- Charges for service (if applicable)

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- Name of person/technician performing service.

14.6 TEST EQUIPMENT

When not specifically addressed in this specification, the Offeror shall recommend, organize uniquely in the equipment list, and price accordingly the test equipment necessary to properly maintain the network infrastructure, various subsystems, and the active subscriber unit fleet. The same level and types of test equipment mandated by the Offeror for its own service organizations shall be identified and priced as an option for the County. All test equipment shall be delivered new and of first quality with the proper calibrations. The Offeror shall present a matrix of all recommended test equipment with an explanation of purpose and need as it applies to maintaining the proposed system.

15.0 OPERATIONAL, TECHNICAL AND USER TRAINING

The Offeror shall fully describe all proposed and available training courses. This shall include, at a minimum, classroom style instruction, operational style classes, a detailed training plan, description of available training material, resume of potential course instructors and a customer reference list of trained personnel (to include: names, telephone numbers, company, and system description).

The Offeror shall train County employees, County contractors, and County designees. The Offeror shall permit videotaping of training sessions for use within the County for re-fresher training. All written and presentation training materials shall become property of the County.

The following sections describe the radio system operational, maintenance, and user type of training that is required for the system. The Offeror shall complete development of the entire customized County training program prior to completion of the Detailed Design Review process.

15.1 RADIO SYSTEM OPERATIONAL TRAINING

The Offeror shall provide on-site, customized operational training for up to twelve (12) students. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. The Offeror shall propose a training schedule that correlates to the implementation schedule. The Offeror's highly skilled personnel, familiar with the same equipment as that being implemented, shall conduct the training. This training shall be designed for administrators, agency coordinators, and system managers that require a solid, high-level understanding of the radio system and all supporting infrastructure.

The Offeror shall provide one (1) set of manuals per student plus an additional six (6) sets of manuals. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) and read with the Adobe Acrobat Reader software. Twelve (12) CD-ROM copies shall be supplied.

The Offeror's program shall include training in orientation, management, and operation of all equipment provided under the following items:

- Overview of the Radio System
- Use of Radio System/Consoles
- Use of Microwave System
- Use of Diagnostic Tools
- Fleetmapping
- Database Management and Network Administration

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- Use of NMS/Alarm Monitoring Equipment
- Familiarization and Orientation with Communication Facilities
- Reporting and Utilization Analysis.

The Offeror shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's actual system/equipment.

The training shall be designed so that, upon completion, a user will be qualified to comprehend radio system management, the network, fallback design, perform system diagnostics, and operate the subscriber units. The Offeror's highly skilled personnel shall conduct the training. Instruction material should be included as a part of each course and shall become property of the County.

15.2 RADIO SYSTEM MAINTENANCE TRAINING

The Offeror shall provide on-site, customized training for up to Six (6) people. Training shall include system orientation, management, operation, and maintenance of all system infrastructures and associated system equipment provided. The training shall include education on the theory of operation and practical maintenance procedures for the entire system infrastructure and all systems contained therein. This training shall be designed primarily for technical and telecommunications personnel within the County that may require sufficient education to assist in the restoration of the system during a failure.

The training shall be designed so that upon completion, a technician will be qualified to perform all levels of installation/setup, optimization, troubleshooting and maintenance of the system infrastructure and subscriber units to the board level. The Offeror's highly skilled personnel shall conduct the training. Instruction material should be included as a part of each course and will become property of the County. Since this training is customized to the County's proposed system design, the Offeror shall provide technicians from the assigned local maintenance service provider shop to attend this training at no additional cost to the County.

The Offeror shall provide one (1) set of manuals per student plus an additional six (6) sets of maintenance manuals. Additionally, all maintenance manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) and readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be made available.

The course content shall include the following, at a minimum, for all network subsystems:

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- As-Built documentation structure, numbering system, and configuration control system
- Principles of digital transmission and RF troubleshooting
- Level setting
- Network traffic analysis and bandwidth utilization measurement
- Block diagram and circuit description - all units
- Installation and turn-on procedure
- Service alignment and testing procedures
- Troubleshooting and fault diagnosis to unit and board level
- Test equipment configuration and usage
- Unit replacement procedures
- Operating and safety procedures
- Subscriber equipment repair and programming
- NMS design and use
- Network security
- Client/server architecture and network administration
- Database maintenance and optimization
- Software refresh and flash upgrades
- System restoration and failure modes
- Shelter subsystems maintenance and operation
- In-Building systems (if utilized)
- Traffic continuity procedures.

The Offerors shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's system/equipment.

15.3 RADIO SYSTEM MANAGEMENT TRAINING

The following section describes the Radio System Management system operational, administrative, and diagnostic type of training.

The Offeror shall provide on-site training for Twelve (12) people. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. Ongoing training opportunities for new or updated components via Internet or CD-based self-paced programs developed by the Offeror are also encouraged by the County. The Offeror shall provide on-site training for Twelve (12) people in orientation, management, operation, and maintenance of all radio system management subsystems and associated network elements. The training shall include education on the theory of operation and practical

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administration and maintenance procedures for the entire system infrastructure and all systems contained therein.

The Offeror shall conduct comprehensive classroom operator training for the communications management personnel operating and administering the new radio system. This training shall be conducted in a classroom environment, using training aids, and a comprehensive model of the entire radio system. Training aids such as videos, system diagrams, training manuals showing working functionality and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a customized system management training manual. In addition to the system management training manual, an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software shall be provided. Twelve (12) hard copies and six (6) CD-ROM copies shall be supplied. The Offeror shall provide, in addition to the customized training plan, and handout material, three (3) DVD copies that would instruct a user on the operational functions and features of the proposed radio system and subscriber unit fleet.

The course content shall include the following, at a minimum, for all network subsystems:

- As-Built documentation structure, numbering system, and configuration control system
- Block diagram and system description
- Installation and as-built documentation comprehension and analysis
- Radio programming and fleetmapping
- Use of software applications
- Troubleshooting/diagnosis to element level
- Troubleshooting techniques and use of NMS
- Console configuration and management
- Logging recorder configuration and management
- In-Building systems (if utilized)
- Microwave backbone training
- Database development, optimization, and management
- Shelter subsystems operation
- Failure mode analysis.

The Offeror shall submit a resume, a list of training classes, and prior client references that have been trained by the Offeror's training personnel. The County shall interview the Offeror's training team, and shall mutually agree on the training package and the qualifications of the training personnel prior to the development and execution of the customized County training program.

15.4 USER TRAINING – “TRAIN THE TRAINER”

15.4.1 On-Site Radio Usage Training

The Offeror shall provide on-site, “Train the Trainer” type courses for the following categories of equipment:

- Subscriber Mobiles
- Subscriber Portables
- Subscriber Control Stations
- Vehicular Repeaters (if utilized)
- Alternative Support Systems and Specialized Equipment (if utilized).

Training shall include system orientation and familiarization that includes theory of operation discussion and equipment demonstration. The training shall be designed so that, upon completion, each student will be qualified to train system end-users on the customized County operation of the specific equipment. For example, the student shall be qualified to train County first-responders and general government users on the operation of all proposed mobiles and portables. The Offeror shall customize all “Train the Trainer” courses per County satisfaction in conjunction with the specific programming and configuration parameters utilized by the County.

The Offeror shall provide training for up to three (3) classes of ten (10) students per class. The Offeror’s highly skilled personnel shall conduct the training. Instructional material shall be included as parts of each course and will become property of the County. Training aids such as videos, system diagrams, training manuals showing working functionality and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a personal “Trainer’s Guide” training manual. In addition to the “Trainer’s Guide” training manual, an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software shall be provided. Thirty (30) hard copies and thirty (30) CD-ROM copies shall be supplied. The Offeror shall provide, in addition to the training plan, and handout material, three (3) DVD copies that would instruct a user on the operational functions and features of all proposed radio system subscriber units.

15.4.2 On-Site Dispatch Console Operator Training

The Offeror shall conduct comprehensive, dispatch console operator training in nine (9) separate sessions. Training sessions shall be coordinated for all of the dispatch personnel before the new console system is placed in service. Sessions are to be scheduled so that all personnel can be coordinated into one of the sessions with

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minimum impact on shift personnel. This training shall be conducted in a classroom environment, using training aids, and actual County dispatch radio consoles. Training aids such as videos, system diagrams, training manuals showing functionality, and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Additionally, there shall be six (6) master quality hard copies of the Dispatcher Operator Training manual for future reference and follow-up training. The County intends to duplicate these “masters” for distribution to other personnel as personnel requirements change. In addition, the Operator's Training manual shall be available in a *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be supplied. There shall be no restrictions or licensing requirements for information provided as reference or used for future training purposes.

Additional training classes also shall be conducted using operational console equipment and ancillary subsystem equipment required by the dispatch personnel (e.g., logging recorder, NMS, etc.). All required training shall be conducted in the County Sheriff's Primary Dispatch Center utilizing the proposed system consoles. Each trainee shall become thoroughly familiar with the operations of the new console to become experienced and fully qualified to operate the new consoles.

The Offeror shall provide a list of course objectives and core competency skills for each of the training sessions prior to completion of the Detailed Design Review. The Offeror shall provide, in addition to the training plan and handout material, six (6) DVD copies that would instruct the user on the customized use of the operational functions and features of the County console system.

The Offeror shall submit a resume, a list of training classes, and prior client references that have been trained by the proposed training personnel. The County shall interview the Offeror's training team, and shall mutually agree on the training package and the qualifications of the training personnel prior to the development and execution of the training program.

15.5 MICROWAVE SYSTEM TRAINING

The following sections describe training for microwave maintenance and operation.

15.5.1 Microwave System Maintenance Training

The Offeror shall provide on-site microwave backbone system training for up to six (6) people and shall be coordinated with the comprehensive Radio System Maintenance Training Program. Training shall include system orientation, theory of operation, management, customized operation, and maintenance of all system infrastructures, and associated proposed subsystem equipment. The training shall

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include education on the theory of operation and practical maintenance procedures for the entire microwave system infrastructure and all ancillary subsystems contained therein.

The Offeror shall provide six (6) sets of manuals for the training course. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be supplied.

The customized course content shall include the following, at a minimum for all microwave subsystems:

- As-Built documentation structure, numbering system, and configuration control system
- Principles of digital microwave transmission and loop microwave topology
- Block diagram, wiring, and circuit description-all units/subsystems
- Level setting and RF troubleshooting
- Multiplexer provisioning, cross-connects, and configuration
- Installation and turn-up procedures
- Test equipment configuration and usage
- Alignment and testing procedure
- Troubleshooting and fault diagnosis to unit and board level
- Unit replacement procedure
- Preventive maintenance procedures
- Orderwire, DC Plant, Pressurization operation and troubleshooting
- Operation and safety
- Failure mode analysis
- Traffic continuity procedures.

The Offeror shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's actual system/equipment.

15.5.2 Microwave System Operational Training

The Offeror shall provide on-site operational training for up to twelve (12) people and shall be coordinated with the comprehensive Radio System Operational Training Program. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. The Offeror shall propose a

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training schedule that correlates to the implementation schedule. The Offeror's highly skilled and experienced personnel shall conduct the training.

The Offeror shall provide twelve (12) sets of manuals for the training class. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Twelve (12) CD-ROM copies shall be supplied.

The Offeror's program shall include customized training in orientation, management, and operation of all equipment provided under the following items:

- Theory of operation
- FCC licensing
- Use of microwave terminals
- Use of diagnostic tools
- Use of alarm monitoring equipment
- Use of orderwire
- Provide an overview of the microwave network
- Provide an understanding of the alternate routing and failure mode analysis
- Provide an understanding of traffic management and provisioning.

The Offeror shall provide a list of customized courses required along with the duration (hours, days, weeks, etc.) cost for each course. All training shall be conducted on-site with substantial hands on involvement using the County's system and ancillary equipment.

16.0 DETAILED EQUIPMENT LIST BY SITE/NETWORK NODE

The Offeror's proposal shall contain detailed equipment lists with unit cost/line item pricing as required in the solicitation specifications. The detailed equipment list shall be easily cross-referenced to the Offeror's itemized pricing sheets (see Appendix F for pricing and equipment list requirements).

Detailed equipment lists shall be provided by radio sites and/or each network node, and the lists shall include details of requirements needed for the installation and operation of the equipment as deemed necessary. Equipment lists also shall contain all radio subscriber information organized by the County agency/user group. Equipment lists shall make clear distinctions between hardware and software with unique versions or types delineated.

The equipment list shall contain equipment OEM and Offeror model numbers with associated options, OEM and Offeror nomenclature/description, quantities and/or amounts ordered, OEM and equipment Offeror, manufacturing facility location/origination, planned site and/or node for installation, and the associated cross reference to the provided pricing sheet items. The Offeror must provide this detailed equipment list as part of their technical support and documentation response to the solicitation specifications. Failure to comply with the equipment list and pricing matrix requirements will lead to a dismissal of the Offeror proposal for non-compliance.

Detailed Design Review (DDR) and final system as-built information also shall contain system equipment lists in the same format as the original proposal response for straightforward tracking of project change orders and equipment reconciliation. Spare equipment and test equipment shall be uniquely noted and organized separately in the proposal response and all subsequent equipment list iterations. Pricing discounts and incentives shall be clearly noted, if applicable, for all equipment list items. The Offeror bears sole responsibility for delivering all equipment, software, and services necessary to fully commission a system that meets or exceeds the specifications outlined in this document.

17.0 DETAILED SITE LAYOUTS BY EQUIPMENT RACKS

The Offeror shall provide, as part of the proposal response and subsequent DDR process, scaled equipment rack profiles and layouts and scaled floorplan drawings indicating dimensions and the model numbers of all equipment specified. Equipment rack numbers shall identify all proposed site equipment racks with detailed rack profiles identifying all proposed equipment. These layout drawings shall be provided by site and cross-referenced to the detailed equipment list.

As part of the proposal response, the proposed design also shall demonstrate the space in each facility available for future growth. Each Offeror also shall provide all equipment specifications including: equipment AC and DC power consumption; commercial and backup power requirements and load; emergency backup runtimes for UPS, generator, and -48V batteries; heat dissipation; size; rack or cabinet height/width/depth; floor loading; weight and environmental requirements in a spreadsheet format by rack and site noting every piece of equipment. Detailed Design Review and final system as-built information also shall contain system layout and racking information in the same detailed format as the original proposal response for straightforward tracking of all design changes.

18.0 SYSTEM PERFORMANCE GUARANTEES

The Offeror shall provide a thorough description of all equipment, subsystems, RF coverage and system-related guarantees that are part of its offering. These guarantees shall be clearly defined for the County's review and comments. The County expects these guarantees to cover terms, conditions, and timeframes for each type of guarantee. The Offeror shall provide all types of guarantees as part of the response support material.

18.1 EQUIPMENT AND SOFTWARE

The County requires the Offeror to respond to equipment guarantees by defining each guarantee by product offering. The Offeror shall list each product and define the guarantee as it applies to each product offered. All equipment, at a minimum, must meet published specifications and/or solicitation specifications in order to meet or exceed product performance. The Offeror is required to provide published specifications as part of the response support material. The Offeror shall provide MTBF and MTTR data for all proposed equipment to support performance reliability and availability guarantees.

As part of the proposal response, the Offeror shall provide a comprehensive history of the proposed system platform history in terms of defect resolution and platform enhancements since the platform was initially introduced. Subsequent to the proposal submission, the Offeror shall provide all system platform and equipment performance history upon County request and on a quarterly basis, at a minimum, in both paper and electronic format.

18.2 SUBSYSTEMS

The Offeror shall provide guarantees on each subsystem offered as part of the Offeror's response. The Offeror shall list each subsystem and clearly define the guarantee as it applies to the proposed subsystem. Each subsystem must meet or exceed the solicitation specifications and performance requirements in order to be accepted as a compliant guarantee.

18.3 RF COVERAGE

The Offeror shall guarantee RF Coverage as specified in the solicitation specifications. The Offeror shall submit a RF coverage guarantee that is based on the coverage predictions. The Offeror must utilize the system design, coverage predictions, and coverage acceptance testing as the minimum elements of the RF Coverage guarantee.

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Any and all changes in system design that may be necessitated due to the system's inability to meet the system coverage performance criteria shall be provided by the Offeror at the Offeror's sole expense. Any additional sites or changes in antennas that may be required to correct deficiencies where the Offeror has failed to satisfy the coverage requirements of this solicitation and any resulting agreement shall be provided by the Offeror at the Offeror's sole expense. Any modifications of antenna or transmitter configurations by the Offeror to address coverage issues shall comply with all regulatory and zoning restrictions placed on the County. All design changes must be properly coordinated by the Offeror at no cost to the County to comply with the requirements of NPSPAC Region 54 and neighboring NPSPAC regions. The entire system implementation effort and field equipment configuration shall be in strict compliance with all FCC and Region 54 guidelines and authorizations.

19.0 EXPANSION AND MIGRATION CAPABILITIES

The Offeror shall provide detailed information on the expansion and scalability capabilities of the proposed system and ancillary subsystems. These details shall include the following items that facilitate a total County understanding of the Offeror's offering as related to expansion capabilities.

- Maximum Number of Sites/Subsystems (Multi-Cast, Simulcast, RFSS, etc.)
- Maximum Number of Talkgroups
- Maximum Number of Unit IDs
- Maximum Number of Dispatch Consoles
- Maximum Number of Channels/Talk-Paths
- Maximum Number of NMS Clients/Concurrent Applications
- Maximum Number of Discrete Alarm Points Per Site
- Maximum Number of Conventional Mutual Aid Interfaces
- Maximum Number of Console Auxiliary Inputs/Outputs
- Maximum Number of Logging Recorder Channel Hours
- Maximum Number of Encryption Keys Manageable by Infrastructure
- Expandability of Microwave Network
- Upper and Lower Limits of the Controllers and Network Elements Inputs and Outputs
- Maximum Number of Control Channels
- Impact to the System Architecture
- Impact to System Access
- Impact to Other Support Systems
- Impact to Shelters
- Impact to Towers
- Impact on Existing Users
- System Expandability Incremental Costs

20.0 SYSTEM OWNERSHIP

In the event that the Offeror's proposal response is developed using a Offeror-owned, existing commercial, or a joint venture/limited ownership network, the division of ownership, liabilities, access, and control of the proposed system solution meeting the solicitation specifications shall be clearly and thoroughly defined for the County. This may also include Offeror offerings of access to rights-of-way, subscriber units, frequencies, and software.

The Offeror shall provide a definition of specific ownership and the terms and conditions that are being offered to the County. All costs, life-cycle analysis, and contractual terms shall be defined by the Offeror's description of the offering.

The Offeror is expected to provide a detailed cost analysis based on the life expectancy of the proposed system. The Offeror shall define the system's life expectancy and cost analysis based on sound business practices and professional criteria as related to telecommunication networks and the County's demonstrated procurement practices.

20.1 SITES

If the Offeror proposes the use of privately-owned sites which are not part of the County's suggested sites as contained in the solicitation, the Offeror shall provide a detailed disclosure on the ownership and associated costs. These costs, terms, leasing arrangements, etc., must be clearly defined as part of the Offeror's proposal. If the Offeror determines that raw land must be acquired to facilitate a new communications site, the Offeror shall identify and define all costs, terms, leasing arrangements associated with the raw land as part of the Offeror's proposal.

20.2 TOWERS

If the Offeror proposes the use of privately-owned towers, the Offeror shall provide a detailed disclosure on the ownership and associated long-term costs. These costs, terms, leasing arrangements, access, etc., must be clearly defined as part of the Offeror's proposal.

20.3 INFRASTRUCTURE

If the Offeror proposes the use of privately-owned infrastructure, the Offeror shall provide a detailed disclosure on the ownership and associated costs. These costs, terms, leasing arrangements, access, etc., must be clearly defined as part of the Offeror's proposal.

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20.4 FREQUENCIES

If the Offeror proposes the commercial acquisition of frequencies to construct the radio network by means of leasing, renting, or selling, the Offeror shall clearly define the ownership and associated costs. These costs, terms, leasing arrangements, use, etc., must be clearly defined as part of the Offeror's proposal.

20.5 SOFTWARE

If the Offeror proposes software to support the radio network by means of leasing, renting, or selling, the Offeror shall clearly define the ownership and associated costs. The Offeror shall provide definitions of software upgrades, fixes, and enhancements. These costs, terms, leasing arrangements, use, etc., must be clearly defined as part of the Offeror's proposal. As deemed necessary by the County to protect its investment, the Offeror shall provide the necessary source code for all software to be kept in escrow.

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APPENDIXES

The County offers this reference information to the Offeror in order to assist the Offeror in generating a complete and comprehensive system design and turnkey proposal.

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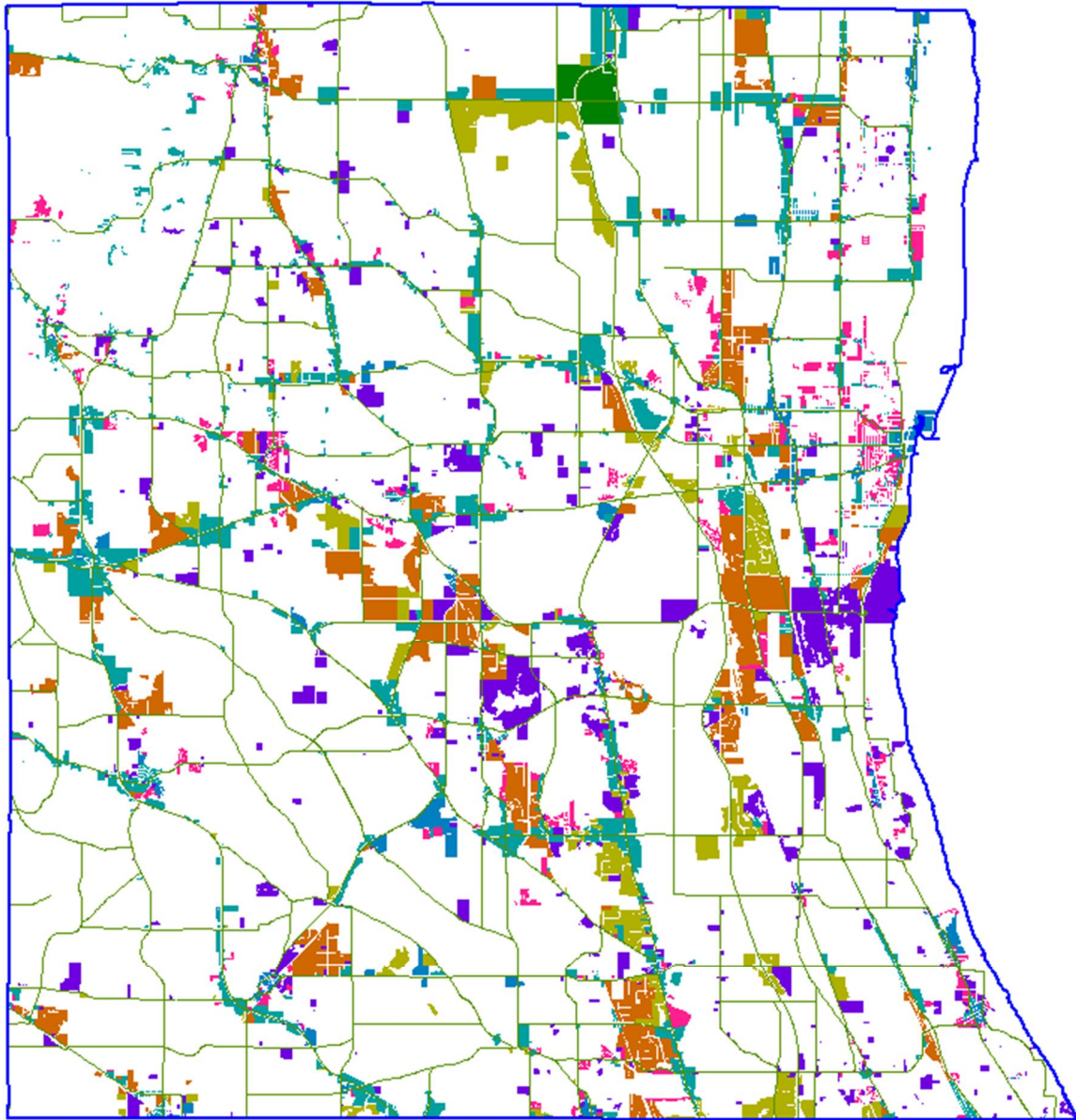
APPENDIX A: COUNTY FACILITIES AS MUST-COVER BUILDINGS

- 1) Central Permits – 500 W. Winchester Road, Libertyville, IL 60048
- 2) Administration Tower – 18 N. County Street, Waukegan, IL 60085
- 3) Babcox Center – 20 S. County Street, Waukegan, IL 60085
- 4) Community Based Corrections Center (CBCC) - 15 South Martin Luther King Jr. Ave., Waukegan, IL 60085
- 5) Sheriff's Office County 1 – 25 S. Martin Luther King Jr. Ave., Waukegan, IL 60085
- 6) Sheriff's Office County 2 – 1301 N. Milwaukee Avenue, Libertyville, IL 60048
- 7) Courts Complex – 18 N. County Street, Waukegan, IL 60085
- 8) Depke Center - 24647 N Milwaukee Ave., Vernon Hills, Illinois 60061
- 9) Communications Building – 1303 N. Milwaukee Avenue, Libertyville, IL 60048
- 10) Health Department – 3010 Grand Avenue, Waukegan, IL 60085
- 11) Forest Preserve District General Office – 1899 W. Winchester Road, Libertyville, IL 60048

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APPENDIX B: AREAS REQUIRING 16 DB OF IN-BUILDING COVERAGE

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Current and Future Land Use

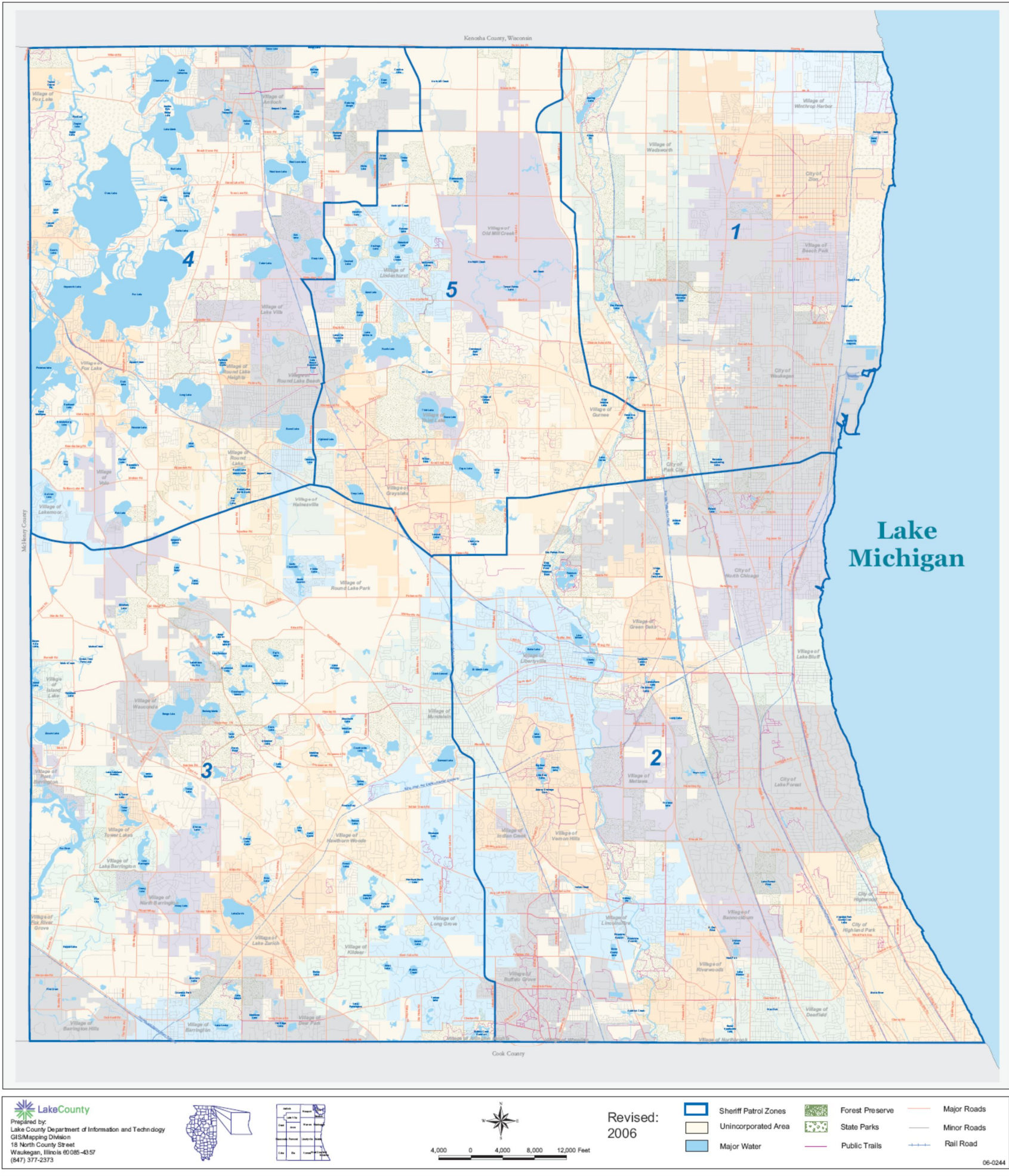
Potential Barriers to Radio Signal Propagation

■ Gateway	■ Office and Research Parks
■ Government and Institutional	■ Retail/Commercial
■ Industrial	■ Multi-Family
■ Mixed Use	

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APPENDIX C: SHERIFF PATRO ZONES/DISTRICTS

Lake County, Illinois - Sheriff Patrol Zones



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APPENDIX D: ESTIMATED SUBSCRIBER RADIO QUANTITY

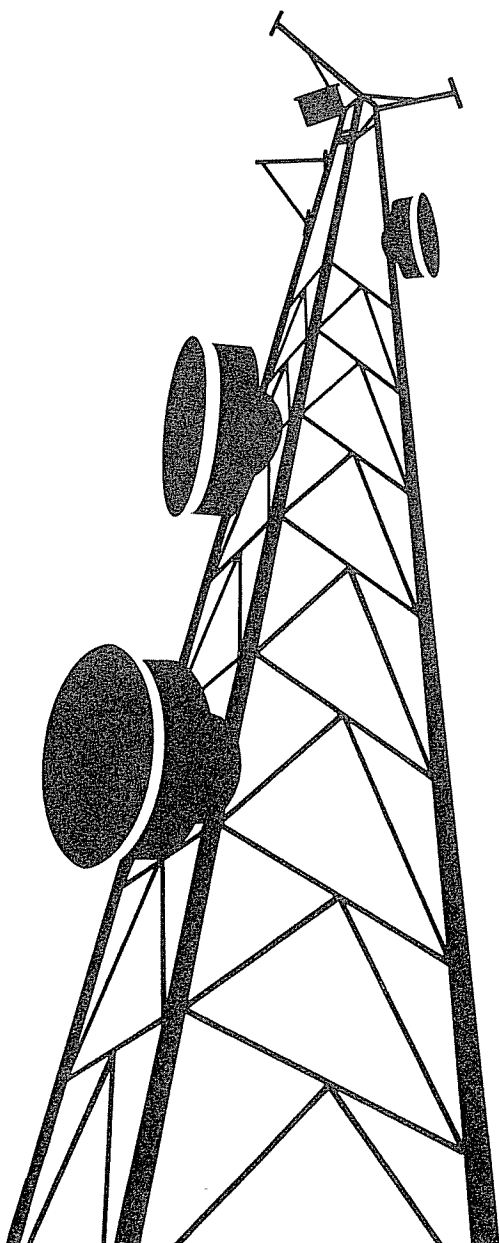
Estimated Quantity of Subscribers				
Description	Qty	High Tier	Mid Tier	Low Tier
		Encrypted	Unencrypted	Unencrypted
Software to upgrade existing radios	584	319	190	75
Purchase New Mobile Radios – Remote Mount	200		200	
Purchase New Mobile Radios – Dash Mount	200			200
Purchase New Portable radios	433	300	33	100
Purchase New Submersible Portable radios	20	20		
Single Unit Chargers	253			
Multiple Unit Chargers	30			
Desktop Stations	40	40		
Total	1,477			

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APPENDIX E: RELIABILITY ANALYSIS OF MICROWAVE SYSTEMS

TELESCIENCES

MICROWAVE REFERENCE GUIDE



Reliability Analysis of Microwave Systems

TELESCIENCES

TRANSMISSION SYSTEMS

Effective July 1, 1991, Motorola Microwave was merged with TeleSciences Transmission Systems. Our headquarters location is 171 N. Covington Drive, Bloomingdale, Illinois 60108 (800) 545-0334 or (708) 307-5900

Introduction

Previous discussions of microwave system reliability have concentrated on the microwave path, but the microwave equipment itself and its system configuration along with a maintenance plan also can have significant impact on system reliability. This paper addresses these areas from three levels.

- 1) How equipment failure rate is determined.
- 2) How site configuration and maintenance affects availability.
- 3) How the total system plan affects reliability.

Before getting into the specifics of these three areas, some basic definitions will be reviewed as a background for the discussions to follow [5].

Reliability: It is generally accepted that the reliability of a component or a collection of components with respect to time follows an exponential distribution.

$$R(t) = e^{-\lambda t} \quad (1)$$

where λ is the failure rate in failures/time

MTBF: The mean time between failures is the integration of the reliability function over a specified mission time. If the mission time is $0 \leq t \leq \infty$, then MTBF is just one over the failure rate.

$$\text{MTBF} = \int_0^{\infty} R(t) dt = \int_0^{\infty} e^{-\lambda t} dt = \frac{1}{\lambda} \quad (2)$$

Unit Reliability: The reliability function of a unit is the product of the reliability functions of the individual piece parts.

$$R_{\text{unit}}(t) = R_1 \cdot R_2 \cdot \dots \cdot R_n = \exp\left[-t \sum_{i=1}^n \lambda_i\right] \quad (3)$$

Unit MTBF: The MTBF of a unit is computed from the integral of equation (2).

$$\text{MTBF}_{\text{unit}} = \int_0^{\infty} \exp\left[-t \sum_{i=1}^n \lambda_i\right] dt = \frac{1}{\sum_{i=1}^n \lambda_i} \quad (4)$$

It is seen that this is the inversion of the sum of the individual piece-part reliabilities.

Unreliability: The unreliability of a component or function is one minus the reliability.

$$Q(t) = 1 - R(t) \quad (5)$$

Outage Time: The actual time that a system is unavailable. In this paper, T_o , designates outage time. In many cases this is equal to restoral time (T_r), where restoral time is the total time to return a system to full operation after a failure. Restoral time includes travel time and the mean time to diagnose and repair a failure at a site (MTTR).

Unavailability: This is the fraction of time that a system is not available.

$$P_u = \frac{T_o}{\text{MTBF} + T_o}$$

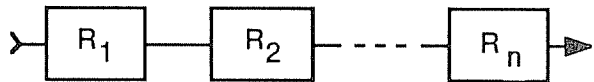
For $\text{MTBF} \gg T_o$

$$P_u \approx \frac{T_o}{\text{MTBF}} = \lambda T_o \quad (6)$$

Availability: This is the fraction of time that a system is available.

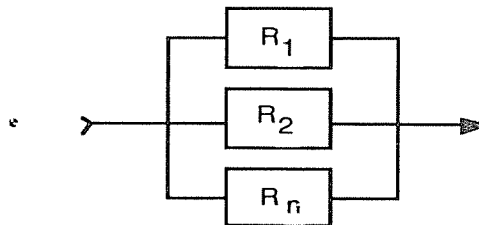
$$P_a = 1 - P_u \quad (7)$$

Reliability of Series Systems: This is the reliability of the product of the individual element reliabilities.



$$R_s = R_1 \cdot R_2 \cdot \dots \cdot R_n \quad (8)$$

Reliability of Parallel Systems: This is the reliability of one minus the products of the individual element unreliabilities.



$$R_p = 1 - Q_1 \cdot Q_2 \cdot \dots \cdot Q_n$$

$$= 1 - (1 - R_1) \cdot (1 - R_2) \cdot \dots \cdot (1 - R_n) \quad (9)$$

I. Determination of Equipment MTBF

Calculation of MTBF provides the capability of predicting how long electronic equipment will operate before having a failure. Failure rates for all the parts are determined and the sum of all the individual failure rates is the failure rate of the particular piece of equipment. The unit for a failure rate is failures per hour. Because they are normally very small numbers, they are given in failures per 10^6 or 10^9 hours. The reciprocal of the failure rate for a particular piece of equipment is the the MTBF in hours.

Two types of MTBF can be calculated for microwave equipment, system MTBF's ($MTBF_s$) and equipment MTBF's ($MTBF_e$). If the primary concern is system outage, then the only parts to be used for determining $MTBF_s$ in a non-redundant system are those that, upon failure, would cause a system outage. Therefore, alarm lights, etc. would not be included in the calculation. If the primary concern is the amount of maintenance that will be required to maintain a system, then all parts must be included in the calculation. The method for calculating MTBF of a redundant system is covered in the second section of this paper. When system outage or system availability is the primary concern, redundancy can make $MTBF_s$ very long. However, since approximately twice as many parts are used as compared to a non-redundant system, the $MTBF_e$ from a maintenance viewpoint is half as long. For example, if a non-redundant radio had an MTBF of 1 1/2 years, the redundant radio could have an $MTBF_s$ of 65 years from a system outage point of view. However, from an maintenance point of view the $MTBF_e$ would be less than 3/4 years.

Standards for Failure Rates

Currently there are three standards that can be used for obtaining failure rates. They are MIL HDBK 217 [1], Bellcore [2], and AT & T. [3] (Bellcore is Bell Communication Research Inc.) AT & T labels them hazard rates rather than failure rates. The MIL HDBK 217 is the oldest. MIL HDBK 217A [4] was published in 1965. It has been revised a number of times so that the current edition is MIL HDBK 217E which was published in 1986. It lists most of the electronic components used in military electronics equipment. The failure rates are based on laboratory tests and test results from vendors for the various components [4]. Both Bellcore and AT & T used

the MIL HDBK 217 for the basic failure rates but have modified them considerably with other tests results from their own laboratories and from field data. As a result, not only because the failure rates are somewhat different but as we will see later, the multiplying factors are different, so the resultant MTBF's calculated using the three standards are different. MIL HDBK 217 lists many more component types than the other two. For example, for paper/plastic capacitors, AT & T has one failure rate, Bellcore has three types, MIL HDBK 217E has nine different types.

In addition each of the three standards have their own quality levels and environmental conditions.

Environmental Conditions

Since the Bellcore and AT & T standards are only meant for telephone communications equipment, the environmental conditions are limited to just a few as shown in Table 1, while MIL HDBK 217E [1] has 27 different environments. These include Space Flight, Naval Sheltered, and Airborne Inhabited as well as Ground Benign and Ground Fixed.

However, normally when MIL HDBK 217E is used for calculation of MTBF for microwave radios, only Ground Benign and Ground Fixed are used. Ground Benign is an environment with low stress levels such as an air conditioned building, and Ground Fixed includes non-air conditioned buildings or pole mounted equipment.

Table 1

<u>Environment</u>	<u>Multiplying Factor</u>	
	<u>Bellcore</u>	<u>AT & T</u>
Permanent Shelters, environmentally controlled	1.0	1.0 (Gnd Benign)
Permanent Shelters, not Environmentally controlled		1.1
Manholes , poles	1.5	1.5 (Gnd Fixed)
Vehicular-mounted	5.0	8.0

The environmental multiplying factors used by Bellcore and AT & T shown in Table 1 apply to all the components. Therefore, the basic rate is used for each component and after they are totaled, the appropriate factor from Table 1 is used to multiply the sum. In MIL HDBK 217E, the multiplying factor is also 1.0 for Ground Benign

but for Ground Fixed it varies with each component. For example, it varies from 1.9 for plastic capacitors to 15.8 for transistors. Therefore, the multiplying factor must be used for every part.

Stress Levels

In addition to the general environmental conditions, there are specific stress levels, both temperature and electrical, that affect the failure rates. For example, even though the equipment is in an air conditioned room, the temperature inside the equipment enclosure may be considerably higher. Electrical stress can be either voltage, current or power. For example, for voltage it is the actual voltage applied compared to the rated voltage. All three standards use similar multiplying factors for the various stress levels.

In calculating MTBF there are two general methods used, average stress and actual stress. For the actual stress calculation, the actual temperature is measured near the components when the equipment is at room temperature. If the actual room temperature is expected to be other than at room temperature, this is taken into consideration. The electrical stress, either voltage, current or power (depending on the particular component) of each component is determined and is used for the calculation. This is a long procedure compared to the average stress method. In the average stress method, an average temperature and an average stress is used for all components. This is the method used by AT & T where in the original design, engineers keep electrical stress

to 25% or less. They also have determined that the average temperature rise in their equipment is 15°C. Therefore, all calculations are made using average stress levels of 25% electrical stress and 40°C temperature.

Quality Levels

In both Bellcore and AT & T, there are three quality levels. However, as can be seen from Tables 2 & 3, the multiplying factors for the different levels for AT & T are approximately twice those used by Bellcore.

AT & T attempts to use only Level III components [3]. Bellcore recommends using Level II or III.

The quality levels are defined as follows [2]:

Level I-Commercial grade devices without qualification or lot-to-lot controls. (a) Steps are taken to ensure that components are compatible with the design application. (b) Effective feed back and corrective action program to resolve manufacturing and field problems.

Level II-Meet (a) and (b) above and (c) purchase specifications must identify electrical, mechanical and/or optical characteristics and acceptable quality levels (AQL) for lot controls, (d) devices and vendors must be qualified and identified on approved parts/vendor lists, (e) lot-to-lot controls must be in place.

Table 2
AT & T

	<u>Integrated Circuits</u>		<u>Diodes and Transistors</u>		<u>Passive</u>
	<u>Hermetic</u>	<u>Plastic</u>	<u>Hermetic</u>	<u>Plastic</u>	
Level III	1.0	1.2	1.0	1.0	1.0
Level II	1.1	1.3	2.0	2.4	2.0
Level I	3.0	3.6	3.0	3.6	3.0

Table 3
Bellcore

Level III	0.5	0.6	0.5	0.6	0.5
Level II	1.0	1.2	1.0	1.2	1.0
Level I	1.5	1.8	1.5	1.8	1.5

Level III- Meet (a) thru (e) above and (f) devices must be requalified periodically, (g) lot-to-lot controls must include 100% screening (temperature cycling and burn in), (h) where screening is used, the % defective allowed should be specified.

Again, quality levels do not vary widely for individual components for AT & T and for Bellcore, but in MIL HDBK 217E the quality levels vary widely from component to component and from level to level. For example, see Table 4 for quality levels for transistors and plastic film capacitors.

In MIL HDBK 217E the different levels as listed in Table 4 are determined by various Mil Specs. For example, Mil-M-38510 lists all of the requirements for the various levels such as S, R, P etc. Of course, because of all the additional burn in, and special handling, the higher level parts cost considerably more than the lower level parts.

Table 4

MIL HDBK 217E [1]

<u>Quality Levels for Transistors</u>		<u>Quality Levels for Plastic Film Capacitors</u>	
JANTXV	0.12	S	0.03
JANTX	0.24	R	0.10
JAN	1.20	P	0.30
Lower	6.00	M	1.00
Plastic	12.00	L	3.00
		MIL-C-19978	10.00
		Lower	30.00

Sample MTBF Calculation

It is difficult to predict which standard will give the highest MTBF for a given equipment. The failure rates are not consistently higher in any one standard. Using a hypothetical parts list

Table 5

Sample MTBF Calculations using 40°C Temperature and 50% Stress Levels

Ground Benign

Assumed Parts List	<u>MIL HDBK 217A</u>	<u>MIL HDBK 217E</u>	<u>Bellcore</u>	<u>AT & T</u>
10 Plastic NPN Si Transistors	4.11	0.19	0.32	0.72
10 Plastic PNP Si Transistors	12.50	0.28	0.45	0.72
20 Plastic Diodes	8.20	0.08	0.18	0.18
100 Carbon Resistors	0.35	1.00	0.60	0.25
10 Alum. Capacitors	2.90	3.10	1.43	0.45
10 Mica Capacitors	8.30	0.34	0.05	0.005
10 Solid Tant. Capacitors	0.44	0.05	0.225	0.135
10 Plastic Capacitors	<u>0.50</u>	<u>0.325</u>	<u>0.008</u>	<u>0.06</u>
	37.30	5.365	3.263	2.52

Ground Fixed (Pole Mounted)

10 Plastic NPN Si Transistors	1.08	0.48	1.08
10 Plastic PNP Si Transistors	1.62	0.67	1.08
20 Plastic Diodes	0.32	0.27	0.27
100 Carbon Resistors	2.90	0.90	0.38
10 Alum. Capacitors	7.44	2.14	0.675
10 Mica Capacitors	0.806	0.068	0.007
10 Solid Tant. Capacitors	0.119	0.337	0.203
10 Plastic Capacitors	<u>0.835</u>	<u>0.013</u>	<u>0.09</u>
	15.12	4.878	3.785

the failure rates were calculated for Ground Benign and Ground Fixed (Pole Mounted) environments using three different standards. The units are failures per 10^6 hours. The results are shown in Table 5. Two versions for MIL HDBK 217 are included for Ground Benign to indicate how much they have changed. Version A is 21 years older than version E..

It can be noted that MIL HDBK 217A rates are considerably higher than those of version E. Therefore when viewing MTBF numbers calculated using MIL HDBK 217 it is important to know which version is used. In general, the later versions have lower numbers. As expected for Ground Fixed, numbers for MIL HDBK 217E are the highest. The Bellcore numbers for aluminum capacitors are higher than those of AT & T while the AT & T numbers for transistors are higher than the Bellcore values. Using a different set of components could result in higher failure rates for AT & T.

In general, it has been found that the calculation for MTBF as described above when compared to actual field data has been conservative. Motorola and AT & T [3] have found that the actual MTBF is at least 2 to 3 times better than the calculated MTBF.

Comparing MTBF's Calculated for the Same Equipment

When reviewing MTBF's it is important to know the following:

1. What failure rate standard was used?
2. If MIL HDBK 217 was used, which version?
3. Were average or actual stress levels used?
4. What environmental factor was used?
5. Were any failure rates used other than those in the particular standard?

Infant Mortality

The failure rates used above are all considered to be steady state conditions. This condition exists only after the equipment has been operated for some time. Failure rates in general go thru 3 stages, infant mortality, steady state and wearout [2][3]. The wearout state normally only applies to electro-mechanical or mechanical equipment. Electronic components in general do not exhibit the wearout stage except for aluminum electrolytics and power devices[3]. Figure 1 is a typical

bathtub curve showing the various stages.

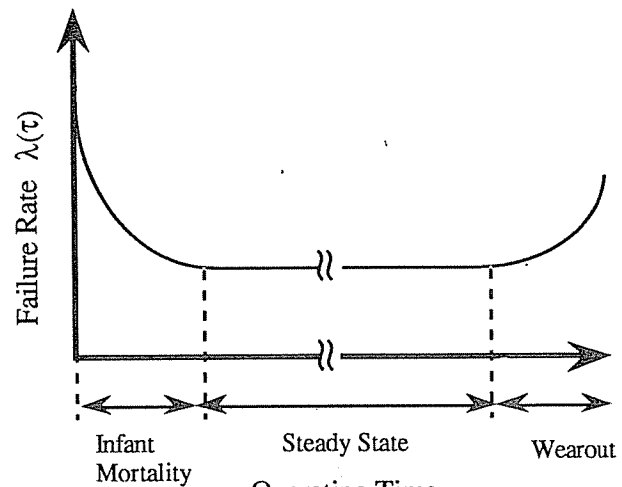


Figure 1

Bellcore[2] and AT & T[3] have methods of calculating infant mortality rates for the various components. They find that on the average, the infant mortality failure rate keeps decreasing until it reaches the steady state condition after 10,000 hours. Figure 2 shows the same curve as Figure 1 without the wearout stage and with both the failure rate and time having log scales.

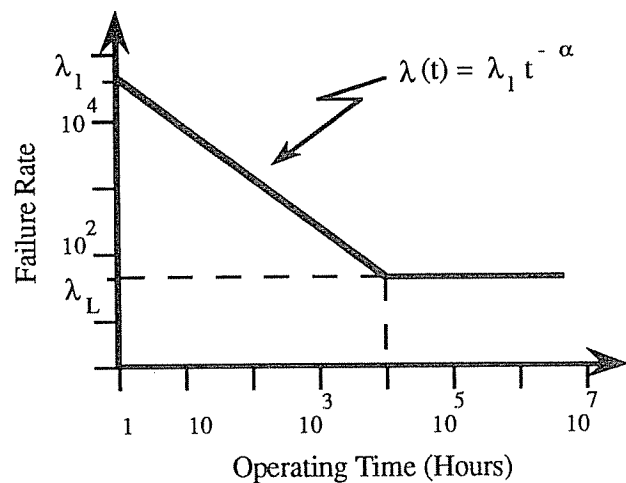


Figure 2

Alternate Methods for Obtaining MTBF

For existing equipment, the best way to get the actual MTBF is to obtain field data where accurate data of all failures are kept over a considerable length of time.

The second method of determining MTBF is by conducting an Accelerated Life Test (ALT).

Failure rates are so low that it takes a long time to measure the MTBF. Reliability engineers have found that over stressing the equipment causes failures at a higher than normal rate and then by experimentation an appropriate multiplying factor can be determined. Raising the temperature above levels higher than normal but below the specification limit of the individual components works for many components. Temperature cycling and raising the humidity is also used. When testing individual components, rather than a complete piece of equipment, increasing electrical stress is used. References [2] and [3] both have excellent discussions on ALT.

In a 2 or 3 month period it has been possible to determine an 18 month MTBF. Then if the MTBF is measured in the field for that particular equipment, the accuracy of the multiplying factor can be determined.

II. Site Equipment & System Maintenance

The approach used to maintain a microwave system can have a significant impact on the overall unavailability of the system due to equipment failure. Three different approaches to system maintenance and how this impacts system unavailability are discussed in conjunction with various radio equipment configurations.

Scheduled Maintenance: In this maintenance method, a site is visited every "T" hours and any failures are diagnosed and repaired. Note that a failure, whenever it occurs, is not repaired until the scheduled site visit. Note also that the average outage time, T_o , as used in equation (6), is given by $(T/2 + MTTR)$.

24 Hour On-Call: In this maintenance approach, a crew located at a central depot is on-call 24 hours a day to go and repair any reported failure. The restoral time, T_r , will be the average response and travel time to a site after a failure is reported plus the MTTR. The outage time, T_o , is one half the restoral time.

9-5 On-Call: As a contrast to the 24 hour on-call, this maintenance approach has a crew at a central depot only during a single shift work week of "h" hours a day for "d" days a week. If a failure occurs at night or on weekends, the equipment will not be repaired until the regular hour work crew returns. There will be three different outage time periods here. While the crew is on-call, the outage time is as 24 hour on-call.

During the weekday hours, the average outage time will be $[(24-h)/2 + MTTR]$. During the weekends the average outage time will be $[24*(7-d)/2 + MTTR]$.

Equipment Site Configurations

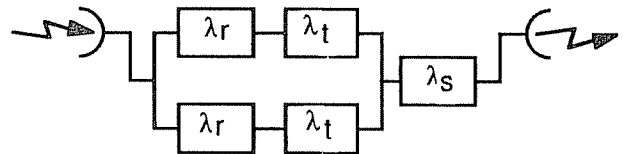
The way that a microwave radio is configured at a site also has an impact on overall radio unavailability. The simplest configuration is the non-switchover (NSWO) radio which has an unavailability given by

$$P_u = \frac{T_r}{MTBF_{NSWO}} \quad (10)$$

which is valid for any maintenance approach.

For hot switchover (HSWO) and space diversity radios, the unavailability is affected by how much redundancy there is among the radio functions.

HSWO: Non Switched Receivers For this configuration, shown as a site repeater below, either a transmitter or receiver failure will cause the standby transmitter-receiver to be switched on line.



HSWO with Non-Switched Receivers

Since the switch is in a common path to the antenna, a failure here causes a system failure. So the unavailability will be controlled in large part by the failure rate of the common switch functions. The unavailability of this configuration will now be determined for the three maintenance approaches discussed previously.

Scheduled Maintenance: This is equivalent to operating the equipment for "T" hours, renewing it and repeating this cycle over. Under this condition a good approximation of the system failure rate is [6]

$$\lambda_{ave}(T) \approx \frac{-\ln[R_{sys}(T)]}{T} \quad (10)$$

where the system reliability calculated from equations (8) and (9) for the above configuration is

$$R_{sys}(T) = e^{-\lambda_s T} \left[1 - \left(1 - e^{-\lambda_r T} \right)^2 \right] \quad (11)$$

where $\lambda_{tr} = \lambda_t + \lambda_r$

The unavailability for scheduled maintenance will be from equation (6)

$$P_u = \lambda_{ave}(T) T_o \quad (12)$$

$$= -\ln \left[\frac{2e^{-(\lambda_s + \lambda_r)T} - e^{-2(\lambda_s + \lambda_r)T}}{T} \right] \left(\frac{T}{2} + MTTR \right)$$

Note that the average outage time T_o is as discussed in the scheduled maintenance paragraph.

24 Hour On-Call: In this situation, the equipment is repaired within the restoral time immediately after a failure is reported. The common switch is not affected by restoration time since a failure here causes a total system failure so its reliability function is simply

$$R_s(t) = e^{-\lambda_s t} \quad (13)$$

The redundant transmitter-receiver reliability is a function of the restoral time, since its only during the time that the failed unit is being restored that a failure in the standby unit will cause a system failure. For this case, the reliability will be [7]

$$R_{tr}(t) = \left(e^{-\lambda_{trB} T_r} \right)^{\lambda_{trA} t} \cdot \left(e^{-\lambda_{trA} T_r} \right)^{\lambda_{trB} t} \quad (14)$$

$$= e^{-2\lambda_{tr}^2 T_r t}$$

The repair of side A while side B is active and the repair of side B while side A is active is considered as two independent events. So, they are multiplied together as shown above in equation (14). Since the failure rates of both A and B sides are usually identical equation (14) is reduced as shown. The system MTBF can now be calculated using equation (2)

$$MTBF = \int_0^\infty R_s(t) \cdot R_{tr}(t) dt = \frac{1}{\lambda_s + 2\lambda_{tr}^2 T_r} \quad (15)$$

and the unavailability will be from equation (6)

$$P_u = \lambda_s T_r + 2\lambda_{tr}^2 T_r T_o \quad (16)$$

where $T_o = T_r/2 = (T_{tr} + MTTR)/2$

T_{tr} is the average travel time to the site.

9-5 On-Call: [7] Calculation of system MTBF is accomplished by determining the system reliability for each time period. For the on-call period, the failure rate of the common equipment is still given by equation (13), but the redundant equipment will be restored in T_r time only ($d \cdot h/168$) th of the time. So equation (14) is modified to be

$$R_{tr}(t) = e^{-2\lambda_{tr}^2 ((d \cdot h)/168) T_r t} \quad (17)$$

There will be $(d-1)$ periods of time, each $(24-h)$ long and one period $[168-24(d-1)+h]$ long over the weekend when no equipment restoral takes place. For these time periods, the reliability of the redundant blocks will be

$$R_{tr2} = \left(2e^{-\lambda_r T_1} - e^{-2\lambda_r T_1} \right)^{(d-1)/168 t}$$

and

$$R_{tr3} = \left(2e^{-\lambda_r T_2} - e^{-2\lambda_r T_2} \right)^{1/168 t} \quad (18)$$

$$\text{with } T_1 = 24 - h \quad \& \quad T_2 = 168 - 24(d-1) + h$$

The MTBF will be the product of the three reliability functions since each time period is considered an independent event.

$$MTBF = \int_0^\infty (R_{tr1} \cdot R_{tr2} \cdot R_{tr3}) dt$$

$$= \frac{1}{\left\{ -(\lambda_s + F_0(T_r)) + \frac{(d-1)}{168} \ln[F(T_1)] + \frac{1}{168} \ln[F(T_2)] \right\}} \quad (19)$$

where $F_0(T_r) = \frac{2dh\lambda_{tr}^2 T_r}{168}$

$$F(T_1) = 2e^{-\lambda_r T_1} - e^{-2\lambda_r T_1}$$

$$\text{and } F(T_2) = 2e^{-\lambda_r T_2} - e^{-2\lambda_r T_2}$$

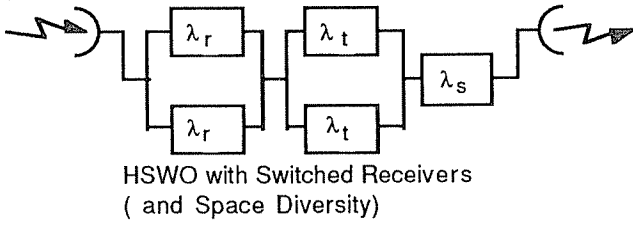
Using the different restoral times for the different time periods discussed in the 9-5 On-Call paragraph, the unavailability will be

$$P_u = \lambda_s T_r + F_0(T_r) (T_r/2)$$

$$- \left\{ \frac{(d-1)}{168} \ln[F(T_1)] \right\} \left[\frac{(24-h)}{2} + MTTR \right] \quad (20)$$

$$- \left\{ \frac{1}{168} \ln[F(T_2)] \right\} \left[\frac{(7-d)}{2} \cdot 24 + MTTR \right]$$

HSWO: Switched Receivers The same basic equipment is set up as before except that now the receivers can be switched independent of the transmitters. This will offer some improvement in system MTBF



Note also that this configuration can also be used to analyze a space diversity system; the physical change being the separate antenna attached to the second receiver input.

Again, the impact of this configuration and the three maintenance approaches is discussed.

Scheduled Maintenance: For scheduled maintenance every "T" hours, equation (10) is still used but the system reliability is modified by the product of two redundant (parallel) elements in series. So, using equations (8) and (9), the system reliability is

$$R_{sys}(T) = e^{-\lambda_s T} [1 - Q_r(T)^2] [1 - Q_t(T)^2]$$

$$\text{where } Q_r(T) = 1 - e^{-\lambda_r T} \quad (21)$$

$$Q_t(T) = 1 - e^{-\lambda_t T}$$

multiplying out the Q functions in the brackets gives

$$G(T) = 4e^{-(\lambda_r + \lambda_r)T} - 2e^{-(\lambda_r + 2\lambda_r)T} - 2e^{-(2\lambda_r + \lambda_r)T} + e^{-(2\lambda_r + 2\lambda_r)T} \quad (22)$$

Then using the same form as equations (10) and (12), the unavailability becomes

$$P_u = -\ln \left[\frac{e^{-\lambda_s T} \cdot G(T)}{T} \right] \left(\frac{T}{2} + MTTR \right) \quad (23)$$

24 Hour On-Call: For independently switched receivers, the reliability function of the common switch block is unchanged, but the reliability of the switched transmitters and receivers form the product of two independent series elements so equation (14) is modified to

$$R_{tr}(t) = e^{-2(\lambda_r^2 + \lambda_t^2) T_r t} \quad (24)$$

Following the development of equation (15), the MTBF of this system will be

$$MTBF = \frac{1}{[\lambda_s + 2(\lambda_r^2 + \lambda_t^2) T_r]} \quad (25)$$

and the unavailability function directly follows

$$P_u = [\lambda_s T_r + (\lambda_r^2 + \lambda_t^2) T_r^2]$$

where T_r = travel time + MTTR (26)

9-5 On-Call: Following the same development as was used for the non-switched receivers; that is, equations (17), (18), and (19), the system MTBF can be written

$$MTBF = \int_0^\infty (R_{tr1} \cdot R_{tr2} \cdot R_{tr3}) dt \quad (27)$$

$$= \frac{-1}{\left\{ -(\lambda_s + G_0(T_r)) + \frac{(d-1)}{168} \ln[G(T_1)] + \frac{1}{168} \ln[G(T_2)] \right\}}$$

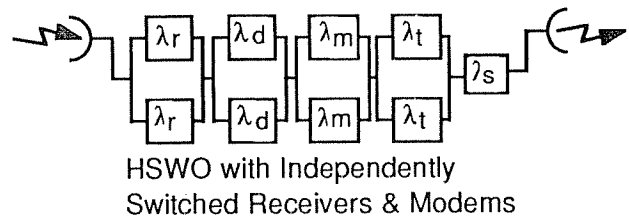
where $G_0(T_r) = \frac{2 d h (\lambda_r^2 + \lambda_t^2) T_r}{168}$

$G(T_1)$ and $G(T_2)$ are as defined in equation (22) with T_1 and T_2 substituted for T . T_1 and T_2 were defined in equation (18). The unavailability function follows directly from equations (6) and (27)

$$P_u = \lambda_s T_r + G_0(T_r) T_r / 2 - \left\{ \frac{(d-1)}{168} \ln[G(T_1)] \right\} \left[\frac{(24-h)}{2} + MTTR \right] - \left\{ \frac{1}{168} \ln[G(T_2)] \right\} \left[\frac{(7-d)}{2} \cdot 24 + MTTR \right] \quad (28)$$

HSWO: Switched Receivers & Modems

Carrying the concept of independently switched modules further, data modulators and demodulators can also be switched independently from the transmitter and receiver functions.



One change in equipment configuration will also be added here which also could apply to the previous example. The previous example assumed that each independent switched module had its own power supply. In the configuration above, some common power supply elements are shared among all the main modules. A redundant set of common power supply elements is shared among the standby modules. This means that a common power supply failure will affect all the independent modules in a redundant arm at the same time. To compensate for this, that fraction of the power supply that controls the common failure of the independent units is added to the failure rate of each independent module. For example, the failure rate of the transmitter section would become

$$\lambda_{tp} = \lambda_t \left(1 + \frac{\lambda_{pc}}{\lambda_t + \lambda_r + \lambda_m + \lambda_d + \lambda_{pc}} \right) \quad (29)$$

where the failure rates in the denominator are the failure rates of the individual independent modules.

With these modified module failure rates, the development of the MTBF and unavailability equations for the three maintenance approaches follows as before.

Scheduled Maintenance: For scheduled maintenance every "T" hours

$$R_{sys}(T) = e^{-\lambda_s T} U(T)$$

where

$$\begin{aligned} U(T) &= [1 - Q_{tp}(T)^2] \cdot [1 - Q_{rp}(T)^2] \\ &\cdot [1 - Q_{mp}(T)^2] \cdot [1 - Q_{dp}(T)^2] \\ Q_{tp}(T) &= 1 - e^{-\lambda_{tp} T} \\ Q_{rp}(T) &= 1 - e^{-\lambda_{rp} T} \\ Q_{mp}(T) &= 1 - e^{-\lambda_{mp} T} \\ Q_{dp}(T) &= 1 - e^{-\lambda_{dp} T} \end{aligned} \quad (30)$$

and the unavailability is

$$P_u = -\ln \left[\frac{e^{-\lambda_s T} \cdot U(T)}{T} \right] \left(\frac{T}{2} + MTTR \right) \quad (31)$$

24 Hour On-Call: For 24 hour on-call maintenance, the common power supply configuration

modifies the form of equation (24) to include the cross terms between the power supply failure rate and the independent module failure rates as shown below.

$$R_{tr}(t) = e^{-2(\lambda_t^2 + \lambda_r^2 + \lambda_m^2 + \lambda_d^2 + U_2(\lambda_{pc})) T_r t}$$

where $U_2(\lambda_{pc}) = \lambda_{pc} (\lambda_t + \lambda_r + \lambda_m + \lambda_d + \lambda_{pc})$ (32)

and the system MTBF is

$$MTBF = \frac{1}{\lambda_s + 2(\lambda_t^2 + \lambda_r^2 + \lambda_m^2 + \lambda_d^2 + U_2(\lambda_{pc})) T_r} \quad (33)$$

and the unavailability is

$$P_u = \frac{T_o}{MTBF} = \left[\lambda_s T_r + (\lambda_t^2 + \lambda_r^2 + \lambda_m^2 + \lambda_d^2 + U_2(\lambda_{pc})) T_r^2 \right] \quad (34)$$

9-5 On-Call: The MTBF and unavailability equations for "9-5 on-call" will have the same form as equations (27) and (28) except that $G(T_1)$ and $G(T_2)$ are replaced by $U(T_1)$ and $U(T_2)$ with $U(T)$ given by equation (30).

$$MTBF = \frac{-1}{\left\{ -(\lambda_s + U_0(T_r)) + \frac{(d-1)}{168} \ln[U(T_1)] + \frac{1}{168} \ln[U(T_2)] \right\}}$$

where $U_0(T_r) = \frac{2d h (\lambda_t^2 + \lambda_r^2 + \lambda_m^2 + \lambda_d^2 + U_2(\lambda_{pc})) T_r}{168}$ (35)

and the unavailability is given by

$$P_u = \lambda_s T_r + U_0(T_r) T_r / 2 - \left\{ \frac{(d-1)}{168} \ln[U(T_1)] \right\} \left[\frac{(24-h)}{2} + MTTR \right] - \left\{ \frac{1}{168} \ln[U(T_2)] \right\} \left[\frac{(7-d)}{2} \cdot 24 + MTTR \right] \quad (36)$$

Reliability Comparison Examples

Some examples using the previously discussed equipment configurations and maintenance approaches will be calculated using the MTBF and unavailability equations developed for each situation. Note that for a two-way site, the unavailability is twice the value of a one-way calculation. All the given formulas are for a one-way calculation. The values given in the examples to follow are for a two-way site. For convenience, the availability and unavailability is given in %.

The following information is used in the example calculations. All failure rates are in failures per million hours.

Tx Failure Rate (λ_t)	45
Rx Failure Rate (λ_r)	37
Data Mod. Failure Rate (λ_m)	11
Data Demod. Fail Rate (λ_d)	14
Common P. S. Fail Rate (λ_{pc})	17
Common Equip. Fail Rate (λ_s)	2
Time to Restore (T_r)	
Mean Travel Time to Site	2 hrs
Mean Time to Diagnose & Repair	1 hr
Limited on-call maintenance	
Hours per day	8 hrs
Days per week	5 days

Site Configurations (2-way repeater)

NSWO repeater	#1
HSWO non-switched receivers	#2
HSWO switched receivers	#3
HSWO independently switched receivers and modems	#4

The Reliability Comparison Table below lists the MTBF's and availabilities for the four site configurations above for each of three maintenance approaches. Note that the system with no redundancy (site configuration #1) has a much lower MTBF and as a consequence much higher unavailability. Hot-standby redundancy in site configurations 2,3, and 4 raises the MTBF by a factor of 50 but system availability is still dependant on the maintenance approach and the amount of module redundancy. As expected 24 hour on-call maintenance gives the best availability. But, on-call maintenance limited to 40 hours a week can give availabilities that approach 24 hour on-call maintenance for highly redundant equipment configurations as seen in site configuration #4.

Table 6
Reliability Comparison

<u>Site Config.</u>	<u>Item</u>	<u>24hr Sched Maint.</u>	<u>24hr On-Call</u>	<u>9-5 On-Call</u>
#1	MTBF (hrs)	8064.5	8064.5	8064.5
	Unavail (%)	.3224	.0744	.0744
	Avail (%)	99.6776	99.92560	99.92560
	Outage (min/yr)	1695.7	391.314	391.314
#2	MTBF (hrs)	422310	477953	402021
	Unavail (%)	.00615662	.00122768	.00323461
	Avail (%)	99.993843	99.998772	99.996765
	Outage (min/yr)	32.381	6.457	17.013
#3	MTBF (hrs)	467834	488503	447122
	Unavail (%)	.00555753	.00121412	.00218542
	Avail (%)	99.994442	99.998786	99.997815
	Outage (min/yr)	29.230	6.386	11.494
#4	MTBF (hrs)	478703	491421	464211
	Unavail (%)	.00543135	.00121047	.00183837
	Avail (%)	99.994569	99.998790	99.998162
	Outage (min/yr)	28.567	6.367	9.669

III. Telecommunication System Reliability

In the first two sections of this paper, we have discussed module reliability, radio link reliability, and maintenance philosophy. In this section, we will discuss overall reliability for telecommunication systems. First, we will make some simplifying assumptions in our reliability calculations. Then we will discuss some general system configurations and offer some examples. Finally, we will try to draw some conclusions about system reliability.

Simplified Reliability Calculations

The key to simplifying the reliability equations is to assume that the mean time between failures of any part of the system is much greater than the equipment restoral time.

$$MTBF \gg T_R$$

Let us also assume that we are using a 24-hour, on-call maintenance philosophy. With these in mind, let us consider a system composed of a collection of non-redundant elements and a collection of redundant elements. These may be modules or complete radios or complete links.

For non-redundant elements with individual failure rates λ_{Ni} and restoral time T_R :

$$\text{Total Failure Rate: } \lambda_N = \sum \lambda_{Ni}$$

$$\text{Outage per Failure: } T_O = T_R$$

$$\text{Unavailability: } U_N = \lambda_N T_O = \sum \lambda_{Ni} T_R$$

For redundant elements with individual failure rates λ_{Ri} and restoral time T_R :

$$\text{Total Failure Rate: } \lambda_R = \sum 2\lambda_{Ri}^2 T_R$$

$$\text{Outage per Failure: } T_O = 0.5 T_R$$

$$\text{Unavailability: } U_R = \lambda_R T_O = \sum \lambda_{Ri}^2 T_R^2$$

Then for the whole system, we can say :

$$\text{System Failure Rate: } \lambda_T = \lambda_N + \lambda_R$$

$$\text{System MTBF: } MTBF = \lambda_T^{-1}$$

$$\text{System Unavailability: } U_T = U_N + U_R$$

Note that the system unavailability is calculated as a sum of the element unavailabilities and not from the system failure rate. The reason is that the average outage for double failures of redundant elements is not the same as that for single failures of non-redundant elements.

Basic System Configurations

Every system is unique, but most systems can be viewed as a combination of three basic forms: the star, the backbone, and the loop. Each form can be used to interconnect a number of sites, supplying a certain amount of capacity to each. Which way is best for a particular system depends on several factors. The most important is the geographic location of the sites that are linked by the system. Next is system cost, impacted by channel availability and channel capacity. Finally, system availability, including both equipment and path reliability, and system failure modes.

Let's use the simplified reliability equations to characterize the three basic system configurations applied to a hypothetical system problem.

Hypothetical System Problem

Let us consider a hypothetical system consisting of N sites, each requiring C channels of capacity. Let us also assume that on each link the path unavailability is U_p and the equipment unavailability is U_e . (See Figures.)

The Star Configuration

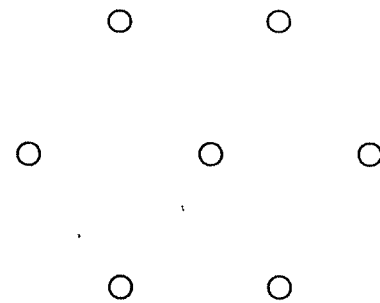
In a star configuration, a number of remote sites are tied to one hub site. Each of these links operates independently, which means that a failure of one link affects only one remote site. Since the traffic on the link is destined for only one remote site, the capacity of the link need only be C.

The Backbone Configuration

In a backbone configuration, the sites are linked in a straight line fashion, from a terminal at one end through a series of repeaters with drops to a terminal at the other end. Traffic from one terminal to the other passes through all the repeaters while traffic between repeaters may proceed through only the intervening repeaters. The capacity required on each link is not the same since each link is carrying traffic destined for other

HYPOTHETICAL SYSTEM PROBLEM

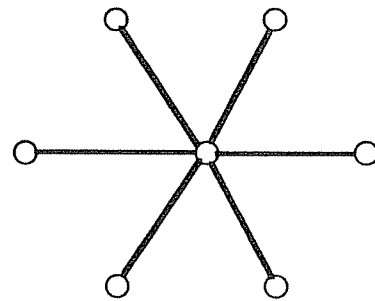
Number of sites: N
 Channels at a site: C
 For One Link:
 Path Unavailability: U_p
 Equipment Unavailability: U_e



THE STAR CONFIGURATION

Number of sites: N
 Channels at a site: C
 Number of Links: $N-1$
 Capacity of Link: C

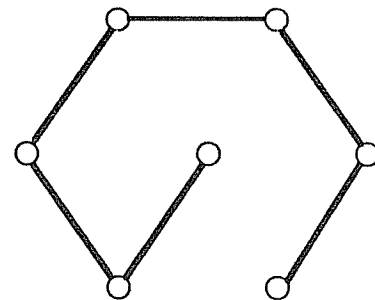
Note: All links are low capacity. Failure of any one link cuts only one site from the system.



THE BACKBONE CONFIGURATION

Number of sites: N
 Channels at a site: C
 Number of Links: $N-1$
 Capacity of Link: $(N-1)*C$

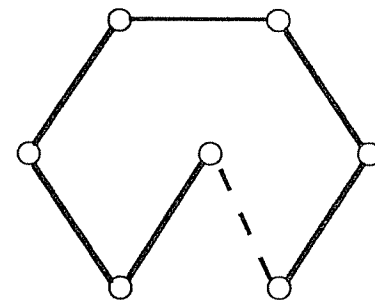
Note: Higher link capacity required. Failure of any one link cuts about half the sites from the system.



THE LOOP CONFIGURATION

Number of sites: N
 Channels at a site: C
 Number of Links: N
 Capacity of Link: $(N-1)*C$

Note: High link capacity required. Failure of any one link will not cut any sites from the system.



sites further down the backbone. The capacity required is usually much higher over some part of the system. If a link fails in a backbone system, the system is severed and all traffic between the two sections is cut.

The Loop Configuration

A loop system is very much like a backbone system bent around on itself with an additional redundant link from one terminal end to the other. If a link should fail in the loop, the redundant path is switched in and traffic is routed around the loop in the other direction. Since traffic can be passed either way around the loop, the capacity of every link must be equal to the maximum capacity of any link and equal to the total traffic to all sites. The redundant link also provides path diversity, something not found in the star or backbone systems. It can be used not only for equipment failure but also in case of radio path outage.

Comparison of System Configurations

These three system configurations are sketched in the figures here and are compared in Table 7. From the table we can see that a star system requires the fewest number of links and the lowest capacity links while the loop system requires the highest. The loop system also has the best unavailability and least outage time since its unavailability moves as the square of the link unavailabilities. This will become clearer if we consider a few numerical examples.

System Examples: Hypothetical Radio Link

Let's consider a hypothetical two-way microwave radio link from which we will construct our system examples. We can assume that a pair of NSW0 radios has an MTBF of 10,000 hours and a pair of HSW0 radios has an MTBF of 100,000 hours. These are very typical numbers.

TABLE 7. COMPARISON OF SYSTEM CONFIGURATIONS

	STAR	BACKBONE	LOOP
NUMBER OF LINKS:	N-1	N-1	N
CAPACITY OF LINK:	C	(N-1) C	(N-1) C
SYSTEM UNAVAILABILITY			
EQUIPMENT:	(N-1) U_e	(N-1) U_e	N U_e [U_o]
PATH:	(N-1) U_p	(N-1) U_p	N U_p [(N-1) U_p + U_o]

where N = number of sites
C = capacity needed for each site
 U_e = equipment unavailability for each link
 U_p = path unavailability for each link
 U_L = loop-switch equipment unavailability
and $U_o = (N-1) U_e + U_L$

SYSTEM EXAMPLES

EXAMPLE 1. 2 SITES, DS-1 TO EACH

	STAR -----	BACKBONE -----	LOOP -----
NUMBER OF LINKS:	1	1	2
CAPACITY OF LINK:	1	1	1
NSWO UNAVAILABILITIES			
EQUIPMENT:	0.1%	0.1%	0.0002%
PATH:	0.001%	0.001%	0.000002%
HSWO UNAVAILABILITIES			
EQUIPMENT:	0.01%	0.01%	0.000004%
PATH:	0.001%	0.001%	0.0000004%

EXAMPLE 2. 3 SITES, DS-1 TO EACH

	STAR -----	BACKBONE -----	LOOP -----
NUMBER OF LINKS:	2	2	3
CAPACITY OF LINK:	1	2	2
NSWO UNAVAILABILITIES			
EQUIPMENT:	0.2%	0.2%	0.0006%
PATH:	0.002%	0.002%	0.000006%
HSWO UNAVAILABILITIES			
EQUIPMENT:	0.02%	0.02%	0.000009%
PATH:	0.002%	0.002%	0.000001%

EXAMPLE 3. 7 SITES, DS-1 TO EACH

	STAR -----	BACKBONE -----	LOOP -----
NUMBER OF LINKS:	6	6	7
CAPACITY OF LINK:	1	6	6
NSWO UNAVAILABILITIES			
EQUIPMENT:	0.6%	0.6%	0.004%
PATH:	0.006%	0.006%	0.00004%
HSWO UNAVAILABILITIES			
EQUIPMENT:	0.06%	0.06%	0.00005%
PATH:	0.006%	0.006%	0.000005%

We will neglect antennas, feedlines, and power sources. If we assume 24-hour on-call maintenance, then a restoral time of 10 hours is very reasonable. We can also assume a 25 mile path length at 6 GHz, so that with reasonable fade margins we can achieve a path unavailability of 0.001%. We can also assume that a very reliable loop-switch system is available with an MTBF of 100,000 hours.

System Examples: Discussion

The first example is a two site system. In this case, a star is the same as a backbone: a single link. A loop, however, requires a second path between the sites, such as is afforded by a second co-located radio link. This would be the same as frequency diversity which is not always allowed by government regulations.

The second example adds a third site, making the systems true star, backbone, and loop. Now we can see the greater link capacity required for backbone and loop systems.

The third example is a seven-site system which is a good example of a typical county-wide microwave radio system. Note the high capacity required in backbone and loop systems.

System Examples: Conclusions

Some conclusions can be drawn from these few examples:

1. Equipment availability is almost always worse than path availability.
2. HSWO equipment always has better availability than NSWOW equipment.
3. Loop diversity dramatically improves both equipment and path availability.

System Unavailability Goals

It is impossible to build a system that has no outages. Reality says that parts do fail and radio paths do fade and Mother Nature does try to tear down what we try to build up. As we mentioned before, every system is unique. The type of user, the type of traffic, the size of the system, and the way the system fails all affect the acceptable level of unavailability. An amateur radio re-

peater link does not require the same availability as a cellular telephone link or electric power grid protective relaying. The unavailability goal is up to the user, but there are some general recommendations that can be useful as guidelines.

Common carriers very often use an unavailability goal of 0.01% average per year for a 250 mile long system. Shorter or longer systems can be scaled by length. This is total, including both equipment and path outages for both directions on the links. This amounts to 53 minutes outage per year.

Utilities often use the same goal as common carriers, 0.01% per year, but some applications require less outage. Additional requirements often imposed are 0.01% path unavailability during the worst month for a single non-diversity hop. Sometimes the goal is tightened to 0.0001% path unavailability during the worst month for a single diversity hop.

One thing to note is that, in most cases, path unavailability is not the major contributor. Equipment outage usually dominates in most systems. Paths may be out for a few seconds or minutes at a time every month, but when the equipment fails, the system is down for hours or days.

System Reliability Summary

System unavailability depends on system configuration and maintenance philosophy.

Star systems require the fewest radios with the lowest capacity per link. System outage usually affects only one site.

Backbone systems use the same number of radios, but capacity per link is high. System outage affects the whole system.

Loop systems add a diversity path to the backbone system. Capacity per link is high. System outage is rare but will affect the whole system.

System unavailability goals are aggressive but can be achieved by using equipment redundancy, path diversity, and rapid response to equipment failure.

References

- [1] *Reliability Prediction of Electronic Equipment*, DoD MIL-HDBK-217E, 1986.
- [2] *Bell Communications Research Reliability Manual*, Doc. No. SR-TSY-000385, Issue 1, June 1986.
- [3] D. Klinger, Y. Nakada, M. Menendez, (Eds.), *AT & T Reliability Manual*, Van Nostrand Reinhold, 1990.
- [4] *Reliability Prediction of Electronic Equipment*, DoD MIL-HDBK-217A, 1965
- [5] J. C. Conlon and W. Lilius, Test and Evaluation of System Reliability, Availability, and Maintainability, Dept. of Defense, DoD-3235.1-H, March 1982.
- [6] Igor Bazovsky, *Reliability Theory and Practice*, Prentice-Hall, 1961, pp.200-207.
- [7] J. L. Williams. "Reliability Considerations for Microwave Systems", Report No. RDP/S-MWPL-003, Collins Radio Company, Dallas, Texas.



Lake County, Illinois
REQUEST FOR PROPOSAL
COUNTYWIDE RADIO COMMUNICATIONS SYSTEM
EXHIBIT A – TECHNICAL SPECIFICATIONS

APPENDIX F: PRICING WORKSHEETS

		TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																						
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
<u>RF TRANSCEIVER SITE (TRUNKING SYSTEM)</u>																								
Site/Node Controller																								
P25 Base Station Transceiver																								
Timing/Frequency Reference																								
Low Speed Multiplex (Channel Bank)																								
Networking/Switching Equipment																								
NMS/Fault Management																								
Transmit Antenna/Transmission Line System																								
Receive Antenna/Transmission Line System																								
Transmit Multiplex System/Combiner																								
Receive Multiplex System/Amplifier																								
DC Power Plant/Rectifier/Charger/Distribution																								
DC Batteries																								
AC Power/Distribution																								
Rack/Cabinet																								
Cabling/Cross-Connect																								
Grounding/Suppression																								
Test Equipment																								
Software/Firmware Licenses (Must Define All)																								
Programming Software, Cables and Interface																								
Spare Equipment (Must Define Each Component)																								
<u>MICROWAVE/TRANSPORT SITE EQUIPMENT</u>																								
Microwave Radio																								
Multiplexer																								
Antenna/Transmission Line System																								
Pressurization/Dehydrator																								
Orderwire																								
NMS/Fault Management																								
DC Power Plant/Rectifier/Charger/Distribution																								
DC Batteries																								
AC Power/Distribution																								
Rack/Cabinet																								
Cabling/Cross-Connect																								
Grounding/Suppression																								
Test Equipment																								
Software/Firmware Licenses (Must Define All)																								
Programming Software, Cables and Interface																								
Spare Equipment (Must Define Each Component)																								

		TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																						
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
<u>TOWER/SHELTER EQUIPMENT/TOWER/SITE DEVELOPMENT</u>																								
Tower (Must Note Height)																								
Tower Foundation																								
Tower Lighting System																								
Equipment Shelter (Must Note Size)																								
Shelter Foundation																								
UPS/Batteries																								
Generator/Fuel Tank/Transfer Switch																								
Generator Foundation																								
Fire Suppression																								
NMS/Fault Management/Alarms																								
Access Road/Stone Surfacing																								
Fencing																								
Grounding/Suppression																								
Electrical Distribution																								
Spare Equipment (Must Define Each Component)																								

	TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																							
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
<u>NETWORK CONTROL SITE (TRUNKING SYSTEM)</u>																								
Redundant Master Network Controllers (MNC)																								
MNC Servers (Must define All Servers)																								
MNC Software Applications (Must Define)																								
Wide Area Audio Switch																								
Networking/Routing/Switching Equipment																								
Network Security and AntiVirus Protections																								
NMS/Fault Management																								
Network Management System Clients/Printers																								
NMS Software Applications																								
Over-the-Air Network Monitoring																								
Key Management Facility/Key Fill																								
P25 Comparators/Audio Distribution																								
Timing/Frequency Reference																								
Low Speed Multiplex (Channel Bank)																								
DC Power Plant/Rectifier/Charger/Distribution																								
DC Batteries																								
AC Power/Distribution																								
Rack/Cabinet																								
Cabling/Cross-Connect																								
Grounding/Suppression																								
Test Equipment/Optimization Equipment																								
Software/Firmware Licenses (Must Define All)																								
Programming Software, Cables and Interface																								
Spare Equipment (Must Define Each Component)																								
Telephone Interconnect (Option)																								
Status/Message (Option)																								
Multiple-Key Encryption (Option)																								
GPS Location Services (Option)																								
Short Message/Alphanumeric Text Services (Option)																								
<u>DISPATCH CONTROL SITE (TRUNKING SYSTEM)</u>																								
Common Console Electronics																								
Console Servers (Must define All Servers)																								
Console Software Applications (Must Define)																								
Dispatch Console Clients/Accessories																								
Dispatch Console/Call Taker Instant Recall Recorder																								
Paging Encoder																								
Legacy Mutual Aid and other Radio channels Interfaces																								
Networking/Routing/Switching Equipment																								
Network Security and AntiVirus Protections																								

		TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																						
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
Subscriber Warranty Year 6																								
Subscriber Warranty Year 7																								
Subscriber Warranty Year 8																								
Subscriber Warranty Year 9																								
Subscriber Warranty Year 10																								
Subscriber Warranty Year 11																								
Subscriber Warranty Year 12																								
Subscriber Warranty Year 13																								
Subscriber Warranty Year 14																								
Subscriber Warranty Year 15																								
Software/Firmware Warranty Year 1																								
Software/Firmware Warranty Year 2																								
Software/Firmware Warranty Year 3																								
Software/Firmware Warranty Year 4																								
Software/Firmware Warranty Year 5																								
Software/Firmware Warranty Year 6																								
Software/Firmware Warranty Year 7																								
Software/Firmware Warranty Year 8																								
Software/Firmware Warranty Year 9																								
Software/Firmware Warranty Year 10																								
Software/Firmware Warranty Year 11																								
Software/Firmware Warranty Year 12																								
Software/Firmware Warranty Year 13																								
Software/Firmware Warranty Year 14																								
Software/Firmware Warranty Year 15																								
TRUNKING SYSTEM INTEGRATION SERVICES																								
Project Management																								
Project Engineering																								
Factory Staging/Integration																								
Licensing/Regulatory/Permitting																								
System Acceptance Testing																								
Documentation																								
System Manager Training																								
Technician Training																								
Field User/Dispatcher Training																								
Shipping/Freight																								
Project Manager Man-Day Rate																								
Engineer Man-Day Rate																								

		TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																						
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
Technologist Man-Day Rate																								
Radio Technician Man-Day Rate																								
Foreman/Site Supervisor Man-Day Rate																								
Tower Climber Man-Day Rate																								
<u>MICROWAVE SYSTEM INTEGRATION SERVICES</u>																								
Project Management																								
Project Engineering																								
Factory Staging/Integration																								
Licensing/Regulatory/Permitting																								
Path Study/Site Survey																								
System Acceptance Testing																								
Documentation																								
Training																								
Shipping/Freight																								
Project Manager Man-Day Rate																								
Engineer Man-Day Rate																								
Technician Man-Day Rate																								
Foreman/Site Supervisor Man-Day Rate																								
Tower Climber Man-Day Rate																								
<u>TOWER/SHELTER/SITE DEVELOPMENT INTEGRATION SERVICES</u>																								
Site Design/Engineering																								
Site Permitting/Regulatory/Licensing																								
Site Preparation/Development																								
Project Management																								
Testing																								
Documentation																								
Shipping/Freight																								
Project Manager Man-Day Rate																								
Engineer Man-Day Rate																								
Foreman/Site Supervisor Man-Day Rate																								
Tower Climber Man-Day Rate																								
Laborer Man-Day Rate																								
																				SYSTEM PRICING TOTALS				
																				TRUNKING SYSTEM EQUIPMENT GRAND TOTAL				
																				TRUNKING SYSTEM SERVICES GRAND TOTAL				

		TOTAL SUMMARY OF QUANTITIES PER SITE/COSTS																						
Countywide 700/800 MHz Radio System Pricing Template																				Total	Equipment	Unit Labor	Total Labor	Combined Equipment & Labor
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					
Equipment Description	Equipment Unit Cost	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18	Total Units	Equipment Total Cost	Unit Labor/Install Cost	Total Labor/Install Cost	Combined Equipment & Labor Total Cost
																				MICROWAVE SYSTEM EQUIPMENT GRAND TOTAL				
																				MICROWAVE SYSTEM SERVICES GRAND TOTAL				
																				TOWER/SHELTER/SITE DEVELOPMENT EQUIPMENT GRAND TOTAL				
																				TOWER/SHELTER/SITE DEVELOPMENT SERVICES GRAND TOTAL				
																						TOTAL SYSTEM DISCOUNT		
																						NET SYSTEM PRICE		\$ -
NOTES:																								
1. SUPPLIER SHALL ADD LINE ITEMS WHENEVER THE EQUIPMENT UNIT COST AND/OR UNIT LABOR COST VARIES BETWEEN SITE FOR THE SAME BASIC EQUIPMENT/SERVICE.																								
2. SUPPLIER SHALL PROVIDE TOTAL COSTS FOR THE SYSTEM AS A WHOLE AND TOTAL COSTS FOR EACH SITE.																								
3. SUPPLIER SHALL NOT ASSUME THAT THE COUNTY REQUIRES 18 DIFFERENT SITES FROM THIS MATRIX. THIS NUMBER IS USED FOR ILLUSTRATIVE PUPPOSES AND SHOULD BE BASED UPON SUPPLIER DESIGN.																								
4. SUPPLIER SHALL LEAVE FORMULAS INTACT ON THIS SPREADSHEET.																								
5. SUPPLIER SHALL COMPILE ALL SYSTEM/SITE TOTALS ON THE COST SUMMARY WORKSHEET.																								
6. SUPPLIER SHALL ADD DETAIL TO THE PRICING WORKSHEET AS NECESSARY TO THOROUGHLY DEFINE ALL SOFTWARE OPTIONS AND LICENSING REQUIREMENTS.																								

[illegible]

Lake County, IL 700/800 MHz Radio System Cost Summary	
SITE 1	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 2	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 3	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 4	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 5	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 6	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 7	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 8	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 9	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 10	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 11	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 12	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 13	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 14	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 15	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 16	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 17	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
Site 18	
Line Item	Cost
RF Transceiver/Trunking Equipment	
Microwave Transport Equipment	
Tower/Shelter/Site Development	
Master Network Control Equipment	
Dispatch Control	
Radio Subscribers (Optional)	
Radio System Integration Services	
Microwave System Integration Services	
Tower/Shelter Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
SUBSCRIBERS (Optional)	
Line Item	Cost
Non-Public Safety Radio Subscribers	
Public Safety Radio Subscribers	
Subscriber Installation/Integration Services	
Spares	
Test Equipment	
Miscellaneous	
Discount	
SITE TOTALS	\$ -

Lake County, IL 700/800 MHz Radio System Cost Summary	
SYSTEM PRICING TOTALS	
TRUNKING SYSTEM EQUIPMENT GRAND TOTAL	
TRUNKING SYSTEM SERVICES GRAND TOTAL	
MICROWAVE SYSTEM EQUIPMENT GRAND TOTAL	
MICROWAVE SYSTEM SERVICES GRAND TOTAL	
TOWER/SHELTER/SITE DEVELOPMENT EQUIPMENT GRAND TOTAL	
TOWER/SHELTER/SITE DEVELOPMENT SERVICES GRAND TOTAL	
TOTAL SYSTEM DISCOUNT	
NET SYSTEM PRICE	\$ -
NOTES:	
1. SUPPLIER SHALL PROVIDE TOTAL COSTS FOR THE SYSTEM AS A WHOLE AND TOTAL COSTS FOR EACH COMPONENT. TOTAL COSTS SHALL TRACK TO THE DETAILED PRICING WORKSHEET.	
2. SUPPLIER SHALL NOT ASSUME THAT THE COUNTY REQUIRES 18 DIFFERENT SITES FROM THIS PROJECT. THIS NUMBER IS USED FOR ILLUSTRATIVE PURPOSES AND SHOULD BE BASED UPON SUPPLIER'S ESTIMATE.	
3. SUPPLIER SHALL LEAVE FORMULAS INTACT ON THIS SPREADSHEET.	
4. SUPPLIER SHALL BASE ALL SYSTEM/SITE TOTALS ON THE DETAILED PRICING WORKSHEET.	
5. SUPPLIER MAY ADD ADDITIONAL INFO IN COST SUMMARY FOR MORE CLARITY (e.g., IN-BUILDING, WARRANTY/SERVICE, SPARES, etc.).	
6. SUPPLIER SHALL ADD DETAIL TO THE PRICING WORKSHEET AS NECESSARY TO THOROUGHLY DESCRIBE SOFTWARE OPTIONS AND LICENSING REQUIREMENTS.	

Lake County, IL 700/800 MHz Radio System Cost Summary	
MISCELLANEOUS OPTIONS	
Line Item	Cost
Trunking System - 16 dB of In-Building Coverage (provide detailed pricing similar to base system pricing)	
Backup Provision to Trunked System	
Multi-key Encryption	
Status Messaging	
Discreet Terminal Monitoring	
Short Messaging	
Tracking/GPS Location Services	
Telephone Interconnect	
Digital Audio Logging Recorders	
Miscellaneous Parts Discount % Level	
OPTION TOTALS	\$ -

SECTION 3

TECHNICAL REQUIREMENTS

COUNTYWIDE RADIO COMMUNICATION SYSTEM RFP #13231

OCTOBER 2013

PACKAGE 2 - TECHNICAL PROPOSAL



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TECHNICAL REQUIREMENTS

3.1 TECHNICAL REQUIREMENTS

1.0 INTRODUCTION

1.1 DEFINITIONS

The meaning of certain words as used within this solicitation shall be controlled through the use of the following definitions unless stated otherwise in the document.

700 MHz means the radio spectrum between 764 and 806 Megahertz as currently authorized by the FCC

800 MHz means the radio spectrum between 806 and 861 Megahertz as currently authorized by the FCC

APCO means the Association of Public-Safety Communications Officials, International

API means application programming interface, an interface that enables one program to use the facilities provided by another program

Autonomous Network means another land mobile radio network operated by an independent unit of government.

Backbone means a network of redundant components that provides communications between network RF transmission sites, communications centers where consoles are located, and the master network control location

BER means bit error rate

Business Day means any day, Monday – Friday that is not designated as a legal holiday by the County.

C or C++ means a compiled, computer software language

CATP means Coverage Acceptance Test Procedure CMRS means Commercial Mobile Radio service

DTMF means dual tone multi-frequency

DSX means digital cross connection

Electronic Patch (or Network Gateway patch) means a device such as a Motorola Motobridge®, Harris NetworkFirst®, Raytheon ACU-1000® or similar product designed to provide interoperability between radio systems employing incompatible electronic technologies or architectures

FCC means the Federal Communications Commission

FDMA means frequency division multiple access

Fixed Network Equipment (FNE) means all hardware and software used to transmit and receive radio signals including but not necessarily limited to: the system's 800 MHz (700 MHz capable) transceivers, comparator/voter, system control systems, combiners, multiplexers, antennae, microwave transceivers and dishes, etc.

Full-Duplex means the ability to simultaneously transmit and receive a radio signal

Half-Duplex – See Semi-Duplex

In-building Coverage means the amount of signal margin in decibels or dB provided for in a radio system design for the purpose of overcoming signal attenuation due to building structure, in order to provide at least the minimum signal level necessary to provide acceptable portable radio communications inside a building. The RFP refers to 12 dB and 16 dB building penetration losses. It is the difference in signal strength between the outside and the inside of a building.

Link Budget An RF link budget is the wireless system designer's tool that allows them to incorporate the performance characteristics of the specific equipment used in a design and to determine the level of the wireless signal (or system sensitivity) necessary to provide the required level of performance.

LMR means Land Mobile Radio system

Network Site means a location proposed by the Offeror and approved by the County for the installation of FNE

Non-Compliant – See Non-Responsive

Non-Responsive (Non-Compliant) means that a requirement of the solicitation was not met and the proposal is subject to rejection

NPSPAC means the National Public Safety Planning and Advisory Committee

NPSPAC Region 54 means the coordinating body authorized by the National Public Safety Planning Advisory Committee with administrative authority over the County

PSTN means the Public Switched Telephone Network

Project 25 (P25) means a standard for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in an emergency

Repeater means an electronic device designed to instantly retransmit at a higher power the transmission of a subscriber

RF means radio frequency

Semi-Duplex (Half-Duplex) means the ability to non-simultaneously transmit and receive a radio signal using two discrete radio frequencies

Simplex – See Talkaround.

Solicitation means this document through which the requirements of the procurement are defined

SQL means structured query language, a relational database program used with a computer system

Offeror means the firm or entity with which the County will have contracted to install the System (synonymous with "Contractor", "Supplier", and "Bidder")

System means all electronics, hardware, and software components routinely employed to operate the 800 MHz (700 MHz capable) digital trunked network including but not limited to fixed network equipment, antennae, transmission lines, electronic control consoles, microwave system, towers, tower grounding systems, associated subsystems, etc., resulting in a fully operational, licensable, highly reliable 800 MHz (700 MHz capable) digital trunked public safety and non-public safety radio communications capability meeting the requirements of and intended to be procured as a result of this solicitation.

Talkaround (Simplex) means the ability of a mobile or portable radio to communicate directly with another mobile or portable radio without the support of the network

TDMA means time division multiple access

Turnkey Solution means the entire system and all tasks or services associated with the system, including the preparation of sites or structures for the installation of System components, including



the removal of any existing components of any kind, shall be performed under the responsibility of the Offeror.

MOTOROLA RESPONSE

Understood.

2.0 BACKGROUND AND GENERAL DESCRIPTION OF WORK

2.1 CURRENT SYSTEM DESCRIPTION

A description of the public safety communications systems that are currently in use in Lake County is given in the following sections.

MOTOROLA RESPONSE

Understood.

2.1.1 Lake County 800 MHz Trunked System

Lake County, IL owns and operates an 800 MHz trunked radio system. The system is described in the following sections.

MOTOROLA RESPONSE

Understood.

2.1.1.1 Description of the existing Harris EDACS 800 MHz System

The County operates radio license WPMB711 which licenses a total of 8 frequencies at 5 transmit/receive sites and a 6th control point site in a simulcast configuration. The County operates a dual mode analog/digital Ericsson EDACS trunked radio system at these 6 sites. Additionally, WPMB711 includes 5 of those 8 channels at a 6th site for a backup system. Radio licensee WPSZ771 includes the 5 National Public Safety Planning Advisory Committee (NPSPAC) mutual aid channels at that same 6th site for mutual aid purposes.

All of the frequencies identified in both WPMB711 and WPSZ771 are part of the NPSPAC frequency band (806-809/851-854 MHz).

MOTOROLA RESPONSE

Understood.

2.1.1.2 System Functionality

The 800 MHz EDACS system is a public safety trunked system. This is a proprietary system that provides radio coverage within Lake County. The system was designed for 90%, 12 dB in-building countywide radio coverage for portable radios equipped with speaker microphone antenna attachment (at shoulder level).

There are approximately 1,500 radios operating on the County radio system, 1,000 portables and 500 mobiles. Approximately 1208 of these radios are operated by County departments/agencies.

A total of twenty-one (21) departments/agencies operate on the radio system, eleven (11) County and ten (10) local government.



There are approximately 288 radios used by local governments that operate on the County radio system as follows:

Forest Preserve District – 128
Chem-Bio Group – 7
Homeland Security Group – 52
Island Lake Police – 29
Local and Regional PSAP Centers – 32
Lake County MEG – 25
Wauconda Fire/EMA – 4
Lake Bluff Police – 1
Gurnee Police – 1
Park City Police – 9

MOTOROLA RESPONSE

Understood.

2.1.2 Equipment & Sites

2.1.2.1 Primary System

Lake County currently operates a 5-site and 1 Control Point site; 8-channel EDACS simulcast trunked radio system. The five transmit/receive sites are:

Site Name (Address)	Latitude	Longitude
Lake Zurich (25705 Fairfield Rd.)	42:14:12.1	88:04:17.3
Highwood (700 Sheridan Rd.)	42:12:37.7	87:48:55.9
Waukegan (18 N. County St.)	42:21:29.1	87:49:59.3
Lake Villa (1510 N. Cedar Lake Rd.)	42:23:17.1	88:05:40.3
Gurnee (32093 O'Plaine Rd.) also known as Warren	42:19:44.0	87:54:38.0

Each site contains 8 EDACS MASTR III base station/repeaters and associated Radio Frequency (RF) multiplexing and combining equipment. Each site uses two 5-port combiners, of which 4 ports are currently occupied on each. There are a total of 3 antennas at each site; 2 transmit and 1 receive.

The frequencies utilized at each simulcast site are shown in the Table below



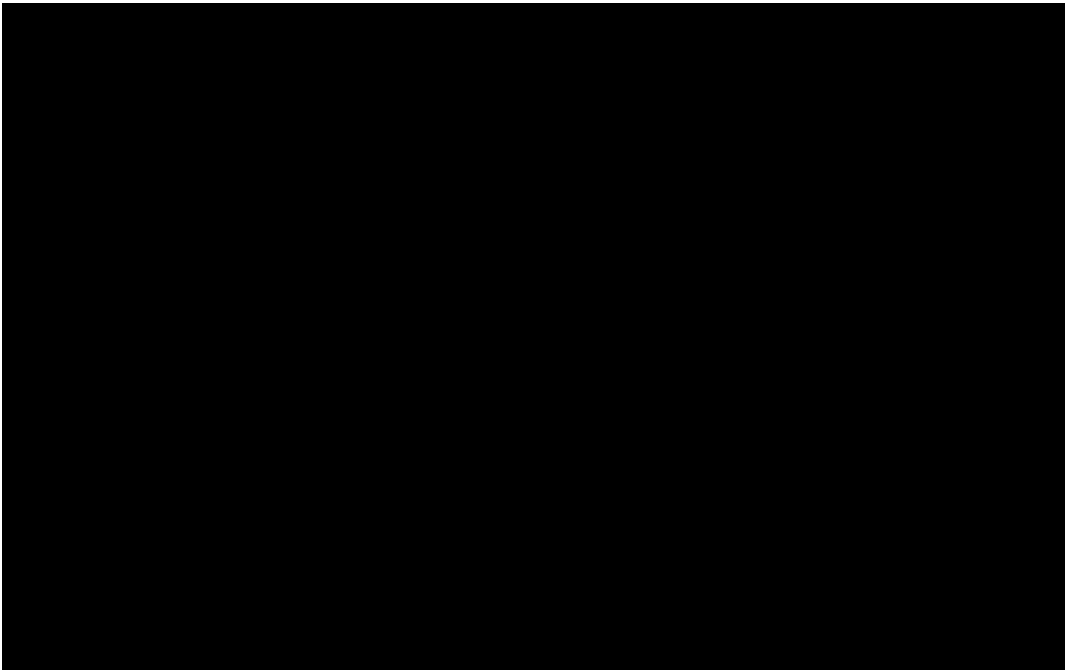
Channel	Base Station Frequency (MHz)	Mobile Frequency (MHz)
1	851.2500	806.2500
2	851.3000	806.3000
3	851.6875	806.6875
4	851.6875	806.6875
5	852.1250	807.1250
6	852.7250	807.7250
7	852.8125	807.8215
8	853.5625	808.5625

The radio sites that operate in a simulcast mode are linked by a microwave system (Alcatel MDR-8700, 6.7 GHZ). The figure on the next page provides an overview of the system configuration.

The additional information on the microwave system is as follows:

Licenses: WPQQ753 (Libertyville), WPTF809 (Gurnee), WPQQ756 (Lake Villa), WPQQ754 (Lake Zurich), WPQQ757 (Highwood), WPQQ750 (Waukegan)

Frequencies (MHz): 6755.0, 6775.0, 6655.0, 6695.0, 6690.0, 6850.0, 6615.0, 6855.0, 6595.0, 6815.0



MOTOROLA RESPONSE

Understood.

2.1.3 Backup and Mutual Systems

The backup system is a single-site system located at the Control Point site, 1303 N. Milwaukee Ave in Libertyville, IL (42:17:47.0/87:57:32.0). This site houses a 5- channel EDACS trunked radio system in addition to a 5-channel conventional mutual aid system utilizing the 5 NPSPAC channels. This site also uses 2 combiners, 2 transmit antennas and a single receive antenna. The frequencies in use at this site are displayed in the table below.

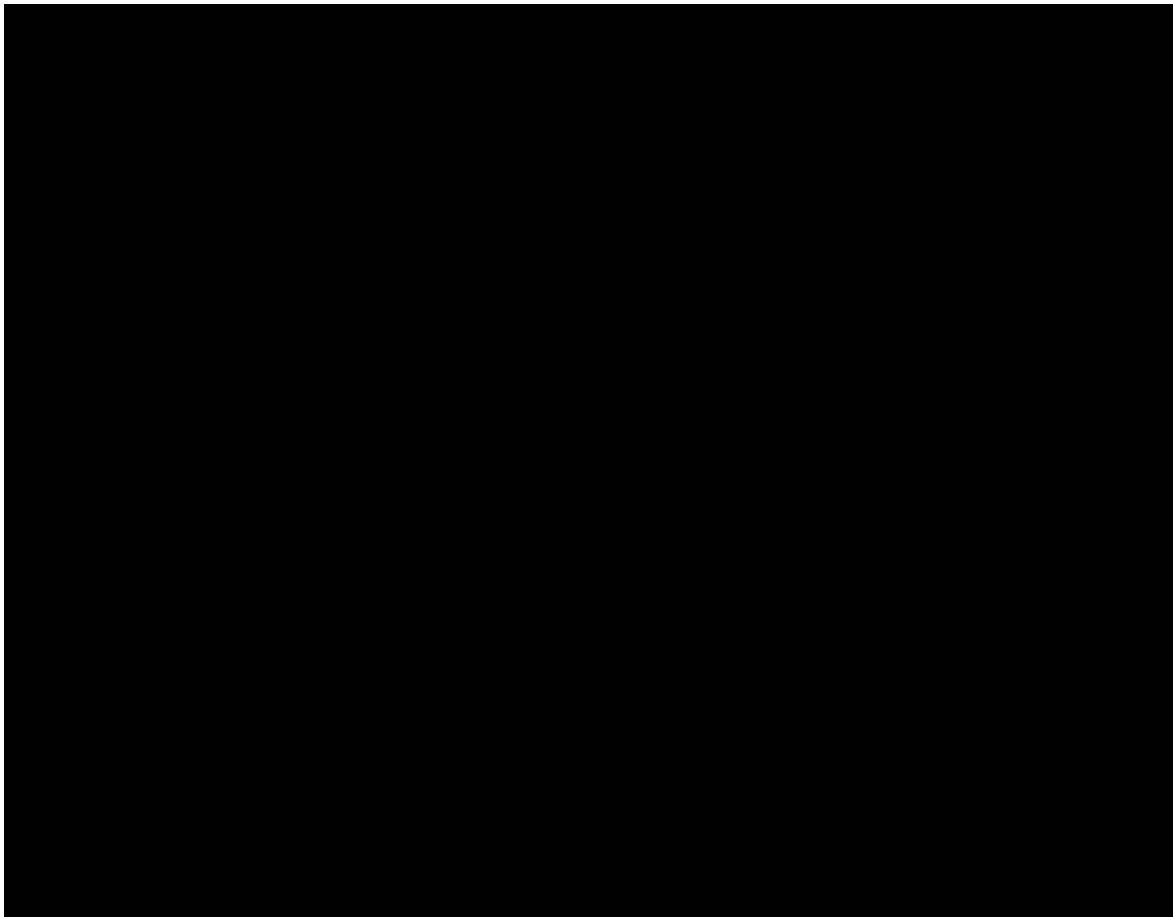
Channel	Base Station Frequency (MHz)	Mobile Frequency (MHz)
Backup System		
1	850.2500	806.2500
3	851.6375	806.6375
5	852.1250	807.1250
7	852.8125	807.8125
8	853.5625	808.5625
Mutual Aid System		
1	851.0125	806.0125
2	851.5125	806.5125
3	852.0125	807.0125
4	852.5125	807.5125
5	853.0125	808.5125

MOTOROLA RESPONSE

Understood.

A map of all of the sites is displayed on the next page.





2.1.4 Antennas and RF Combining Equipment

Each of the 5 transmit/receive sites of the simulcast system utilizes two 5-port combiners, of which 4 ports are currently occupied on each (with the exception of Waukegan), which feed 2 transmit antennas. A single receive antenna with Tower- Top mounted Amplifier (TTA) and receive multi-coupler is used at each site.

MOTOROLA RESPONSE

Understood.

The Waukegan site is unique in that one of the combiners has its fifth port in use. For this combiner, the 5th port is used to provide a signal source for the in-building system that supports the Lake County Administration Building, Courthouse and Jail.

MOTOROLA RESPONSE

Understood.



2.1.5 Dispatch

The County Sheriff's Primary Dispatch Center at 1303 N. Milwaukee Ave. in Libertyville uses six (6) 911 Dispatch radio consoles to operate on the system with the ability to communicate with all radio system users and interface to 24 different conventional radio systems. The radio consoles are EDACS C3 Maestro XP from Harris Corporation. The positions are equipped with radio control stations and portable radios as backup to the consoles.

MOTOROLA RESPONSE

Understood.

The County Sheriff's Primary Dispatch Center currently provides contractual law enforcement dispatch services for the following communities:

- Long Grove

MOTOROLA RESPONSE

Understood.

- Deer Park

MOTOROLA RESPONSE

Understood.

- Lake Barrington

MOTOROLA RESPONSE

Understood.

- North Barrington

MOTOROLA RESPONSE

Understood.

- Village of Volo

MOTOROLA RESPONSE

Understood.

- Beach Park

MOTOROLA RESPONSE

Understood.



- Forest Preserve

MOTOROLA RESPONSE

Understood.

The Sheriff's Office also provides services to unincorporated areas of the County including the Chain of Lakes.

MOTOROLA RESPONSE

Understood.

2.1.6 Coverage

The system was designed for 95%, on-street, countywide radio coverage for portable radios equipped with a speaker microphone antenna attachment (at shoulder level) and 90%, 12 dB in-building countywide radio coverage for portable radios equipped with a speaker microphone antenna attachment (at shoulder level).

MOTOROLA RESPONSE

Understood.

2.2 BDAs in Lake County 800 MHz System

The Lake County system includes a Bi-Directional Amplifier (BDA) and fiber- optic in-building system to enhance the radio signal inside the Lake County Administration Building, Courthouse and Jail. The in-building system is connected via fiber to the Waukegan simulcast site located on the 12th floor penthouse of the Lake County building.

MOTOROLA RESPONSE

Understood.

In addition to this BDA system, the County utilizes 2 mutual aid 800 MHz frequencies as backup to this BDA system. There is a back-to-back repeater configuration in use at the jail and one at the courthouse.

MOTOROLA RESPONSE

Understood.

The County also has BDAs located at two branch courts at Lakehurst & Grayslake. These units are both Allen Telecom model #TPA7510180M. Each BDA uses two indoor antennas.

MOTOROLA RESPONSE

Understood.



2.2.1 Channel Loading

The radio system consists of 176 talk groups. The radio system channel usage capacity averages around 16.5 % per year. The radio system Push to Talk (PTT) transmissions average 3,000,000 per year.

MOTOROLA RESPONSE

Understood.

The following table shows the talkgroups and their abbreviated name displayed on the radio for the County departments.



Talkgroup Abbreviation	Talkgroup Name
AC-ADMIN	Animal Control Administration
AC-DISP	Animal Control Dispatch
AC-DTL1	Animal Control Detail 1
AC-DTL2	Animal Control Detail 2
ALT-1	Tactical Unit Alternate 1 (Encrypted)
ALT-2	Tactical Unit Alternate 2 (Encrypted)
ALT-3	Tactical Unit Alternate 3 (Encrypted)
BLDGSECR	Andy Frain Building Security
BLDSRVS1	Facility Maintenance Building Services 1
BLDSRVS2	Facility Maintenance Building Services 2
CAR-CAR	Sheriff Office Car to Car
CID-TAC1	CID Tactical Unit 1 (Encrypted)
CID-TAC2	CID Tactical Unit 2 (Encrypted)
CIVIL-PR	Sheriff Office Civil Processing Div.
COM-NET	Com-Net Ericsson Testing Talk Group
CORADMIN	Coroner Office Administration
COR-COM1	Coroner Office Common Talk Group 1
COR-COM2	Coroner Office Common Talk Group 2

Talkgroup Abbreviation	Talkgroup Name
COR-DISP	Coroner Office Dispatch
CRT-SECR	Sheriff Office Court Security Div.
DES-TST	Encryption Test talk Group (Encrypted)
DOTADMIN	Division of Transportation Administration
DOT-COM1	Division of Transportation Common 1
DOT-COM2	Division of Transportation Common 2
DOT-DISP	Division of Transportation Dispatch
DOTFLAG1	Division of Transportation Survey Talk Group 1
DOTFLAG2	Division of Transportation Survey Talk Group 2
DOTFLAG3	Division of Transportation Survey Talk Group 3
DOTMAINT	Division of Transportation Maintenance
EMPATCH1	Emergency Patch Talk Group 1
EMPATCH2	Emergency Patch Talk Group 2
EMPATCH3	Emergency Patch Talk Group 3
FIRECOM	Fire Command (Digital)
FLTSVRS	Sheriff Office Fleet Services
FP-ADMIN	Forest Preserve Administration
FP-COM1	Forest Preserve Common Talk Group 1
FP-COM2	Forest Preserve Common Talk Group 2
FP-DISP	Forest Preserve Dispatch



Talkgroup Abbreviation	Talkgroup Name
FP-DTL1	Forest Preserve Detail Talk Group 1
FP-DTL2	Forest Preserve Detail Talk Group 2
FP-MAINT	Forest Preserve Maintenance
FP-RANGR	Forest Preserve Rangers
I LK ADM	Island Lake Administration
I LK CAR	Island Lake Car to Car
I LK DIS	Island Lake Dispatch
I LK INV	Island Lake Investigation (Digital)
I LK SUP	Island Lake Supervisor (Digital)
INTER10A	Interoperable Talk Group 10A
INTER10B	Interoperable Talk Group 10B (Digital)
INTER-1A	Interoperable Talk Group 1A
INTER-1B	Interoperable Talk Group 1B (Digital)
INTER-2A	Interoperable Talk Group 2A
INTER-2B	Interoperable Talk Group 2B (Digital)
INTER-3A	Interoperable Talk Group 3A
INTER-3B	Interoperable Talk Group 3B (Digital)
INTER-4A	Interoperable Talk Group 4A
INTER-4B	Interoperable Talk Group 4B (Digital)
INTER-5A	Interoperable Talk Group 5A
INTER-5B	Interoperable Talk Group 5B (Digital)
INTER-6A	Interoperable Talk Group 6A



Talkgroup Abbreviation	Talkgroup Name
INTER-6B	Interoperable Talk Group 6B (Digital)
INTER-7A	Interoperable Talk Group 7A
INTER-7B	Interoperable Talk Group 7B (Digital)
INTER-8A	Interoperable Talk Group 8A
INTER-8B	Interoperable Talk Group 8B (Digital)
INTER-9A	Interoperable Talk Group 9A
INTER-9B	Interoperable Talk Group 9B (Digital)
INTEROPA	Interoperable Operations Analog (Fleet Call)
INTEROPB	Interoperable Operations Digital (Fleet Call)
IP-GATE1	Internet Protocol Gateway 1
JAIL CRT	Sheriff Office Jail CRT
JAILADMIN	Sheriff Office Jail Administration
JAILSVRS	Sheriff Office Jail Services
LC IT	Information & Technology Services
LC-ADMIN	Lake County Administration
LC-COM1	Lake County Common Talk Group 1
LC-COM2	Lake County Common Talk Group 2
LC-COM3	Lake County Common Talk Group 3
LC-COM4	Lake County Common Talk Group 4
LC-COM5	Lake County Common Talk Group 5
LC-COM6	Lake County Common Talk Group 6



Talkgroup Abbreviation	Talkgroup Name
LC-COM7	Lake County Common Talk Group 7
LCEMA-1	LC Emergency Management Agency 1
LCEMA-2	LC Emergency Management Agency 2 (Encrypted)
LCFOREST	Forest Preserve Operations (Fleet Call)
LC-GANG	Lake County Gang Unit (Encrypted)
LCG-LCS	Local Government to Lake County Sheriff
HD-DISP	Health Department Dispatch
LC-MEG	Lake County MEG Unit (Encrypted)
LC-ROPE	Lake County Rope Unit (Encrypted)
LCS-1	Lake County Sheriff Common Talk Group 1
LCS-2	Lake County Sheriff Common Talk Group 2
LCS-911	Lake County Sheriff Emergency 911 Talk Group
LCS-CID	Lake County Sheriff CID Div.
LCS-HP1	Lake County Sheriff Highway Patrol 1
LCS-HP2	Lake County Sheriff Highway Patrol 2
LCS-JAIL	Lake County Sheriff Jail Div.
LCS-OPS	Lake County Sheriff Operations (Fleet Call)
LCS-RD	Lake County Sheriff Reserve Deputy
LCS-SUP	Lake County Sheriff Supervisor (Encrypted)



Talkgroup Abbreviation	Talkgroup Name
LCS-TAC1	Lake County Sheriff Tactical Unit 1 (Encrypted)
LCS-TAC2	Lake County Sheriff Tactical Unit 2 (Encrypted)
LCS-TAC3	Lake County Sheriff Tactical Unit 3 (Encrypted)
LCS-TAC4	Lake County Sheriff Tactical Unit 4 (Encrypted)
LCS-TAC5	Lake County Sheriff Tactical Unit 5 (Encrypted)
LCS-TAC6	Lake County Sheriff Tactical Unit 6 (Encrypted)
LCS-TAC7	Lake County Sheriff Tactical Unit 7 (Digital)
LC-SVRS1	Lake County Services 1 (Fleet Call)
LC-SVRS2	Lake County Services 2 (Fleet Call)
MAJCRM	Major Crime Task Force Unit (Encrypted)
MARINE	Sheriff Office Marine Unit
MARINE 2	Sheriff Office Marine Unit
MUNI OPS	Municipal Operations (Fleet Call)
P&DADMIN	Planning and Development Administration
P&D-COM1	Planning and Development Common 1
P&D-COM2	Planning and Development Common 2
P&D-DISP	Planning and Development Dispatch
P&D-INSP	Planning and Development Inspectors



Talkgroup Abbreviation	Talkgroup Name
P&D-PLAN	Planning and Development Planning
PC ADMIN	Park City Administration
PC CARS	Park City Car to Car
PC INV	Park City Investigation (Digital)
PC-DISP	Park City Dispatch
PD-ADMIN	Public Defender Administration
PD-COM1	Public Defender Common1
PD-COM2	Public Defender Common 2
PT B ADM	Port Barrington Administration
PT B INV	Port Barrington Investigation (Digital)
PUBSVRS	Public Service Operations (Fleet Call)
PW-ADMIN	Public Works Administration
PW-COM1	Public Works Common 1
PW-COM2	Public Works Common 2
PW-DISP	Public Works Dispatch
PW-MAINT	Public Works Maintenance
RADICOM	Radicom Testing Talk Group
RADIO 2	Radio Maintenance Talk Group
RA-MAINT	Radio Maintenance Talk Group
SA-ADMIN	States Attorney Administration
SA-COM1	States Attorney Common Talk Group 1
SA-COM2	States Attorney Common Talk Group 2



Talkgroup Abbreviation	Talkgroup Name
SA-INV	States Attorney Investigations (Encrypted)
SD ADMIN	Sheriff Office Administration (Encrypted)
SMC-1	Storm Water Management Talk Group 1
SMC-2	Storm Water Management Talk Group 2
SP-DTL1	Special Event Detail 1
SP-DTL2	Special Event Detail 2
SP-DTL3	Special Event Detail 3
SP-DTL4	Special Event Detail 4
SPEVENT	Special Event Operations (Fleet Call)
SPEVENT1	Special Event 1
SPEVENT2	Special Event 2
SPEVENT3	Special Event 3
SPEVENT4	Special Event 4
SPL-OPS	Special Operations (Fleet Call)
SP-SRVS	Special Services (Fleet Call)
STAPOL 1	Illinois State Police Talk Group
T LK ADM	Towers Lake Administration
T LK INV	Towers Lake Investigation (Digital)
TEAM LDR	TAC Team Leaders (Encrypted)
TECH1	Radio Technician Talk Group 1
TECH2	Radio Technician Talk Group 2
TECH3	Radio Technician Talk Group 3

Talkgroup Abbreviation	Talkgroup Name
TECH4	Radio Technician Talk Group 4
TRNG1	Training Talk Group 1
TRNG2	Training Talk Group 2
TRNG3	Training Talk Group 3
TRNG4	Training Talk Group 4
TRANSPORT	Sheriff Office Jail Transport
TST-TRN	Test and Training (Fleet Call)
WARRANT	Sheriff Office Warrants Div.
WAUCONDA	Wauconda Fire Talk Group
WRNTTAC1	Sheriff Office Warrants Div. (Encrypted)
WRNTTAC2	Sheriff Office Warrants Div. (Encrypted)
HD-ADM	Health Department Administration
HD-1	Health Department Talk Group 1
HD-2	Health Department Talk Group 2

MOTOROLA RESPONSE

Understood.



2.2.2 Subscriber Equipment

Below is a table indicating the current number and type of subscriber units utilized by the Lake County system (Radio models highlighted **Green** are capable of both P25 Phase1 and Phase 2 and are dual band 700/800 MHz. Radio models highlighted **Yellow** are Phase I and 800 MHz only.):

Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Animal Control	P5100	9	500M	8

Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Coroner Office	P7250	10	500M	6
Division of Transportation	LPE-50	29	500M	117
Facilities Operations	LPE-50	28	500M	2
Forest Preserve District	LPE-200/50	72	Orion	4
	P7150	33	M7100	19
Health	LPE-200/50	34	500M	3
	P5150	20	M7300	1
	P7250	3		
	P7270	1		
	XG-75	20		
Emergency Management	LPE-200	114	Orion	2
	P7250	8		
Public Works	LPE-50	13	500M	73
Radio	LPE-200	1	500M	4
	P7150	4		
Planning, Building & Development	LPE-50	30	500M	3
State Attorney's Office	LPE-200	9	-	-



Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Coroner Office	P7250	10	500M	6
Division of Transportation	LPE-50	29	500M	117
Facilities Operations	LPE-50	28	500M	2
Forest Preserve District	LPE-200/50	72	Orion	4
	P7150	33	M7100	19
Health	LPE-200/50	34	500M	3
	P5150	20	M7300	1
	P7250	3		
	P7270	1		
	XG-75	20		
Emergency Management	LPE-200	114	Orion	2
	P7250	8		
Public Works	LPE-50	13	500M	73
Radio	LPE-200	1	500M	4
	P7150	4		
Planning, Building & Development	LPE-50	30	500M	3
State Attorney's Office	LPE-200	9	-	-

Department	Portable Radios		Mobile Radios	
	Model	Quantity	Model	Quantity
Sheriff's Office	P7150	153	Orion	211
	LPE-200/50	111	M7100	16
	P7250	280	500M	7
	--	--	M7300	19
	TOTAL	982	TOTAL	495

MOTOROLA RESPONSE

Understood.

The table below identifies the current radio units that are capable of Phase I, Phase II and 700/800 MHz.



Portable	Mobile	Phase I	Phase II	700 MHz	Quantity
P5150		Yes	No	No	20
P7150		Yes	No	No	190 ¹
P7250		Yes	Yes	Yes	299
XG-75		Yes	Yes	Yes	20
	M7100 ²	Yes	No	No	35
	M7300	Yes	Yes	Yes	20
Total					584

1 There are total of 207 P7100 series (7100, 7150, and 7170) portable radios in the County's inventory list. There are about seven (7) units of the total that will require additional investigation to determine if they are upgradable to P25 Phase I.

2 M7100 mobile is discontinued – support is provided through December 31, 2014.

MOTOROLA RESPONSE

Understood.

2.2.3 EDACS End-of-Life (EOL)

The County has received end-of-life (EOL) notice for EDACS products from the radio system manufacturer, Harris as follows:

Product	EOL Date:	Harris provides support and service parts through:
P5100	September 2010	September 2, 2015
M7100	December 31, 2009	December 31, 2014
Integrated Multisite Console Controller (IMC)	December 30, 2011	February 2014 IMC Boards ordered as service parts by March 2015
MASTR III station and site related equipment	December 30, 2011	December 3, 2017
Communications Systems Director (CSD)	August 2009	August 2014 through after-market distributors
C3 Maestro Radio Dispatch Consoles	December 17, 2010	March 23, 2015

MOTOROLA RESPONSE

Understood.



2.2.4 Entities in Lake County

For information purposes, the following table indicates the entities in Lake County that operate on various networks.

Lake County Entities	Count
9-1-1 Systems	21
PSAP & Dispatch	41
County	6
Fire	33
Police	42
Municipalities	52

Lake County Entities	Count
Township	18
Other Governmental	1
Hospital	5
Schools	51
Parks	21
Utility	3
Railroad & Transit	8
State & Federal	11
Venue	3
NFP Service Provider	3
Private	5

MOTOROLA RESPONSE

Understood.

2.3 Summary of Major Concerns and Challenges

During recent interviews with County representatives, the following items of concern were raised by the participants:

2.3.1 Sheriff's Office – 911 Primary Dispatch Center

The major concerns of the Sheriff's Office 911 Dispatch Center are as follows:

- Coverage



- Intermittent dead spots in various geographical localities throughout the County
- Unable to reach deputies inside buildings
 - ◆ Areas with limited/sporadic coverage:
 - Inverrary
 - Beach park
 - Cary
 - Deer Park
 - Lake Barrington

MOTOROLA RESPONSE

Understood.

- Channel congestion (Not a radio issue)

MOTOROLA RESPONSE

Understood.

- Limitation on changing console desktop layout and updating the screens

MOTOROLA RESPONSE

Understood.

- Battery issues (batteries seem to die on portables with very little warning)

MOTOROLA RESPONSE

Understood.

The major needs of the County Sheriff's Office 911 Primary Dispatch Center are as follows:

- Coverage:
 - Reliable countywide Coverage
 - In-building coverage at the following facilities (Appendix A & B Contain a listing of the major facilities and schools requiring in- building coverage):
 - ◆ All hospitals (Condell, Vista Hospitals, Good Shepard)
 - Emergency rooms
 - ◆ All schools
 - ◆ All nursing/extended care facilities
 - ◆ Trailer parks
 - ◆ Movie theaters & Hotels



- ◆ Abbott Laboratories – Libertyville
- ◆ HSBS – Mettawa
- ◆ CDW – Mettawa
- ◆ COSCO – Mettawa
- ◆ Baxter Health Care – McGaw Park
- ◆ Menards – Long Grove
- ◆ Sheriff’s Office County 1
- ◆ Sheriff’s Office Jail
- ◆ Depke Juvenile Center

MOTOROLA RESPONSE

Understood.

- Patching and simulselecting on the radio console

MOTOROLA RESPONSE

Understood.

- Programmable tones

MOTOROLA RESPONSE

Understood.

- Manually reassigning portables to another group from dispatch

MOTOROLA RESPONSE

Understood.

- Ability to add departments on other bands to Sheriff’s consoles whether monitor only or transmit and monitor

MOTOROLA RESPONSE

Understood.

- Door monitoring

MOTOROLA RESPONSE

Understood.



- Paging system

MOTOROLA RESPONSE

Understood.

- VoIP capability

MOTOROLA RESPONSE

Understood.

- Portable radios
 - Earpiece compatibility
 - Battery life minimums
 - Identifiers that can be programmed with a name or unit number – to a radio that is semi-permanently assigned to the deputy

MOTOROLA RESPONSE

Understood.

2.3.2 Sheriff's Office – Corrections

The major concerns of the Sheriff's Corrections Division in Waukegan are as follows:

- Coverage
 - There are several dead spots including parts of the Command offices in the basement and elevators Jail facility at 20 South County in Waukegan.

MOTOROLA RESPONSE

Understood.

- Issues with batteries charge not lasting for the entire 8 hour shift. The officers currently share radios.

MOTOROLA RESPONSE

Understood.

- Issues with cable to speaker-mic-antenna constantly breaking

MOTOROLA RESPONSE

Understood.



The major needs of the Sheriff's Corrections Division in Waukegan are as follows:

- Coverage:
 - Reliable coverage within the jail and bullpen area and a range of 5 miles outside of the Jail building at 20 South County in Waukegan.
 - ◆ Also reliable coverage Inside the following facilities:
 - Court Complex (18 North County, Waukegan)
 - Community Based Correction Center (15 N. Martin Luther King Blvd., Waukegan)

MOTOROLA RESPONSE

Understood.

- Portable radio with speaker mic; antenna placement either on the mic or radio.

MOTOROLA RESPONSE

Understood.

- Currently use encryption for the Supervisors talk group. Would also like to have an encrypted talkgroup for the tactical unit.

MOTOROLA RESPONSE

Understood.

2.3.3 Sheriff's Office – Admin

The major concerns of the Sheriff's Admin Division are as follows:

- Coverage
 - Lack of reliable portable coverage in District 1 (Appendix C contains a map showing the Sheriff Patrol Zones/Districts) and in buildings – hospitals and schools.

MOTOROLA RESPONSE

Understood.

- Channel congestion

MOTOROLA RESPONSE

Understood.

- Interoperability – Cannot communicate with Mundelein or Waukegan.

MOTOROLA RESPONSE

Understood.



- Equipment issues – Cannot change from HP1 to a desired talkgroup by clicking the talkgroup knob (requires additional steps).

MOTOROLA RESPONSE

Understood.

- Scan – Cannot change settings of scan with priority on the portable without reprogramming of the radio.

MOTOROLA RESPONSE

Understood.

The major needs of the Sheriff's Admin Division are as follows:

- Coverage:
 - Reliable coverage within all hospitals schools, government facilities, and corporate buildings in Lake County.

MOTOROLA RESPONSE

Understood.

- Portable radio with speaker mic; antenna placement either on the mic or radio. Prefer antenna on the portable.

MOTOROLA RESPONSE

Understood.

2.3.4 Sheriff's Office – Patrol Division

The major concerns of the Sheriff's Patrol Division are as follows:

- Lack of adequate coverage in Barrington, Inverrary, Buffalo Grove, Volo

MOTOROLA RESPONSE

Understood.

- Lack of coverage inside buildings (Hospitals, schools, corporate campuses and buildings, colleges)

MOTOROLA RESPONSE

Understood.



- Channel congestion

MOTOROLA RESPONSE

Understood.

The major needs of the Sheriff's Patrol Division are as follows:

- Reliable coverage

MOTOROLA RESPONSE

Understood.

- Encrypted talkgroups

MOTOROLA RESPONSE

Understood.

- Prefer antenna on the portable

MOTOROLA RESPONSE

Understood.

- Combine VHF and 800 MHz radio heads inside the vehicle into one.

MOTOROLA RESPONSE

Understood.

- VHF ISPERN on the 800 MHz portable radio

MOTOROLA RESPONSE

Understood.

2.3.5 Sheriff's Office – Marine Unit Division

The major concerns of the Sheriff's Marine Unit Division are as follows:

- Coverage
 - Weak portable radio coverage in some areas along the shore with high hills while patrolling in waters: Bluff Lake, Channel Lake and Marie.
 - ◆ Inside buildings (the marine officers operate in pairs. It is possible that they can switch to simplex operation when entering the buildings. The current car-to-car talkgroup is repeated through the system).
 - Weak signal miles out on Lake Michigan (harbors of Lake Michigan, especially Lake Forest and Winthrop Harbor areas).



MOTOROLA RESPONSE

Understood.

- Interoperability
 - Lack of direct radio interoperability with fire departments. All boats are equipped with VHF marine radios. However, only two of them are capable of being programmed on fire interoperability channels such as NIFERN (the two boats have the older Motorola VHF Spectra radios).
 - Lack of direct radio interoperability with Conservation police (DNR)
 - They are on STARCOM21.

MOTOROLA RESPONSE

Understood.

- Inadequate portable radio battery performance. Need to last the entire shift.

MOTOROLA RESPONSE

Understood.

- Audio feedback when two or more portable units in close proximity of each other (on the same talkgroup).

MOTOROLA RESPONSE

Understood.

- Hard to operate the volume control on the speaker-mic-antenna unit.

MOTOROLA RESPONSE

Understood.

The major needs of the Sheriff's Marine Unit Division are as follows:

- Coverage:
 - Reliable coverage within Northwest Lake County comprised of Chain of Lakes.
 - Reliable coverage up to 5 miles offshore of Lake Michigan boundaries.
 - Coverage inside the emergency room and EMS area of the following hospitals:
 - ◆ Northern Illinois Medical
 - ◆ Condell
 - ◆ Good Shepard



MOTOROLA RESPONSE

Understood.

- All features such as interoperability must be “simple” to operate without complicated steps.

MOTOROLA RESPONSE

Understood.

- Portable radio with speaker mic; antenna placement on the radio.

MOTOROLA RESPONSE

Understood.

- The portable radio to be adaptable to using with an earpiece, so one can hear the radio over large noisy crowd and music.

MOTOROLA RESPONSE

Understood.

- Portable radios with “D-Clip” holster mounts.

MOTOROLA RESPONSE

Understood.

- Water resistant (weatherproof) and in some cases (personal watercraft) shall be submersible radios. These radio swill require an earpiece and push button microphones.
 - The microphone should also be waterproof to increase coverage reliability.

MOTOROLA RESPONSE

Understood.

2.3.6 Sheriff’s Office – Criminal Investigation

The major concerns of the Sheriff’s Criminal Investigation are as follows:

- Their coverage issues are the same as the Patrol Division.

MOTOROLA RESPONSE

Understood.



- Lack of radio coverage when their operation is outside of the County.

MOTOROLA RESPONSE

Understood.

The major needs of the Sheriff's Criminal Investigation are as follows:

- Coverage:
 - Reliable coverage within Lake County as well as anywhere in Illinois and beyond border areas in Wisconsin and the St. Louis area.

MOTOROLA RESPONSE

Understood.

- Use of talk-around channel during their tactical operation

MOTOROLA RESPONSE

Understood.

- Use of two or more encrypted talkgroups

MOTOROLA RESPONSE

Understood.

- Covert radio equipment installations (such as inside glove compartment)

MOTOROLA RESPONSE

Understood.

2.3.7 Sheriff's Office – Court Security

The Court Security main operation is in Waukegan with additional operation at the following branch courts:

- Round Lake Beach (1792 Nicole Lane) – 1 deputy

MOTOROLA RESPONSE

Understood.

- Vernon Hills (24647 North Milwaukee Avenue) – 3 deputies

MOTOROLA RESPONSE

Understood.



- Park City (301 S Greenleaf Avenue) – 2 to 3 deputies

MOTOROLA RESPONSE

Understood.

- Mundelein (105 E. State Route 83 - Hwys. 83/60 and Diamond Lake Road)
– 1 deputy

MOTOROLA RESPONSE

Understood.

The major concerns of the Sheriff's Court Security are as follows:

- Inadequate number of portable radios

MOTOROLA RESPONSE

Understood.

- Inadequate portable radio battery performance. Need to last the entire shift.

MOTOROLA RESPONSE

Understood.

- Audio feedback when two or more portable units in close proximity of each other (on the same talkgroup).

MOTOROLA RESPONSE

Understood.

- Issues with cable to speaker-mic-antenna constantly breaking

MOTOROLA RESPONSE

Understood.

- Interference to recently installed wireless alarm in Juvenile Court. It triggers the panic alarm when transmitting on radio.

MOTOROLA RESPONSE

Understood.



The major needs of the Sheriff's Court Security are as follows:

- Need for additional radios (there are 74 deputies and 40 radios which are assigned to the full deputies. Some of the radios are loaned to this department from the Radio Department).

MOTOROLA RESPONSE

Understood.

- Encrypted talkgroups

MOTOROLA RESPONSE

Understood.

- Prefer antenna on the portable

MOTOROLA RESPONSE

Understood.

- Ear phone option (a must inside the court)

MOTOROLA RESPONSE

Understood.

- Need coverage within 2 blocks of the Waukegan facility for escorts

MOTOROLA RESPONSE

Understood.

2.3.8 Lake County Forest Preserve Police Department

The major concerns of the Lake County Forest Preserve are as follows:

- Coverage inside the following buildings:
 - 1899 W Winchester Rd., Libertyville – 3-story office building housing Forest preserve General Office.
 - 19808 W Grand Ave., Lindenhurst – two story office building for Public Safety Office.
 - 1215 Green Bay Road, North Chicago – single story cultural center.

MOTOROLA RESPONSE

Understood.



The major needs of the Lake County Forest Preserve are as follows:

- Reliable coverage inside the specified offices.

MOTOROLA RESPONSE

Understood.

- Portable radio with speaker mic; antenna placement on the radio.

MOTOROLA RESPONSE

Understood.

2.3.9 State Attorney Office

The major needs of the State Attorney Office are same as Sheriff's Office.

MOTOROLA RESPONSE

Understood.

2.3.10 Lake County Animal Care and Control

The major concerns of the Lake County Animal Care and Control are as follows:

- Portables are bulky and uncomfortable to wear.

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Animal Care and Control are as follows:

- Reliable coverage countywide

MOTOROLA RESPONSE

Understood.

- Reliable coverage inside the following facilities:

- LCACC office and kennel facility
- Lake County Government offices

MOTOROLA RESPONSE

Understood.

2.3.11 Lake County Planning, Building & Development

The major concerns of the Lake County Planning, Building & Development are as follows:

- Coverage issues across the County (The Department has 17 portable radios and one control station for their base. No mobile radios).

MOTOROLA RESPONSE

Understood.

- Lack of features to communicate between departments (today it is performed via cellphone and other means such as email)

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Planning, Building & Development are as follows:

- Reliable coverage countywide

MOTOROLA RESPONSE

Understood.

- Reliable coverage inside:
 - large non-residential medical and industrial buildings
 - All Lake County facilities (basements included)

MOTOROLA RESPONSE

Understood.

2.3.12 Lake County Health Department

The major concerns of the Lake County Health Development are as follows:

- Poor reception inside some of their locations:
 - 3010 Grand Ave., Waukegan
 - Permit Facility in Libertyville

MOTOROLA RESPONSE

Understood.



The major needs of the Lake County Health Development are as follows:

- Reliable coverage countywide

MOTOROLA RESPONSE

Understood.

- Reliable coverage inside the specified facilities.

MOTOROLA RESPONSE

Understood.

2.3.13 Lake County Facilities Operations

The major concerns of the Lake County Facilities Operations are as follows:

- Poor reception inside some of their locations:
 - Jail (offices in basement area) in Waukegan
 - Central Permit Facility in Libertyville

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Facilities Operations are as follows:

- Reliable coverage inside the following facilities:
 - Central Permits – Libertyville
 - Administration Tower – Waukegan
 - Babcox Center – Waukegan
 - Community Based Corrections Center (CBCC) (15 South Martin Luther King Jr. Ave., Waukegan)
 - Courts Complex - Waukegan
 - Depke (24647 N Milwaukee Ave., Vernon Hills, Illinois 60061)

MOTOROLA RESPONSE

Understood.

- Portable radio with speaker mic; antenna placement on the radio.

MOTOROLA RESPONSE

Understood.



2.3.14 Lake County Division of Transportation (DOT)

The major concerns of the Lake County Division of Transportation (DOT) are as follows:

- Interoperability is currently only available on certain radios on the emergency channels or through the County Sheriff's Primary Dispatch Center and only if they are monitoring the DOT's transmissions

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Division of Transportation (DOT) are as follows:

- The DOT needs more open and accessible interoperability with other agencies.

MOTOROLA RESPONSE

Understood.

2.3.15 Lake County Public Works

The Lake County Public Works has no major issues with the current system. They use cellphones as their primary mode of communications.

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Public Works are as follows:

- Interoperability with EMA and HWY during certain events

MOTOROLA RESPONSE

Understood.

- Portable coverage inside their 650 and 648 buildings in Libertyville complex.

MOTOROLA RESPONSE

Understood.

- Portable will need to be hip mounted with holder and a speaker microphone on shoulder.

MOTOROLA RESPONSE

Understood.



2.3.16 Lake County Coroner's Office

The Lake County Coroner's Office has five vehicles, four of which are equipped with mobile radios. There are seven deputies each with a portable radio. There are two additional portable radios as spare. There is also a desktop control station at their office at 26 N. Martin L. King Jr. Ave, Waukegan, IL 60085-4351. The deputies use cellphones as their primary mode of communications. The two-way radios are necessary in the event they need to call for backup or reach other departments on the radio.

MOTOROLA RESPONSE

Understood.

The major concerns of the Lake County Coroner's Office are as follows:

- Channel congestion on Lake County Sheriff's Primary Dispatch Center talkgroup (LCS1). The Department will use cellphones to contact the dispatch center in those instances when the channel is busy.

MOTOROLA RESPONSE

Understood.

- Poor or lack of coverage when transmitting from inside the hospitals. This can be any part of the hospital.

MOTOROLA RESPONSE

Understood.

The major needs of the Lake County Lake County Coroner's Office are as follows:

- Encrypted channel (currently in use)

MOTOROLA RESPONSE

Understood.

- Reliable coverage inside the hospitals including basement where typically the morgue is located:
 - Condell
 - Vista
 - Vista West
 - Highland Park
 - Lake Forest
 - Good Shepard

MOTOROLA RESPONSE

Understood.



2.4 SYSTEM FUNCTIONAL OBJECTIVES

The proposed LMR system shall:

A. Provide reliable on-street and in-building portable radio communications coverage pursuant to the standards defined in this solicitation.

MOTOROLA RESPONSE

Understood.

B. Replace the County's existing radio systems with no loss of present capabilities or functionality in a manner that will maximize resource sharing and interoperability among all County agencies through direct radio communications using a common P25 digital trunked 800 MHz (700 MHz capable) radio system with the following features:

1) Trunked digital voice communications between all portable, mobile, control station subscriber radios and dispatch consoles in the system. Automatic fallback modes of operation in the event of network failure or compromise.

MOTOROLA RESPONSE

Understood.

2) Emergency call, individual private call, call alert paging, dynamic regrouping, priority talkgroup scan, radio inhibit/uninhibit capabilities, status/message, short message service, and PTT-unit identification from all radio units.

MOTOROLA RESPONSE

Understood.

3) Automatic unit identification with alias throughout the duration of each call upon every push-to-talk on a radio unit.

MOTOROLA RESPONSE

Understood.

4) Multiple-key encryption between suitably equipped subscriber units and dispatch consoles.

MOTOROLA RESPONSE

Understood.

5) Maximized utilization of the assigned 800 MHz frequencies.

MOTOROLA RESPONSE

Understood.



6) The capability of direct radio-to-radio conventional simplex “talkaround” communications in both P25 digital (Common Air Interface) and analog modes of operation.

MOTOROLA RESPONSE

Understood.

10) Optionally, automatic vehicle location (AVL) capability from suitably equipped mobile and portable subscriber radios.

MOTOROLA RESPONSE

Understood.

11) Optionally, the transmission and reception of text messaging between subscriber radios and the network’s FNE.

MOTOROLA RESPONSE

Understood.

C. Provide physical and logical redundancy throughout all of the system components such that there are no single points of failure in any aspect of the delivered system.

MOTOROLA RESPONSE

Understood.

D. Employ technologies to:

1) Allow shared use of one or more autonomous network(s) with proposed subscriber radios. Allow shared use of proposed network with interoperability partners utilizing neighboring autonomous network(s).

MOTOROLA RESPONSE

Understood.

2) Provide for system and subscriber equipment expandability for future growth in the 700 MHz public safety band as well as additional 800 MHz frequencies.

MOTOROLA RESPONSE

Understood.



3) Support industry standards for compatible, interoperable multiple vendor subscriber hardware such as mobile, portable and control station units.

MOTOROLA RESPONSE

Understood.

4) Support and fully employ applicable APCO Project 25 Standards for Phase 1 and Phase 2.

MOTOROLA RESPONSE

Understood.

5) Support and allow expandability of the proposed system/network to accommodate additional channels, sites and simulcast cells to support additional users, groups and coverage areas.

MOTOROLA RESPONSE

Understood.

E. Interface with and integrate existing equipment and subsystems as specified in this solicitation.

MOTOROLA RESPONSE

Understood.

F. Provide reliable and uninterrupted wireless communications in the vicinity of existing commercial wireless telecommunications facilities located within the County, as well as commercial facilities located near its borders.

MOTOROLA RESPONSE

Understood.

2.5 MAJOR SYSTEM COMPONENTS

The major components of the Offeror's system shall include:

A. A main dispatch control site to be located at the County Sheriff's Primary Dispatch Center at 1303 N. Milwaukee Ave., Libertyville IL as specified by the County.

MOTOROLA RESPONSE

Understood.

B. Remote network digital FNE RF transceiver sites with associated antennas and transmission lines required to provide in-building portable coverage as outlined in this specification.

MOTOROLA RESPONSE

Understood.



C. Interfaces to integrate existing conventional analog NPSPAC ITAC, VHF/UHF/800 MHz mutual aid infrastructure for interoperability and intra- County operations.

MOTOROLA RESPONSE

Understood.

D. Dispatch communications consoles and a logging recorder and interface at the County Sheriff's Primary Dispatch Center referenced.

MOTOROLA RESPONSE

Understood.

E. A high-capacity loop microwave backbone network with associated transport equipment to connect the master control components with all associated remote FNE RF transceiver sites.

MOTOROLA RESPONSE

Understood.

F. Site development and improvements/modifications as required to construct the LMR and microwave backbone networks.

MOTOROLA RESPONSE

Understood.

G. Mobile, portable, and control station subscriber radios that meet the functional requirements of the user agencies.

MOTOROLA RESPONSE

Understood.

H. Control stations at assorted County facilities as specified in the solicitation.

MOTOROLA RESPONSE

Understood.

I. A fault management system with PC-based diagnostic clients having a graphical user interface capable of monitoring site conditions and providing network alarm information to Lake County Radio Department and remote network administrator positions.

MOTOROLA RESPONSE

Understood.



J. Fault-tolerant and/or redundant computers and associated server computers, as required, to control real-time trunking call processing and system database and user privileges.

MOTOROLA RESPONSE

Understood.

K. Network timing and synchronization equipment required to provide transport and discrete network element clocking.

MOTOROLA RESPONSE

Understood.

L. In-building coverage solutions (as required) to provide coverage to critical buildings as identified in the Exhibits.

MOTOROLA RESPONSE

Understood.

2.6 SERVICES TO BE PROVIDED BY THE SUCCESSFUL OFFEROR

2.6.1 Turnkey

This solicitation and any resulting agreement require the turnkey construction, installation, testing, and delivery of a completely operational system as specified by this solicitation and any resulting agreement. The Offeror shall furnish all materials, equipment, tools, skill, engineering, and labor necessary to fully complete, in a timely manner, the requirements of this solicitation and any resulting agreement according to the specifications, terms, and conditions contained in this solicitation and any resulting agreement, including any Appendices and Exhibits. The Offeror assumes full responsibility for personnel, materials, and equipment employed in construction of the system and agrees to make no claims against the County for damages to such materials or equipment except for that which is caused solely by the County, its employees, or agents.

MOTOROLA RESPONSE

Exception.

This proposal has been prepared in accordance with Motorola's understanding of the Customer requirements based on the information provided and on good systems design techniques. However, the actual results in the Customer's particular operations (including, among other aspects, coverage, personnel requirements, and costs) may vary from those indicated in the proposal due to factors outside the scope of this proposal such as variations in sites, equipment, volume, environment, personnel and other factors outside of Motorola's control. Motorola has also provided exceptions to terms and conditions included in the RFP. Motorola proposes that title to the Equipment will pass to Customer upon shipment and that risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Title to Software will not pass to Customer at any time.



In the event that any existing towers are reused in the Offeror's network design, the Offeror's proposal also shall include as a part of the turnkey project the cost for removing any existing antennae, cable, connectors, etc. that need to be removed from operation. In the event that any existing communications facilities are reused in the Offeror's network design, the Offeror's proposal also shall include as a part of the turnkey project the cost for improving or rehabilitating the existing facilities. All surplus materials shall remain the property of the County. The Offeror shall haul away and dispose of any used materials the County does not desire to retain.

MOTOROLA RESPONSE

Understood.

2.6.2 Inspection of Potential Network Sites

Prior to recommending any network sites, including those identified in this solicitation for the Offeror's consideration, the Offeror shall conduct a thorough review and assessment of all sites to be included in the proposed system and identify all of the required services and costs necessary to completely develop the sites. The Offeror shall perform tower loading analyses and microwave path field verifications

MOTOROLA RESPONSE

Understood.

2.6.3 Geotechnical Site Assessments

In the assessment of potential network sites, the Offeror shall propose to provide an engineering assessment of a site's soil conditions and remediation requirements, if any. The Offeror shall certify that the site is intended to be included in the proposed design. Before any work is authorized, the Offeror shall submit a written proposal to the County stating that they intend to incorporate the site in the proposed network design. All geotechnical site assessment activities shall be included in the original contract proposal price and detailed explicitly.

MOTOROLA RESPONSE

Understood.

2.6.4 System Design

Except as specifically noted elsewhere in this solicitation, the Offeror shall be solely responsible for the design of the County system. The Offeror shall incorporate the current and currently projected population and system usage growth requirements of the County into the proposed system design. The Offeror shall warrant, guarantee, and covenant that the system is and will be engineered, furnished, installed, optimized, tested, and warranted, by the Offeror to meet or exceed the current needs and currently projected future growth needs of the County.

MOTOROLA RESPONSE

Exception.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola

disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

The Offeror, at the Offeror's sole expense, shall provide any and all changes in the system required due to the system's inability to meet the stated system performance criteria. The Offeror at the Offeror's sole expense shall provide any additional sites or changes in antennas which may be required to correct coverage design deficiencies because the Offeror has failed to satisfy the coverage requirements of this solicitation and any resulting agreement.

MOTOROLA RESPONSE

Exception.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

2.6.5 Integration

The Offeror shall be solely responsible for the proper installation and interfacing of all equipment provided pursuant to this solicitation and any resulting agreement. In any circumstances where existing equipment of the County is being utilized in the system, the Offeror shall warrant that the equipment provided by the Offeror will fully perform in strict conformance to the specifications and conditions incorporated in this solicitation and any resulting agreement and will be compatible with the County's existing communications system, as required by this solicitation and any resulting agreement.

MOTOROLA RESPONSE

Understood.

The Offeror shall be responsible for a complete, integrated factory staging of the radio communications system and ancillary subsystems, with the associated microwave backbone prior to shipment of the equipment to the County for field integration. The County will witness the complete system staging and participate in a factory acceptance process which shall result in the approval of the staged system for shipment to the County.

MOTOROLA RESPONSE

Understood.



Field integration of the radio communications system, microwave backbone, and required tower/shelter facilities shall be the sole responsibility of the Offeror. Shipment, storage, and warehousing at Offeror-provided facilities of equipment prior to site availability shall be the responsibility of the Offeror. All electrical and mechanical work necessary to commission each site for usage and testing shall be the responsibility of the Offeror. Coordination with telecommunications and electrical service providers shall be the responsibility of the Offeror.

MOTOROLA RESPONSE

Understood.

2.6.6 Sites and Inspection

As of the date of execution of any resulting agreement, the Offeror shall have completed a site inspection by qualified personnel of each existing and proposed site comprising the system, and shall have agreed that the present condition of such sites and any existing facilities are acceptable to the Offeror and that the system can be installed in a workable condition at each site. Should the proposed site not meet the requirements of the Offeror, the Offeror shall identify with specificity the materials of all kinds needed to bring the site to the standards needed to meet all State and County building codes as well as the Offeror's own published internal quality and workmanship standards. No change orders for site preparation or remediation materials shall be accepted following the execution of an agreement between the Offeror and the County.

MOTOROLA RESPONSE

Understood.

During the term of any resulting agreement, should it become necessary that alternative sites and facilities be substituted for other sites and facilities, the Offeror shall inspect the submitted sites and facilities and report to the County, in writing, those conditions that make substitution necessary. The Offeror shall agree to correct malfunctions, hardware defects, and failures of the system to perform in strict conformance with the specifications of this solicitation and any resulting agreement. The Offeror shall, prior to installation of the system at each site, re-inspect such site including structures located thereon and shall identify, in writing, to the County any changes in sites, materials, and facilities since the initial inspection that may affect the system. If the Offeror fails to re-inspect the sites prior to installation of components of the system, it shall thereafter be liable for any failure of the system to perform in conformance with this solicitation and any resulting agreement caused, in whole or in part, by changes at any site.

MOTOROLA RESPONSE

Understood.



2.6.7 Installation and Alteration

Prior to installing any components of the system at any site, the Offeror shall determine and ensure that the construction and alterations required for the system to be properly installed, including the following, are present, sufficient, and appropriate at each site:

1. Access

MOTOROLA RESPONSE

Understood.

2. Electrical power and PSTN Telco facilities

MOTOROLA RESPONSE

Understood.

3. Wiring

MOTOROLA RESPONSE

Understood.

4. Standards-compliant site grounding

MOTOROLA RESPONSE

Understood.

5. Environmental controls and equipment

MOTOROLA RESPONSE

Understood.

6. Emergency generators

MOTOROLA RESPONSE

Understood.

7. Towers/Lights

MOTOROLA RESPONSE

Understood.



8. Shelter and emergency fuel tanks

MOTOROLA RESPONSE

Understood.

9. Fencing

MOTOROLA RESPONSE

Understood.

10. Fire Suppression

MOTOROLA RESPONSE

Understood.

11. Console cabinets and furniture.

MOTOROLA RESPONSE

Understood.

All of the Offeror's work shall comply with all applicable federal, state, and local codes and ordinances.

MOTOROLA RESPONSE

Understood.

2.6.8 Permits

The Offeror shall agree to prepare and submit all necessary forms and to obtain all permits, licenses, certificates of occupancy, and clearances, as required.

MOTOROLA RESPONSE

Understood.



2.6.9 Network Backbone

The Offeror shall agree to engineer, design, and implement a public-safety-grade, highly available (>99.9999% availability) backbone network. The Offeror shall be responsible for prior coordination notices (PCN) as well as for fully processing, on behalf of the County, the FCC license application for all microwave frequencies required to implement the system in accordance with the requirements of this solicitation and any resulting agreement. All field site survey and path walks necessary to design the microwave backbone are the sole responsibility of the Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

All paths meet or exceed the 99.9999% availability requirement.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The overall loop design for the Alternate offer meets the RFP's 99.999% system availability requirement. See diagram below:

***PATH AVAILABILITY
(PERCENTAGE)***

PATH	SITE A	SITE B	64 QAM, HT (45 MB)
1	SO Dispatch	Gurnee	99.99999%
2	Gurnee	Waukegon	99.99997%
3	Waukegon	Beach Park	99.99996%
4	Beach Park	Antioch	99.99995%
5	Antioch	Antioch NW	99.99984%
6	Antioch NW	Lake Villa	99.99999%
7	Lake Villa	Lake Zurich	99.99996%
8	Lake Zurich	Highwood	99.99973%
9	Highwood	SO Dispatch	99.99976%
ALL LOOP PATHS			99.99913%



2.6.10 FAA/FCC Regulatory Work

The Offeror is responsible for obtaining, on behalf of the County, all required FAA, FCC, and other miscellaneous licenses necessary to commission the entire radio communications system at all of the selected network sites. The County understands that it will be the ultimate signatory for all license documents, but the Offeror shall be responsible for producing all required technical analyses, coordinating all licensing activities, and processing the licensing documentation with the appropriate licensing and regulatory authorities.

MOTOROLA RESPONSE

Understood.

2.7 OTHER OFFEROR REQUIREMENTS

2.7.1 Property Damage

The Offeror shall neither remove any County fixture nor County property, real or personal, from County premises, nor temporarily nor permanently affix any equipment to County premises not specifically required by this solicitation and any resulting agreement without the express written consent of the County. In the event that any real or personal property of the County is damaged by any act or omission of the Offeror, or any of its employees, agents, subcontractors or servants, the Offeror shall, at the sole option of the County, either immediately repair or replace such damage to the complete satisfaction of the County, or, upon the County's presentation of an invoice, reimburse the County for the actual reasonable cost of repairing such damaged property. The Offeror shall regularly keep the County's premises reasonably clean of accumulations of rubbish or scrap resulting from the work covered by this solicitation and any resulting agreement. Upon completion of the system, the Offeror shall leave the County's premises free from rubbish or scrap material resulting from the Offeror's performance. At any time during the project if the County or its designee deems a site to be in need of trash removal due to Offeror efforts, the Offeror shall be responsible for removing the rubbish at its expense upon County notification.

MOTOROLA RESPONSE

Understood.

2.7.2 Existing System Interruptions

The Offeror fully understands that the system will, at times, be operating in parallel with the County's current communications system. The Offeror also understands that interruptions to the existing County communications system must be minimized or altogether eliminated during the field implementation due to the commitment of the County to provide for the health, welfare, and safety of its citizens. Therefore, the Offeror agrees that at no time will its employees, agents, subcontractors or servants perform any work under this solicitation and any resulting agreement that will interrupt the existing communications system of the County or any components of such system unless coordinated in advance with the County. If an interruption is unavoidable for the Offeror to perform work under this solicitation and any resulting agreement, the Offeror shall first contact the County's Project Director and set out in writing the following:

MOTOROLA RESPONSE

Understood.



- The nature of the work that will cause the unavoidable interruption.

MOTOROLA RESPONSE

Understood.

- The nature of the interruption.

MOTOROLA RESPONSE

Understood.

- The duration of the interruption.

MOTOROLA RESPONSE

Understood.

- A detailed statement of the scope and sequence of the work to be performed during the interruption.

MOTOROLA RESPONSE

Understood.

After giving notice and providing the written notification described above, the Offeror may proceed with the work only after receiving written confirmation from the County's Project Director that the interruption is both unavoidable and can be tolerated by the County. If the Offeror fails to follow the procedure described above or if the Offeror's work causes an interruption to a greater extent or duration than was set out in the writing described above, the Offeror shall be strictly liable for all actual damages arising from and caused by the interruption. In no event shall the Offeror be granted any extensions of time for performance under any resulting agreement for the time spent following the above-described procedures.

MOTOROLA RESPONSE

Understood.

2.7.3 Factory Staging

The Offeror shall stage the entire system in or near its primary land mobile engineering/manufacturing facility. The staging shall include all new components, subsystems, ancillary equipment required to complete the entire system, microwave radio backbone, channel banks, frequency standards/GPS receivers, voting equipment, base stations, transmitter combiners, receiver multicouplers, network controllers, redundancy equipment, system management equipment, alarm systems, subscriber equipment, and all other relevant components. The components of the system shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming, and equipment configurations shall be completely integrated in the final configurations prior to shipment. No additional work shall be needed to ready the site for operation. It is understood that additional optimization (level setting, power adjustment, etc.) may be



required to meet the technical requirements of this specification. The Offeror shall provide a detailed packing plan (including a checklist) that ensures the protection of all equipment prior to shipping.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

UPS, battery backup equipment, and generators are not required for system staging unless they are essential to proper system function for the demonstration. At staging, equipment shall be configured as it would appear at its final installation site. The system as-built (as-staged) documentation shall be available at the time of system demonstration for County review. Simulation of any existing County equipment required for demonstrating the system in staging shall be provided by the Offeror wherever possible.

MOTOROLA RESPONSE

Understood.

At the time that all system components are staged and are functioning as they would at final acceptance, County representatives shall inspect the equipment as it is cabled, tested, “burned in”, and labeled. The Offeror shall demonstrate complete system functionality and failure scenarios to County representatives at the staging site. A list of tests to be performed and descriptions of each test shall be provided to the County for approval at least 45 calendar days prior to the demonstration date. The County reserves the right to add/delete/modify test scripts for the staging test plan at any time.

MOTOROLA RESPONSE

Understood.

After successful completion of the staging demonstration, a County representative will approve the shipment of the equipment to the sites/field staging location(s) for installation. If the demonstration or staging fails to meet County’s approval, another date shall be set to repeat the testing at the Offeror expense. No system equipment shall be shipped from the staging facility or other Offeror facilities without the County’s prior approval. The system equipment shall be tested and shipped from the Offeror’s staging facility with the latest certified and available software/hardware complement at the time of staging acceptance testing.

MOTOROLA RESPONSE

Understood.



The County shall be responsible for the travel expenses of its personnel and consultant(s) witnessing the initial staging of equipment. The Offeror shall be responsible for all County travel and lodging expenses associated with any necessary re-testing of the staged system at its primary land mobile engineering/manufacturing facility.

MOTOROLA RESPONSE

Understood.

2.7.4 Shipments

In accordance with the Project Schedule provided by the Offeror and approved by the County, the Offeror shall be responsible to ship all equipment and software to mutually agreeable locations for storage, for which the Offeror shall be responsible. The Offeror shall receive all materials purchased and shall receive all delivered items from Offeror at the job site or mutually agreed upon location. Any equipment or parts required to provide a complete and operational system and not specifically mentioned in the Offeror's proposal and any resulting contract shall be the sole responsibility of the Offeror without any claim for additional payment.

MOTOROLA RESPONSE

Understood.

Deliveries shall be made in accordance with the Project Schedule, as approved by the County and mutually amended from time to time, and shall be made F.O.B. Destination to the mutually agreeable facilities, the Offeror staging facilities, warehousing facilities, or any combination thereof, which in any event shall be located in the County or other such locations as may be mutually agreed to by the parties (the "Facilities"). Subject specifically to the requirements section entitled "Factory Staging", the Offeror shall advise prior to shipment of actual destination and delivery date.

MOTOROLA RESPONSE

Understood.

2.7.5 Title and Risk of Loss

Title to the fixed network equipment shall pass to the County upon County's final acceptance of the component(s) as reflected in the system acceptance testing criteria. Title to mobiles, portables, and control stations shall pass to each individual agency upon receipt of delivery to a mutually-agreed upon location where installation by the Offeror or issuance by the responsible agency is to occur and successful customized device programming and installation by the Offeror. Risk of loss to mobiles, portables, and/or control stations shall pass to the responsible agency upon successful programming and installation by the Offeror. Notwithstanding the foregoing, the Offeror shall retain risk of loss for all mobiles, portables, and control stations that it is using. Risk of loss to fixed network equipment shall pass to the County upon final acceptance of the entire system by the County. Should the system not pass all acceptance tests required by this solicitation and any resulting agreement, title shall revert to the Offeror, and the County shall retain all rights and remedies available under any resulting agreement, including, but not limited to, termination. The Offeror warrants that, at the time title passes, it shall pass free and clear of all liens, charges, security interests, and encumbrances.



MOTOROLA RESPONSE

MAIN OFFER:

Exception.

Motorola proposes that title to the Equipment will pass to Customer upon shipment and that risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Title to Software will not pass to Customer at any time. Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

ALTERNATE OFFER:

Exception.

Motorola proposes that title to the Equipment will pass to Customer upon shipment and that risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Title to Software will not pass to Customer at any time. Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

2.7.6 Errors and Omissions

The Offeror shall assume full responsibility for the acts and omissions of all its agents, servants, and employees, and all subcontractors, their agents, servants, and employees, and all other persons performing any of the work required under this solicitation and any resulting agreement.

MOTOROLA RESPONSE

MAIN OFFER:

Exception.

Motorola will assume full responsibility for the acts and omissions of all its agents, servants, and employees, and all of Motorola's subcontractors, their agents, servants, and employees, and all other persons performing work that Motorola is responsible to perform under a resulting agreement.

ALTERNATE OFFER:

Motorola will assume full responsibility for the acts and omissions of all its agents, servants, and employees, and all of Motorola's subcontractors, their agents, servants, and employees, and all other persons performing work that Motorola is responsible to perform under a resulting agreement.



2.7.7 Testing

The Offeror shall perform all testing and re-testing as described throughout this solicitation and any resulting agreement.

MOTOROLA RESPONSE

Understood.

2.7.8 Training

The Offeror shall conduct a comprehensive suite of training courses to instruct County personnel in the proper operation, administration, use, maintenance, and upgrading of the system as well as to instruct employees in how to train other personnel in such subjects. The Offeror shall comply with all training requirements contained in this solicitation and any resulting agreement. The County agrees to notify the Offeror promptly in the event that a date change for a scheduled training program is required.

MOTOROLA RESPONSE

Understood.

2.7.9 Maintenance & System Management

The Offeror shall provide all labor, parts, tools, and test equipment required for the maintenance of the system through the warranty period and any extensions thereof covered by a contracted maintenance agreement. This maintenance program must include maintenance of the existing conventional base stations and repeaters. The Offeror shall provide a recommended system management plan (personnel and location) to ensure operational efficiency, monitoring, and control. The Offeror also shall provide information regarding key personnel; training/specialization; number of personnel; equipment required for analysis and troubleshooting; optimization; and schedules for preventive maintenance.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will make a best effort to maintain existing conventional stations and repeaters on a time and materials basis, but cannot guarantee lifecycle support on non-Motorola products.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola will make a best effort to maintain existing conventional stations and repeaters on a time and materials basis, but cannot guarantee lifecycle support on non-Motorola products.



The Offeror shall propose a yearly maintenance program for 15 years, purchasable in any increment from one to five years, and to commence after the conclusion of the system warranty period. This maintenance plan shall include parts and labor; 24/7/365 infrastructure support; 2-hour on site response for severity one issues; 4 hour response for severity two issues; depot-level board repair; analysis, annual preventive maintenance, and subscriber equipment repair.

Severity Level	Problem Types
Severity 1	Response is provided continuously - Major System failure - 33% of System down - 33% of Site channels down - Site Environment alarms (smoke, access, temp, AC power. - This level is meant to represent a major issue that results in an unusable system, sub-system, Product, or critical features from the Customer's perspective. No Work-around or immediate solution is available.
Severity 2	Response during Standard Business Day - Significant System Impairment not to exceed 33% of system down - System problems presently being monitored - This level is meant to represent a moderate issue that limits a Customer's normal use of the system, sub-system, product, or major non-critical features from a Customer's perspective
Severity 3	Response during Standard Business Day - Intermittent system issues - Information questions - Upgrades/Preventative maintenance - This level is meant to represent a minor issue that does not preclude use of the system, sub-system, product, or critical features from a Customer's perspective. It may also represent a cosmetic issue, including documentation errors, general usage questions, recommendations for product enhancements or modifications, and scheduled events such as preventative maintenance or product/system upgrades.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will make a best effort to maintain existing conventional stations but cannot guarantee lifecycle support on non-Motorola products.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola will make a best effort to maintain existing conventional stations but cannot guarantee lifecycle support on non-Motorola products.

2.7.10 Maintenance Documentation

The Offeror shall furnish to the County a sufficient number of equipment and maintenance manuals and customized system drawings of commercial standard with sufficient information included therein so that an average technician or engineer with basic electronic knowledge and experience, but unfamiliar with the system, will be able to define its operations and perform corrective and preventive maintenance. The manuals shall note in detail any special circuitry, special wiring, special interfacing, special tools/instruments and custom or non-standard procedures required to operate, maintain, and install any of the equipment furnished under this solicitation and any resulting agreement. All documentation shall be specifically applicable and customized to the system, except



documentation for standard issue equipment which may be standard issue documentation. The Offeror shall warrant that any inability of County or subcontracted technicians or engineers to perform corrective and preventive maintenance on the scheme caused in whole or in part by the Offeror's failure to provide accurate or sufficient information in provided manuals will cause the Offeror to be liable for damage if such failure results in damage to or interruption of the system.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola makes no warranties concerning the ability or inability of technicians or engineers, other than Motorola or Motorola subcontractor technicians or engineers, to perform corrective and preventive maintenance.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola makes no warranties concerning the ability or inability of technicians or engineers, other than Motorola or Motorola subcontractor technicians or engineers, to perform corrective and preventive maintenance.

2.7.11 Project Management & Engineering

The Offeror shall assign both a full-time, exclusively dedicated Project Manager and a Communications System Engineer who are actual employees of the Offeror and are authorized to exercise technical direction of this project. Full-time and exclusively dedicated means that the Offeror's Project Manager and System Engineer shall have no other (Offeror) company assignments of any kind, except for related technical training classes that support the proposed system. The County expects that the Offeror shall propose a Project Manager and System Engineer with exceptional verbal and written communicative and technical skills as well as a thorough knowledge of the components to be installed by the Offeror and experience in project management and RF engineering (respectively). Both the Offeror's Project Manager and System Engineer are subject to initial approval and continual review by the County, which approval shall not be unreasonably withheld. The County reserves the right at any time to require the Offeror to replace the Project Manager and/or System Engineer within thirty (30) days upon written notification to the Offeror's executive management team.

MOTOROLA RESPONSE

Understood.

The Offeror's Project Manager and System Engineer shall, at a minimum: attend weekly project meetings as scheduled by the County; generate meeting minutes within three working days of the respective meeting and in a format as approved by the County for each project meeting; produce a running log of project issues and punch list items; provide written monthly status reports in draft and final forms in a format as approved by the County not later than the fifth business day after the end of each calendar month for the draft report; and archive all project correspondence to be supplied with final system "as-built" documentation. The County shall have seven (7) calendar days to review the draft report and submit comments and/or corrections. A final monthly report shall be provided no later than fifteen (15) business days after the end of the preceding calendar month. The Project Manager shall provide written schedule updates to the County project team every two weeks, as



required, using Microsoft Project conforming to the County's formatting and content requirements and transmitted to the County or County's designee in both hardcopy and disk format; and provide other reports related to the system or its implementation as reasonably requested by the County.

MOTOROLA RESPONSE

Understood.

The Offeror shall provide its Project Manager and System Engineer with a computer for email, a projector for presentations, a vehicle for travel to/from County facilities, a cellular telephone, a wireless data device, and other communications devices that permit rapid communications between the County team and the Offeror's Project Manager and System Engineer.

MOTOROLA RESPONSE

Understood.

The Offeror shall implement and utilize a web-based portal for management of this project. The Offeror shall establish project access accounts for each Offeror, subcontractor, and County project team member. The Offeror's Project Manager shall upload, maintain, and keep current all project documents on the web-based management platform. The Offeror's Project Manager shall archive all project documents on the web-based management platform. The County project team members shall have continual access to all documents stored on the project's web-based management platform.

MOTOROLA RESPONSE

Understood.

2.7.12 Site Plans

The Offeror shall prepare site plans where required for zoning or any permit approvals, as well as file and be responsible for all necessary zoning and applications for permits of any kind related to the system design and implementation. All plans shall be submitted to the County's Project Manager for review and approval prior to final submission to the appropriate regulatory body or office. The Offeror is responsible for coordinating, processing, and leading all zoning/permitting/licensing efforts (Site Plan Approval, Conditional Use Permit, etc.) on behalf of the County. Attendance and involvement at any relevant hearings or committees shall be the responsibility of the Offeror throughout the course of the project.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



2.8 SERVICES PROVIDED BY THE COUNTY

The County has begun certain tasks related to system implementation. Ongoing work by the County includes:

1. Assisting the Offeror in the identification of suitable network sites.

MOTOROLA RESPONSE

Understood.

2. Designating a County Project Manager, assisted by a professional communications consulting firm, to guide the implementation of the system.

MOTOROLA RESPONSE

Understood.

3. Coordinating the scheduling of meetings with other political jurisdictions or relevant governmental resources.

MOTOROLA RESPONSE

Understood.

2.9 STANDARDS OF WORK

The applicable sections or portions of the standards, regulations, and codes of the entities listed below shall apply to the Offeror for site preparation and for the installation, operation, maintenance, and service of the System by the Offeror:

- American Concrete Institute (ACI)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- American Institute of Steel Construction (AISC)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- American National Standards Institute (ANSI)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- American Society for Testing and Materials (ASTM)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- American Welding Society (AWS)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Electronics Industries Association (EIA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Federal Aviation Administration (FAA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Federal Aviation Administration (FAA) Advisory Circular

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Federal Communications Commission (FCC)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Federal Environmental Protection Agency (EPA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Institute of Electrical and Electronics Engineers (IEEE)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- National Fire Protection Association (NFPA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- National Electronic Manufactures Association (NEMA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- National Electric Code (NEC)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Occupational Safety and Health Act (OSHA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Telecommunications Industry Association (TIA)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Underwriters Laboratories (UL)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Any State or local ordinances and building, fire, and zoning codes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



The County shall be informed in the event that the requirements of the standards, regulations, or codes differ, and that the most stringent shall apply.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

3.0 SYSTEM INFORMATION

The County requires a two-way radio system consisting of radio units as specified in detail in this document. The County reserves the right to purchase user radios through a separate procurement. An additional number of agencies, both internal as well as external may also decide to utilize the County's radio system for interoperability purposes. For Grade of Service purposes, the specific number of users for this procurement is defined in the Appendix D of this document. Exact quantities shall be determined from the successful radio vendor's design and shall be dependent upon technologies and RF coverage guarantees. Any changes in subscriber radio quantities from those in the associated Appendix D will be accomplished during contract negotiations and subsequent change orders. The Offeror shall provide voice radios, antenna subsystems, and ancillary equipment as specified in the solicitation to facilitate complete on-site installation, integration, testing, and commissioning. The Offeror shall provide a completely functional two- way radio system meeting the requirements of the County.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.

ALTERNATE OFFER

Fully Compliant.

Production COTS.

The Offeror's solution must incorporate these issues into the system design and provide the County with a satisfactory approach to each issue and concern as represented in the following paragraphs.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.

ALTERNATE OFFER

Fully Compliant.

Production COTS.



A training period will follow the installation period wherein the communications officers, radio users, and communications technical personnel are to become familiar with new system operations and maintenance prior to final cutover.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.

ALTERNATE OFFER

Fully Compliant.

Production COTS.

The system must be designed to support the County without requiring significant reinvestment for at least fifteen (15) years following system acceptance. System size, capacity, functionality, flexibility, and coverage must be sufficient to support the County's anticipated 50% growth in system subscriber units and RF channels and changing needs throughout this period, as well as the possibility of other agencies within the County participating in the system. The design approach shall have the flexibility to accommodate additional users, additional RF sites, and the seamless addition of 700 MHz and 800 MHz channels, at a later time.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.

ALTERNATE OFFER

Fully Compliant.

Production COTS.

3.1 SYSTEM IN-BUILDING COVERAGE

The goal is for the system to provide 95% reliable, balanced talk-in/talk-out portable coverage throughout the County service area, with the portable radio worn on the hip in a leather swivel case using a standard lapel speaker microphone and ¼-wavelength style antenna mounted on the portable radio chassis at hip level. The RF coverage design is based upon the unique requirements of the County, TSB-88- C (most recent edition at time of Offeror proposal), signal strength testing, BER testing and subjective voice testing based upon the Delivered Audio Quality (DAQ) criteria of 3.4. Coverage requirements include these elements at a minimum.

- Element 1 – 800 MHz (700 MHz capable) portable On-Hip On-Street Countywide service area plus 3-miles or maximum allowed by FCC and Region 54

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Element 2 – 800 MHz (700 MHz capable) portable On-Hip 12 dB In- Building Countywide service area

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Element 3 – 800 MHz (700 MHz capable) portable On-Hip inside County facilities (See Appendix A)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Element 4 – The County also desires to have 16 dB in-building penetration for 800 MHz (700 MHz capable) portable on-hip in the areas specified in the Appendix B maps. The Offeror must indicate if their baseline design (Elements 1 through 3) meets this requirement or if additional infrastructure is required. If it does not meet the requirement the Offeror must propose an optional system enhancement that would meet that requirement. Use the map provided in Appendix B for guidance on placing the RF sites should there be requirements for additional infrastructure. Appendix B map shows the areas requiring 16 dB of in-building coverage. Shapefiles for the 16 dB areas are provided for Offerors to download and to use with their propagation software.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



Please refer to Package 2 Section 3 maps, which show the Appendix B 16 dB building loss coverage enhancement by adding the 11th site in Gurnee.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please refer to Package 2 Section 3 maps, which show the Appendix B 16 dB building loss coverage enhancement by adding the 9th site in Gurnee, and the 10th site in Vernon Hills.

Elements 1 through 4 requires a 95% service area reliability using a portable on-the-hip with 12 dB in-building loss over the entire Lake County landmass and political territory, for both talk-in and talk-out configurations. Element 3 requires that all County facilities listed in Appendix A, provide 95% or greater in-building coverage reliability throughout the building structure. Element 4, as an option, to provide higher level of in-building coverage, 16 dB, in some areas of the County as specified above as not all of the County contains buildings of that level of loss.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola is recommending an additional site at Gurnee to cover high density of 16 dB buildings in that area. Please see cost proposal in Package 3 Section 2 for more information.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola is recommending other enhancements to your system that may affect coverage such as: Public Safety speaker mic, DAQ 3.0, and other potential site use (Gurnee, Vernon Hills, and Lake Barrington water tower).

The radio coverage design shall take into account the current noise floor environment as well as predictable degradations for the near future.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



In addition to standard considerations for environmental losses, the coverage design shall take into account the following:

- Predictable co-channel Interference near the Contour

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Potential for Portable Receiver Desensitization from Mobiles Operating in Fringe Coverage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- 8-point Body Absorption Averaging or Similar Assumptions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

These factors shall be taken into account in the Offeror's MRSL (Minimum Receive Signal Level) figure. The Offeror shall provide a detailed signal path loss calculation in its response that reflects all assumptions and loss values.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The delivered audio quality in each area defined below shall meet or exceed DAQ 3.4 per the guidelines of TSB-88-C as defined in the following table.

DAQ (Delivered Audio Quality)	Grade of Performance
1	Unusable. Speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion.
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion.
4	Speech easily understood. Occasional Noise/Distortion.
4.5	Speech easily understood. Infrequent Noise/Distortion.
5	Speech easily understood.

Table 1 - Definitions for Delivered Audio Quality

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.2 APCO PROJECT 25 CONFORMANCE

The 800 MHz (700 MHz capable) trunked radio system architecture shall conform to the objectives, user requirements and specifications outlined in the current APCO P25 Phase 1 suite of standards (see TIA/EIA-102 family of specifications) specifically relating, but not limited to digital modulation, spectral efficiency, enhanced audio quality, conventional and trunking modes, ID methodology, and direct interoperability with equipment from other manufacturers. The Offeror's proposal shall include comprehensive detail on all subscriber and fixed network equipment P25 conformance testing for equipment being offered to County. Such conformance testing detail shall include field and laboratory test results from the ongoing NIST/SAFECOM and TIA P25CAWG compliance assessment programs. For the life of the contract and maintenance period, the Offeror shall provide on a quarterly basis, at a minimum, the results of industry-led conformance testing with the proposed system platform and subscriber base. All proprietary features and operational characteristics shall be identified to the County in writing for all proposed subscriber and fixed network equipment to identify the Offeror's deviation from the P25 Phase 1 specification.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

Motorola recognizes the importance of Project 25 standards development and follows the P25 standard documents to ensure interoperability of our system and subscriber equipment with system and subscriber equipment of other P25 compliant manufacturers. Motorola believes that the entire public safety community is best served with a rigorous and standardized approach to verifying interoperability, for which the P25 Compliance Assessment Program (CAP) was created. CAP is a partnership between the US Department of Homeland Security, the National Institute of Standards and Technology, the emergency response community and industry.

The P25 CAP program is a voluntary program in which Project 25 equipment manufacturers may choose to participate to support their products' P25 compliance claims. Participating manufacturer's products are tested per the tests outlined in the P25 Compliance Assessment Bulletin (CAB), in a P25 CAP recognized laboratory. The P25 CAB references P25 TIA tests and includes performance and interoperability testing. Project 25 TIA tests are created by industry and user subject matter experts as part of the standards development process. The P25 CAP recognized laboratory issues a Detailed Test Report (DTR) which outlines the results of the testing to the manufacturer, who then uses the DTR to issue a Summary Test Report (STR) and Supplier's Declaration of Compliance (SDoC). On-line published copies of P25 testing reports, (P25 Summary Test Reports (STR) and Supplier's Declaration of Compliance (SDoC) are available on FEMA's Lessons Learned Information Sharing (LLIS) Website at <https://www.llis.dhs.gov/knowledgebase/certifications-declarations>. Motorola will provide updates to P25 testing reports listed on LLIS as required when product development changes occur.

Summary Test Report (STR)

An STR is issued by the manufacturer and outlines the individual tests conducted and the associated test results for a given product. Key information found on an STR includes:

- Product description information*
- Other devices the product is tested with*
- Individual tests conducted on the product*
- Pass criteria for performance tests*
- Test results for a given test (Pass, Fail, etc)*
- Supplier's Declaration of Compliance (SDoC)*

An SDoC is issued by the manufacturer and is a companion document to the Summary Test Report (STR). The SDoC references the applicable STR and includes a declaration that a product passed a given test suite(s). Key information found on an SDoC includes:

- Product description information*
- Other devices the product is tested with*



- *The test suite(s) a product passed with any exceptions*
- *A declaration from the manufacturer including a signature from an authorized representative*

Motorola is dedicated to working closely with our customers, industry, government and standards partners to ensure that the P25 standard achieves its stated interoperability objectives.

Motorola supports proprietary features because our customers ask specifically for these features—and indeed we are the first in the industry to offer many of these features. Motorola strives to develop system features in accordance with the P25 Standards and is very actively engaged in the P25 standards. Motorola is continually developing features to meet its customers' requests, and as such, some features are developed before they are defined in P25. Some features were developed before they were defined in P25. Because of this they do not follow the exact feature definition that was subsequently published by P25. Two of these features are Failsoft and GPS Location. Regarding the Failsoft feature, many vendors have already adopted and licensed Motorola's approach, making it the de-facto standard, including: Harris, E.F. Johnson, Inc, Tait Electronics, and Thales. The P25 Failsoft specification was only recently published by the TIA organization last year, and Motorola is in the process of evaluating this new Failsoft standard within our product roadmaps. These licensed vendors took advantage of Motorola's P25 interoperability laboratory equipment and tested their failsoft feature on Motorola's trunking infrastructure to check for interoperability. Regarding the GPS Location feature, Motorola has included this new GPS Location standard on our product roadmap.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola recognizes the importance of Project 25 standards development and follows the P25 standard documents to ensure interoperability of our system and subscriber equipment with system and subscriber equipment of other P25 compliant manufacturers. Motorola believes that the entire public safety community is best served with a rigorous and standardized approach to verifying interoperability, for which the P25 Compliance Assessment Program (CAP) was created. CAP is a partnership between the US Department of Homeland Security, the National Institute of Standards and Technology, the emergency response community and industry.

The P25 CAP program is a voluntary program in which Project 25 equipment manufacturers may choose to participate to support their products' P25 compliance claims. Participating manufacturer's products are tested per the tests outlined in the P25 Compliance Assessment Bulletin (CAB), in a P25 CAP recognized laboratory. The P25 CAB references P25 TIA tests and includes performance and interoperability testing. Project 25 TIA tests are created by industry and user subject matter experts as part of the standards development process. The P25 CAP recognized laboratory issues a Detailed Test Report (DTR) which outlines the results of the testing to the manufacturer, who then uses the DTR to issue a Summary Test Report (STR) and Supplier's Declaration of Compliance



(SDoC). On-line published copies of P25 testing reports, (P25 Summary Test Reports (STR) and Supplier's Declaration of Compliance (SDoC)) are available on FEMA's Lessons Learned Information Sharing (LLIS) Website at <https://www.llis.dhs.gov/knowledgebase/certifications-declarations>. Motorola will provide updates to P25 testing reports listed on LLIS as required when product development changes occur.

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- Product description information*
- Other devices the product is tested with*
- Individual tests conducted on the product*
- Pass criteria for performance tests*
- Test results for a given test (Pass, Fail, etc)*
- Supplier's Declaration of Compliance (SDoC)*

An SDoC is issued by the manufacturer and is a companion document to the Summary Test Report (STR). The SDoC references the applicable STR and includes a declaration that a product passed a given test suite(s). Key information found on an SDoC includes:

- Product description information*
- Other devices the product is tested with*
- The test suite(s) a product passed with any exceptions*
- A declaration from the manufacturer including a signature from an authorized representative*

Motorola is dedicated to working closely with our customers, industry, government and standards partners to ensure that the P25 standard achieves its stated interoperability objectives.

Motorola supports proprietary features because our customers ask specifically for these features—and indeed we are the first in the industry to offer many of these features. Motorola strives to develop system features in accordance with the P25 Standards and is very actively engaged in the P25 standards. Motorola is continually developing features to meet its customers' requests, and as such, some features are developed before they are defined in P25. Some features were developed before they were defined in P25. Because of this they do not follow the exact feature definition that was subsequently published by P25. Two of these features are Failsoft and GPS Location. Regarding the Failsoft feature, many vendors have already adopted and licensed Motorola's approach, making it the de-facto standard, including: Harris, E.F. Johnson, Inc, Tait Electronics, and Thales. The P25 Failsoft specification was only recently published by the TIA organization last year,



and Motorola is in the process of evaluating this new Failsoft standard within our product roadmaps. These licensed vendors took advantage of Motorola's P25 interoperability laboratory equipment and tested their failsoft feature on Motorola's trunking infrastructure to check for interoperability. Regarding the GPS Location feature, Motorola has included this new GPS Location standard on our product roadmap.

Because the APCO P25 specification and standards work continues to evolve, some of the features required by the County in this specification may initially be outside of the current scope of the P25 standard. The County requires the Offeror to adhere to the P25 standard for all features that are included in the P25 TIA/EIA-102 specifications, but the County will accept Offeror-specific solutions for those features currently outside of the P25 scope in order to obtain a full-featured communications network. The Offeror has the responsibility to demonstrate P25 conformance for those subscriber and network infrastructure features contained in the P25 specification, while clearly delineating those features that have been developed with proprietary solutions. The Offeror accepts the added responsibility of working openly with all qualified industry vendors to facilitate P25 interoperability for those features that may initially be offered as proprietary solutions. For those features and solutions deemed initially proprietary in nature, the County requires the Offeror to provide all of the necessary details to all sanctioned P25 working groups and committees to continue to foster a truly open industry communications solution. Through this specification, the County requires the Offeror to guarantee its commitment to further promoting the APCO P25 specification by actively and openly working with LMR industry vendors in a manner of full disclosure for all features and functionality. For the life of the contract and maintenance period, the Offeror accepts full responsibility and expense for remedying and correcting any identified P25 non-conformance issue for all affected system hardware and software.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Offeror must clearly and specifically define its state of development, migration path, and any costs associated with migration from its proposed County solution to the Offeror's solution which is compliant with P25 Phase 2.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The proposed solution is a 10 channel FDMA solution that is fully upgradeable to a P25 Phase 2 TDMA network. The cost to migrate the STARCOM21 RF infrastructure to Phase 2 TDMA will be covered by Motorola when Lake County needs the capacity to meet



or exceed your 1% grade of service requirement. The cost to upgrade Lake County's subscribers to TDMA will be the agency's responsibility.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed solution is a 10 channel FDMA solution that is fully upgradeable to a P25 Phase 2 TDMA network. The cost to migrate the STARCOM21 RF infrastructure to Phase 2 TDMA will be covered by Motorola when Lake County needs the capacity to meet or exceed your 1% grade of service requirement. The cost to upgrade Lake County's subscribers to TDMA will be the agency's responsibility.

3.3 INTEROPERABILITY

The system also shall be capable of direct conventional (analog and digital mode) and trunked subscriber radio interoperability with other local government public safety and public service agencies utilizing 700/800 MHz P25 digital trunked radio networks located in or around County boundaries, but which are not a part of County Government. This user community specifically includes, at a minimum, the public safety radio users.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The County also requires a design that includes mutual aid console and subscriber radio interoperability functionality with these agencies.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All existing infrastructure, subscriber radio, and console interoperability capabilities shall be preserved in the proposed system. The County requires NPSPAC 800 MHz mutual aid infrastructure to be integrated into the proposed system through both subscriber radio programming and dispatch console access.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A list of current interfaced interoperability channels are as follows:

LAKE COUNTY FREQUENCY LIST

<u>CHANNEL</u>	<u>FREQ</u>	<u>CTCSS</u>	<u>SERVICE</u>	<u>RPTR CH</u>	<u>CALL</u>
ESDA LO	45.4400	CSQ	PL	N	KNEJ960
VTAC11	151.1375	156.7	PL	N	KSA958
NIFERN (MABAS)	154.2650	CSQ	PF	N	KBNF240
VTAC12	154.4525	156.7	PL	N	KSA958
ESDA HI	155.0250	CSQ	PL	N	KNFL504
IREACH	155.0550	CSQ	PF	N	KSA958
Point to Point	155.3700	CSQ	PP	N	KSA508
ISPERN	155.4750	CSQ	PP	N	KAS958
Lake County Sheriff F2	155.6550	127.3	PP	Y/out	KSA958
Lake County Sheriff F3	155.7000	127.3	PP	Y/out	KSA958
VCALL10	155.7525	156.7	PL	N	KSA958
Lake County Sheriff FI	156.2100	127.3	PP	Y/out	KSA958
VTAC13	158.7375	156.7	PL	N	KSA958
Lake County Sheriff F3	158.8950	127.3	PL	Y/in	KSA958
Lake County Sheriff F2	158.9400	127.3	PL	Y/in	KSA958
Lake County Sheriff F1	158.9700	127.3	PP	Y/in	KSA958
VTAC14	159.4725	156.7	PL	N	KSA958
UCALL40D	453.2125	CSQ	PL	Y/out	KSA958
Lake County LOCAL GOV.	453.4500	127.3	PL	Y/out	KDS792
UTAC41D	453.4625	CSQ	PL	Y/out	KSA958
UTAC42D	453.7125	CSQ	PL	Y/out	KSA958
Lake County UHF	453.8500	127.3	PL	Y/out	KSG305
UTAC43D	453.8625	CSQ	PL	Y/out	KSA958
UCALL40	458.2125	156.7	PL	Y/in	KSA958
Lake County LOCAL GOV.	458.4500	127.3	PL	Y/in	KDS792
UTAC41	458.4625	156.7	PL	Y/in	KSA958
UTAC42	458.7125	156.7	PL	Y/in	KSA958
Lake County UHF	458.8500	127.3	PL	Y/in	KSG305
UTAC43	458.8625	156.7	PL	Y/in	KSA958
Lake County Mutual Aid 1	806.0125		YF	Y/in	WPSZ771
Lake County Trunked 1	806.2500		YF	Y/in	WPMB711
Lake County Trunked 2	806.3000		YF	Y/in	WPMB711
Lake County Mutual Aid 2	806.5125		YF	Y/in	WPSZ771
Lake County Trunked 3	806.6375		YF	Y/in	WPMB711
Lake County Trunked 4	806.6875		YF	Y/in	WPMB711
Lake County Mutual Aid 3	807.0125		YF	Y/in	WPSZ771
Lake County Trunked 5	807.1250		YF	Y/in	WPMB711
Lake County Mutual Aid 4	807.5125		YF	Y/in	WPSZ771



Lake County Trunked 6	807.7250	YF	Y/in	WPMB711
Lake County Trunked 7	807.8125	YF	Y/in	WPMB711
Lake County Mutual Aid 5	808.0125	YF	Y/in	WPSZ771
Lake County Trunked 8	808.5625	YF	Y/in	WPMB711
Lake County Mutual Aid 1	851.0125	YF	Y/out	WPSZ771
Lake County Trunked 1	851.2500	YF	Y/out	WPMB711
Lake County Trunked 2	851.3000	YF	Y/out	WPMB711
Lake County Mutual Aid 2	851.5125	YF	Y/out	WPSZ771
Lake County Trunked 3	851.6375	YF	Y/out	WPMB711
Lake County Trunked 4	851.6875	YF	Y/out	WPMB711
Lake County Mutual Aid 3	852.0125	YF	Y/out	WPSZ771
Lake County Trunked 5	852.1250	YF	Y/out	WPMB711
Lake County Mutual Aid 4	852.5125	YF	Y/out	WPSZ771
Lake County Trunked 6	852.7250	YF	Y/out	WPMB711
Lake County Trunked 7	852.8125	YF	Y/out	WPMB711
Lake County Mutual Aid 5	853.0125	YF	Y/out	WPSZ771
Lake County Trunked 8	853.5625	YF	Y/out	WPMB711

The Offeror shall describe in detail the architecture, features, limitations, and overall compatibility that the proposed network offers in terms of maintaining and integrating the required subscriber radio and console interoperability. The Offeror shall identify any proposed network gateway infrastructure integral to the system design for interoperability. The Offeror shall address County interoperability requirements in concert with current federal, state, and regional interoperability goals and best practices.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.4 NETWORK BACKBONE

The Offeror shall provide a high-capacity, loop microwave network backbone that provides redundant connectivity with 99.9999% availability between all network RF transmission sites, dispatch consoles, and network management components. The Offeror shall provide traffic utilization, bandwidth consumption, and overall throughput assessment baseline reports for each backbone transport and Ethernet networks upon system commissioning in the field to baseline the as-built condition for each delivered network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



PATH AVAILABILITY (PERCENTAGE)

PATH	SITE A	SITE B	64 QAM, HT (45 MB)
1	SO Dispatch	Gurnee	100.00000%
2	Gurnee	Waukegon	100.00000%
3	Waukegon	Beach Park	100.00000%
4	Beach Park	Antioch	100.00000%
5	Antioch	Antioch NW	99.99995%
6	Antioch NW	Lake Villa	99.99999%
7	Lake Villa	Lake Zurich	99.99996%
8	Lake Zurich	Highwood	99.99996%
9	Highwood	SO Dispatch	99.99993%

SPURS

10	Barrington WT	Lake Zurich	99.99999%
11	Vernon Hills	SO Dispatch	99.99999%

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The alternate offer provides a full microwave loop with a minimum of 5 nines availability.

PATH AVAILABILITY (PERCENTAGE)

PATH	SITE A	SITE B	64 QAM, HT (45 MB)
1	SO Dispatch	Gurnee	99.99999%
2	Gurnee	Waukegon	99.99997%
3	Waukegon	Beach Park	99.99996%
4	Beach Park	Antioch	99.99995%
5	Antioch	Antioch NW	99.99984%
6	Antioch NW	Lake Villa	99.99999%
7	Lake Villa	Lake Zurich	99.99996%
8	Lake Zurich	Highwood	99.99973%
9	Highwood	SO Dispatch	99.99976%
ALL LOOP PATHS			99.99913%

3.5 CORE AND TECHNICAL/OPERATIONAL NETWORK FEATURES

This section presents basic functional definitions and system requirements that apply throughout the solicitation. These definitions are supplemental to those found in previous sections and are intended to describe operational characteristics for all radio systems regardless of the technologies, media, or any feature proposed by an Offeror.

MOTOROLA RESPONSE

Understood.



The Offeror shall respond to each definition by stating compliance or non-compliance as described. If the proposed technology offering differs in any way, then the Offeror must offer a complete description indicating how the proposed technology or offering provides the required system functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.1 Talkgroup Call

A talkgroup call is defined as a one-to-many voice transmission to members of the same organizational unit known as a talkgroup. Group calls shall be a network-wide capability and shall be fully supported by the system in all locations. Group calls shall be capable of being initiated from a subscriber radio terminal or a dispatch console. Group calls are half duplex. Late entry must be supported. Talkgroups shall be either defined in advance by system administrators or assigned dynamically by dispatch operators or system administrators.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed system shall provide the ability to authorize or deny system access in real-time for an individual subscriber and/or talkgroup by remote site. The proposed system shall provide the ability to configure the maximum call duration for a specific talkgroup call as well as the hang time associated with a group call. Priority scanning of group call activity shall be permitted from any subscriber terminal. The creation of new talkgroups in the proposed system shall be straightforward using the Network Management System (NMS). By talkgroup, the proposed system shall be capable of providing the capability to queue a group call or proceed immediately with a group call based on the availability of every affiliated site to provide voice channel service to every affiliated member of the active talkgroup. All subscriber terminals and dispatch consoles shall be equipped with configurable talkgroup call functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.2 Talkaround (Direct Mode)

Talkaround or Direct Mode is the ability of radio subscriber units to operate unit-to-unit (direct simplex mode) without requiring the use of radio tower site transceivers. If an individual terminal loses contact with its base station due to coverage difficulties, base station failure or trunking network failure, it shall be possible to operate in talkaround, or direct, mode. The radio subscriber unit shall have the ability to transmit and receive on base repeater frequencies or other simplex frequencies not operational at the fixed radio sites. Range is limited to the power of the subscriber radio units. Talkaround allows unit-to-unit operations when out of range of the system or allows a tactical operation to exist within the system range but does not load the system talk-paths. Talkaround channels also may be utilized for vehicular repeater operations. Talkaround can be utilized in either analog or digital modes. Talkaround usage is necessary for out-of-network or fringe coverage such as encountered upon entering a highly attenuated building or tunnel. Talkaround usage is also envisioned for times of limited network capacity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All subscriber terminals shall be equipped with talkaround (direct mode) functionality that can operate in any combination of 800 MHz (700 MHz capable) analog and digital conventional modes. All digital talkaround conventional modes shall be capable of utilizing the APCO Project 25 Common Air Interface (CAI) for interoperability. All talkaround modes of operation shall utilize FCC-approved channel bandwidths and, as appropriate, shall be in concert with the APCO Project 25 modulation schemes for spectral efficiency. All analog conventional modes shall utilize a radio programmable CTCSS/PL/DPL scheme to control transmit and receive functionality. All digital conventional modes shall utilize a radio programmable network access/unit identifier scheme to control transmit and receive functionality. All conventional modes shall be capable of multi-key encryption. Note that the Appendix D will delineate the specific subscriber need for secure-equipped radios.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed system shall allow direct mode communications at any time without degrading normal system performance. Direct mode communications while in range of the fixed equipment shall do no more than temporarily capture receivers from possible outbound messages. Direct communication shall be possible at any time while out of range of the fixed equipment with no degradation in system performance or capacity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.3 Push-To-Talk Unit Identification (PTT-ID)/Display

In all modes of trunking operation, the proposed network and all subscriber radios shall be capable of operating in a PTT-ID mode of operation in which the programmable radio unit ID(s) are transmitted to the network upon every radio PTT for call logging and radio user recognition at the Network Management System and dispatch workstations. All radio IDs shall be capable of being alphanumerically aliased at the NMS and dispatch workstations. PTT-ID signaling shall not delay or degrade the radio transmission in any manner. All display wireless dispatch, dispatch consoles, and subscriber field radio units must display the transmitting radio unit ID and display a user alias as well.

MOTOROLA RESPONSE:

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.4 Emergency Alert/Call

An emergency call is defined as a specialized talkgroup call with the highest assigned queuing priority. An emergency alert is defined as an instantaneous data service that signals the identity of the initiating unit to a dispatch console(s), dedicated network management terminal(s), and all other members of the affiliated talkgroup. Emergency calls shall be a network-wide capability and shall be



fully supported by the system in all locations. Emergency calls shall be capable of being initiated from any subscriber terminal. The proposed network shall provide the ability to authorize or deny emergency access in real-time for an individual subscriber and/or talkgroup by subsystem. The proposed network shall provide the ability to configure the maximum call duration for an emergency call as well as the hang time associated with an emergency call.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Emergency functionality shall be configurable by talkgroup to operate in either a preempt mode or top of busy queue mode when operating under a channel busy scenario. If a second emergency call is placed while an earlier emergency call is in progress, the second call shall not preempt the first. Instead, the second emergency call should queue for available network resources. No emergency alerts/calls shall be terminated until the user clears the emergency status from the initiating subscriber terminal. All subscriber radios, dispatch consoles, and NMS workstations must be equipped with emergency alert/call functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Emergency functionality shall be configurable to operate in either a tactical or revertive mode. Tactical emergency mode is defined as initiating and processing the emergency alert/call on the actively selected talkgroup mode. Revertive emergency mode is defined as initiating and processing the emergency alert/call on a pre-assigned talkgroup mode that may or may not be the actively selected talkgroup mode. Configurable duration “hot microphone” emergency (i.e., radio keys automatically for a predefined duration upon activation of emergency button or switch) capability shall be provided for all subscriber terminals. “Stay Alive” emergency (i.e., radio cannot be powered off upon activation of emergency button or switch until emergency condition has been cleared at the subscriber terminal) capability shall be provided for all subscriber terminals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All subscriber terminals shall be notified audibly and visually when a talkgroup has been placed in emergency mode by another member of the talkgroup. All subscriber terminals and dispatch consoles also shall be capable of defeating the audible and visual alerts (i.e. clandestine or covert tactical operations) associated with emergency when a talkgroup has been placed in emergency mode by another member of the talkgroup. Emergency alert/call shall be fully operational through any vehicular repeater system operation (the dispatcher will observe the field user ID rather than the host mobile user ID connected to the vehicular repeater in use).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed mobiles, portables, control stations and dispatch consoles shall be equipped with a dedicated switch or function that allows emergency notification. The switch shall be easily accessed while minimizing the chances for accidental activation. The radio emergency switch or button also shall be equipped with a configurable depress timer to adjust the length of time the button or switch must be depressed to activate and clear the emergency. Upon emergency activation, the field unit shall transmit the emergency message on a periodic basis until acknowledged by the console operator (dispatcher). Offerors shall describe the proposed emergency functionality in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.5 Selective Alert

Selective Alert is the capability for one voice/data radio and/or dispatch console/NMS workstation to selectively alert or “page” a specific voice/data radio. A “source” radio or console selectively alerts a “target” radio (or console) to indicate that the target radio should return to a “Home” or predefined talkgroup for a message. No talk-path or voice resource should be assigned for a selective alert, and the command shall be completed instantaneously.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Source radios can be equipped to initiate selective alerts via a pre-programmed list(s) stored in memory or through a full radio alphanumeric keypad. Properly equipped source radios or dispatch consoles/NMS workstations can selectively alert any radio in the system by entering the specific unit ID of the desired target radio. Radios can also be “target-only,” thus only capable of receiving selective alerts. Positive or negative acknowledgement shall be provided to the subscriber terminal or dispatch/NMS console as to whether the target radio receives the individual call. All subscriber terminals and dispatch consoles/NMS workstations shall be equipped with selective alert functionality. Offerors shall describe the proposed selective alert functionality in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.6 Individual Call

An individual call is defined as a wide-area, one-to-one voice transmission between any combination of subscriber terminals and/or dispatch consoles operating within the network. Individual calls shall be a network-wide capability and shall be fully supported by the system. Such calls need only be half duplex. Users also shall be able to place individual calls to dispatch consoles. Identification of the calling party shall be made to the subscriber terminal in alphanumeric format. Positive or negative acknowledgement shall be provided to the subscriber terminal or dispatch console as to whether the target radio receives the individual call. The proposed network shall provide the ability to configure the maximum call duration for an individual call. The proposed network shall provide the ability to configure the real-time permission to initiate an individual call per subscriber terminal and dispatch



console. All subscriber terminals and dispatch consoles shall be equipped with individual call functionality. Offerors shall describe the proposed individual call functionality in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.7 Selective Radio Disable/Inhibit

Selective Radio Disable/Inhibit is the ability of the system to indefinitely disable a specific subscriber radio unit or dispatch position from transmitting and receiving talkgroup calls, emergency alerts, emergency calls, selective alerts, selective calls, telephone interconnect calls, and status/message indications and receptions. The NMS shall be capable of issuing the selective radio disable/inhibit command as an instantaneous data service not utilizing a talk-path or voice resource. Likewise, the NMS shall be capable of issuing a Selective “Uninhibit” command as an instantaneous data service not utilizing a talk-path to re-enable the previously- disabled target subscriber terminal. Positive or negative acknowledgement shall be provided to the NMS console as to whether the target radios receive the selective radio disable/inhibit & uninhibit commands. All subscriber terminals and dispatch consoles shall be equipped with selective inhibit/uninhibit functionality. Offerors shall describe the proposed selective radio disable/inhibit functionality in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.8 Dynamic Regrouping

Dynamic Regrouping is the ability of a radio system to create a new talkgroup(s) and automatically assign radios to that new talkgroup(s) without requiring the user to manually change the channel selector switch.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Dynamically regrouped radio units can either be forced to remain on the new talkgroup(s) (restricted mode) or be allowed to freely change talkgroups (selectable mode). Pre-defined “action plans” can be created and initiated to regroup an unlimited number of affiliated subscriber radios into a new talkgroup automatically with a minimum of keystrokes by the system manager or dispatcher.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The NMS shall be capable of issuing the dynamic regrouping command as an instantaneous data service not utilizing a talk-path or voice resource. Likewise, the NMS shall be capable of issuing a Dynamic “Unregroup” command as a data service not utilizing a talk-path to remove the target subscriber terminal from the regrouping scenario. Positive or negative acknowledgement shall be provided to the NMS console as to whether the target radios receive the dynamic regrouping and unregrouping commands. All subscriber terminals and NMS workstations shall be equipped with dynamic regrouping functionality. Offerors shall describe the proposed dynamic regrouping functionality in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.9 Talkgroup Patch/Merge

Multiple talkgroups are combined together providing two-way communications between all talkgroups in the patch. A talkgroup patch may involve the use of multiple talk-paths to process the specific call. Similar in functionality to a talkgroup patch, talkgroup merge involves combining multiple talkgroups into a single talk-path for the duration of the call. All subscriber terminals and dispatch consoles shall be equipped to participate in a talkgroup patch and/or talkgroup merge call. The system shall be equipped to establish any talkgroup patch/merge in both a dynamic



(i.e., dispatcher can enable or disable from console position) and permanent mode (i.e., dispatcher cannot disable), depending on specific County configuration requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.10 Multi-Select (Simul-Select)

A multi-select occurs when multiple talkgroups are linked together dynamically for one-way outbound communications from the dispatch console. A multi-select may involve the use of multiple talk-paths to process the specific call or also shall be configurable to regroup all target talkgroups to a common talkgroup that is broadcast by the system. The dispatch console shall simultaneously hear the audio from all multi-selected talkgroups on the select speaker of the console, but the field users only hear the dispatcher conducting the multi-select or talkgroup audio from other members of their talkgroup. All subscriber terminals and dispatch consoles shall be capable of participating in a multi-select call.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.11 Priority Level Access

In a busy talk-path condition, the system shall stack or queue call service requests from users on a first-in-first-out (FIFO) basis. The system shall be capable of rearranging the queue based upon a relative priority level associated with a specific radio unit ID or talkgroup ID allowing faster servicing of higher priority (i.e., public safety) calls. By system design default, emergency calls shall have the highest priority of any other call in the busy queue. Priority levels shall be configurable by individual ID and/or talkgroup ID.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The system must have a priority structure that is supported throughout the network. This must enable the following:

- Network administrators must be able to dynamically assign different priority levels to various types of calls and radio users.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Emergency Calls must have the highest priority and be capable of preempting lower priority calls if no channels are available.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Channels shall be assigned on the basis of the highest priority among calls waiting.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- At least ten priority levels should be supported.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Recent users shall be capable of giving an elevated priority to maintain continuity of conversation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Offerors shall describe the proposed priority scheme in detail. All subscriber terminals and dispatch consoles shall be capable of participating in the proposed multiple priority access level scheme.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.12 Busy Processing/Queuing

If no talk-paths or voice channel resources are available, radios requesting channels for new conversations should be placed in a busy queue. Users of the same priority should move through the queue in a FIFO sequence; however, users of higher priority should be elevated ahead of lower priority users in the queue.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

When a voice channel becomes available, the radio at the top of the busy queue shall receive a channel assignment and generate a callback tone to the user. This callback tone alerts the user that a channel assignment has been made and communication is now possible on the selected talkgroup. All subscriber terminals and dispatch consoles shall be capable of providing the busy queuing/callback functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.13 Site Registration/Affiliation

Site registration is the ability for a subscriber unit to seamlessly roam into RF coverage of a specific site or cell and automatically transmit individual ID, current talkgroup, and other pertinent affiliation information. The network controller(s) can then dynamically manage and assign RF talk-path resources for the affiliated talkgroup/radio unit in this and other sites/cells containing other members of the talkgroup.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed system must allow users to roam freely throughout all areas served by the system. It must also have the ability to restrict movement of individual terminals and/or talkgroups to specified sites or combination of sites. The proposed system shall be capable of activating a configurable deregistration timer upon a subscriber radio roaming out of system RF coverage so that channel resources are not unnecessarily keyed indefinitely.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe how its system manages mobility, roaming, and site registration/deregistration. Subscriber radio handoff between remote sites shall be seamless and without voice or data interruption to the subscriber terminal or dispatch console. Handoff/roaming algorithms, registration/deregistration parameters, and network mobility configuration control shall be explained in detail. All subscriber terminals shall be capable of dynamic site registration and wide area roaming.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.14 Talkgroup Steering

Talkgroup steering is the system capability to manage and restrict the assignment of specific talkgroups to specific RF channels and talk-paths. Thus, some talkgroups may be limited to utilizing specific talk-paths while other talkgroups are limited to these and other talk-paths. Since the entire user base is made of users from different categories, the system must accommodate the network usage partitioning of these various categories. The proposed system shall be capable of multiple levels of talkgroup steering employing any combination of talkgroups. Shared use and interoperability agreements may dictate that certain talk-paths are reserved for some talkgroups and



other talkgroups are restricted from particular channel access. Talkgroup steering and associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall be capable of participating in any talkgroup steering configuration configured by the network administrator.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.15 Broadcast/Announcement Talkgroup Call

The proposed system shall provide Broadcast/Announcement Talkgroup Call functionality. Broadcast/Announcement Talkgroup Call functionality is defined as the ability for a properly configured dispatch console or subscriber terminal to transmit to multiple talkgroups simultaneously using a single talk-path for the duration of the call. A broadcast/announcement talkgroup call shall be configurable to either wait for all associated transmitting talkgroup members in active calls to de-key, or the proposed system shall be configurable to interrupt calls in progress when a broadcast/announcement talkgroup call is initiated. Talkgroup membership in a broadcast/announcement talkgroup call shall be configurable at the dispatch console or NMS workstation. The proposed system shall provide the capability to create multiple, different broadcast/announcement talkgroup call resources. All subscriber terminals and dispatch consoles shall be capable of generating and participating in a broadcast/announcement talkgroup call.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.16 Sub-Network (Subsystem) Call

The proposed system shall provide Sub-Network (Subsystem) Call functionality which enables dispatch consoles or properly configured subscriber terminals to issue an announcement using a single talk-path to all affiliated radios and talkgroup members at a specific RF site or combination of RF sites. A sub-network (subsystem) call shall be configurable to either wait for all affiliated transmitting talkgroup members in active calls to de-key, or the proposed system shall be configurable to interrupt calls in progress when a sub-network (subsystem) call is initiated. The proposed system shall provide the capability to create multiple, different sub-network (subsystem)



call resources. All subscriber terminals and dispatch consoles shall be capable of participating in a sub-network (subsystem) call.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.17 Late Entry

The proposed system must provide Late Entry capabilities. Late Entry is defined as the functionality whereby the proposed system can transmit late entry indications related to any active call thus allowing latecomer users (i.e., previously turned off radio, radio out of range, etc.) to join an active talkgroup, broadcast/announcement group, or sub-network call. All subscriber terminals and dispatch consoles shall provide late entry functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.18 Transmission/Message Trunking

In all modes of trunking operation, the proposed network shall be capable of operating both in transmission trunking and message trunking modes of operation configurable by talkgroup resource. Transmission trunking refers to the ability to configure the system so that the network does not associate any hangtime with a talkgroup call so that channel resources are immediately available for reassignment following a subscriber radio or console de-key. Message trunking refers to the ability to configure the system such that the network associates a configurable-length hangtime with a talkgroup call so that channel resources remain temporarily available following a subscriber radio or console de-key on a specific talkgroup to preserve continuity of conversation. All subscriber terminals and dispatch consoles shall be capable of working in either transmission trunking or message trunking modes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.19 Audio Interruption

The proposed system shall be capable of being configured to provide Audio Interruption functionality. Audio Interruption is defined as the ability for a subscriber or a talkgroup member with equal or higher priority (relative to the transmitting unit) to interrupt an active call in progress and become the source of the talkgroup audio. Audio Interruption shall be configurable: (1) to allow interruptions based on priority levels, (2) to never permit interruptions, and (3) to always permit interruptions. Radios not permitted to interrupt an active talkgroup call shall receive a distinguishable, audible “interrupt prohibit tone” to signify the inability to interrupt an active call. Audio Interruption and associated configuration control shall be explained in detail. All subscriber terminals shall be capable of working in any audio interruption mode.

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Per Addendum #3 this requirement has been deleted.

ALTERNATE OFFER:

N/A

Per Addendum #3 this requirement has been deleted.

3.5.20 Scan/Priority Monitoring

The proposed system shall be capable of being configured to provide talkgroup and conventional mode scan functionality. Scan is defined as the ability for a subscriber to monitor/temporarily join active talkgroup or conventional calls (other than the talkgroup or conventional mode currently selected/tuned on the subscriber radio) in progress based on a configurable subscriber radio scan list of talkgroup and/or conventional resources. Scan functionality shall be controlled either by a configurable subscriber radio switch/button/menu item or through radio programming using auto-scan functionality configured by talkgroup or conventional modes. Scan also shall be configurable to provide talkback scan functionality meaning that a subscriber radio user could key up on an actively-scanned mode if the subscriber radio PTT switch is activated. Scan and associated configuration control shall be explained in detail. All subscriber terminals shall provide multiple, user-configurable subscriber scan modes and lists. All subscriber terminals shall be capable of working in the various scan modes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed system also shall be capable of being configured to provide Priority Monitoring Scan functionality. Priority Monitoring Scan is defined as the ability for a subscriber or a talkgroup member to scan to an active higher priority talkgroup while involved in an active, lower priority talkgroup call. Various levels of priority shall be configurable for a subscriber terminal. Priority Monitoring Scan and associated configuration control shall be explained in detail. All subscriber terminals shall be capable of working in a priority monitoring scan mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.21 Out-of-Range Indications

The proposed system subscriber terminals shall provide audible and visual Out-of- Range indications upon entering a service or geographic area in which trunked system RF coverage levels have dropped below an acceptable and reliable usage threshold. All subscriber terminals shall be capable of providing audible and visual out-of-range indications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.22 Console Priority

The proposed system shall provide Console Priority functionality for all dispatch consoles. Console Priority is defined as the ability for a dispatch console to assume control of a talkgroup call at any time. The audio generated at a dispatch console position shall always be broadcast to all members of the talkgroup even if a subscriber terminal is actively transmitting. If a dispatch console assumes control of an active talkgroup call and asserts Console Priority, the dispatch console should still hear

the transmitting unit's inbound audio but the rest of the members of the talkgroup shall hear only the outbound dispatch console audio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.23 ID Scheme

The proposed system and subscriber terminals shall adhere to the recommended APCO Project 25 ID coding structure (i.e., subscriber IDs, network ID, system ID, subsystem/site ID, talkgroup IDs, etc.) to facilitate inter-system interoperability and mobility management. Trunked user roaming between P25 networks supplied by various P25 LMR vendors shall be accomplished per the P25 specification. The proposed network shall be equipped to manage at least 48,000 unique radio subscribers and at least 2,000 unique talkgroups. The proposed ID methodology and associated database maintenance of these IDs shall be explained in detail. All proposed subscribers shall be equipped to program and interoperate on at least 48 different P25 trunked systems for interoperability purposes. The Offeror shall define the delivered capacity and scalability of the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Note: Motorola APX7000/7500 and APX6000/6500 Subscribers can be equipped to operate on 50 different P25 Trunked systems for interoperability purposes. APX 4000/4500 Subscribers can be equipped to operate on 35 P25 Trunked systems.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Note: Motorola APX7000/7500 and APX6000/6500 Subscribers can be equipped to operate on 50 different P25 Trunked systems for interoperability purposes. APX 4000/4500 Subscribers can be equipped to operate on 35 P25 Trunked systems.

3.5.24 Area (Site) Selection

The proposed system must have the ability to provide Area (Site) Selection functionality. Area (Site) Selection is defined as the ability to define areas for site control and call processing, on both a subscriber and talkgroup basis. The system shall provide the configuration capability to define a specific area/subset of sites to be used by the proposed system for establishing and processing call



types. For an individual or group call, this means that called active users will not be alerted and engaged for the active call if the subscriber radio is affiliated outside the selected area or pool of valid sites for that specific call type.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.25 Site Preferences

The proposed system must have the ability to provide Site Preferences functionality. Site Preferences is defined as the ability to rank/prioritize the affiliation and usage of specific sites and/or subsystems within a subscriber terminal. The system shall provide the configuration capability, at a radio subscriber level, to customize the site preferences for every proposed network site or subsystem. A “home” site or subsystem also shall be configurable for all subscriber terminals which would serve as the most-preferred (highest ranked) site or subsystem if configured. The site preferences database or configuration table governs the sites utilized by subscriber terminals for establishing and processing all call types. Multiple levels of site preference shall be provided for all subscriber terminals, and criteria such as real-time control or voice channel bit error rate (BER), received signal strength, and site channel capacity shall be used in executing the site preferences algorithms. Site Preferences and the associated configuration control shall be explained in detail. All subscriber terminals shall provide the site preferences functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.26 Channel Beacon

The proposed system must have the ability to provide Channel Beacon functionality. Channel Beacon is defined as the ability for a dispatch console to apply or generate a recurring, unique audible alert tone on a specific talkgroup and/or conventional resource to notify resource members of the need to refrain from using the channel or talkgroup (i.e. officer shot, stakeout in progress, working fire, etc.) while a serious event is being managed. Channel Beacon and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide the channel beacon functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.27 Alert Tones

The proposed system must have the ability to provide Alert Tones functionality. Alert Tones functionality is defined as the ability for a dispatch console and/or properly-equipped subscriber terminal to apply unique, audible alert tones on a specific talkgroup and/or conventional resource to notify resource members of a special situation or to preamble a special dispatcher broadcast. The system shall provide multiple (at least three) unique alert tones so that various routine situations and announcements can be associated with a specific alert tone for operational efficiency. Alert Tones and the associated configuration control shall be explained in detail. All subscriber terminals and dispatch consoles shall provide the alert tones functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The Enhanced Alert Tones feature provides dispatchers with access to up to 15 customizable alert tones on their MCC7500 and MCC7100 dispatch consoles. The tones are stored as a .wav file. Having up to 15 customizable alert tones enables customers who are migrating to MCC7500/7100 consoles from competitive consoles to continue to use the alert tones they are used to using, thereby eliminating the risks associated with changing established procedures for handling critical situations.

Having the ability to configure alert tones for latched operation simplifies the dispatcher's job by enabling them to send an entire alert tone with a single momentary button press instead of having to press and hold the button.

The ability for a third-party software application to change the alert tone files in real time opens the possibility for customers to automate some of their dispatching activities. Subscriber radios can receive, but are not able to initiate Alert Tones.



ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The Enhanced Alert Tones feature provides dispatchers with access to up to 15 customizable alert tones on their MCC7500 and MCC7100 dispatch consoles. The tones are stored as a .wav file. Having up to 15 customizable alert tones enables customers who are migrating to MCC7500/7100 consoles from competitive consoles to continue to use the alert tones they are used to using, thereby eliminating the risks associated with changing established procedures for handling critical situations.

Having the ability to configure alert tones for latched operation simplifies the dispatcher's job by enabling them to send an entire alert tone with a single momentary button press instead of having to press and hold the button.

The ability for a third-party software application to change the alert tone files in real time opens the possibility for customers to automate some of their dispatching activities. Subscriber radios can receive, but are not able to initiate Alert Tones.

3.5.28 Ready-to-Talk Tone

The proposed system must have the ability to provide Ready-to-Talk Tone functionality. Ready-to-Talk Tone functionality is defined as the ability to configure a subscriber terminal with a unique, audible tone that signifies to the radio user that a trunked talk-path or voice channel has been assigned and is ready for use. The intent of the ready-to-talk tone is so that radio users do not begin speaking too quickly following the activation of the PTT switch creating a condition in which audio may be truncated to some degree. The ready-to-talk tone shall be configurable for all subscriber terminals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.29 Talkgroup Misdirection

The proposed system must have the ability to provide Talkgroup Misdirection functionality. Talkgroup Misdirection functionality is defined as the ability for a misdirected (i.e., inadvertent and inappropriate radio affiliation to an unselected talkgroup when user not selected to active talkgroup) subscriber terminal to be immediately removed from an active talkgroup call in which the subscriber radio should never have been a participant. All subscriber terminals and dispatch consoles shall provide the talkgroup misdirection functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Per Addendum #3 this requirement was deleted.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Per Addendum #3 this requirement was deleted.

3.5.30 Critical/Mandatory Site(s)

The proposed system must have the ability to provide Critical/Mandatory Site functionality. Critical/Mandatory Site(s) functionality is defined as the system ability to delay the processing of a talkgroup or announcement group call until all critical/mandatory sites have talk-paths or voice channel resources available to serve the call. Critical sites must be real-time configurable in the NMS workstations. The proposed system shall provide the capability to create any permutation or combination of critical/mandatory sites by talkgroup or announcement group. Critical/Mandatory Site(s) functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall provide the critical/mandatory site(s) functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.31 Call-Delay Defeat

The proposed system must have the ability to provide Call-Delay Defeat functionality. Call-Delay Defeat functionality is defined as the configurable system ability to continue the initiation and processing of a talkgroup or announcement group call despite the fact that a subset of talkgroup/announcement group members may be affiliated at network sites which have no available talk-paths or voice channel resources to immediately serve the call. Although the system should normally delay the handling of the call until all affiliated members have the necessary talk-paths or voice channels to serve the call (so as to facilitate 100% affiliated member participation), the system shall provide the configuration capability to defeat the normal call-delay algorithm so as to be able to immediately process the talkgroup or announcement group call without all affiliated members participating. Call-Delay Defeat functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall provide the call-delay defeat functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.32 Dynamic (Tactical) Priority

The proposed system must have the ability to provide Dynamic (Tactical) Priority functionality. Dynamic (Tactical) Priority functionality is defined as the configurable system ability for a dispatch console and NMS terminal to dynamically elevate (above its normally configured priority level) the priority level of an active talkgroup or multigroup resource. The target elevated priority level shall be the priority level just below emergency priority status. Dynamic (Tactical) Priority functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in the dynamic (tactical) priority functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.33 Repeat Disable

The proposed system must have the ability to provide Repeat Disable functionality. Repeat Disable functionality is defined as the configurable system ability for a dispatch console and/or NMS terminal to disable the normal repeat mode functionality of the network infrastructure so that only dispatch console positions can monitor the talkgroup and multigroup audio generated by a subscriber terminal. Although the system should normally operate in a repeat mode configuration so that field users can hear each other, the system shall provide the configuration capability to engage a repeat disable mode by talkgroup and/or multigroup so that a dispatcher can restrict sensitive or strategic communications to only being heard by dispatch consoles. Repeat Disable functionality and the associated configuration control shall be explained in detail. All subscriber terminals, dispatch consoles, and fixed network infrastructure shall be capable of participating in the repeat disable functionality.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.34 Multiple Key Encryption (OPTION)

The proposed system shall include, as an option for selected subscriber units, multiple key hardware-based encryption utilizing the DES and AES encryption algorithms. No single key encryption configurations shall be proposed with this system. Security and confidentiality of system operations is a major and growing concern for some of the County public safety agencies. As a result, it is the County's objective to protect the system from eavesdropping, corruption or compromise of information, denial of service, disruption or any other type of event through the use of scanners, hacking, electronic break-ins, use of unauthorized radios, stolen radios, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Select subscriber terminals (portables, mobiles, control stations) and all dispatch consoles shall be capable of a dual encryption algorithm (DES-OFB & AES) approach with the ability to store at least 16 different encryption keys per algorithm and per subscriber terminal. The network infrastructure shall be capable of processing any combination of at least 256 different encryption keys per algorithm. Dispatch consoles shall be able to decrypt any of the 256+ encryption keys per algorithm created in the system on an end-to-end basis. Over-the-Air-Rekeying (OTAR) from the NMS shall



be available for key distribution to remote subscriber terminals within the coverage range of the trunked system. Manual encryption key distribution also shall be available using a handheld, battery-operated, password-protected key fill device.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Multiple Key Encryption and associated configuration control shall be explained in detail. Encryption functionality shall be available in both trunking and conventional modes on both a user-selectable or hard-coded “mode-strapped” basis for select subscriber terminals and all dispatch consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.35 Status & Message (OPTION)

The proposed system shall include, as a system option, Status & Message functionality. Status & Message is the capability for a source radio unit to send pre-defined status indication updates and/or pre-programmed message definitions to a dispatch console and network management terminal. Radio users shall be capable of initiating status and message indications from a pre-programmed status and message list. A source radio shall be notified if a target does not receive the sent status message. The proposed network and subscriber terminals shall be capable of processing status and message data services without the use of a dedicated talk-path or voice channel resource. Status and message functionality should be quoted as a system option for all subscriber terminals and dispatch consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Status functionality is an included feature with all Motorola subscribers and dispatch consoles. Message functionality requires the Advanced Messaging Service option. This

provides pre-programmed or free-form text messaging capability between subscribers or between subscribers and messaging clients at dispatch. Advanced Messaging uses the P25 Data service and, therefore, an available Data channel for these short burst messages.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Status functionality is an included feature with all Motorola subscribers and dispatch consoles. Message functionality requires the Advanced Messaging Service option. This provides pre-programmed or free-form text messaging capability between subscribers or between subscribers and messaging clients at dispatch. Advanced Messaging uses the P25 Data service and, therefore, an available Data channel for these short burst messages.

3.5.36 Discreet Terminal Monitoring (OPTION)

The proposed system shall have Discreet Terminal Monitoring capabilities quoted as an option. Discreet Terminal Monitoring is defined as the service whereby a dispatch console/network control point may place a subscriber terminal into a special type of individual voice call mode whereby the target terminal begins transmitting without any action from, or indication to, the called user. The purpose of the discreet terminal monitoring functionality is for the dispatch console/network control point to discreetly listen to the activities of a field user that may be operating in a dangerous or volatile situation. Discreet Terminal Monitoring functionality should be quoted as a system option for all subscriber terminals and dispatch consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.5.37 Short Message/Alphanumeric Text Service (OPTION)

The proposed system shall have Short Message/Alphanumeric Text Service capabilities quoted as an option. Short Message/Alphanumeric Text Service is defined as the data service whereby any combination of subscriber terminals, dispatch consoles, and NMS workstations can exchange free text messages using alphanumeric characters. Alphanumeric message length shall be at least 150 characters. Users shall be capable of generating the free text messages from the subscriber terminal keypad and/or workstation keyboards.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Sent and received text messages shall be time and date-stamped in the respective source and target radios/consoles/NMS workstations. The proposed subscriber terminals/dispatch consoles/NMS workstations shall provide address book functionality so that target recipients can easily be stored and retrieved. Receipt of a message shall provide visual and audible indication to the subscriber terminals/dispatch consoles/NMS workstations. At least five messages shall be archived in the subscriber terminals on a FIFO basis and a user shall have the capability to flag a message to be saved and not deleted. Messages received and generated at dispatch consoles and NMS workstations shall be capable of being archived and printed for historical record-keeping purposes. A source radio/dispatch console/NMS workstation shall be notified if a target does not receive the sent message.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed network and subscriber terminals shall be capable of processing Short Message/Alphanumeric Text Services without the use of a dedicated talk-path or voice channel resource. Short Message/Alphanumeric Text Service functionality and the associated configuration control shall be explained in detail. Short Message/Alphanumeric Text Service functionality should be quoted as a system option for all subscriber terminals, dispatch consoles, and NMS workstations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



3.5.38 Subscriber Tracking/GPS Location Services (OPTION)

The proposed system shall have Subscriber Tracking/GPS Location Services capabilities quoted as an option for all subscriber types. Subscriber Tracking/GPS Location is defined as the service whereby a network control point or properly equipped dispatch console may monitor the real-time location of mobile or portable subscriber terminals (within coverage range of the proposed network) on a map display using the proposed network infrastructure. Automatic network polling and/or manual user polling functionality shall be offered to provide real-time location status, and the location information shall be displayed on a map that updates at specified time intervals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Additional triggers for location updates shall include: (1) emergency alert/call activation, (2) user PTT channel request, (3) dispatcher/administrator query, and (4) power-up/affiliation. All subscriber location change data (latitude, longitude, time of date, subscriber ID, etc.) shall be capable of being archived to a *.csv file (comma delimited file) on a designated network control point client computer/server for a period of up to 30 days on a FIFO basis. Subscriber Tracking/GPS Location Services functionality and the associated configuration control shall be explained in detail. The Offeror shall further identify and price any available API that may exist in which the subscriber GPS Location Services data may be exchanged with a third-party mapping system.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The proposed GPS solution is designed for 8 mapping clients and 500 user licenses with 500 radios with GPS options enabled. All of the triggers except for (2) user PTT channel request are available. The GPS Location Services available on the ASTRO25 system provides an API for a mapping application so you can use your mapping vendor of choice. All the subscriber location change data is stored within the mapping vendor's application and the archiving capabilities will be dependent upon their offering. Motorola has partnered with several mapping vendors to test their solution in our labs, two of which are CompassCom and Salient Federal Solutions.

Additional information about the GPS Location Services is provided in Package 2 Section 3.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.



The proposed GPS solution is designed for 8 mapping clients and 500 user licenses with 500 radios with GPS options enabled. All of the triggers except for (2) user PTT channel request are available. The GPS Location Services available on the ASTRO25 system provides an API for a mapping application so you can use your mapping vendor of choice. All the subscriber location change data is stored within the mapping vendor's application and the archiving capabilities will be dependent upon their offering. Motorola has partnered with several mapping vendors to test their solution in our labs, two of which are CompassCom and Salient Federal Solutions. Additional information about the GPS Location Services is provided in Package 2 Section 3.

3.5.39 Telephone Interconnect (OPTION)

The proposed system shall have the optional ability to connect a mobile or portable subscriber on the system to the Public Switched Telephone Network (PSTN). Connection of a subscriber radio unit to and from the PSTN is a specialized form of selective calling that requires appropriate processes for providing outbound call placement from a source radio and inbound call reception to a target radio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A telephone interconnect call is defined as a wide-area, one-to-one voice transmission between any subscriber terminal operating within the network and a PSTN or PABX subscriber. Telephone calls shall be a network-wide capability and shall be fully supported by the system on an optional basis. Telephone calls may be half- or full-duplex, DTMF-initiated, and provide echo cancellation. The proposed network shall support landline-to-subscriber and subscriber-to-landline call types. Identification of the calling party shall be made to the subscriber terminal in alphanumeric format. Positive or negative acknowledgement through call progress tones shall be provided to the subscriber terminal when participating in a telephone call. The proposed network shall provide the ability to configure the maximum call duration for telephone calls.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The proposed network shall provide the ability to configure the permission to initiate a telephone call per subscriber terminal. The proposed network shall provide the ability to authorize or deny a configurable number of telephone calls in real-time by remote site. Authorized users also shall be able to place and receive calls on PABX/PSTN networks. The system must be able to restrict calls from individual terminals from calling specific numbers, locations or PABX systems. The system must be able to restrict calls by site or network subsystem. The system shall be capable of restricting the number of simultaneous telephone interconnect calls to preserve the intended system grade of service. Individual subscriber terminals shall be capable of being assigned a unique Direct Inbound Dial (DID) number and/or being served by a pool of DID numbers in conjunction with a unique subscriber unit ID. The proposed system shall support a PSTN interface of any combination of at least six unique loop-start or ground-start lines. Telephone Interconnect functionality and the associated configuration control shall be explained in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.0 RF SPECTRUM CONSIDERATIONS

This section describes considerations for use of the RF spectrum. The Offeror shall review this section and determine the best possible technical solution for the development of the radio network based on County's requirements. Radio coverage, future expansion, system life cycle, and regional interoperability considerations are all critical design issues for the County; thus, the Offeror must give full consideration to all of these aspects when creating a system design.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.1 RF DESIGN REQUIREMENTS

4.1.1 700 MHz & 800 MHz Operational Modes

The proposed LMR system and associated subscriber radios shall all be equipped to operate throughout the entire frequency range from 764-861 MHz (764-862 MHz once the FCC Reconfiguration process has been completed) per the FCC-outlined channel plans in each portion of the 700 MHz and 800 MHz spectrum. Required operational modes and associated modulation schemes include:



- 764-861 MHz Trunking--APCO Project 25-Compliant Digital Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- 764-861 MHz Conventional--APCO Project 25-Compliant Digital Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- 764-861 MHz Conventional--Analog Mode (with CTCSS/PL/DPL).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Equipment proposed in the 800 MHz band must comply with the National Public Safety Planning Advisory Committee (NPSPAC) Mutual Aid requirements. All voice subscriber units and national NPSPAC base stations must be capable of operating in the conventional analog FM mode with Continuous Tone Coded Squelch System (CTCSS/PL/DPL). Additionally, all 800 MHz (700 MHz capable) subscriber units must be capable of operating in both analog and digital conventional and trunked operational modes on 764-861 MHz channels.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

There may be additional negotiations to add frequencies in the 700 and 800 MHz bands to the system. Subscriber terminal antennas shall implicitly be capable of operating across the entire 764-861 MHz operating band using a single subscriber antenna.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.1.2 APCO Project 25 Conformance

The County requires a new 800 MHz (700 MHz capable) digital trunked system that meets the APCO Project 25 (P25) Phase 1 and Phase 2 requirements for modulation, spectral efficiency, and audio quality. At a minimum, the proposed system shall be equipped to operate in a 12.5 kHz channel with a 9600 bps bit rate using an FDMA access method. Subscriber terminal and fixed network equipment conformance testing results must be provided by the Offeror to demonstrate complete alignment with the open P25 standard. The P25 Phase 1 Common Air Interface (CAI) shall be provided for all subscriber radios and fixed network equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.1.3 RF Engineering Data

The Offeror shall provide a comprehensive level of technical RF coverage design information relative to the proposed network. At a minimum, the information to be provided by the Offeror for each proposed RF site shall include:

1. Transmit and receive antenna models noting gain, orientations, azimuths, downtilt, sidearm lengths, and antenna base mounting heights;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3 for data sheets.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3for data sheets.

2. Type and length of transmission cable for transmit and receive antenna systems;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3 for data sheets.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3 for data sheets.



3. Insertion loss values noted in decibels (dB) for all proposed transmit combiners/cavities, receive multicouplers, filters, duplexers, RF connectors, circulators, lightning arrestors, wattmeters, RF jumper cables, attenuators, etc.;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The GTR 8000 ESS product that has been proposed includes all Transmit combining and filtering along with the Receive Multi coupler internal to the cabinet. The 40 W output from the cabinet and Receive Sensitivity value takes into account all losses and gains respectively.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The GTR 8000 ESS product that has been proposed includes all Transmit combining and filtering along with the Receive Multi coupler internal to the cabinet. The 40 W output from the cabinet and Receive Sensitivity value takes into account all losses and gains respectively.

4. Transmit power levels for all fixed network equipment base station transceivers and all subscriber terminals;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3 for data sheets.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

See Package 2 Section 3 for data sheets.



5. Net amplification gain (if utilized) of each tower top amplifier system;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6. Receive sensitivities for all fixed network equipment base station transceivers and all subscriber terminals;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Base Station Sensitivity at 5% Bit Error Rate Static (BER) is –123 dBm.

For a typical portable, such as APX 7000, the Digital Sensitivity at 5% BER is 0.251 μ V.

For a Typical mobile or control station, such as APX 7500, the Digital Sensitivity at 5% BER is 0.25 μ V.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Base Station Sensitivity at 5% Bit Error Rate Static (BER) is –123 dBm .

For a typical portable, such as APX 7000, the Digital Sensitivity at 5% BER is 0.251 μ V.

For a Typical mobile or control station, such as APX 7500, the Digital Sensitivity at 5% BER is 0.25 μ V.



7. The faded performance margin [cf/(i+n)] utilized per TSB-88-C for the required CPC (channel performance criterion) requirement of DAQ 3.4;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Inbound is 16.2 dB and Outbound is 17.0 dB.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Inbound is 16.2 dB and Outbound is 17.0 dB.

8. The portable antenna factor utilized per TSB-88-C which accounts for all body, pattern, and polarization effects;

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

Production COTS.

The portable antenna values are considered Motorola Solutions Proprietary and Confidential. The portable antenna factor is utilized in the coverage prediction maps.

ALTERNATE OFFER:

Non-Compliant.

Production COTS.

The portable antenna values are considered Motorola Solutions Proprietary and Confidential. The portable antenna factor is utilized in the coverage prediction maps.

9. The minimum usable received signal level (mrsl) for all proposed mobile, portable, and control station subscriber terminals;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



The Faded Sensitivity for portable is: -108.50 dBm and for mobile/control station is: -108.53 dBm.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Faded Sensitivity for portable is: -108.50 dBm and for mobile/control station is: -108.53 dBm.

10. The propagation model, diffraction model, and effective antenna model utilized in the coverage modeling for the proposed County system with actual environmental and adaptive loss parameters (i.e., land use land clutter) specified;

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola uses a modified propagation prediction model based on the Okumura prediction model. We have incorporated this model into our design tool, HydraSM, which is a software tool developed by Motorola to predict our coverage, model traffic (voice and data), analyze interference, plan channel re-use, and perform other design tasks for Motorola's diverse and customized portfolio of radio networks.

Diffraction model is part of the Propagation model that Motorola Solutions use.

Effective Antenna model uses the horizontal and vertical patterns provided by the antenna vendor.

Hydra's environmental clutter losses are Motorola Solutions Proprietary and Confidential information.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola uses a modified propagation prediction model based on the Okumura prediction model. We have incorporated this model into our design tool, HydraSM, which is a software tool developed by Motorola to predict our coverage, model traffic (voice and data), analyze interference, plan channel re-use, and perform other design tasks for Motorola's diverse and customized portfolio of radio networks.

Diffraction model is part of the Propagation model that Motorola Solutions use.



Effective Antenna model uses the horizontal and vertical patterns provided by the antenna vendor.

Hydra's environmental clutter losses are Motorola Solutions Proprietary and Confidential information.

11. The simulcast minimum capture ratio (in decibels) and maximum delay spread (in microseconds);

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

Production COTS.

This information is Motorola Solutions Proprietary and Confidential.

ALTERNATE OFFER:

Non-Compliant.

Production COTS.

This information is Motorola Solutions Proprietary and Confidential.

12. The terrain and land use database resolution in arc-seconds for all coverage modeling, and

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Terrain and Land Cover databases are one arc-second resolution.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Terrain and Land Cover databases are one arc-second resolution.



13. Intermodulation studies for all sites which factor in all RF equipment in use or intended for use at the specific site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola will provide intermodulation studies for each site taking into account all frequencies to be used at each site.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola will provide intermodulation studies for each site taking into account all frequencies to be used at each site.

Additionally, the RF Engineering submittal must include a complete RF schematic for each transmit and receive antenna system per site noting all proposed antennas, transmission lines, tower top amplifiers, receiver multicouplers, transmit combiners, circulators, filters, RF connectors, etc. The Offeror shall indicate the effective radiated power of each site that accomplishes the coverage design for the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ERP values listed are maximum in the direction of the antenna azimuth and are lower in all other directions. See Package 2 Section 3 for data sheets.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

ERP values listed are maximum in the direction of the antenna azimuth and are lower in all other directions. See Package 2 Section 3 for data sheets.



A talk-in/talk-out RF link budget (quantifying any link imbalance) must be included for all proposed mobile, portable, and control station subscriber terminals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for details.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for details.

Color- coded talk-in, talk-out and combined (round-trip) coverage maps shall be provided in a high resolution format (1 arc-second) for Elements 1-3 from Section 3.1 and noting the following:

1. FCC/Region 54-required coverage contours,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the Inbound, Outbound, Round Trip and Region 54 contour maps.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the Inbound, Outbound, Round Trip and Region 54 contour maps.



2. Areas of simulcast (if proposed and where applicable) distortion, and

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Simulcast distortion is part of the algorithm that produces the provided coverage maps.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Simulcast distortion is part of the algorithm that produces the provided coverage maps.

3. Expected bit error rate (BER) percentages.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Provided coverage maps depict a maximum BER percentage corresponding to DAQ 3.4.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Provided coverage maps depict a maximum BER percentage corresponding to DAQ 3.0.

Product data sheets shall be provided for all proposed antennas, transmission lines, tower top amplifiers, receiver multicouplers, transmit combiners, circulators, filters, RF connectors, attenuators, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Data sheets are provided in Package 2 Section 3.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Data sheets are provided in Package 2 Section 3.

The Offeror shall provide coverage prediction maps indicating a service area reliability of 95% RF coverage for all required scenarios. Prediction maps shall indicate County borders including adjacent counties, RF base site location(s), primary roads, and areas of non-coverage. In addition, one original of each RF coverage prediction map shall be provided on “ANSI E” size paper. For each scenario and service area required, a second coverage prediction map shall be provided noting the guaranteed service area reliability with a proposed coverage test grid structure underlay per the TSB-88-C grid size guidelines.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for data sheets. According to Addendum #1, “E” size maps will be provided on CD.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for data sheets. According to Addendum #1, “E” size maps will be provided on CD.

All engineering analysis and coverage modeling shall be executed in accordance with FCC/Region 54 parameters and restrictions. The County will serve as the signatory for all licensing efforts, but the Offeror shall be responsible for provision to the County of all technical data required to properly license the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



4.1.4 RF Sites

Option 1 –The Offeror has the ultimate latitude to propose alternative sites in which to achieve the desired engineering goals and coverage requirements of the system. However, the Offeror shall note that re-use of existing sites, to the greatest extent possible, is highly preferable and should be considered the primary option to control system costs and optimize the timeframe to transition to the new system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

All exiting Lake County Sites were chosen in the new design except Lake County's existing Gurnee/Warren site. SO Dispatch at Libertyville will host the Main Prime Site and a co-located RF subsite. Waukegan site will host a backup Geo-Redundant Prime Site with a co-located RF site. The rest of the RF sites were chosen as the best possible option for Lake County coverage. The total RF Site count is 10.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All exiting Lake County Sites were chosen in the new design except Lake County's existing Gurnee/Warren site. SO Dispatch at Libertyville will host the Main Prime Site and a co-located RF subsite. The rest of the RF sites were chosen as the best possible option for Lake County coverage. The total RF Site count is 8.

Option 2 – If the Offeror finds other commercial sites to be suitable for the coverage design, then the Offeror shall provide a detailed explanation of the site owner's proposed costs, accessibility, and certification that the structure can handle the proposed load. The cost of acquiring and leasing alternatively-owned tower sites shall be included in the Offeror's price proposal. The use of an existing commercial site shall be secondary to the goal of re-using existing County sites, but this design alternative is still preferable to the County versus constructing a wholly new tower. The County also views collocation on an existing tower a viable alternative to control system costs and to optimize the overall timeframe to transition to the new system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Option 3 – A third option for the County is to construct brand new communications facilities to serve the proposed system. This specification outlines in a subsequent section how communications facilities shall be designed and implemented to meet the needs of the County. Whenever wholly new communications facilities are required and proposed, the County highly encourages the deployment of such sites on available County owned property.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

In general, the County prefers to own and operate critical communications sites within its bounds. Justification includes better control of security and limited access, additional control over interference from co-locations, lower overall cost over the normal radio system life-cycle, and higher levels of reliability than typical commercial facilities. Ultimately, the County remains flexible in the site selection process for the new system as the most important design criteria for County users is the delivered RF coverage and resulting audio quality. The County requires the Offeror to thoroughly justify and explain the rationale for the proposed sites and resulting tower heights/shelter sizes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.1.5 FCC Licensing

The County requires the supplier to utilize any combination of the County's existing LMR and microwave frequencies to complete the network design. The supplier must realize that most of these frequencies are currently in use as part of the existing trunking system, so the necessary arrangements shall be made to craft a workable cutover plan to re-use the same frequencies in the new system design. All FCC, Region 54, and frequency coordination licensing activities will be the sole responsibility of the supplier. The County will serve as the ultimate signatory and licensee, but the Offeror is responsible for defining, designing, documenting, and providing all technical data necessary to commission a fully-functional and licensed radio system network that meets or exceeds the County specifications contained herein. If the Offeror determines that additional channels are required, the Offeror shall define, design, document, and provide all technical data necessary to obtain the additional frequencies to complete the network design. While Special Temporary Authorizations (STAs) shall be permissible during the implementation phase of the process, the



County requires that all licenses be fully granted in the County's name with FCC call signs prior to final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4.1.6 Interference Prevention/Mitigation

The proposed radio system shall account for the current noise floor environment in the County as well as possible degradations into the near future. The Offeror is required to engineer a network that provides sufficient signal margins, in concert with the Interference Protection Standard guidelines specified in the August 6, 2004 FCC Report and Order on WT Docket 02-55 (FCC 04-168), throughout the County to mitigate and eliminate adjacent and in-band noise/interference. The proposed system also shall be designed to mitigate and eliminate the effects of out-of-band emissions and intermodulation products originating from CMRS, SMR, and other nearby wireless radio networks. The proposed system shall not, in any way, be degraded by self-induced interference or noise that results from the normal, daily operation of the network. In the event that the proposed system experiences interference of any kind during the deployment and warranty phases, the Offeror shall provide at no additional cost the technical resources to the County to identify, characterize, and resolve the interference issues.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.0 RADIO SYSTEM INFRASTRUCTURE REQUIREMENTS

5.1 SYSTEM ATTRIBUTES

The County intends to implement a wireless two-way digital trunked radio communication system providing highly reliable radio service throughout the entirety of the County. The proposed radio system infrastructure shall utilize open protocols and be very scalable to allow migration and expansion as compared to existing legacy systems. The proposed network provided must allow the County the option to choose various types of subscriber equipment from multiple vendors that can be readily supported by the system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The proposed system is an APCO Phase 1 compliant P25 system and Phase 2 capable. The Motorola system allows operation for multiple non Motorola P25 subscribers.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: The proposed system is an APCO Phase 1 compliant P25 system and Phase 2 capable. The Motorola system allows operation for multiple non Motorola P25 subscribers.

The proposed radio system shall include portable and mobile subscriber units, base station transceivers and associated antenna systems, control stations, real-time call processing controllers, network routing and switching equipment, microwave transport and channel bank equipment, network controllers and location registers, configuration and database servers, audio switching equipment, diagnostic and troubleshooting network management subsystems, dispatch console interface equipment, mutual aid and interoperability interfaces, and all other required equipment that comprises a complete system infrastructure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The radio system must allow shared access to system services by the agencies while restricting access by unauthorized subscriber units. The radio system must be configurable such that individual agencies can communicate on talkgroups privately within their operation, as well as to interoperate with other County agencies, as required.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The radio system shall support the use of the following types of subscriber radio and control equipment configurations:

- Mobile (vehicle-installed) subscriber units including various tiers and different mounting configurations;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Portable (handheld) subscriber unit including various tiers, configurations, and specialized accessories;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Control stations subscriber units including various tiers, configurations, and remote deskset/handset-style controllers;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Vehicular repeater subscriber configurations facilitating in-band or cross- band communications;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dispatch consoles providing all required features and capabilities using wireline and optional RF interfaces.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The network management system shall provide for high system availability by monitoring of the voice radio system on a continuous basis through the use of automatic alarms and diagnostics that provide an immediate interface to maintenance technicians through both integrated monitoring equipment and optional Offeror-provided central monitoring equipment. The radio system also shall provide a method for monitoring the use of the system through historical and real-time statistical reports by agency and for the entire system generated by network equipment on demand.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



5.1.1 Grade of Service

Designing a mission-critical public safety system requires consideration for worst- case scenarios that may require a tremendous, rapid increase in radio traffic in any localized area of County service territory as well as an increase in radio traffic for a wide-area incident. A well-designed public safety system easily should be able to provide the channel capacity for unblocked, routine, daily County radio operations as well as to embed sufficient additional capacity to cope with crisis and disaster circumstances. In order to facilitate this balancing act, the County requires the Offeror to complete a comprehensive Grade of Service (GOS) analysis to determine the Grade of Service the County can expect when serving the quantity of subscriber units for each Department as contained in the Appendix D of this document.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

*Erlang-C is the correct traffic model to use to determine Grade of Service (GoS) in a Trunking Environment. The actual Erlang-C formula is very complex. Fortunately, there are a number of good Erlang-C calculators available on the internet. Motorola has chosen to use a calculator provided by the Department of Mathematics of vrije University, Amsterdam. The Erlang-C calculator may be accessed with the following URL:
<http://www.math.vu.nl/~koole/ccmath/ErlangC/index.php>*

All Erlang-C results contained in the following responses were obtained using the above defined Erlang-C calculator. Since the Erlang-C calculator uses different terminology than that used in Radio Trunking Systems, the following translation in terms is required when using the calculator:

PTTs per hour translates to Arrivals per Hour, Talk Time or Duration translates to Service Time, Number of Talkpaths translates to Number of Agents, Grade of Service translates to Service Level and is expressed as (100 – (Desired GoS)).

ALTERNATE OFFER:

Fully Compliant.

*Erlang-C is the correct traffic model to use to determine Grade of Service (GoS) in a Trunking Environment. The actual Erlang-C formula is very complex. Fortunately, there are a number of good Erlang-C calculators available on the internet. Motorola has chosen to use a calculator provided by the Department of Mathematics of vrije University, Amsterdam. The Erlang-C calculator may be accessed with the following URL:
<http://www.math.vu.nl/~koole/ccmath/ErlangC/index.php>*

All Erlang-C results contained in the following responses were obtained using the above defined Erlang-C calculator. Since the Erlang-C calculator uses different terminology than that used in Radio Trunking Systems, the following translation in terms is required when using the calculator:

PTTs per hour translates to Arrivals per Hour, Talk Time or Duration translates to Service Time, Number of Talkpaths translates to Number of Agents, Grade of Service translates to Service Level and is expressed as (100 – (Desired GoS)).



The County desires a Grade of Service (GOS) metric of 1% using the Erlang-C traffic model. Using documented Offeror-assumptions and the requested number of subscriber radios, the County requires the Offeror to perform a GOS analysis to determine how closely the County can expect its Grade of Service to adhere to the County's 1% GOS target. The County requires all GOS assumptions to be clearly identified to explain the analysis and optimum channel number conclusion. To facilitate a uniform comparison, the Offerors shall utilize the following data and guidelines in the GOS analyses as a starting point:

- 75% of the requested subscribers will be active at the busiest time

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

This Specification was replaced with 1107 radios active during the busy hour (Lake County Response to RFP Questions).

ALTERNATE OFFER:

Fully Compliant.

This Specification was replaced with 1107 radios active during the busy hour (Lake County Response to RFP Questions).

- Average call duration is approximately 6 seconds

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

This Specification was replaced with 3.06 seconds call duration (Lake County Response to RFP Questions). This will be entered, into the calculator as 3.06 seconds Service Time.

ALTERNATE OFFER:

Fully Compliant.

This Specification was replaced with 3.06 seconds call duration (Lake County Response to RFP Questions). This will be entered, into the calculator as 3.06 seconds Service Time.

- Number of calls per subscriber per hour is approximately 2

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The RFP specifies 2 PTTs per radio during the busy hour. Total Lake County PTTs per hour during busy hour is $(1107 * 2) = 2214$ PPTs per hour. This will be entered, into the calculator as 2214 Arrivals per hour.



ALTERNATE OFFER:

Fully Compliant.

The RFP specifies 2 PTTs per radio during the busy hour. Total Lake County PTTs per hour during busy hour is $(1107 \times 2) = 2214$ PPTs per hour. This will be entered, into the calculator as 2214 Arrivals per hour.

- Number of system talkgroups is approximately 180

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Number of System Talkgroups is not relevant to Erlang-C calculations as every arrival is considered unique and not dependant on any relationship with other Arrivals. Motorola's proposal will easily accommodate the requested 180 Talkgroups or more.

ALTERNATE OFFER:

Fully Compliant.

Number of System Talkgroups is not relevant to Erlang-C calculations as every arrival is considered unique and not dependant on any relationship with other Arrivals. Motorola's proposal will easily accommodate the requested 180 Talkgroups or more.

- Message trunking repeater hangtime, if used, is approximately 1 second

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola intends to operate Lake County sites in Transmission Trunking mode as it is a more efficient use of total site bandwidth. For this reason, Hang time will be 0 seconds.

ALTERNATE OFFER:

Fully Compliant.

Motorola intends to operate Lake County sites in Transmission Trunking mode as it is a more efficient use of total site bandwidth. For this reason, Hang time will be 0 seconds.

- Maximum acceptable average wait time is 0.5 seconds

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola has used .5 seconds as the maximum acceptable wait time. Calls that wait less than .5 seconds do not count against GoS.



ALTERNATE OFFER:

Fully Compliant.

Motorola has used .5 seconds as the maximum acceptable wait time. Calls that wait less than .5 seconds do not count against GoS.

- Computer network GOS % values for the system design utilizing 7 trunked channels/talkpaths.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola is proposing an add on to the STARCOM21 Statewide Radio Network which is the current default system for the State of Illinois. Motorola will be proposing a 9 Talkpath (10 channels including control channel). Motorola's detailed explanation of its analyses, additional assumptions, and conclusions are in our response to the next question.

Although Motorola will not be offering a 7 talkpath standalone system, the answers to GoS% for a 7 Talkpath site are:

- **Original Specifications (1500 radios, 75% active during busy hour, and 6 second duration) yields a GoS of 7.85% wait longer than .5 seconds.**
- **Revised Specifications (1107 radios active during busy hour and a 3.06 second duration) yields a GoS of .15% wait longer than .5 seconds.**

ALTERNATE OFFER:

Fully Compliant.

Motorola is proposing an add on to the STARCOM21 Statewide Radio Network which is the current default system for the State of Illinois. Motorola will be proposing a 9 Talkpath (10 channels including control channel). Motorola's detailed explanation of its analyses, additional assumptions, and conclusions are in our response to the next question.

Although Motorola will not be offering a 7 talkpath standalone system, the answers to GoS% for a 7 Talkpath site are:

- **Original Specifications (1500 radios, 75% active during busy hour, and 6 second duration) yields a GoS of 7.85% wait longer than .5 seconds.**
 - **Revised Specifications (1107 radios active during busy hour and a 3.06 second duration) yields a GoS of .15% wait longer than .5 seconds.**
-



The Offeror shall provide a detailed explanation of its analyses, additional assumptions, conclusions, and the engineering tools utilized.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola is proposing an add on to the existing STARCOM21 Statewide Radio Network which is the current default radio network for the State of Illinois. Motorola is proposing a 9 Talkpath (10 channels including control channel). This site will be carrying the traffic of both the existing STARCOM21 users as well as Lake County users offering an opportunity for extensive interoperability with the existing STARCOM21 users. Motorola GoS calculations follow:

- Using the already defined Erlang-C calculator, a site with 9 talkpaths carrying call durations of 3.06 seconds can handle 4671 PTTs per hour. Converting to Erlangs, $(4671 \times 3.06) = 14,293 \text{ seconds} = (14,293/3600) \text{ Erlangs} = 3.97 \text{ Erlangs of capacity.}$*
- Existing STARCOM21 users produce 1063 PTTs per hour (Arrivals per hour) with a Call Duration (Service Time) of 5.16 seconds requiring 1.52 Erlangs of capacity.*
- Site capacity remaining after adding existing STARCOM21 traffic is 3.97 Erlangs – 1.52 Erlangs = 2.45 Erlangs available for Lake County radios. $(2.45 \text{ Erlangs}) \times (3600 \text{ seconds/Erlang}) = 8,820 \text{ seconds. } (8,820 \text{ seconds}) / (3.06 \text{ seconds}) = 2,882 \text{ PTTs per hour.}$*
- $(2882 \text{ PTTs per hour}) / (2 \text{ PTTs per radio}) = 1,441 \text{ Lake County radios (at 3.06 seconds) can be supported, on top of the existing STARCOM21 radio traffic. Since Lake County has specified 1107 radios, in this RFP, Motorola is confident that 9 Talkpaths will carry both STARCOM21 and Lake County traffic at less than 1% GoS.}$*

ALTERNATE OFFER:

Fully Compliant.

Motorola is proposing an add on to the existing STARCOM21 Statewide Radio Network which is the current default radio network for the State of Illinois. Motorola is proposing a 9 Talkpath (10 channels including control channel). This site will be carrying the traffic of both the existing STARCOM21 users as well as Lake County users offering an opportunity for extensive interoperability with the existing STARCOM21 users. Motorola GoS calculations follow:

- Using the already defined Erlang-C calculator, a site with 9 talkpaths carrying call durations of 3.06 seconds can handle 4671 PTTs per hour. Converting to Erlangs, $(4671 \times 3.06) = 14,293 \text{ seconds} = (14,293/3600) \text{ Erlangs} = 3.97 \text{ Erlangs of capacity.}$*
- Existing STARCOM21 users produce 1063 PTTs per hour (Arrivals per hour) with a Call Duration (Service Time) of 5.16 seconds requiring 1.52 Erlangs of capacity.*
- Site capacity remaining after adding existing STARCOM21 traffic is 3.97 Erlangs – 1.52 Erlangs = 2.45 Erlangs available for Lake County radios. $(2.45 \text{ Erlangs}) \times$*



(3600 seconds/Erlang) = 8,820 seconds. (8,820 seconds)/(3.06 seconds) = 2,882 PTTs per hour.

- *(2882 PTTs per hour)/(2 PTTs per radio) = 1,441 Lake County radios (at 3.06 seconds) can be supported, on top of the existing STARCOM21 radio traffic. Since Lake County has specified 1107 radios, in this RFP, Motorola is confident that 9 Talkpaths will carry both STARCOM21 and Lake County traffic at less than 1% GoS.*
-

5.1.2 Throughput Delay

Throughput delay, which is defined as the mouth-to-ear transfer delay of voice information involving a calling and a called subscriber radio, shall be as follows:

- Less than 250 milliseconds in direct simplex radio-to-radio communications;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Less than 350 milliseconds in radio-to-radio communications through a single conventional repeater;

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Less than 500 milliseconds in radio-to-radio communications utilizing the proposed trunking network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Audio buffering shall occur so that no audio is truncated or lost between the time the radio or console PTT switch has been pressed and the actual trunked channel grant. Radios shall be equipped to deliver, via programming, a ready-to-talk tone to operationally guide radio users and adjust usage behavior.

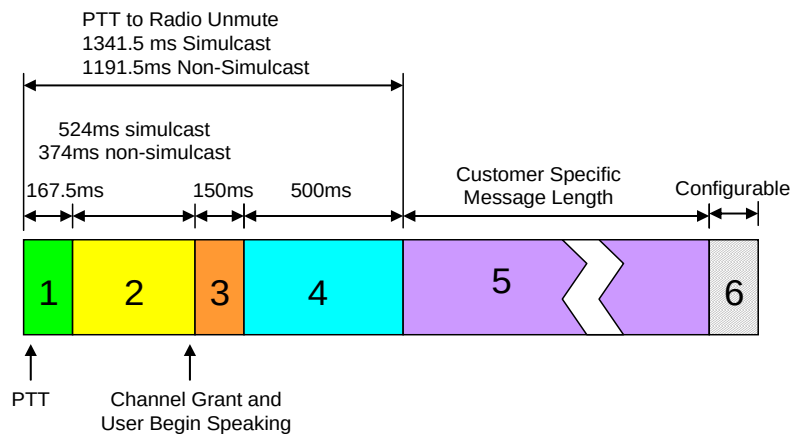
MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

No audio is truncated after the ready-to-talk tone is provided to the user. The proposed system meets the P25 specifications for Trunking Request Time, which is the time from PTT until a channel is granted and the subscriber keys up on a traffic channel. The P25 Trunking Request time requirement for simulcast is 841 ms. The ready-to-talk tone is provided to the user when the channel grant is received.

Project 25 Trunking Timing



1. **Trunking request time** - Time for a subscriber unit from the initiation of a PTT (Push-To-Talk) until a channel or call request ISP (Inbound Signaling Packet) message is sent over the control channel. The APCO requirement for trunking request time is 167.50 ms utilizing a 45 ms control channel slot.
2. **Time to Grant** - Time the RF Sub-System (RFSS) takes to respond to a channel or call request for service by issuing a channel or call grant Outbound Signaling Packet (OSP) message. The APCO requirement for time to grant is 374.00 ms for non-simulcast systems and 524.00 ms for simulcast systems utilizing a triple Trunk Signaling Block (TSBK) OSP message of 75 ms duration.
3. **Transmitter Time to Key** - on a traffic channel is the time it takes for a subscriber unit to respond to a channel or call grant OSP by keying on the assigned working traffic channel. This includes the time for the RF power to be keyed on and the time for modulation to be presented on the working channel. The APCO requirement for transmitter time to key on a traffic channel is 150.00 ms utilizing the short channel or implicit form of OSPs.
4. **Audio Throughput Delay** - the propagation delay of audio through a system. The APCO requirement for audio throughput delay is 500.00 ms.
5. **Message** - Time for message
6. **Hang Time** - If the system is message trunked, there is a hang time between transmissions in a call, and is determined by the Customer specific message profile. With message trunked, the start of each call includes 1-5, and only includes 6 for each PTT. If the system is transmission trunked, there is no hang time, and every PTT includes 1-5.

ALTERNATE OFFER:

Conditionally Compliant.

No audio is truncated after the ready-to-talk tone is provided to the user. The proposed system meets the P25 specifications for Trunking Request Time, which is the time from PTT until a channel is granted and the subscriber keys up on a traffic channel. The P25 Trunking Request time requirement for simulcast is 841 ms. The ready-to-talk tone is provided to the user when the channel grant is received.

See graph above under MAIN OFFER.

5.1.3 Trunking Operation

The 800 MHz (700 MHz capable) trunked repeaters should be managed by the Master Network and/or Primary Site Trunking Controller(s) that manages and selects available communications channels. When a request for communications from a subscriber unit or dispatch console occurs, the controller shall acknowledge the request and assign an idle channel for communications, based on user privileges and call access control parameters. The proper talkgroup or individual call also shall be assigned to the available trunked channel by the appropriate call processing controller which communicates through a dedicated or working control channel.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.

ALTERNATE OFFER

Fully Compliant.

Production COTS.

The trunking communications protocols simply organize all subscriber units belonging to a specific configurable talkgroup address to electronically merge to an electronically assigned available talkgroup RF resource under the domain of the trunked system controller network for the duration of the voice transmission. Once talkgroup communications has ended, network logic causes subscriber units to return to the system control channel awaiting further communications instructions.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant.

Production COTS.



ALTERNATE OFFER

Fully Compliant.

Production COTS.

The system shall allow a transmitting unit access to an available channel and unmute a receiving unit's speaker with the transmitting unit's audio, within 0.5 seconds of the transmitting unit's "Push-To-Talk" (PTT) switch activation. Should system traffic be at a level where all trunked channels or talk-paths are busy, the system will automatically give preference to higher priority units attempting access. The system shall indicate to the user that channels are busy, that the unit is placed in a busy queue, and that a requesting unit will be offered an available channel in a call back mode. The Offeror shall describe in detail the priority access scheme that the proposed system offers.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Trunking voice access time is the time required from the initiation of a user PTT (Push-to-Talk) until a traffic channel is granted, and transmission on that channel has begun. This measurement includes the time for both the subscriber equipment and the RF Sub-System (RFSS) equipment. The APCO requirement for trunking voice access time is an implied time of 691.50 ms for non-simulcast systems and 841.50 ms for simulcast systems.

Audio throughput delay is the propagation delay of audio through a system. The APCO requirement for audio throughput delay is 500.00ms, although there is no applicable method of measurement given for this requirement.

System access time is the elapsed time from an initiating (transmitting) user's call request of PTT to the destination (receiving) unit's speaker unmuting and emitting the intended audio from the transmitting unit. The APCO time would be the sum of the trunking voice access time and audio throughput delay, an implied of $691.50\text{ms} + 500.00\text{ms} = 1191.50\text{ms}$ for non-simulcast systems and $841.50\text{ms} + 500\text{ms} = 1341.50\text{ms}$ for simulcast systems. Motorola's proposed system meets and exceeds the APCO requirements.

The system provides ten (10) priority levels, allowing administrators to segment their users according to their communications needs. Priority 1 is always reserved for emergencies. Priorities 2 through 10 can be assigned by the System Manager on a per radio or talkgroup basis. These priorities are only applicable when the system is busy.

This system has been designed to maximize availability to the end user. In the unlikely event that all the channels are busy, a user depressing their Push-To-Talk (PTT) will be given a busy signal, and placed into a busy queue. When a channel becomes available, the system assigns the user to a channel via pre-assigned priority levels. Once a channel is assigned, the system notifies the user with a call back tone. This feature makes it unnecessary for the radio operator to waste valuable time rekeying their radio in an effort to gain channel access.

In emergencies, the dispatch center is notified immediately, regardless of whether the system is busy. If one or more voice channels are available, one of those channels will be



assigned immediately to the emergency call when the user presses the PTT switch. The duration of the emergency call can be defined by the system administrator.

In the event that the system is busy, two alternatives are provided for handling emergency traffic:

- Top of the Queue – when an emergency is initiated and no channel is available, the emergency user is put at the top of the busy queue. As soon as the first user on any channel de-keys, the emergency caller is assigned that channel. The major advantage to this approach is that there is no contention for the channel.*
- Ruthless Pre-emption – when an emergency is initiated and no channel is available, the Zone Controller selects the channel assigned to the lowest priority user and assigns it to the emergency caller; a feature unique to Motorola trunking systems.*

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Trunking voice access time is the time required from the initiation of a user PTT (Push-to-Talk) until a traffic channel is granted, and transmission on that channel has begun. This measurement includes the time for both the subscriber equipment and the RF Sub-System (RFSS) equipment. The APCO requirement for trunking voice access time is an implied time of 691.50 ms for non-simulcast systems and 841.50 ms for simulcast systems.

Audio throughput delay is the propagation delay of audio through a system. The APCO requirement for audio throughput delay is 500.00ms, although there is no applicable method of measurement given for this requirement.

System access time is the elapsed time from an initiating (transmitting) user's call request of PTT to the destination (receiving) unit's speaker unmuting and emitting the intended audio from the transmitting unit. The APCO time would be the sum of the trunking voice access time and audio throughput delay, an implied of $691.50\text{ms} + 500.00\text{ms} = 1191.50\text{ms}$ for non-simulcast systems and $841.50\text{ms} + 500\text{ms} = 1341.50\text{ms}$ for simulcast systems. Motorola's proposed system meets and exceeds the APCO requirements.

The system provides ten (10) priority levels, allowing administrators to segment their users according to their communications needs. Priority 1 is always reserved for emergencies. Priorities 2 through 10 can be assigned by the System Manager on a per radio or talkgroup basis. These priorities are only applicable when the system is busy.

This system has been designed to maximize availability to the end user. In the unlikely event that all the channels are busy, a user depressing their Push-To-Talk (PTT) will be given a busy signal, and placed into a busy queue. When a channel becomes available, the system assigns the user to a channel via pre-assigned priority levels. Once a channel is assigned, the system notifies the user with a call back tone. This feature makes it unnecessary for the radio operator to waste valuable time rekeying their radio in an effort to gain channel access.

In emergencies, the dispatch center is notified immediately, regardless of whether the system is busy. If one or more voice channels are available, one of those channels will be



assigned immediately to the emergency call when the user presses the PTT switch. The duration of the emergency call can be defined by the system administrator.

In the event that the system is busy, two alternatives are provided for handling emergency traffic:

- Top of the Queue – when an emergency is initiated and no channel is available, the emergency user is put at the top of the busy queue. As soon as the first user on any channel de-keys, the emergency caller is assigned that channel. The major advantage to this approach is that there is no contention for the channel.*
 - Ruthless Pre-emption – when an emergency is initiated and no channel is available, the Zone Controller selects the channel assigned to the lowest priority user and assigns it to the emergency caller; a feature unique to Motorola trunking systems.*
-

5.1.3.1 Operations within Challenging RF Environments-VRS Compatibility

The proposed network shall incorporate a high degree of in-building coverage throughout the County service area; and if necessary, the system shall support the augmentation of network coverage through the use of trunked Vehicular Repeater Systems (VRS). The compatible VRS must be capable of extending both talk-in and talk-out coverage and associated trunking features for portable radios that reside in areas of inferior coverage locations. A VRS configuration shall include a trunked system mobile radio and a properly-filtered vehicular repeater. VRSs must be designed to operate across the entire 764-861 MHz frequency bands.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The mobile portion of the DVRS (Digital Vehicular Repeater System) communicates with trunked infrastructure over this range. While supporting trunking type operation, the mobile repeater portion works in a conventional mode and is available in either 764-805 or 806-868.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The mobile portion of the DVRS (Digital Vehicular Repeater System) communicates with trunked infrastructure over this range. While supporting trunking type operation, the mobile repeater portion works in a conventional mode and is available in either 764-805 or 806-868.



Compatible VRS configurations shall offer the following features:

- Support for 764-861 MHz digital trunked communications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support for 764-861 MHz analog and digital conventional communications

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The mobile portion of the DVRS (Digital Vehicular Repeater System) communicates with other analog conventional devices or infrastructure over this range. The mobile repeater portion works in a conventional mode and is available in either 764-805 or 806-868.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The mobile portion of the DVRS (Digital Vehicular Repeater System) communicates with other analog conventional devices or infrastructure over this range. The mobile repeater portion works in a conventional mode and is available in either 764-805 or 806-868.

- Capability for portable subscriber radios to remotely switch VRS talkgroup and channel modes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Capability to extend talk-in/talk-out for encrypted conventional and trunked calls

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to extend talk-in/talk-out for emergency calls and unique PTT-ID unit identifiers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The DVRS passes the PTT and emergency ID of the P25 subscribers going through it. The DVRS also passes subscribers IDs from the network to subscribers communicating with the DVRS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The DVRS passes the PTT and emergency ID of the P25 subscribers going through it. The DVRS also passes subscribers IDs from the network to subscribers communicating with the DVRS.

- Support for multiple VRS assemblies to co-exist and operate without disruption or self-induced interference in the same localized area

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The DVRS uses a sophisticated algorithm to automatically select a master unit. A manual function (programmable per unit) is also available to override this automatic selection, allowing incident command to select the most appropriate unit to act as a master.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The DVRS uses a sophisticated algorithm to automatically select a master unit. A manual function (programmable per unit) is also available to override this automatic selection, allowing incident command to select the most appropriate unit to act as a master.

- Capability to operate in a tactical repeater or “local-only mode” when both the VRS and nearby portables have roamed out of reliable network coverage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to operate in a “re-broadcast (system extension) mode” when the VRS remains in reliable network coverage but the nearby portable subscriber radios have roamed out of reliable network coverage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to operate in a “silent mode” (non re-broadcast mode) when both the VRS and nearby portable subscriber radios remain in reliable network coverage.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe in detail the VRS features, limitations, and VRS compatibility that the proposed system and subscriber equipment complement offers. Optional VRS assembly pricing with installation costs shall be quoted as part of this proposal response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.3.2 Operations within Challenging RF Environments-In-Building System Compatibility

The proposed network shall incorporate a high degree of in-building coverage throughout the County service area; and if necessary, the system shall support the augmentation of network coverage through the use of in-building repeater systems. The compatible in-building repeater systems must be capable of extending both talk-in and talk-out coverage and associated trunking features for portable radios that reside in areas of inferior network coverage. An in-building repeater system configuration shall include all electronics, antenna systems, power supplies, cabling, connectors, suppression, grounding, and hardware necessary to provide reliable in-building coverage designed to meet the County's requirements as outlined in this specification. In-building systems must be designed to operate across the entire public safety 764-861 MHz frequency bands.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Compatible in-building system configurations shall offer the following features:

- Emergency backup power for a minimum of 4 hours continuous, uninterrupted runtime in the event that commercial power becomes unavailable

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Power consumption levels are provided in the Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Power consumption levels are provided in the Package 2 Section 3.

- Support for 764-861 MHz digital trunked communications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support for 764-861 MHz analog and digital conventional communications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Capability to support fiber-optic, CAT-6 twisted pair, and/or radiating coaxial cable based signal distribution (as offered or permitted at each candidate in-building system location)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Configurable level-setting and power output control to optimize signal levels inside the structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Craft interface to all configurable electronics with capability to archive and retrieve optimization/level settings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Filtering and attenuation that eliminates out-of band emissions and interference

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Both a craft interface and discrete relay alarm/monitoring capability to remotely monitor the performance and operating characteristics of the in-building system

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Rack-mountable and/or wall-mountable electronics

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Aesthetically pleasing cabling and disguised antenna placements per building design and layout

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Comprehensive documentation that defines as-built physical, electrical, and RF designs on scaled drawings.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe in detail any required in-building system features, limitations, and system compatibility that the proposed offering includes. All proposed in-building systems included to meet the network coverage requirements shall be priced independently clearly noting all included equipment and installation costs.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.3.3 Failure Mode Analysis

The entire FNE and backbone microwave systems shall be free of any single point of failure that totally disables the radio system. No failure, even the complete loss of a network control site, shall render the system totally devoid of radio coverage and basic network talk-in/talk-out functionality. Wide-area trunking communications shall be preserved and maintained throughout all failure modes as feasible, but conventional modes of operation are deemed acceptable provided wide-area communications and coverage characteristics are maintained. The Offeror shall provide a comprehensive analysis explaining how the proposed system will continue to provide radio service (noting specific coverage and functionality impacts) to the County's subscribers following the various failures of the hierarchical systems that control operation of the trunked network.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All fallback modes of communication shall be thoroughly described with an explanation of what must occur to trigger the specific fallback mode. The analysis shall consider thoroughly the impacts to coverage reliability, field subscriber trunking and conventional features, dispatch console trunking and conventional features, network management control, and interoperability. In addition, the analysis shall describe the complexities of operations restoration within the PSAP(s). In particular, the Offeror should describe how console positions controlling multiple talk groups will maintain communications with the different talkgroups operating in a County mode during the various failure modes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The purpose of the failure mode analysis is to ensure that the Offeror recognizes the criticality of the County's radio network infrastructure in relationship to its unique role of protecting the citizens and property of the County. The Offeror must demonstrate through its network design that the level of redundancy proposed is exceptional and engineered to continue network operations without interruption in virtually any circumstance including attacks of terrorism and natural disaster.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The County requires the Offeror to provide an extraordinary design for the electronic hardware and software as well as a separate plan to protect every aspect of the physical infrastructure supporting and protecting the network. For example, if a site is proximate to flooding or any other source of water, the design must contain strategies to protect the site from flooding and other acts of nature.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.4 Simulcast Operation

The following subsections pertain to the expected simulcast system architecture to provide the wide-area coverage requirements. Wide-area coverage is defined as operation over an area that cannot be covered by a single base station transceiver site. The basic wide-area design concept for the County system shall be a P25 digital trunked system providing wide area coverage and the Grade of Service requirements described above, including a high degree of in-building coverage. Interconnection between the base station sites, console electronics and dispatch positions shall be provided by a high-capacity microwave system preferably in a loop configuration.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.4.1 Transmitter Simulcast

The simulcast design shall have the capability to connect audio and data between the prime control site and remote transceiver sites via multiple DS-1 (T-1) microwave circuits. The system shall be capable of automatically adjusting the path delay and amplitude of any one or all DS-1 circuits utilized in the system. The automatic adjustment shall compensate for any change in microwave paths. The system shall be capable of maintaining a phase delay (launch time) of no more than +/- 3 microseconds and an amplitude of 0.1 dB between transmit sites. The path delays shall be dynamically adjustable to compensate for at least 60 milliseconds of inherent path delay. A simulcast design also shall be compatible with the use of leased Fiber Optic services (if necessary).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A written response to the following items shall be included in the Offeror's response:

- Renetting Interval - The recommended interval at which the system is to be "renetted" or verified with respect to adjustment of frequency, modulating signal amplitude and phase, shall be specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The use of high stability frequency standards removes the need to regularly adjust or renet the base station frequencies, as the base station is continuously disciplined by the frequency standard.

- Simulcast Time Delay Control - Once the path delays have been measured, the method by which audio path time delay will be automatically controlled and equalized shall be specified. The maximum amount of path delay compensation shall be specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The voting receivers manage the amount of path delay compensation based on your particular system. The maximum amount of path delay compensation is 250 ms.



- Frequency Stability - The method by which the frequency of base station transmitters is maintained within the required tolerance for satisfactory simulcast operation shall be specified, and this value shall be provided. Options for enhanced frequency stability, if any, shall be identified and the cost(s) listed in the Pricing section.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The Frequency Stability of the Base Station is 30 ppb/yr and 100 ppb/5 year.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Frequency Stability of the Base Station is 30 ppb/yr and 100 ppb/5 year.

- Addition of Sites - The procedure and equipment required for the addition of base repeater or receiver sites shall be specified. Also, the maximum site capacity of the system's simulcast controller(s) shall be specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The maximum subsite capacity is 32 per simulcast cell. Major modifications to the system infrastructure are not required to add additional sites or channels.

No major hardware modifications are required for the simulcast prime site controller to expand to the maximum number of sites including not having to reprogram the user radios if simulcast sites are added. ASTRO 25 repeater site controllers will not require hardware modifications for any channel expansions. When adding channels to a simulcast subsystem, one comparator will have to be added at the prime site for each channel added to the system. When adding a simulcast channel, one channel is required at every simulcast remote site that is part of the simulcast subsystem. Depending on the frequency pairs for the additional base radios, addition combiners may be used.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The maximum subsite capacity is 32 per simulcast cell. Major modifications to the system infrastructure are not required to add additional sites or channels.

No major hardware modifications are required for the simulcast prime site controller to expand to the maximum number of sites including not having to reprogram the user radios



if simulcast sites are added. ASTRO 25 repeater site controllers will not require hardware modifications for any channel expansions. When adding channels to a simulcast subsystem, one comparator will have to be added at the prime site for each channel added to the system. When adding a simulcast channel, one channel is required at every simulcast remote site that is part of the simulcast subsystem. Depending on the frequency pairs for the additional base radios, addition combiners may be used.

- Addition of Channels - The procedure and equipment required for the addition of base repeater or receiver channels shall be specified. Also, the maximum channel capacity of a single simulcast "Site" or "Prime" controller shall be specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

A Simulcast site can have a maximum of 30 Talk paths.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A Simulcast site can have a maximum of 30 Talk paths.

- Control of Sites - The Offeror shall describe the method by which the simulcast remote sites are controlled and interfaced with the trunked system controller. Link type and bit rate shall be specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Link Type is Microwave with the format of DS1 and the bit rate is Ethernet 10 Mbps.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Link Type is Microwave with the format of DS1 and the bit rate is Ethernet 10 Mbps.



- System Architecture - The trunked simulcast system architecture shall be described in detail, with written descriptions of all major system components and their functions. System and site block diagrams shall be provided to show the interconnection and the detailed audio/logic signal flow (e.g.; tx audio +/-, keying +/- etc.) between system elements (components/equipment racks).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.4.2 Digital Comparator

A receiver voting/comparator system shall be furnished and installed which shall allow the automatic selection of the receiver providing the lowest Bit Error Rate (BER) and Forward Error Correction coding (FEC). The voting/comparator shall pass the selected audio to the dispatch consoles and the simulcast audio distribution network for rebroadcast to other mobile, control station or portable field units. The receivers operating in the voting system shall, at minimum, be those included in the base station transceivers. The trunked system shall provide console priority. The operation of the comparator/selector shall not be evident; there shall be no clipped syllables and no noticeable delay in the selection process.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The comparator shall be radio frequency band independent. The digital comparator shall incorporate frame diversity that allows the comparator to utilize the best data frames of all the inputs to construct a better output signal than any one single input signal of the comparator. Each receiver shall generate "idle data" when it is in the idle (squelched) state. The idle data shall be transportable by a DS-1 (T-1) audio circuit.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The comparator shall provide an indication of a failed digital microwave audio circuit or input serving a receiver through loss of detection of idle data, or by other supervisory method. The receiver voting comparator shall be equipped to provide a real-time voting activity display and output. Voting activity displays shall include receiver selected, receiver unsquelched, receiver failed and receiver disabled.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola provides indications of failed circuits/comparators through the network management system/fault management.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola provides indications of failed circuits/comparators through the network management system/fault management.

The digital comparator shall provide alarms for key operational parameters, and shall provide for remote inquiry display, disablement and diagnostic functions via RS232 and Ethernet connections. Alarms shall be displayed at all NMS workstations and through craft interfaces. The digital comparator shall provide high-level diagnostic information through front-panel LEDs and relevant indicators so that a technician or network administrator can quickly gauge the severity of a digital comparator fault by looking at the digital comparator. The digital comparator shall provide both alarm messages and fault conditions using Simple Network Management Protocol (SNMP) and discrete Form-C relays. At a minimum, the digital comparator shall provide Critical, Major, and Minor relays which may be connected to a separate alarm subsystem. All digital comparator alarm information shall be time/date stamped in synchronization with the master network clock. All comparator ports shall be uniquely labeled and identified on the comparator chassis so as to highlight the specific receiver sites.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The comparator hardware does not have Form-C relay closures.



ALTERNATE OFFER:

Conditionally Compliant.

Production COTS

The comparator hardware does not have Form-C relay closures.

5.1.5 Digital Encryption

The proposed system shall be capable of supporting and providing digital voice encryption calls. All properly-equipped subscriber units with multiple key encryption shall be able to scan between and converse on encrypted and clear talk groups. All dispatch positions shall be capable of end-to-end multiple key encrypted voice operations. The coverage range and reliability of the system in encrypted mode must equal the range of the system in the clear, unencrypted mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The encryption process shall not degrade the required delivered audio quality of the system. Encryption shall be available in trunked, conventional and talkaround modes. Encryption shall be available in all proposed fall-back modes of communication. AES and DES encryption algorithms shall be supported by the proposed system. The Offeror shall state the number of encryption algorithms available in its system and the encryption algorithm capacity of all proposed radio units. Multiple keys must be provided in the fixed equipment and the subscriber units. The system shall be capable of re-keying the encryption algorithm for all properly-equipped subscriber radios over-the-air. The Offeror shall fully discuss the encryption scheme in the proposal response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.6 Over-The-Air Subscriber-Provisioning

The system shall offer the ability to provide over-the-air subscriber provisioning to download complete subscriber radio personality configuration changes. All subscriber radios shall be capable of being uniquely addressed and receiving, in real-time, over-the-air subscriber provisioning data



using the proposed trunking system infrastructure. All data contained in the subscriber radio personality shall be reconfigurable in an over-the-air exchange, and the personality data shall be transmitted in a discreet, protected mode to stymie eavesdroppers.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

From a dedicated over-the-air subscriber provisioning workstation or network management terminal, a network administrator shall be able to download all or any subset of the radio personality data to one or multiple field subscriber radios that are actively affiliated with the trunked network. The over-the-air subscriber provisioning tools shall provide the same user functionality, user feedback, dialogue messages, and historical programming data as a traditional hard-wired programming configuration (i.e., laptop with required radio programming software, interface cables, adapters, etc.).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Target radios shall provide positive or negative acknowledgment as to the success of the intended over-the-air provisioning transaction. An over-the-air subscriber provisioning transaction shall take place in real-time and the transaction time shall be commensurate with the bit rates offered by the proposed network. Compression techniques are encouraged to reduce the necessary duration of an over-the-air subscriber provisioning transaction. The Offeror shall fully discuss the over-the-air subscriber provisioning capabilities, methodologies, and limitations in the proposal response, to include batch provisioning.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



5.1.7 Call Sign (Base Station) Identifier

The proposed system shall be equipped to automatically generate and transmit all of the FCC-assigned call signs in International Morse Code format every 30 minutes at a minimum per FCC §90.425 guidelines. Every channel shall be capable of transmitting the appropriate call signs, so that in the event of a specific channel failure, the FCC call signs are assured to be transmitted without any manual intervention required. The proposed system shall offer the ability to easily modify/change all of the FCC call signs through a craft interface without the need to generate new hard-coded PROMS or “codeplug”. The proposed system also shall provide the ability to change the timing between automatic call sign identifiers from the NMS (e.g., set the timer to every 15 minutes). The call sign shall be properly synchronized and phased with other call sign transmissions between sites so as not to cause distortion or a heterodyne effect in any possible overlap coverage areas.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.8 Interference Control

The proposed system shall be designed to be resistant to interference from co-channel, adjacent-channel, and intermodulation effects in a manner that is minimally as effective as Continuous Tone Coded Squelch System (CTCSS) used today in conventional radio systems, trunking connect tone, network ID, or equivalent. The proposed system also shall be immune to intra-system interference and cross-talk caused by frequency re-use, intermodulation, or other relevant system design characteristics. Proper system/subscriber RF filtering as well as subscriber and system equipment configuration control shall be provided to minimize and eliminate the effect of interference on system performance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

System receivers must be capable of detecting interference such that this interference is logged with a time/date stamp within the network management and diagnostics subsystem. Furthermore, the interfered channel must be temporarily shut down so that assignments on the interfered channel are not granted by the network controller until the interference condition is resolved. The proposed system shall be configurable such that the continuous duration and signal levels of the interfering

carrier can be specified before the network controller deactivates the channel from availability. The interfering carrier timer shall be configurable in seconds up to at least three minutes in time, and the interfering signal level threshold shall be configurable in dBm up to a minimum level of -120 dBm.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall fully discuss the interference control capabilities, methodologies, and limitations for both fixed network equipment and subscriber units in the proposal response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.9 Access Mode (FDMA and/or TDMA)

All proposed fixed network equipment (FNE), subscriber terminals, and dispatch consoles shall be equipped with FDMA, and optionally 2-slot TDMA, trunking system access mode functionality in compliance with the APCO Project 25 specification.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



5.1.10 Inter-System Connectivity

The Offeror shall provide a network that easily provides for future subsystem integration to expand coverage areas and add other candidate, compatible P25 networks without the need to overhaul or replace the proposed infrastructure. While the County network initially will serve County and its associated internal agencies, the County requires the proposed network and subscriber fleet to be architected so that additional simulcast or multi-cast trunked subsystems could be integrated in the future for greater interoperability. The County requires that the proposed system be architected in congruence with the APCO P25 specification which necessitates that RF subsystems from any manufacturer must be interconnectable into a wide-area system, using the P25-defined RF ISSI (Inter Sub- System Interface) standard.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe the proposed scalability and expandability of the system and subscriber fleet in detail. The Offeror shall thoroughly define its conformance to the P25 RF ISSI requirements and cite several examples of successful P25 trunking system interoperability in 800 MHz (700 MHz capable) as references.

MOTOROLA RESPONSE

MAIN OFFER:

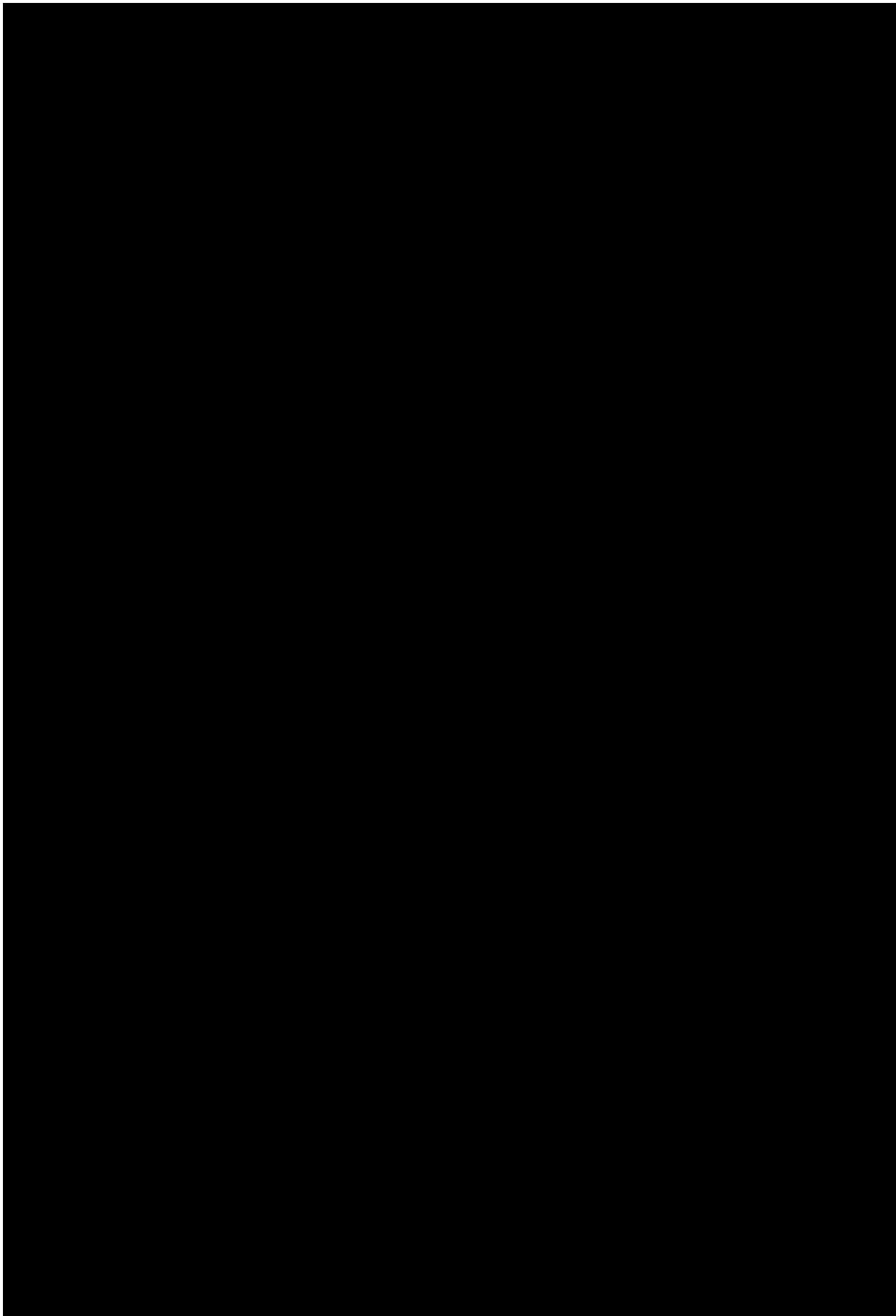
Fully Compliant.

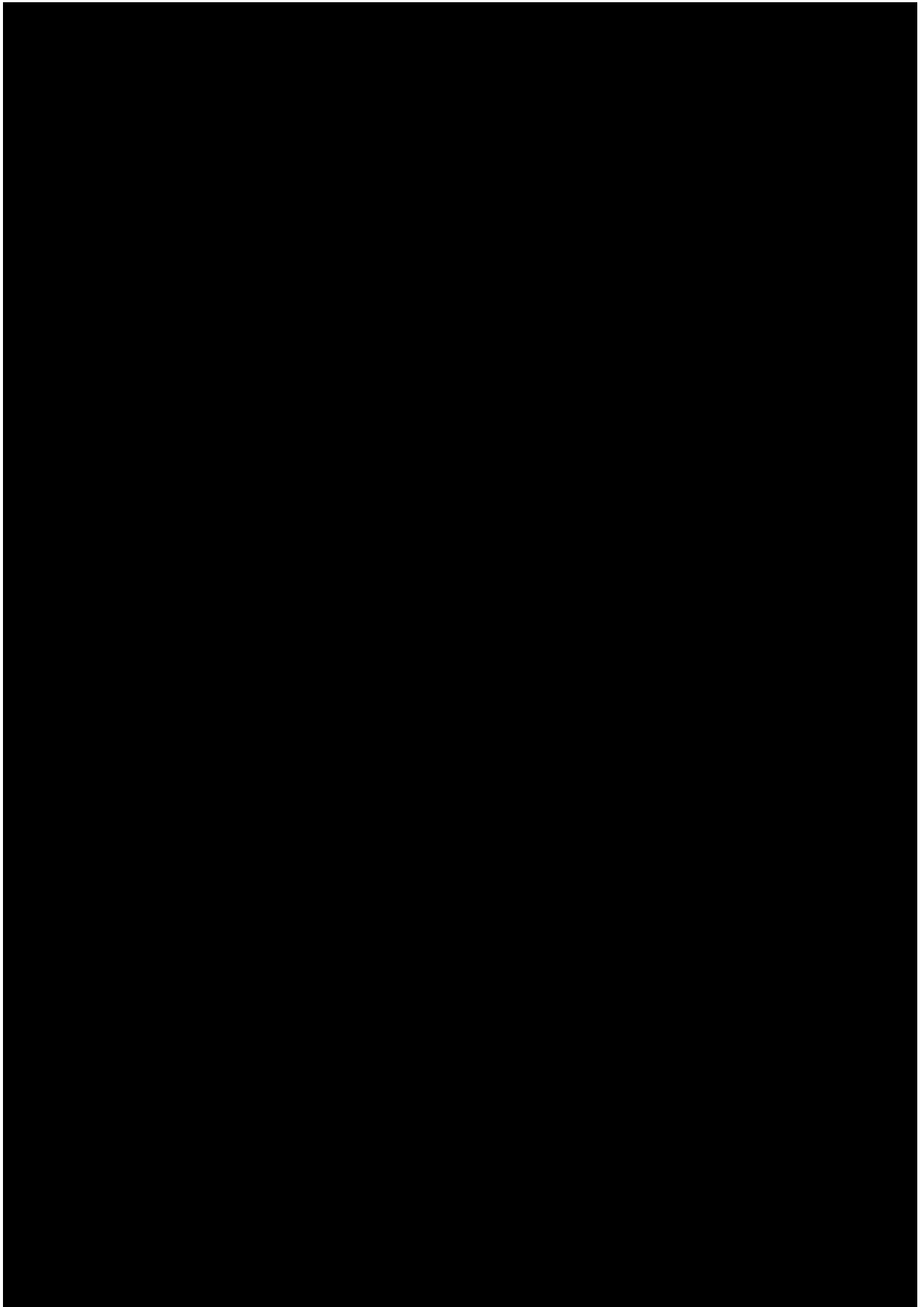
Production COTS.

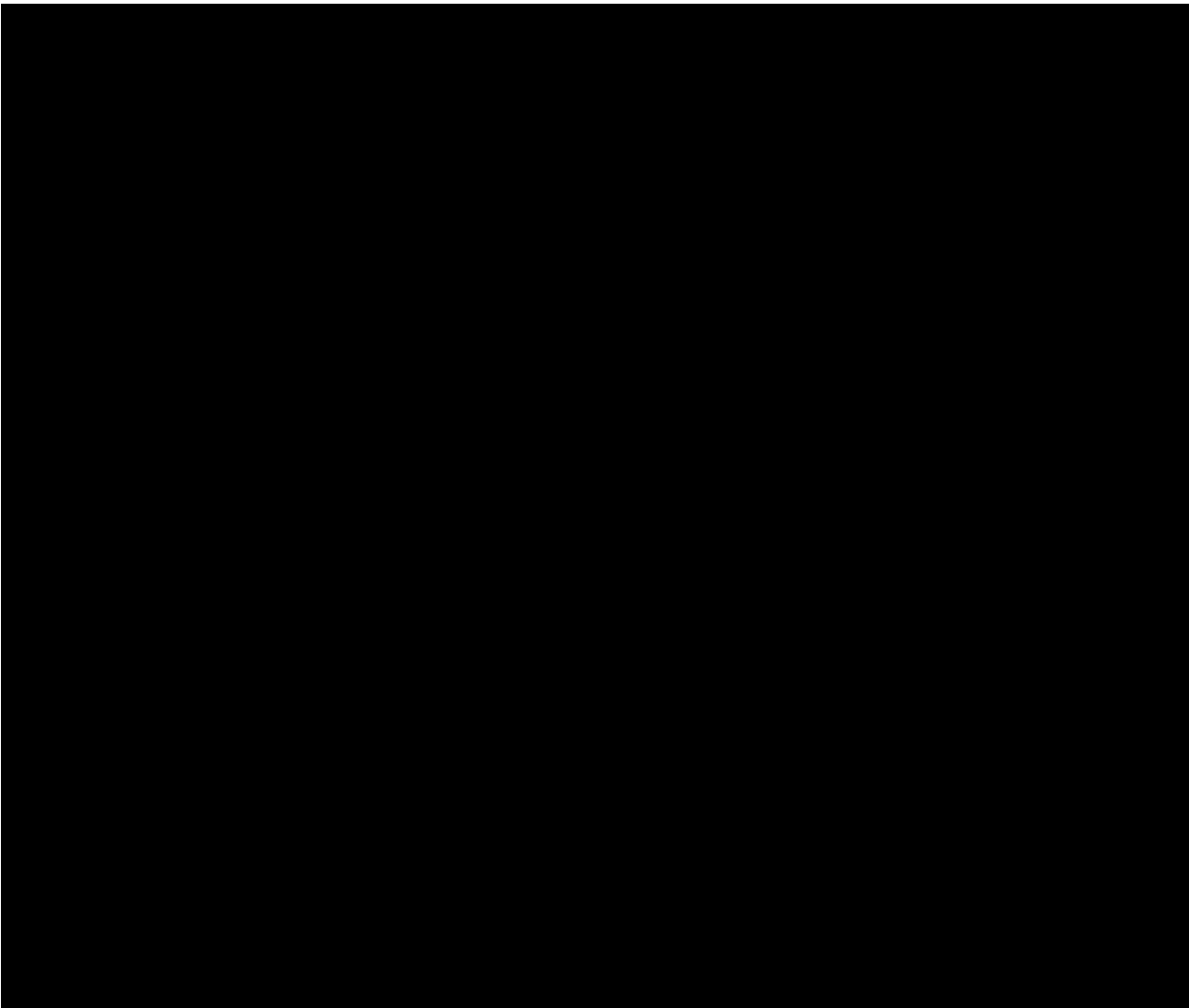
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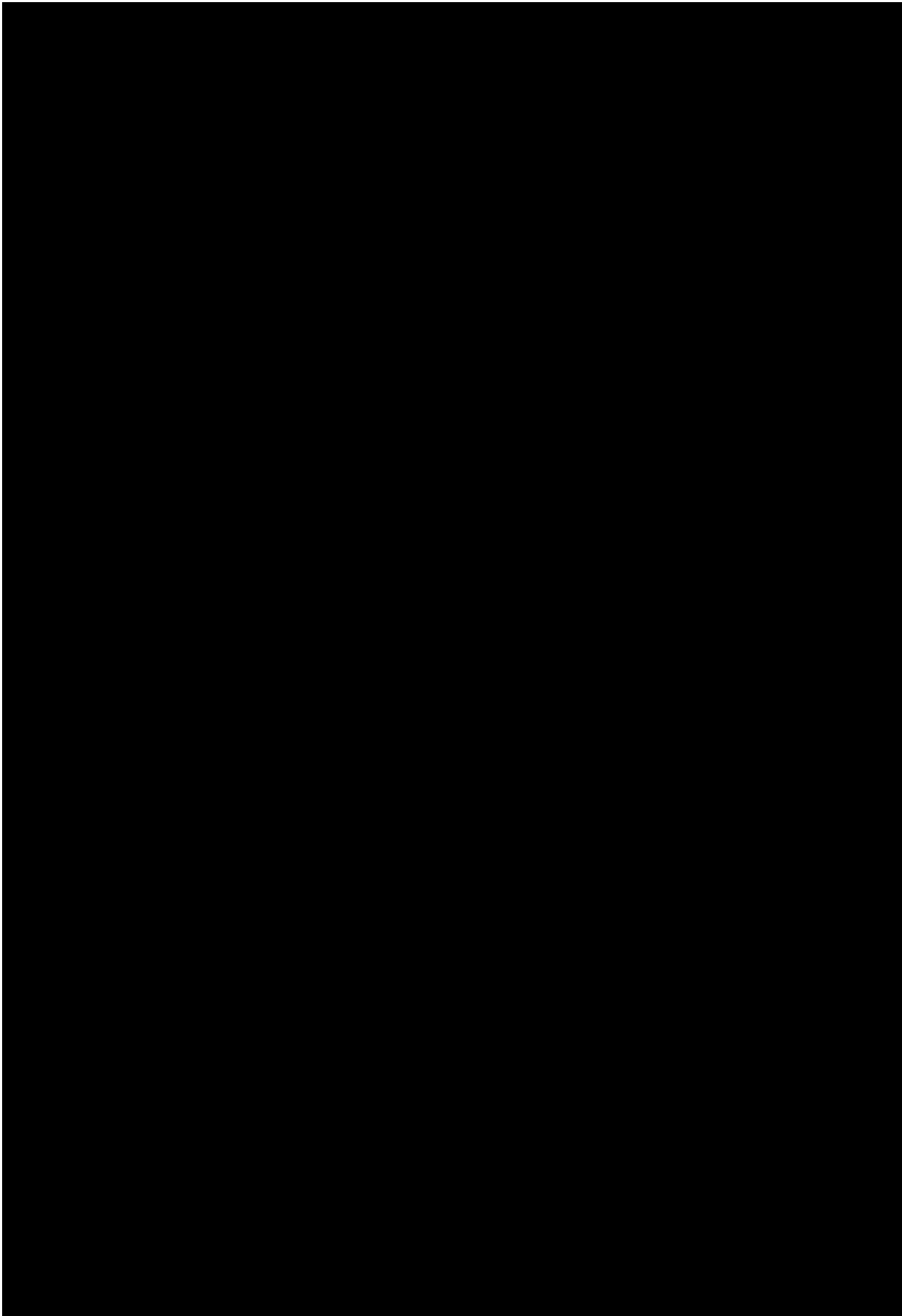
ALTERNATE OFFER:

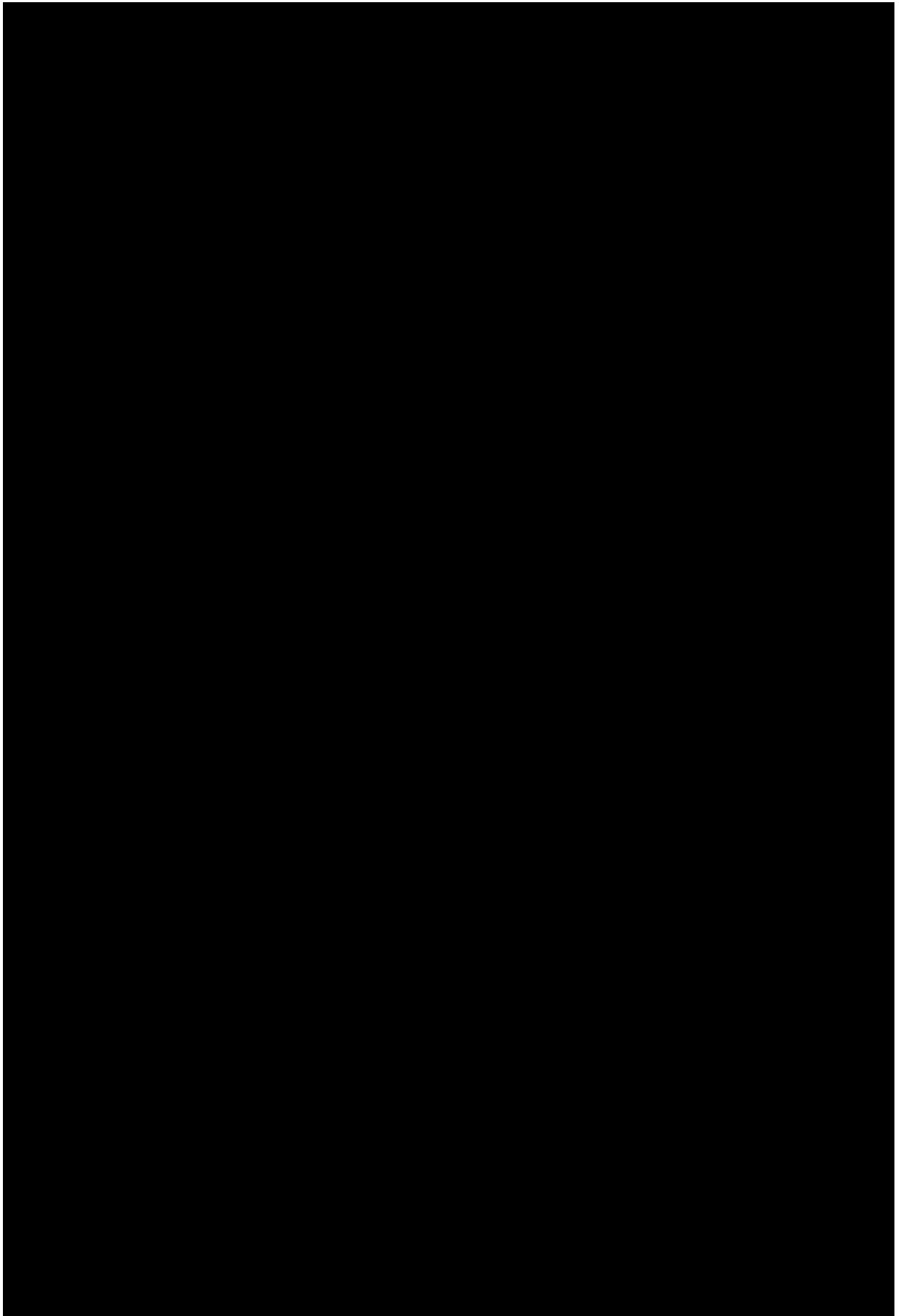
Fully Compliant.

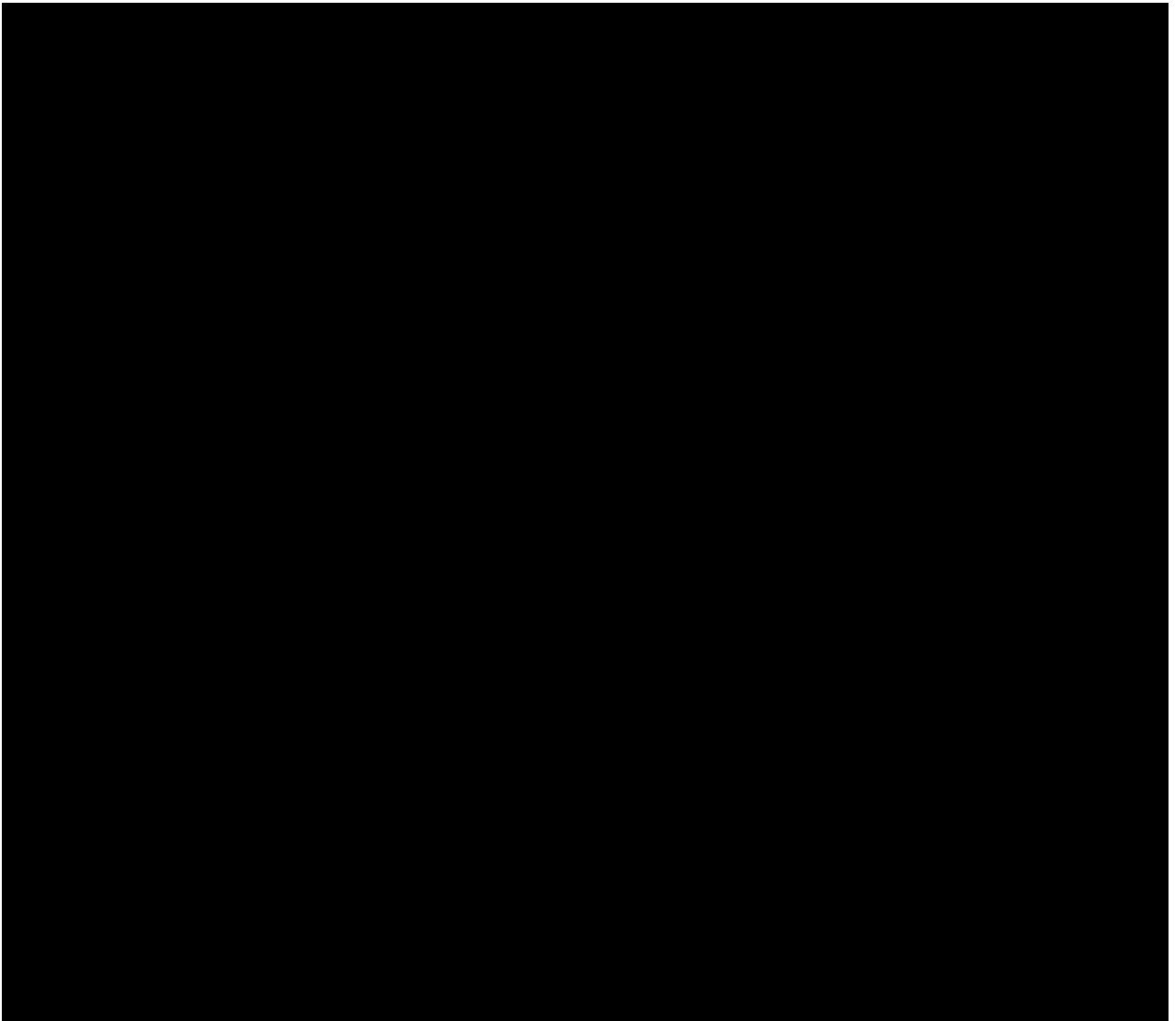
Production COTS.

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	[Redacted]	[Redacted]
	[Redacted]	[Redacted]







5.1.11 System Roaming

If applicable, the proposed system should enable mobile and portable subscriber radios to roam over a wide coverage area with automatic connection and affiliation as the unit enters a new site coverage area within any radio subsystem. The system must provide for registration and authorization control over subscriber units and talkgroups roaming between radio subsystems. Manual and automatic roaming capabilities shall be provided between radio subsystems. The proposed network shall provide network controller functionality that tracks the real-time subscriber unit locations and affiliations through the use of Home and Visitor Location Register databases. Subscriber unit handoff between remote sites shall be seamless and without voice or data interruption to the subscriber terminal or dispatch console.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe the wide-area roaming and mobility functionality being offered with the proposed network. Handoff/roaming algorithms shall be explained in detail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The proposed system is a single simulcast subsystem comprised of 10 sites. In simulcast systems the radios do not roam from site to site. The subscribers receive simultaneous signals from all the transmitter sites and the subscriber transmissions are voted from all the receivers at the sites in range.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed system is a single simulcast subsystem comprised of 8 sites. In simulcast systems the radios do not roam from site to site. The subscribers receive simultaneous signals from all the transmitter sites and the subscriber transmissions are voted from all the receivers at the sites in range.

5.1.12 Network Synchronization

Offerors shall propose a comprehensive design for master network timing and synchronization of the County radio communications system. All network elements and transport equipment shall be synchronized to the master timing source(s). The master timing source(s) shall be GPS-based with high stability, hot standby backup crystal oscillators. Redundancy shall be designed into the master timing source design to the greatest extent possible. Network synchronization shall be alarm monitored.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Stratum 1 timing should be provided for the system and transport infrastructure. All system DS-1/Fiber Optic links shall be capable of deriving clock from the master timing source. Network element equipment clocks shall be synchronized to the master timing source time/date clock for synchronization of diagnostic and failure tracking for internal equipment status logs. All proposed system network/fault management, dispatch consoles, and infrastructure network elements shall derive time/date from the master timing source so that troubleshooting and diagnostic status logs are synchronized system-wide. The master timing source(s) shall provide several additional timing ports for additional synchronization of County network elements such as CAD/RMS, 9-1-1 telephone, logging recorder, mobile data, display clocks, etc. should the County so desire.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.13 Integrated Network Security and User Authentication

The County requires the Offeror to integrate reliable and adaptive network security and user authentication mechanisms into the proposed system to maximize system availability. The proposed system shall be hardened against such network breaches as viruses, worms, malware, spyware, denial of service attacks, and file corruption. The proposed network shall be equipped to quickly update virus definitions and security policies to rapidly prevent, adapt, and cope with malicious network outbreaks. Quarantine and remediation techniques also shall be utilized to prevent and minimize network outbreaks. Firewalls and authentication servers shall be utilized to restrict unauthorized network access while detecting, preventing, and responding to network attacks. Configuration techniques shall be implemented on all computing systems to prevent end-users without supervisor or administrator privileges from loading software or reconfiguring settings in any manner. The Offeror shall provide all passwords and authorization codes for every computing system in a comprehensive list as part of the as-built documentation package.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror shall describe the integrated network security and user authentication functionality being offered with the proposed network as it pertains to all client workstations within all proposed subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see the detailed System Description in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see the detailed System Description in Package 2 Section 3.

5.1.14 Centralized Network Infrastructure Software Distribution

The proposed system shall be equipped with the functionality to download network element upgrades and configuration profiles from a centralized location so as to eliminate the need for technicians and administrators to visit each remote site to deploy enhancements, patches, bug fixes, and configuration modifications. All core network elements, controllers, servers, and transceiver devices shall be equipped to receive software updates and configuration changes from a centralized location. Target network elements shall provide positive or negative acknowledgment as to the success of the centralized software download transaction. A centralized software download transaction shall take place in real-time and the transaction time shall be commensurate with the network throughput offered by the proposed system. The target network elements shall be equipped to run either the existing software or updated software as decided and controlled by the network administrator. The updated network element shall always provide the ability to utilize the previous version of software in the event that the software update was corrupted or contained defects.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror shall describe the centralized network infrastructure software distribution functionality being offered with the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see the detailed System Description in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see the detailed System Description in Package 2 Section 3.

5.1.15 Platform Roadmap/Network Supportability

The County intends to maximize and protect its system purchase investment. The Offeror is required to provide vendor support for the proposed system offering for a period of not less than fifteen (15) years from the date of final system acceptance. The offering consists of all hardware, software, cabling, and services rendered to implement the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola understands that Lake County will sign a 15-year SUAII agreement.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola understands that Lake County will sign a 15-year SUAII agreement.

Offeror support is defined as the ability of the Offeror, without system redesign, to remedy to County satisfaction any hardware and/or software problem with any equipment and services provided as part of this offering. Offeror support will take the form of a 24x7x365 technical support hotline, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or spare/replacement equipment for the proposed offering for not less than fifteen (15) years from the date of final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The County requires the Offeror to provide a comprehensive system platform and subscriber roadmap (noting timetable of initial release through end of Offeror supportability) for the proposed network defining the product life cycles of all FNE, major network elements, software operating systems, software applications, subscriber units, dispatch consoles, subsystems, and ancillary network components. The County further requires the Offeror to define the OEM status of all FNE, major network elements, software operating systems, software applications, subscriber terminals, dispatch consoles, subsystems, and ancillary network components. Throughout the manufacturer support period, the County shall be entitled to receive at no charge the appropriate quantities of any software/hardware upgrade kit(s) that addresses an identified product defect or bug fix.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.1.16 Mobile Data Optimization(Optional)

The County requires the proposed system to be optimized for mobile data communication services in alignment with the APCO P25 standard (as defined in the most recent version of the TIA/EIA-102.BAEA specification).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Radio-to-FNE, Radio-to-Repeater, and Radio-to-Radio configurations shall be supported with any combination of Physical (i.e., RS232, USB) and Link Layer (i.e., SLIP, PPP) interfaces. The proposed system also shall offer an Application Programming Interface (API) and physical connectivity for the County CAD system to transfer future mobile data information in both directions (i.e., Radio-to- CAD, CAD-to-Radio). The Offeror shall fully describe the delivered mobile data functionality and capabilities being offered with the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola has wide range of products and experience delivering mobile data applications to users in the field. Using the data channel within the radio network Motorola can deliver a variety of options to transmit data.

The radio system has several APIs associated with it, one of which allows a CAD system to connect to the messaging server to send dispatch information to a Radio and send and receive messages from the radios in the fleet. Additionally this same configuration can also connect to an external SMTP messaging system to allow for communications outside of the radio network.

An ASTRO 25 radio network with properly equipped radios can provide radio messaging, query to and from the radio, Radio position data (AVL) and CAD status change. All of these features have to be weighed against the normal use of the radio system as well as its data capacity. It is important to note that the radio system may need additional data channels to support a full flight mobile data system. Depending upon the number of users at any given time and the applications chosen dedicated radio channels may be needed to fully support the applications. This system loading can only be evaluated once applications are selected which will use the data channel.

In addition to the CAD to radio communications, Motorola has several applications which can utilize the radio network from applications which extend the portable radio functionality up to a full Windows desktop application. Because of the wide range of functions Motorola is not proposing any one solution however, would welcome the opportunity to narrow down on the Lake County's needs and deliver the right solution.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola has wide range of products and experience delivering mobile data applications to users in the field. Using the data channel within the radio network Motorola can deliver a variety of options to transmit data.

The radio system has several APIs associated with it, one of which allows a CAD system to connect to the messaging server to send dispatch information to a Radio and send and receive messages from the radios in the fleet. Additionally this same configuration can



also connect to an external SMTP messaging system to allow for communications outside of the radio network.

An ASTRO 25 radio network with properly equipped radios can provide radio messaging, query to and from the radio, Radio position data (AVL) and CAD status change. All of these features have to be weighed against the normal use of the radio system as well as its data capacity. It is important to note that the radio system may need additional data channels to support a full flight mobile data system. Depending upon the number of users at any given time and the applications chosen dedicated radio channels may be needed to fully support the applications. This system loading can only be evaluated once applications are selected which will use the data channel.

In addition to the CAD to radio communications, Motorola has several applications which can utilize the radio network from applications which extend the portable radio functionality up to a full Windows desktop application. Because of the wide range of functions Motorola is not proposing any one solution however, would welcome the opportunity to narrow down on the Lake County's needs and deliver the right solution.

The County is very interested in the following types of mobile data applications for its law enforcement and first responder workforce: data dispatch, unit status and history inquiry, NCIC/LEADS/DMV database access, real-time messaging and email, RMS access, AVL, and incident reporting. A complete description shall be offered by the Offeror as to what mobile data functionality exists initially with the proposed network/subscribers and what optional features, hardware, and licensing must be purchased to achieve completely integrated voice and mobile data services on the proposed network. The County requires the Offeror to identify any system limitations or constraints that should be expected with the proposed offering as it relates to a mobile data subsystem. The County requires the Offeror to identify and price as an option all ancillary system and subscriber equipment and configuration changes necessary to implement a complete mobile data subsystem providing the aforementioned applications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola has wide range of products and experience delivering mobile data applications to users in the field. Using the data channel within the radio network Motorola can deliver a variety of options to transmit data.

The radio system has several APIs associated with it, one of which allows a CAD system to connect to the messaging server to send dispatch information to a Radio and send and receive messages from the radios in the fleet. Additionally this same configuration can also connect to an external SMTP messaging system to allow for communications outside of the radio network.

An ASTRO 25 radio network with properly equipped radios can provide radio messaging, query to and from the radio, Radio position data (AVL) and CAD status change. All of these features have to be weighed against the normal use of the radio system as well as its



data capacity. It is important to note that the radio system may need additional data channels to support a full flight mobile data system. Depending upon the number of users at any given time and the applications chosen dedicated radio channels may be needed to fully support the applications. This system loading can only be evaluated once applications are selected which will use the data channel.

In addition to the CAD to radio communications, Motorola has several applications which can utilize the radio network from applications which extend the portable radio functionality up to a full Windows desktop application. Because of the wide range of functions Motorola is not proposing any one solution however, would welcome the opportunity to narrow down on the Lake County's needs and deliver the right solution.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola has wide range of products and experience delivering mobile data applications to users in the field. Using the data channel within the radio network Motorola can deliver a variety of options to transmit data.

The radio system has several APIs associated with it, one of which allows a CAD system to connect to the messaging server to send dispatch information to a Radio and send and receive messages from the radios in the fleet. Additionally this same configuration can also connect to an external SMTP messaging system to allow for communications outside of the radio network.

An ASTRO 25 radio network with properly equipped radios can provide radio messaging, query to and from the radio, Radio position data (AVL) and CAD status change. All of these features have to be weighed against the normal use of the radio system as well as its data capacity. It is important to note that the radio system may need additional data channels to support a full flight mobile data system. Depending upon the number of users at any given time and the applications chosen dedicated radio channels may be needed to fully support the applications. This system loading can only be evaluated once applications are selected which will use the data channel.

In addition to the CAD to radio communications, Motorola has several applications which can utilize the radio network from applications which extend the portable radio functionality up to a full Windows desktop application. Because of the wide range of functions Motorola is not proposing any one solution however, would welcome the opportunity to narrow down on the Lake County's needs and deliver the right solution.

5.2 MASTER NETWORK CONTROLLER SUBSYSTEM INFRASTRUCTURE

5.2.1 General Requirements

The Master Network Controller (MNC) subsystem comprises all system-level, subsystem-level, and associated site controller(s) required to deliver mission-critical digital trunking call processing and features in real-time. The design shall provide for high availability under the most extreme operating conditions and redundant network controllers or fallback designs are required when feasible. General



tasks to be performed by the MNC and/or associated site controllers include: receipt and decoding of digital data from mobile/portable/control station radios, selection and efficient assignment of available radio channels, transmission and encoding of digital data sent to mobile/portable/control station radios, control of base repeaters, transmission of station identification required by the FCC, authenticating and controlling radio system access, maintaining affiliation and subscriber location databases, mobility management, control of switching subsystem infrastructure, and monitoring of alarm functions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.2.2 Availability/Reliability Requirements

The County requires a digital trunked system that will not suffer the loss of trunking capability as a result of the failure of a single system component, in particular the MNC subsystem. Should any component of the MNC subsystem fail, sufficient redundancy shall be incorporated in the system design so that full trunking operation continues without interrupting existing communications. Trunking capability is defined in this context as the ability of the proposed system to assign voice channels to independent talkgroups, as required, and the ability of the system user groups to remain functionally independent (i.e., full APCO 25 trunked feature set with no loss of features). A single controller failure that reverts the proposed system to a non-APCO 25 trunked feature set operation is not acceptable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

In the case of redundant MNC subsystem controllers, both controllers shall remain online continuously with parallel updating and mirroring of all system database(s) to ensure no interruption or degradation of trunking service in the event of failure of an active or standby MNC controller(s). Switching from active to standby controller operation shall be fully automatic, with audible and visual indication of the switchover provided to all network fault management workstations and supervisory dispatch console terminals. Manual switching functionality between the active/standby MNC controller(s) also shall be provided from the network management terminals. The Offeror shall identify the amount of time to switch between the active and standby MNC



controllers. The Offeror shall provide both MNC controller SNMP alarm diagnostic information and discrete MNC alarm relays to the network management and diagnostic terminals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

When switching from active to standby Zone Controller, all consoles, RF sites, and subscribers will return to wide area operation, typically within 20 seconds, but less than 75 seconds.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

When switching from active to standby Zone Controller, all consoles, RF sites, and subscribers will return to wide area operation, typically within 20 seconds, but less than 75 seconds.

The County requires the proposed system and the MNC controller(s) to be designed to provide 99.9999% or greater availability. Any system component enclosure or power distribution design that could render the system or 20% of its trunked channel resources useless or unavailable for communication from a single point of failure, shall incorporate redundancy to eliminate this vulnerability. This vulnerability elimination may be in the form of a redundant component/enclosure or a distributed redundant design that distributes single points of failure among multiple card cages, cabinets or housings each operating on its own dedicated power circuit.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The proposed MNC controllers are 99.9999% or greater availability. Motorola ASTRO 25 systems are very highly reliable networks with standard redundancy for the most critical components and optional redundancy for other components. Motorola analyzes the reliability of system components and how they contribute to the overall system availability during the product specification and design process. Our sophisticated availability modeling analysis considers the entire system design, from the Master Site call processing equipment, to the backhaul links, to the antennas on the towers. The proposed simulcast system is predicted to be able to achieve a system availability of greater than 99.99683%. The RF distribution systems (antennas, Tx combiners, Rx multicouplers) at the RF sites are the biggest obstacle to achieving a high system availability. With redundant RF distribution systems a system availability of 99.999% could be achieved. Most customers choose not to implement redundant RF distribution systems because there is a point of diminishing returns where the extra costs do not justify the potential risk. Redundant RF



distribution system could require larger towers and additional costs for leased sites. Motorola predicts system availability with the following calculation:

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTTR} + \text{MTBF}}$$

Motorola considers the system to be available as long as Wide Area Trunking operation is maintained at all the RF and Dispatch sites. Site Trunking and Failsoft are typical fallback modes when Wide Area Trunking cannot be maintained. Motorola would prefer working with you to understand your specific availability concerns to determine which of the various availability features Motorola offers which will best fit your needs.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The proposed MNC controllers are 99.9999% or greater availability. Motorola ASTRO 25 systems are very highly reliable networks with standard redundancy for the most critical components and optional redundancy for other components. Motorola analyzes the reliability of system components and how they contribute to the overall system availability during the product specification and design process. Our sophisticated availability modeling analysis considers the entire system design, from the Master Site call processing equipment, to the backhaul links, to the antennas on the towers. The proposed simulcast system is predicted to be able to achieve a system availability of greater than 99.99683%. The RF distribution systems (antennas, Tx combiners, Rx multicouplers) at the RF sites are the biggest obstacle to achieving a high system availability. With redundant RF distribution systems a system availability of 99.999% could be achieved. Most customers choose not to implement redundant RF distribution systems because there is a point of diminishing returns where the extra costs do not justify the potential risk. Redundant RF distribution system could require larger towers and additional costs for leased sites. Motorola predicts system availability with the following calculation:

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTTR} + \text{MTBF}}$$

Motorola considers the system to be available as long as Wide Area Trunking operation is maintained at all the RF and Dispatch sites. Site Trunking and Failsoft are typical fallback modes when Wide Area Trunking cannot be maintained. Motorola would prefer working with you to understand your specific availability concerns to determine which of the various availability features Motorola offers which will best fit your needs.



Switching between MNC controllers (manually or automatically) shall not cause radio subscriber units to attempt to roam away or de-affiliate from the site or subsystem at which they are currently affiliated. Subscriber units shall not have to re-affiliate with a site or subsystem after any type of MNC controller switch has occurred.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

If an Offeror's design requires an additional site or subsystem controller to serve and report to the MNC, then the MNC shall have complete control of wide-area call processing and channel assignments until its failure or failure of another critical network component. At that failure time, the site or subsystem controller should assume trunking control, utilizing the same systemwide subscriber radio user database and functionality without user intervention or interruption to trunking communications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall fully define any hierarchical network controller relationship that exists to facilitate normal and fallback communications on the proposed system. The Offeror shall fully explain all redundant and hot-standby functionality integrated into the design to achieve the highest system availability. The Offeror shall fully identify the host network controllers/servers for critical call processing databases, mobility and location registers.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see the Failure Analysis response in Package 2 Section 3.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see the Failure Analysis response in Package 2 Section 3.

The Offeror shall state in the response the procedure and time required for switchover to a reduced functionality or conventional operating mode in the event of the failure of all trunked controller equipment. The proposed system must suffer multiple system element failures before a conventional or reduced capability operating mode is encountered. Offerors are nonetheless required to describe all such failure modes, regardless of how unlikely the occurrence.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

With the proposed redundant Simulcast Prime Sites, if both simulcast controllers were to fail at the primary Prime Site, the backup Prime Site would take over and maintain trunking operation. The backup Simulcast Prime Site also has redundant simulcast controllers. If both controllers fail and stop communication with the comparators, the comparators will start transmitting the Failsoft operation message to the remote sites after 500 msec. This begins the Failsoft conventional operating mode.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Simulcast Prime Site has redundant simulcast controllers. If both controllers fail and stop communicating with the comparators, the comparators will start transmitting the Failsoft operation message to the remote sites after 500 msec. This begins the Failsoft conventional operating mode.

5.2.2.1 Physical Separation of Critical MNC Components

The County prefers that all critical MNC and network management components be of a design that permits physically/geographically diverse installations whenever practical. Offerors are encouraged to design the proposed network in a manner that employs physical diversity of installed components whenever practical; however, when such a design technique is employed, the Offeror shall ensure that security measures designed to protect the network are equivalently maintained at all locations in which components have been installed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall fully identify the required network backbone transport and topology requirements to facilitate the proposed trunked system and MNC subsystem. For example, the nature of site interconnection (i.e., star network, mesh network, loop network, etc.) shall be thoroughly defined. The Offeror shall fully define all site interconnection bandwidth and throughput requirements to support the proposed MNC infrastructure and system as a whole. The network backbone timing and switching requirements shall be fully defined. The Offeror shall define the proposed system's compatibility with various types of site interconnection media: microwave radio, fiber, satellite, broadband cable, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.2.3 MNC Features and Functions

Software and firmware to provide trunking functions and features described shall reside in the MNC subsystem and associated computer software/hardware. The controller(s) and its associated computer software/hardware shall provide the following functions:

- Alarm Monitoring and Diagnostic Functionality - Monitoring of the operational status of all system devices and providing alarms when individual subsystems fail. Diagnostic functions shall allow an operator to view current status and status history of the system. It also shall allow for diagnostic tests to be performed on network devices (i.e. site controllers, base stations, comparators, routers/switches, etc.) to verify component and path integrity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Signaling (Control) Channel Backup/Rollover - Automatic transfer of signaling functions to another channel in the event of transmitter or receiver failure or interference on the signaling channel. The system shall have one active and a minimum of three backup signaling channels. Backup is defined as a channel of different frequency. Hot-standby backup of a signaling channel to a station of the same frequency is not acceptable. The Offeror shall define its control channel methodology.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System Signaling & Special Functions
 - Signaling (Control) Channel Updating - The signaling channel shall continually transmit the current channel assignments of the system. This feature is intended to ensure that radios "signing on", coming into range or switching talkgroup modes, are directed to calls in progress on their selected talkgroup.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Voice Channel Embedded Signaling - Embedded signaling shall be transmitted on assigned voice channels in order to prevent subscriber units from being misdirected or allowed to transmit on an improperly assigned channel.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Disabling of Failed Voice Channels - Automatic disablement of defective or degraded voice channels due to subsystem failure. Failures must be detected prior to the channel being assigned by the controller. Subsystem failures to be detected shall, at a minimum, include:
 - Low forward power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- High-reflected power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Frequency drift

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Unidentified carrier on unassigned voice channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Signaling interface failure between base and controller

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Audio and/or data circuit/packet failure between controller and base

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Receiver failed/disabled

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Voter failed/disabled.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System Usage Reports - Collection and processing of data with regard to system usage. Offerors are to describe how the data is parsed for displaying at the NMS workstations. All reporting functions shall be easily exported into real-time, standardized, spreadsheet and word processing formats for easy retrieval and custom report formatting.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The data is available graphically, in text, through HTML cut-and-paste, and export to .CSV format. Please see the Network Management section of the System Description in Package 2 Section 3 for a full description of available reports.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The data is available graphically, in text, through HTML cut-and-paste, and export to .CSV format. Please see the Network Management section of the System Description in Package 2 Section 3 for a full description of available reports.

- Talkgroup Steering – Talkgroup steering shall allow talkgroup and individual calls to be directed or steered to a single or group of channels. This steering capability shall not prohibit any group from being allowed access to all channels. Talkgroup steering shall be definable at the “subsystem” level. Subsystem steering means that if multiple subsystems are networked together by a Master Network Controller/Switch, that partitioning “tables” shall be defined in each subsystem.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.2.4 Wide Area Scalability

The proposed network infrastructure and MNC subsystem shall have the capability, despite no immediate County plans, to network to other regional MNC subsystems in a higher-tier form of wide-area radio system networking (i.e., capability to have multiple MNC nodes within a larger regional system) per the APCO P25 ISSI standard. Networking or interfacing in this case means the linking of systems at the highest possible level to allow seamless radio roaming (assuming the same frequency band) and equivalent trunking functionality within a larger regional network. The proposed system shall not preclude the networking of separate, additional, compatible trunked systems, procured at some possible future date, but shall enhance such expansion designs wherever possible.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The MNC shall support authorized roamers from compatible P25 digital systems for interagency assistance. The site (or RF subsystem) location of all subscriber units, including authorized roamers, shall be maintained by the MNC. Calls shall not require resources at sites that do not contain affiliated subscriber units (unless specifically provisioned by the network administrator to do so). RF subsystems shall contain all the control intelligence to support full feature provisioning, call processing, access protection and track unit location and roamers within the RF subsystem.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All RF subsystems shall support standard signaling and communications interfaces to be flexibly linked into wider-area networks via private or public networks.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.2.5 MNC Minimum Equipment Specifications

- Power Supply – Redundant, independent circuit 120 VAC/60 Hz power supplies to be protected by an uninterruptible power supply (UPS) that will prevent accidental shutdown of the MNC subsystem controller(s). Optionally, a secondary -48VDC power supply is encouraged to enhance the probability of maintaining MNC operations during a major commercial power failure. The MNC controller(s) shall be designed with an interlocking style power switch, protective cover, or secure cabinet so as to prevent an accidental, unintentional power-down. In the event of complete power failure, the MNC shall be capable of an unattended, automatic graceful shutdown to prevent the corruption of database files and real-time operating systems. Power cabling interfaces to/from the MNC controller(s) shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring. The Offeror shall be responsible for all required electrical and alarm wiring to commission the MNC subsystem. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all Offeror-provided equipment to the single point grounding system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Environmental – The Offeror shall identify the environmental operating characteristics of the proposed MNC subsystem. The MNC controller(s) and any auxiliary site controllers required at remote base station transceiver sites shall be designed to operate under the following conditions:

Temperature: -30 degrees Celsius to +60 degrees Celsius.

Humidity: 90% non-condensing.

RF Fields: Equipment shall be properly shielded to allow proper, uninterrupted operation in equipment rooms or buildings occupied by base station transmitters/control stations/microwave radios generating strong RF fields.



The MNC equipment also shall be designed to suppress its own spurious emissions in concert with FCC Part 15 guidelines so that no detrimental interference is caused by the MNC subsystem to the larger system.

EMP: Electromagnetic pulse shielding is also desired as a network defense against possible acts of terrorism.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Existing STARCOM21 Master site equipment is not protected against EMP, but can be hardened at additional costs.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Existing STARCOM21 Master site equipment is not protected against EMP, but can be hardened at additional costs.

- Duty Cycle – All proposed online and standby equipment shall be rated for continuous duty operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Hardware/Software Platform – The MNC controller(s) shall be rack-mountable in standard 19- or 23-inch wide by 7.5-ft high EIA-style steel relay racks or in a 2-ft wide x 2-ft deep x 7.5-ft high standard computer server vented steel cabinet. Modular construction of the MNC using plug-in circuit cards and blade-style servers is preferred. The MNC controller(s) chassis shall be NEBS (Network Equipment Building System) compliant. The Offeror shall define the proposed MNC hardware and software platform(s) and list the OEM Offeror for all key components and applications/operating systems. The Offeror shall define the product roadmap and upgradeability for all proposed MNC controller(s). The County requires the Offeror to meet or exceed all supportability and product lifecycle requirements for the MNC subsystem as outlined throughout this specification.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Data/Control Interfaces - All necessary interfaces with base repeaters, peripheral computer hardware, and the radio interconnect system shall be provided by the Offeror. Interfaces shall include cabling, networking equipment, and modems, all of which shall be identified in the Offeror's functional system diagrams. Cabling interfaces to/from the MNC controller(s) shall be supported from above using either overhead/aerial cable tray or from underneath via raised computer access flooring. The Offeror shall define all electrical and physical interfaces between the MNC and other system components in the required system functional diagrams. Cabling and equipment interfacing shall be executed in a manner to eliminate the MNC and peripheral equipment from being susceptible to RF and electromagnetic interference (EMI) from collocated equipment. Proper cable shielding and design shall be used to ensure that the MNC will not experience performance degradation due to collocated system equipment. Plenum-rated cabling shall be supplied whenever required by local code or system application.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Craft Interfaces – The MNC controller(s) shall support two distinct and independent types of craft interfaces for remote and local provisioning and troubleshooting. The MNC controller(s) shall support an RS232 (VT100) style craft interface for a local or remote (if proper modem is utilized) terminal session craft interface to enable a technician or network administrator to provision or troubleshoot the controller(s). The MNC controller(s) also shall support an Ethernet style craft interface for a local or remote (if network connectivity exists) TCP/IP craft interface to enable a technician or network administrator to provision or troubleshoot the controller(s). The ability to provision or troubleshoot the MNC controller(s) through either interface shall not be dependent on the other interface being available. All craft interfaces shall provide password protection security. The MNC controller(s) shall be equipped to receive software upgrades/patch fixes through the craft interfaces, and the MNC controller(s) shall be capable of being upgraded without having to degrade or disturb the real-time call processing functionality provided by the MNC. The MNC controller(s) shall provide archive functionality for all configuration, provisioning, and troubleshooting parameters using standard storage media such as CD-R/W,



DVD-R/W, DAT, etc. In the event of complete MNC controller(s) failure, the restoration and/or commissioning of new, replacement MNC controller(s) shall be accomplished using archived provisioning/configuration images rather than requiring a technician to completely re-construct the configuration database from scratch. The Offeror shall fully define the provided capabilities with respect to the MNC controller craft interfaces.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Radio Channel/Site Expansion Capabilities - The MNC controller(s) and any auxiliary site controllers shall provide at each site for expansion to 24 channels or 30 unique radio talkpaths of operation at a minimum without hardware modifications. The MNC shall be equipped to interface to a minimum of four additional MNC controller(s) or “peer network” compatible P25 regional systems in the event of integration of a larger regional network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Local Site Control – Depending on the Offeror’s MNC network controller architecture and hierarchy, local site controllers (if utilized) shall maintain a localized system database in the event that the MNC controller is severed from the local controllers. This local database shall be updated in real-time and shall be accessible locally and remotely via a craft interface. The local database shall contain all of the system access and functionality privileges to ensure a consistent level of system access and integrity during a MNC controller outage.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

System databases are stored in the Zone Controller at the Master Site, and not at the local Prime Site location. If the link between the Master Site and Prime Site is severed then the



Prime Site will continue Trunking operation across the entire Simulcast system, without impacting coverage.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

System databases are stored in the Zone Controller at the Master Site, and not at the local Prime Site location. If the link between the Master Site and Prime Site is severed then the Prime Site will continue Trunking operation across the entire Simulcast system, without impacting coverage.

- Alarms and Diagnostics - The MNC controller(s) and associated site controllers shall provide alarms for key operational parameters, and shall provide for remote inquiry display, disablement and diagnostic functions via RS232 and Ethernet connections. Alarms shall be displayed at all NMS workstations and through craft interfaces. The MNC controller(s) shall provide high-level diagnostic information through front-panel LEDs and relevant indicators so that a technician or network administrator can quickly gauge the severity of an MNC fault by looking at the MNC. The MNC controller(s) shall provide both alarm messages and fault conditions using SNMP and discrete Form-C relays. At a minimum, the MNC controller(s) shall provide Critical, Major, and Minor relays which may be connected to a separate alarm subsystem. All MNC alarm information shall be time/date stamped in synchronization with the master network clock.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3 SWITCHING & NETWORK MANAGEMENT SYSTEM (NMS) INFRASTRUCTURE

5.3.1 General Requirements

All subsystems, authorized radio subscriber units, and dispatch consoles that comprise the proposed radio system must be under the control of a unified switching and network management system (NMS) infrastructure. The scope of the unified NMS scheme includes the five basic elements of network management:

- Configuration Management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fault Management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Security Management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Performance Management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Accounting Management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The NMS must be a comprehensive suite of software and hardware, supported by embedded network intelligence and expertise needed to incorporate system information into a complete, single, unified network management tool. The NMS shall be developed with an emphasis on customizable graphical displays and simplified interfacing to the various proposed subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Management of all system components, software levels, configuration databases, authorization parameters, system usage, and fault management information shall be able to be performed from a single, unified network management terminal. This shall be accomplished in such a manner that an entry change to one database will automatically change all other associated databases without further user action. Overall system management shall be able to delegate vertical partitioning management to an organization/agency responsible for the operation of the partition.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The NMS must be of a modular structure providing end-users with the capability to expand the subsystem as the need arises. The software supporting the NMS must respond to network expansion by enabling modifications to the NMS as new devices are added or deleted. A single client workstation shall be provided that allows for the management and configuration of all proposed radio communication system subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The NMS shall be provided as an integrated subsystem. The Offeror must provide all software and hardware, coordinate the entire installation, create customized graphical representations of the proposed network, perform acceptance tests, and conduct NMS subsystem administrator and end-user training. The Offeror shall populate all system and subscriber databases to fully commission the network in concert with the final defined version of the County fleetmap.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.2 Subsystem Monitoring

The proposed switching and NMS system shall be equipped in such a manner as to allow alarms and control functions from the various subsystems to be passed to all NMS client workstation(s) that shall monitor the entire integrated radio network. The Offeror shall provide detailed information describing NMS functionality with respect to the various subsystems and the required connection/access between the subsystem element manager systems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The detailed information regarding NMS functionality is included in the System Description in Package 2 Section 3.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The detailed information regarding NMS functionality is included in the System Description in Package 2 Section 3.

At a minimum, the NMS subsystem shall provide the capability of automatic monitoring on a 24/7/365 basis for the following infrastructure components:

- Communications Links to all Sites/Network Nodes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Base Stations/Transceivers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Comparators

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Antenna Subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Microwave/Transport Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexers/Channel Banks

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Timing/Frequency Reference Standards

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dispatch Consoles

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Logging Recorder

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Remote Terminal Units/Site Environmental Alarms

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- MNC/Radio Network Site Controllers/Base Station Controllers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Audio/Data Switches

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Telephone Interconnect

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Network Gateways

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- LAN/WAN Networking Equipment (Gateways, Routers, Switches, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Client Workstations/Servers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Power Equipment (Generators/UPS/DC Plant).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



5.3.3 NMS Services

At a minimum, NMS services shall include the following:

- Common client/server workstation platform to provision infrastructure and subscriber assets, diagnose/troubleshoot system faults, track real-time and historical network usage/utilization and availability by infrastructure and subscribers, and establish network and NMS access privileges

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Automatic system infrastructure component fault and failure detection and alarm generation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Audible and visual alarm operator alerting

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Diagnostics for isolating and troubleshooting real-time faults and alarms including all communications links and link equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Message volume statistics per hour of radio network controller, audio switch(s) and consoles(s)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Message volume statistics by radio channels per hour

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Message volume statistics by base stations per hour

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Message volume statistics by subscriber units per hour

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dynamic radio commands for all subscriber radios such as radio regrouping, inhibiting, affiliation monitor, status/messaging

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Control of critical network time-out and operational parameters (e.g., emergency hang-time, interfering carrier timer, fade timer, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Real-time channel, talkgroup, user, and RF site activity monitoring

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Retrievable and printable alarm history log file(s)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Remote dial-in and networked service support capability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Customizable report generation and graphical display for real-time and historical system utilization/fault management/alarm history/dynamic radio commands information

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4 NMS Features and Performance Requirements

The following section describes requirements of the NMS as it pertains to features, functionality, and performance. The Offeror must supply a NMS that can interface with and support different systems and elements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The NMS shall be equipped to enable users to quickly detect, evaluate, and respond to changing network conditions. Manager and agent modules must manage network devices, and the system must automatically respond to the alert messages generated by all network devices. All reported network problems shall be entered into the NMS trouble tracking system, and problem history records shall be stored for each NMS user.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

STARCOM21 monitors the system 24 X 7 and tracks issues in a trouble ticket system.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

STARCOM21 monitors the system 24 X 7 and tracks issues in a trouble ticket system.



A point-and-click mouse operation shall provide access to detailed menus and update data fields on any window. The NMS also shall incorporate a feature that graphically illustrates network trends and statistics. The NMS shall provide accurate information in a format most useful for network management. The NMS shall monitor all network operations and conditions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.1 NMS Features and Functionality Requirements

The following list represents the minimum functionality, performance, and quality requirements that shall be included in the NMS. The list is not necessarily totally inclusive of all requirements since the Offeror may offer additional functionality in its standard NMS offering. The following section briefly defines the required functionality, performance, and quality of the specific requirements in this list.

- Use of open system standards (e.g., SNMP, OSI CMIP, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Use of client /server architecture

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Message and alarm processing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Terminal reach-through

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Use of relational database(s)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- User-friendly

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Network management reports

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Graphical User Interface (GUI)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Modular/upgradeable software

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Application Programming Interface (API)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Redundant and fault-tolerant design

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The NMS system is fault-tolerant but not redundant. However, the NMS system is not required for critical call processing.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The NMS system is fault-tolerant but not redundant. However, the NMS system is not required for critical call processing.

- Network time synchronization for correlation of system events and call transactions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Security and user partitioning (Offerors to identify number and capabilities of partitions)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Security and User partitioning are not limited.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Security and User partitioning are not limited.

- Historical information storage/archive capabilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.2 NMS Functionality Requirement Descriptions

The following list of functional requirements and requested information establishes The County's requirements for the network management system. Intended functionality for the NMS is defined in the following paragraphs. The Offeror assumes responsibility to ensure it completely understands the relationship and impact of the NMS and all functional requirements as related to each of the subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The NMS hardware architecture shall provide multiple levels of computing power based on the size of the network being managed. The NMS system shall be a multi-tasking system capable of simultaneous access and control from multiple users, each having a unique access level, operational capabilities, and information set as configured by a network administrator/superuser.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.3 Use of Open System Standards

The NMS must be developed using industry-proven, open systems standards (e.g. SNMP, OSI CMIP, etc.) in order to provide maximum flexibility and scalability of the NMS. This functionality will also allow for easier enhancements from other compatible software/hardware providers. The NMS shall be provided with the capability of managing devices and elements through the use of different interfaces. The Offeror shall describe the type of interfaces that are available in the response offering. The County is requesting information on standard interfaces such as HP OpenView, Tivoli NetView, CA Unicenter, BMC Patrol, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

STARCOM21's Astro 25 system supports a North Bound Interface (NBI) to forward fault-management information to a higher level Manager of Managers (MoM). APIs are available to allow 3rd party solutions to:

- ***monitor system performance data***
- ***export data for billing management.***
- ***Import/export configuration parameters***

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

STARCOM21's Astro 25 system supports a North Bound Interface (NBI) to forward fault-management information to a higher level Manager of Managers (MoM). APIs are available to allow 3rd party solutions to:

- ***monitor system performance data***
- ***export data for billing management.***



- *Import/export configuration parameters*
-

The Offeror shall fully define the proposed NMS platform and its alignment with industry standards for open standards. The Offeror also shall define the compliance and overall readiness of the proposed NMS subsystem with respect to the APCO Project 25 En Network Management End System interface.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for fully described NMS information.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for fully described NMS information.

5.3.4.4 Use of Client/Server Architecture

The Offeror shall provide a true multi-user/multi-tasking NMS, utilizing a client/server architecture which is capable of supporting at minimum 10/100 Mbps Ethernet connectivity with TCP/IP addressing for all network nodes. Client terminals shall be off-the-shelf Windows-based client workstations with the ability to remote from the server location using microwave T1, ISDN, 802.11a/b/g Wi-Fi, or dial-up/VPN connectivity. The operating system, coupled with standard programming languages such as C, C++, and SQL, shall allow for compatibility across many hardware platforms. The hardware architecture shall provide multiple levels of computing power based on the size of the network. The Offeror shall define the operating system programming language and platforms that are used to develop the proposed NMS. The Offeror shall define all bandwidth and timing requirements for each remote and local NMS workstation relative to each concurrent software application that may be launched at the client workstations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

NM Client uses Windows 7 OS, and remote clients will require fractional T1 link to connect to STARCOM21 Master Site.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

NM Client uses Windows 7 OS, and remote clients will require fractional T1 link to connect to STARCOM21 Master Site.



5.3.4.5 Message and Alarm Processing

The NMS subsystem shall process messages sent by the network elements and other element managers to the NMS server(s) and associated client workstations. These alarm messages may be transported over the transport overhead and/or traffic channel, system LAN/WAN, wireline modem or RF modem. The selected transport mechanism for alarm messages should not be susceptible to a single-point failure which would create an inability to properly provision/diagnose/troubleshoot a remote network element in the event of a system failure. Fault-tolerance and/or redundancy should be incorporated into the design of the NMS alarm message transport mechanism. Critical, major, minor and all other types of messages must be processed in real-time and made available for use by all NMS users.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The Network Management messages use the RF site links over the MW network which provide redundant paths over the Microwave (MW) network and the fiber links to the dispatch center. If the single link from an RF site is disconnected from the system then there will be no path for the NM messages from that site.

All alarms and messages shall be automatically recorded to a relational database in real-time. The NMS shall be capable of processing each individual message from each managed element. The Offeror shall provide detailed information, which should thoroughly define and describe, the message processing functionality of the proposed NMS. Additionally, the Offeror shall describe the capabilities of interfacing and transferring alarm messages and call transaction information to/from the proposed NMS to compatible APCO P25 network management systems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

STARCOM21's Astro 25 system supports a North Bound Interface (NBI) to forward fault-management information to a higher level Manager of Managers (MoM).

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

STARCOM21's Astro 25 system supports a North Bound Interface (NBI) to forward fault-management information to a higher level Manager of Managers (MoM).



5.3.4.6 Terminal Reach-Through

The NMS shall allow authorized users access to all network elements, element management systems, and other support systems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.7 Relational Database(s)

The NMS shall be supplied with an industry-standard SQL relational database such as SQL Server, Informix, Oracle or equivalent. The Offeror shall indicate manufacturer and software versions as part of the response proposal. All database entries shall be user-restricted and password-protected and all transactions shall be logged and tagged by user names. Other required features of the database and NMS software are:

- Capability to store objects and their relationships

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The database used in PostgreSQL, version 9.1.9.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The database used in PostgreSQL, version 9.1.9.

- Capability to use other databases across the network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Software tools shall be provided to automatically update both the database and the graphical network depiction as the County network expands or modifies.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.8 User-Friendly

The NMS system shall be developed in a logical manner allowing the user to understand the conceptual layout of the application software as related to the overall network. The design shall allow for comprehensive on-screen help menus and prompts that provide direction and assistance to facilitate the learning process. These learning tools shall be able to be placed in the background after user efficiency is achieved. Training and user manuals shall contain the same information provided by help screens and prompts. In conjunction with generic NMS object descriptors, the proposed NMS shall be customized with County-defined network element descriptors and user tags that facilitate a quick understanding and recognition of system failures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.9 Network Management Reports

The NMS shall be capable of performing time-based analysis and generating customized system statistical reports based on alarm and radio usage events/transactions. The system shall be able to retain report formats, layouts and schedules for future use, and report data shall be able to be routed to a retrievable file, printer, or screen. Alarm-related data shall be reported as text reports, spreadsheets, charts or line graphs and be used to depict network performance by various categories. At a minimum, all retrievable system data shall be equipped to format data in *.CSV (Comma Separated Value) and/or tab-delimited format so that external applications can also manipulate the specific information independent of the NMS.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.4.10 Graphical User Interface

The NMS shall allow the user to access configuration data, utilization data, and alarms/messages in both graphical and text format. The graphical user interface (GUI) and its display shall be fully integrated and independent of Offeror or protocol components. The GUI shall support the following features:

- Object-oriented

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide real-time updating of events

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support industry standard graphic interfaces

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide multiple views hierarchically

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide point-and-click methodology

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support customer network layouts (locations, equipment, geographic configurations, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Provide a library of icon symbols and be expandable using edit tools

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

The icons used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these icons not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

ALTERNATE OFFER:

Non-Compliant.

The icons used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these icons not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

- Provide the capability of utilizing scanned-in graphic images

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Only the UEM Fault Manager can import an image (such as a map of the County), which can be used as a background for the system topology view.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Only the UEM Fault Manager can import an image (such as a map of the County), which can be used as a background for the system topology view.

- Provide the capability of customizing all scenes with color, graphic symbols and linking

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

The colors and graphics used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these color palettes not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

ALTERNATE OFFER:

Non-Compliant.

The colors and graphics used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these color palettes not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

- Navigation shall be made through menus, dialog boxes and buttons

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide the capability to assign hot keys

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

The Motorola NMS GUI lends itself to point and click operation with a mouse/trackball to ensure intuitive operation of the application. Motorola is open to discussing the need of functions like this for future GUI enhancements.

ALTERNATE OFFER:

Non-Compliant.

The Motorola NMS GUI lends itself to point and click operation with a mouse/trackball to ensure intuitive operation of the application. Motorola is open to discussing the need of functions like this for future GUI enhancements.

- Provide the capability for prioritizing alarm indications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide the capability of user-defined colors

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

The colors and graphics used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these color palettes not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

ALTERNATE OFFER:

Non-Compliant.

The colors and graphics used across Motorola's NMS applications ensure the consistent interpretation of network elements, their status, and feature set. It is recommended that these color palettes not be customized to avoid misunderstanding of system elements across applications, and to provide consistency for troubleshooting.

- Provide a hierarchical view of objects in a network topology representation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide the capability to display all event details and status in text

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide events in a scrolled list format

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide the capability to color code the events by priority and frequency of occurrence

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide the capability to attach messages to events

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Provide sorting of events by different categories

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant .

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide a unique fault tracking mechanism for each event/transaction

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide both audible and visual mechanisms for user alert and feedback.

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

Production COTS.

ALTERNATE OFFER:

Non-Compliant.

Production COTS.

5.3.4.11 Modular/Upgradeable Software & Hardware

The NMS shall be designed to support a suite of all available network management software applications, software/hardware interfaces, communications, and other software capabilities in a modular, licensable fashion. The proposed NMS shall be equipped to facilitate any number of concurrent NMS users running any combination of proposed applications concurrently on any combination of client workstations. The Offeror shall describe how the proposed system is configured to meet this requirement and explain the overall upgradeability of the proposed NMS subsystem. The proposed NMS shall be designed to facilitate hardware upgrades in the form of more powerful server and client computers to realize greater efficiencies and throughput. The proposed



NMS shall be designed to easily integrate additional NMS client workstations as the network expands without causing the active network to be taken offline or disrupted in any manner. The Offeror also shall distinguish between core operating system, third-party software, and custom software while providing a comprehensive description of technical support provided for all software and hardware proposed. The Offeror shall define all NMS licensing requirements and application usage constraints.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Each NM application can have concurrent users up to the licensed limit for that application.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each NM application can have concurrent users up to the licensed limit for that application.

5.3.4.12 Application Programming Interface (API)

The NMS subsystem shall provide a comprehensive API and be capable of supporting custom applications with functions and library files to access the NMS directly for call processing, fault management, and configuration management purposes (e.g., CAD call processing and dynamic radio command interface, airtime billing/usage interface, logging recorder interface, etc.). As part of this response, the Offeror shall provide an explanation, pricing, and details regarding the available API(s).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The following APIs are available as part of the NMS sub-system:

- 1. Air Traffic Information Access (ATIA) - The Flexible ATIA interface provides an access point for air traffic call information on the system. The ATIA server communicates with ATIA clients using standard UDP/IP datagram messages. Whenever events occur in call processing, call information is provided through the Flexible ATIA interface. For non call activity (mobility activity, registration/deregistration, etc.), the Flexible ATIA interface will provide call information in unique data packet formats. This interface is typically used to send the raw call processing information to a third party performance reporting system.***
- 2. The CAD Interface (CADI) API provides a port within the Radio Network that enables bi-directional monitoring and control access to the ASTRO 25 network in a centralized,***



routable configuration. CADI is intended to be used as an interface for CAD applications.

- 3. The Provisioning Manager (PMI) is implemented as a RESTful web application using HTTP as the application protocol and an XML payload. The interface allows the connection of third-party applications to assist with billing, performance, and asset management. Configuration and performance information can be sent to other applications, and configuration information can be imported to reduce the number of times data is entered. Applications from Genesis, Inform, and Premier One have been successfully integrated to the ASTRO 25 system using the PMI.*

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The following APIs are available as part of the NMS sub-system:

- 1 Air Traffic Information Access (ATIA) - The Flexible ATIA interface provides an access point for air traffic call information on the system. The ATIA server communicates with ATIA clients using standard UDP/IP datagram messages. Whenever events occur in call processing, call information is provided through the Flexible ATIA interface. For non call activity (mobility activity, registration/deregistration, etc.), the Flexible ATIA interface will provide call information in unique data packet formats. This interface is typically used to send the raw call processing information to a third party performance reporting system.*
 - 2 The CAD Interface (CADI) API provides a port within the Radio Network that enables bi-directional monitoring and control access to the ASTRO 25 network in a centralized, routable configuration. CADI is intended to be used as an interface for CAD applications.*
 - 3 The Provisioning Manager (PMI) is implemented as a RESTful web application using HTTP as the application protocol and an XML payload. The interface allows the connection of third-party applications to assist with billing, performance, and asset management. Configuration and performance information can be sent to other applications, and configuration information can be imported to reduce the number of times data is entered. Applications from Genesis, Inform, and Premier One have been successfully integrated to the ASTRO 25 system using the PMI.*
-

5.3.4.13 Redundant and Fault-Tolerant Design

The NMS shall ensure uninterrupted network provisioning, administration, and monitoring through support of multiple, redundant network management stations and remote background communications processing. The redundant and fault-tolerant architecture shall enable each network management station to operate independently in the event of equipment failure. The proposed NMS and associated network elements shall be equipped to indicate and capture a discrete network alarm or change of state even in the event of loss of power to the network element (i.e., absence of power to a network element shall trigger a change of state which is captured by the NMS).

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

NM Clients operate independently, so a failure of one Client will not impact the operation of other NM Clients. The NM Server is fault-tolerant, but not redundant.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

NM Clients operate independently, so a failure of one Client will not impact the operation of other NM Clients. The NM Server is fault-tolerant, but not redundant.

The NMS shall be supplied with backup server(s) and associated equipment in order to support a failed primary NMS server or any component of the server network which will cause a system failure. Switching between primary and backup server(s) shall be transparent to the end-user and shall not interrupt any ability to provision, administer, monitor, and archive network management information. The County requires the proposed NMS subsystem to be designed to provide 99.9999% or greater availability. The Offeror shall thoroughly describe the NMS architecture as well as any fault-tolerant equipment offered as a response to the RFP specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

Production COTS.

The NMS server is only offered as a single server.

ALTERNATE OFFER:

Non-Compliant.

Production COTS.

The NMS server is only offered as a single server.

5.3.4.14 Time Synchronization

The proposed NMS shall be time synchronized using a common timing reference scheme for the entire network (i.e., GPS, NTP, WWVB, etc.). All call transactions and network alarm events shall be time/date stamped with the master system clock for accurate NMS diagnostic and troubleshooting. All network elements with internal status/error logging capability shall be synchronized to the same master system clock for accurate diagnostic and troubleshooting and correlation to NMS alarm data information. In the event of master clock failure, the NMS shall provide a free-running clock which is originally disciplined from the master system clocking reference. The Offeror shall define the time synchronization methodology for the proposed NMS subsystem.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

A GPS disciplined Stratum 1 timing source will be used as a master clock to synchronize all network elements.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A GPS disciplined Stratum 1 timing source will be used as a master clock to synchronize all network elements.

5.3.4.15 Security and User Partitioning

The NMS shall support multiple levels of access that are protected in a manner allowing users to control, monitor and use software applications that have been partitioned and provisioned for specific use by the end-user. The Offeror shall provide a detailed description of this capability by defining the levels of partitioning and security, total number of end-users, the total number of simultaneous users with independent views, and the method used to achieve this requirement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

End-users shall be located at different locations such as dispatch centers, offices, maintenance facilities, and other remote sites. Therefore, this user partitioning feature must be provided to remote locations in order to allow restricted access to the overall radio network. User functionality and passwords must be configurable through a network administrator/superuser (root level) login. Superuser (root level) login and password must be re-configurable in the event of a network security breach. The NMS shall provide the administrative functionality to disable in real-time specific client workstation(s) and user login(s) as necessary in the event of malicious or unwanted activity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



5.3.4.16 Historical Information Storage/Archive Capabilities

The NMS shall be equipped to provide up to one year's worth of data for all call processing, fault management, and network utilization data from any client workstation. All historical NMS data shall be written to fault-tolerant server disk drives and/or RAID-5 hard drive arrays (or superior level) so that a single failure does not cause the loss of any historical data. NMS data shall be written to these hard drives on a FIFO basis. For the entire year period, historical NMS data shall be retrievable from a client workstation with the same granularity/level of detail as data is presented to the NMS client workstations in real-time.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

The hard drive where the historical call processing and fault management is stored is currently not redundant. However, this data can be archived to an external storage media of your choice. In release 7.15 we will be offering a new high availability architecture for the server that is the repository for performance data, so the data storage will be redundant. Additionally the ATIA interface allows packet level performance data from each zone to be archived in an SQL database by Genesis's GenWatch3 application. Storage is limited only by the harddisk capacity and configuration that the customer purchases.

ALTERNATE OFFER:

Conditionally Compliant.

The hard drive where the historical call processing and fault management is stored is currently not redundant. However, this data can be archived to an external storage media of your choice. In release 7.15 we will be offering a new high availability architecture for the server that is the repository for performance data, so the data storage will be redundant. Additionally the ATIA interface allows packet level performance data from each zone to be archived in an SQL database by Genesis's GenWatch3 application. Storage is limited only by the harddisk capacity and configuration that the customer purchases.

The NMS shall provide a mechanism to store/write the NMS data at any time to such storage media as CD-R/W, DVD-R/W, and DAT drives. Both automated and manual NMS data archive techniques shall be provided with the proposed NMS system so that the archiving of NMS data can be handled routinely or as necessary. A visual warning or dialogue box shall be provided to the end-user and network administrator if/when NMS data, that has not been externally archived, is subject to being permanently overwritten. NMS data shall be archived in a format that is recognizable and capable of being utilized in both the core applications NMS and off-the-shelf industry standard spreadsheet/database/word processing applications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The ATIA Log Viewer provides daily archives for up to 30 days. These log files can be moved to an offline storage media /local directory both manually or using an automated script.



ALTERNATE OFFER:

Fully Compliant.

The ATIA Log Viewer provides daily archives for up to 30 days. These log files can be moved to an offline storage media /local directory both manually or using an automated script.

The Offeror shall define the historical NMS information and archive capabilities for the proposed NMS subsystem. The Offeror shall define all databases that are capable of being archived and retrieved.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Historical data is stored in time-based intervals. For each interval type, the oldest interval in storage is removed as a new interval is added to storage. The timed intervals are defined as follows:

- Every 15 minutes for 100 intervals (approximately one day, zone level only)***
- Hourly for 241 intervals (approximately ten days, system and zone level)***
- Daily for 62 intervals (approximately two months, system and zone level)***
- Monthly for 36 months (three years, system and zone level)***

Additionally the ATIA interface allows packet level performance data from each zone to be archived in an SQL database by Genesis's GenWatch3 application. Storage is limited only by the harddisk capacity and configuration that the customer purchases.

ALTERNATE OFFER:

Fully Compliant.

Historical data is stored in time-based intervals. For each interval type, the oldest interval in storage is removed as a new interval is added to storage. The timed intervals are defined as follows:

- Every 15 minutes for 100 intervals (approximately one day, zone level only)***
- Hourly for 241 intervals (approximately ten days, system and zone level)***
- Daily for 62 intervals (approximately two months, system and zone level)***
- Monthly for 36 months (three years, system and zone level)***

Additionally the ATIA interface allows packet level performance data from each zone to be archived in an SQL database by Genesis's GenWatch3 application. Storage is limited only by the harddisk capacity and configuration that the customer purchases.



5.3.5 Monitoring and Control of Subsystems

The NMS shall be equipped to control and monitor each and every subsystem contained in the integrated radio communication system. The Offeror shall be responsible for all required electrical and alarm wiring to fully commission and test the NMS subsystem. A list of elements and alarms is provided as a conceptual starting point in the development of the proposed NMS. These systems shall include, but not limited to, the items listed below:

- Radio Infrastructure/Fixed Network Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dispatch Consoles/Logging Recorder

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Legacy/Existing Mutual Aid Radio and Shelter Subsystem Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The MOSCAD/ AUX/IO server alarm system contains digital I/Os, analog I/Os and SNMP.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The MOSCAD/ AUX/IO server alarm system contains digital I/Os, analog I/Os and SNMP.



- Network Management System

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Microwave Transport/Multiplex/Switch Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- DC Power Plant

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- In-Building Systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Shelter Systems (HVAC, Fire Suppression, TVSS, Leak Detection, Fuel)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Emergency Generator/Transfer Switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Uninterrupted Power Supply

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Tower Lights

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each of these items and subsystems shall be monitored and controlled for specific management and diagnostic reasons. The Offeror shall define the entire NMS architecture and methodology utilized to capture diagnostic and control data from every proposed network element.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the System Description.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the System Description.

5.3.5.1 Monitoring of Tower Lighting System Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Beacon on (Red and/or White)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Beacon off (Red and/or White)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Side marker(s) lamp failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Photoelectric cell failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Loss of power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Beacon failure (Red and/or White)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.5.2 Monitoring of Shelter Subsystem Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Fire/Smoke Detector

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Intrusion (Door/Cabinet) Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- High Temperature Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Low Temperature Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- TVSS Surge Suppressor Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fire Suppression Agent Heat Detector

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fire Suppression Agent Smoke Detector

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fire Suppression Agent Discharge

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fire Suppression On Battery

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- High Humidity Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Leak Detection

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- HVAC Equipment Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Loss of Commercial Power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.5.3 Monitoring of Emergency Generator/UPS System Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Utility Power Failure Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Running

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Failure to Start

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Generator Overcrank Shutdown

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Overspeed Shutdown

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator High Coolant Temperature

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Low Coolant Level

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:



Fully Compliant.
Production COTS.

- Generator Low Oil Pressure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator High Engine Temperature

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Low Fuel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Battery Charger AC Fail

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Battery Charger High/Low Current

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Mains Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Low Battery Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- UPS Static Bypass

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Output Voltage (above/below threshold)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Overload

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Battery Charging Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:



Fully Compliant.
Production COTS.

- Transfer Switch Normal Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Transfer Switch Emergency Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.5.4 Monitoring of Transport/Microwave Subsystem Alarms

The following alarm inputs, at a minimum, shall be supplied, installed and connected to the Network Management System:

- Mod/Tx A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Mod/Tx B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Demod/RXU A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Demod/RXU B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mux Tx A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:



Fully Compliant.
Production COTS.

- Mux Tx B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

-
- Mux Rx A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

-
- Mux Rx B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- APC on/off A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- APC on/off B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Pwr Amp on/off A

MOTOROLA RESPONSE

MAIN OFFER:

N/A

There is no alarm for the amplifier as all items on the radio are turned on via the same power source.

ALTERNATE OFFER:

N/A

There is no alarm for the amplifier as all items on the radio are turned on via the same power source.

- Pwr Amp on/off B

MOTOROLA RESPONSE

MAIN OFFER:

N/A



There is no alarm for the amplifier as all items on the radio are turned on via the same power source.

ALTERNATE OFFER:

N/A

There is no alarm for the amplifier as all items on the radio are turned on via the same power source.

- Radio Minor

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Radio Major

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- BER A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- BER B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- RFU PSU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- SP PSU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- TXU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- RXU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Modulator Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Demodulator alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- ATDE Alarm

MOTOROLA RESPONSE

MAIN OFFER:

N/A

AVIAT Networks does not use ATDE as it is a dated technology. We use Tap Adaptive Equalizers and Auto DADE (Differential Absolute Delay Equalization). There is no alarm information for these features.

ALTERNATE OFFER:

N/A

AVIAT Networks does not use ATDE as it is a dated technology. We use Tap Adaptive Equalizers and Auto DADE (Differential Absolute Delay Equalization). There is no alarm information for these features.

- Mux Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- ACU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

N/A

The ACU is a completely passive and mechanical device with only the TX switch attached to the ACU input. The switch will show which radio is active.

ALTERNATE OFFER:

N/A

The ACU is a completely passive and mechanical device with only the TX switch attached to the ACU input. The switch will show which radio is active.



- OWU Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Summary Alarm A

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Summary Alarm B

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- M12 Alarm (for each M12 card, if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

N/A

M12 card is not utilized on the proposed system.

ALTERNATE OFFER:



N/A

M12 card is not utilized on the proposed system.

- M12 Standby On-Line (for each M12 card, if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

N/A

M12 card is not utilized on the proposed system.

ALTERNATE OFFER:

N/A

M12 card is not utilized on the proposed system.

- Ring Switch/Loopswitch Working On-Line

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Ring Switch/Loopswitch Protected On-Line

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Dehydrator Low Pressure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dehydrator Summary Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer High BER

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer Loss of Synchronization

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer AIS (Yellow and/or Red Alarms)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer Card Failure(s)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer Critical

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Multiplexer Major

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer Minor

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer Loss of Power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- DC Power Supply Loss of Power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- DC Power Supply On Battery

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- DC Power Supply Low Voltage Disconnect

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- DC Battery Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



External Controls: NMS shall provide control outputs for the following functionality:

- Mod/TXU A switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mod/TXU B Switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- RXU/Demod A switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- RXU/Demod B switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mux/Tx A switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mux/Tx B switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mux/Rx A switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Mux/Rx B switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- APC on/off switch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Pwr Amp on/off switch A

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Current radios do not have a switch for the RFU amplifier.

ALTERNATE OFFER:

N/A

Current radios do not have a switch for the RFU amplifier.

- Pwr Amp on/off switch B

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Current radios do not have a switch for the RFU amplifier.



ALTERNATE OFFER:

N/A

Current radios do not have a switch for the RFU amplifier.

- DS1 and Ethernet Loopback (for each DS1 and Ethernet facility available).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.3.6 Remote/Mobile NMS Client Access

The proposed NMS subsystem shall be equipped to provide remote client access through dial-up and/or VPN network connectivity. A laptop computer shall be provided which is equipped with all necessary software and hardware to remotely connect to the NMS subsystem through both commercial dial-up and VPN broadband connections. The real-time functionality and application equipage of the proposed mobile NMS client shall be exactly the same as all fixed NMS client workstations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

This mobile client computer and NMS system also shall be configured to enable NMS access from any RF transceiver site, transport site, or switching site utilizing the core infrastructure network connectivity (versus commercial services when away from the network). For example, a technician utilizing the mobile NMS client shall be able to execute all NMS functionality from any RF transceiver node, network switching node, or transport node to fully maintain and troubleshoot the network without having to work in tandem with an NMS user at a fixed client workstation. Network connectivity and mobile NMS client application performance at any RF transceiver, network switching, or transport node shall be equivalent to any fixed NMS client workstation.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall define all bandwidth, service, and timing requirements necessary to establish remote client connectivity in the variety of required forms to the NMS subsystem.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The minimum recommended bandwidth for a remote site with a single NMS Client workstation is 264 kbps for an Ethernet link and 2 DS0 for a T1 link.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The minimum recommended bandwidth for a remote site with a single NMS Client workstation is 264 kbps for an Ethernet link and 2 DS0 for a T1 link.

5.3.7 Over-the-Air Trunked System Monitoring (Optional Purchase)

The proposed NMS subsystem shall include an over-the-air trunked system channel monitoring and activity logging diagnostic tool to augment the networked NMS clients, to be purchased at the option of each entity. The over-the-air diagnostic tool shall be equipped to monitor the active control channel(s) while in all trunking modes to present real-time channel activity and call processing messages (i.e., call type, busy queue, active talkgroup, transmitting unit, call duration, affiliations, emergency activations, individual alerts, etc.) as defined on the RF signaling and/or control channel(s). The over-the-air diagnostic tool shall be equipped to log all control channel and system activity to an internal or external hard drive for historical archiving purposes. The over-the-air diagnostic tool shall not rely on the availability of any MNC or NMS server to monitor and log call processing information transmitted on the active control channel.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The over-the-air diagnostic tool shall run on a standard Windows-based PC client interfaced to a network subscriber radio and be capable of external timing synchronization (i.e., NTP, WWVB, IRIG, etc.). Unit pricing for over-the-air diagnostic tool/interfaces shall be provided. The Offeror shall thoroughly define the capabilities of the proposed over-the-air diagnostic tool and any available options.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

5.3.8 NMS Client Workstation Locations

The County requires two fully-functional NMS client workstations with a minimum 21" flat-screen LCD monitor with associated laser printer. One at the County Radio Department and the other at the County Sheriff's Primary Dispatch Center.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

5.3.9 NMS Alphanumeric Paging/Text Messaging

The proposed NMS subsystem shall be equipped to generate alphanumeric text messages and/or pages using commercially available paging/text messaging services for on-call network administrators, dispatch center operators and technicians to alert of system faults and error conditions. The severity of individual alarm and fault messages shall be customizable so that text messaging and pages can be filtered based on severity for a variety of interested personnel. The alphanumeric paging/text messaging application shall enable group pages/text messages as well as individual pages/text. The length of the alphanumeric page/text message shall be customizable and constrained by the commercial service and not the NMS paging application. The Offeror shall define all bandwidth, service, timing, and interface requirements necessary to establish NMS alphanumeric paging/text messaging.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

5.3.10 NMS Design

The Offeror shall provide the following NMS design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Network Topology with Proposed Connectivity (LAN/WAN)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Network Traffic Baseline/Utilization Baseline

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- System License Matrix/Structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Equipment Layouts and Physical Dimensions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Equipment Electrical and HVAC Requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

5.3.11 Optional Features

The Offeror shall provide a detailed list of optional features that can be supplied for review and understanding. The Offeror shall provide a complete listing and explanation of all available NMS options.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

All details for the optional features and bullets above will be provided in the System Description in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

All details for the optional features and bullets above will be provided in the System Description in Package 2 Section 3.



5.4 BASE STATION TRANSCEIVERS

5.4.1 General Requirements

The Offeror is to provide base station transceivers which fully support the radio subscriber units on the radio network in all modes of voice/data communications. All base station transceivers shall be FCC type-accepted for transmission of the proposed digital modulation, RF channel bandwidths, frequencies, and appropriate emission masks. The base station transceivers shall be designed for the purpose of APCO P25 digital voice/data communications. Each base station transceiver and/or network controller must be capable of providing automatic station identification compliant with FCC Base Station Identification specifications. At a minimum, all base station transceivers shall be capable of operating at 100 Watts in both the 700 MHz and 800 MHz public safety voice spectrum allocations in concert with FCC channel plans and requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each base station transceiver shall be capable of operation in a full-duplex mode in a both clear and encrypted format: sending an outbound transmission while simultaneously receiving an inbound transmission from a subscriber unit. Repeater operation with microwave/fiber connectivity to the County primary dispatch console system is required. The equipment shall meet or exceed specified EIA/TIA standards for transmitters and for receivers. The equipment shall contain all the necessary base station transceiver control/interface circuitry and software to meet or exceed County specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The base station transceivers shall be flexible in design and software provisioning to work seamlessly in all primary and fallback modes of communications without the need for technician intervention or reprogramming. The base station transceivers shall operate in any proposed mode of trunking and conventional voice/data communications (i.e., single site, multi-cast, and simulcast). In the event of loss of trunking control, the base station transceivers shall be equipped and wired to function in both wide-area and localized repeater mode depending upon the specific failure scenario. The Offeror



shall define the various modes of operation for the proposed transceivers and identify any limitations/constraints with the proposed equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: Within a zone, three types of service states are available for sites that affect call processing: wide area trunking, site trunking, and site failsoft.

Wide Area Trunking

Wide area trunking is the normal state for a site within a zone. In this state, the site receives call processing instructions from the zone controller. A subscriber radio registered at the site can communicate with any other subscriber radio in the system. The basic criteria for wide area trunking include an active RF site control path between zone controller and site, an enabled audio rendezvous point in the zone, a control channel and a voice channel at a site.

Site Trunking

Site trunking mode is entered when the remote site loses communication with the zone controller. In this mode, the remote site takes over call processing responsibility. In a simulcast subsystem, the simulcast prime site controller performs the same function as the zone controller. Communication to the console and telephone interconnect are lost when the system is in site trunking.

Site Failsoft

Losing all site controllers or losing all the control channel capable base radios at a site forces the site into Failsoft mode. Basically, there is no trunking functionality. In this mode, and if programmed with Failsoft capability, the individual base radios become active (bring up their carrier) continuously. Individual subscriber radios can communicate in a conventional FDMA manner on fixed channels. The subscriber radios receive a data word from their base radio that instructs them to generate a tone at fixed intervals to indicate to the users that the system is in Failsoft. Communication to the console and telephone interconnect are lost when in failsoft.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: Within a zone, three types of service states are available for sites that affect call processing: wide area trunking, site trunking, and site failsoft.

Wide Area Trunking

Wide area trunking is the normal state for a site within a zone. In this state, the site receives call processing instructions from the zone controller. A subscriber radio registered at the site can communicate with any other subscriber radio in the system. The basic criteria for wide area trunking include an active RF site control path between zone



controller and site, an enabled audio rendezvous point in the zone, a control channel and a voice channel at a site.

Site Trunking

Site trunking mode is entered when the remote site loses communication with the zone controller. In this mode, the remote site takes over call processing responsibility. In a simulcast subsystem, the simulcast prime site controller performs the same function as the zone controller. Communication to the console and telephone interconnect are lost when the system is in site trunking.

Site Failsoft

Losing all site controllers or losing all the control channel capable base radios at a site forces the site into Failsoft mode. Basically, there is no trunking functionality. In this mode, and if programmed with Failsoft capability, the individual base radios become active (bring up their carrier) continuously. Individual subscriber radios can communicate in a conventional FDMA manner on fixed channels. The subscriber radios receive a data word from their base radio that instructs them to generate a tone at fixed intervals to indicate to the users that the system is in Failsoft. Communication to the console and telephone interconnect are lost when in failsoft.

5.4.2 Electrical & Mechanical Characteristics

The transceiver equipment shall be rated for and be capable of continuous duty RF transmission operations in an operating environment with temperatures ranging from -30 degrees Celsius to +60 degrees Celsius. The physical and electrical architecture of the transceivers shall be such that the future addition of additional functionality shall not require the addition and/or replacement of circuit card shelves and/or chassis assemblies. The Offeror shall be responsible for all required electrical and interconnect wiring to fully commission the base station transceiver subsystem. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all Offeror-provided equipment to a single point grounding system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The transceiver equipment shall be modular in design utilizing a card cage or chassis that facilitates replaceable boards or modules (e.g., power amplifier, exciter, transmitter, receiver, transceiver control module, high stability oscillator, power supply, etc.) in the event of component failure. The transceiver equipment subsystem shall be field-expandable up to at least 24 channels per RF site.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The base station transceiver equipment shall be frequency synthesized and field programmable to operate on any channel within the 700 MHz and 800 MHz public safety voice spectrum. The base station transceiver equipment shall be capable of providing a high-stability internal frequency reference (<.1 PPM) or receiving frequency and timing signals from an external high-stability reference to meet or exceed FCC operating requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

To the greatest extent feasible, all transceiver equipment assemblies and subassemblies shall be shielded to minimize and eliminate electromagnetic interference which may be caused to/by electrical equipment co-located and/or adjacent to the transceiver. The base station transceiver equipment shall provide the necessary filtering and preselection to mitigate the presence of an interfering carrier or unwanted interference. After configurable time duration, the transceivers shall work in conjunction with the MNC subsystem and/or internal station control circuitry to remove a channel from service that suffers from continuous interference.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



If microprocessor-based equipment is provided, firmware or software used to determine the various functions to be performed shall be field programmable and configurable through the use of Electronically Erasable Programmable Read Only Memory (EEPROM) circuits. Power loss or electrical surges shall not alter/modify the repeater software or configuration parameters in any manner. In the event of upgrade and/or bug fix scenarios, the base station transceiver shall be capable of storing two versions of software/firmware to facilitate a seamless transition between existing and upgraded station code. Software downloads to the base station transceivers shall be accomplished from both a local craft interface and a centralized software download server.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The base station transceiver equipment shall be designed for 12.5 kHz narrowband operation, but the County strongly encourages the integration of transceiver equipment that offers a straightforward migration path to 6.25 kHz or 6.25 kHz- equivalent operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall thoroughly define the architecture and software complement for the proposed base station transceivers and identify the modules/components that are field replaceable with spares. Spare board kits or modules shall be available and one fully-functional, complete spare base station transceiver shall be provided for every two RF transceiver site(s). All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see the System Description in Package 2 Section 3 for detailed information.



Note: The spare modules include:

- *Power Supply Module - The G-Series power supply operates from either an AC or DC input and provides the DC operating voltage for the base radio or site controller.*
- *Power Amplifier Module - The GTR 8000 Power Amplifier (PA) is a hot-swap capable, forced convection cooled RF power amplifier. It accepts a low-level modulated RF signal from the transceiver module, and amplifies it for transmission via the site transmit antenna.*
- *Transceiver Module - The transceiver (XCVR) module provides receiver, exciter and base radio control functions.*
- *Fan Module - The fan module provides forced air cooling for the power amplifier, transceiver, comparator, reference distribution, XHUB and site controller modules. The fans are controlled by a thermostat in the modules behind the fans. In addition, the power amplifiers will always turn on the fan during any transmission.*
- *GTR Option Card - The Transceiver Option Card is an additional daughter card that can be plugged into the Transceiver Control board. The Transceiver Option Card supports a reference oscillator (OCXO or TCXO) to which the stations internal frequency reference can lock.*

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Spare equipment is managed and controlled by the STARCOM21 team.

5.4.3 Power Supply

The power supply shall be of completely solid state design and shall operate primarily from a nominal 120 VAC/60 Hz single phase (with grounding) power supply source. All stations shall be protected by an uninterruptible power supply (UPS) system to ensure uninterrupted operations. Optionally, a DC power system can be provided, which is protected by an emergency battery system. The electrical connection from the power supply to the shelter facility electrical service shall be protected and secured to prevent accidental transceiver power loss. Power cabling interfaces to/from the base station transceivers shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The base station transceiver shall be designed with an interlocking style power switch, protective cover, or secure cabinet so as to prevent an accidental, unintentional power-down. In the event of complete power failure, the base station transceivers shall be capable of an unattended, automatic graceful shutdown to prevent the corruption of configuration files and real-time operating systems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.4 Equipment Housing

Repeaters shall be permanently housed in an EIA/TIA standard 19"-wide steel relay rack or 19"-wide stationary steel cabinet in each site shelter. Station equipment size shall allow for mounting of at least four (4) 100-Watt stations per 90"-high rack. The base station transceiver shall provide a grounding lug or grounding buss connection that facilitates a single point grounding methodology within the RF site shelter. The base station transceivers shall provide front and rear access for cabling and service purposes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.5 Diagnostics/Alarm Interface

Central metering, alignment, programming and diagnostic information of all essential circuits/modules shall be provided through both a local and centralized (off-site location) craft interface for all base station transceivers. This functionality shall be accessible and adjustable electronically by service personnel via both an RS-232 connection and Ethernet interface utilizing a PC laptop. The craft interface connections shall be accessible without the need to remove RF chassis shields or equipment circuit boards. Any external configuration software, hardware and/or interface cables needed to perform these functions shall be specified and provided on a per site basis (not to include a PC). The base station transceivers shall offer a mechanism to archive the configuration/service alignment parameters for quick restoration in the event of module failure or transceiver restoration.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The base station transceivers shall provide an internal diagnostic log of alarms and fault conditions that is stored locally in the transceiver as well as reported to the NMS subsystem. The internal base station transceiver logs shall be time/date synchronized to the master network timing source for correlation of alarm events with the NMS subsystem. Internal station transceiver logs shall be archiveable and printable in ASCII text format at a minimum. Alarm log information shall be written to internal station transceiver buffers on a FIFO basis with a minimum of 500 alarm events stored at any one time. The base station transceivers shall offer independent, front-panel LEDs to quickly gauge normal or abnormal station operation when on-site. The base station transceivers also shall offer independent discrete alarm relays (e.g., Form-C relays for fundamental station alarms) to connect to the NMS subsystem for remote alarm monitoring.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.6 Base Station Transceiver Accessories

All primary base station transceiver circuits shall be fed by individual breakers.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Each base station transceiver site shall be equipped with an external wattmeter or directional coupler for each transmit combiner output port that provides a reading of the forward and reflected power of each transmitter. This power monitor shall be installed in series with the combiner transmit output.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

For local control operation and for servicing, each base station shall be provided with a monitor speaker. The audio output level shall be rated at not less than ½ watt, and be provided with a volume control. Each base station transceiver site shall be provided with one (1) test microphone which can be used to test or service any repeater at the site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.7 Base Station Transceiver Antenna System Requirements

5.4.7.1 General

The Offeror shall furnish and fully install all antenna subsystem equipment. This includes, but is not limited to, the following equipment: antennas, transmit combiners, receiver multicouplers/amplifiers, transmission line, all mounting hardware (i.e., hangers, hoists, and mounting clamps, sidearm brackets, etc.), surge suppressors, lightning arrestors, jumper cables, grounding straps/cabling, transmission line boots, RF connectors and all ancillary items required to complete the installation at a shared radio site meeting industry-standard, good RF engineering practices. The Offeror is solely responsible for the due diligence and engineering analysis necessary to accommodate the proposed antennae & transmission line loading for any existing or new tower utilized in the final network design.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The antenna system design shall be specified by the Offeror to provide for balanced FNE system 'Talk-Out' & subscriber 'Talk-In' communications. At the network sites, separate antennas shall be used for transmit and receive purposes. The Offeror shall try to minimize the use of transmit and receive network antennas to minimize tower loading, but the antenna system shall be architected to provide a high-level of redundancy and fault tolerance with respect to the antenna system design.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offerors have the option to select any antenna configuration to reduce the potential for intermodulation or receiver desensitization, while providing the required coverage within the constraints of the FCC license and the requirements of NPSPAC Region 54. Additionally, the Offeror shall provide all necessary filtering to prevent interference and receiver desensitization in the new base station transceiver equipment. Shielding and radio frequency filters also shall be provided as necessary.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All model numbers referenced in this section are merely representative of the performance and quality desired. Offerors shall propose models and equipment that are equipped for the channels proposed at each site and are field expandable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The antenna systems shall be provided with all necessary lightning and power surge protection devices. The Offeror shall supply the necessary sidearm brackets and antenna mounts customized for the specific antennas at each site. Sidearms shall be compatible and rated for each applicable tower leg to eliminate drift and sway, and each sidearm shall be designed to offer not less than 6-foot separation from the tower. Offerors shall state the manufacturer and model number of all antenna system equipment being proposed for each site. A minimum of one spare antenna for each unique antenna type utilized in the system shall be provided in addition to the required number of network antennas. All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.7.2 Transmission Line & Accessories

The Offeror shall provide low-loss coaxial antenna transmission lines appropriate for the design. The Offeror shall state the size and type of transmission line being proposed at each site as well as the loss characteristics of the proposed transmission line.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The transmit transmission line proposed for each site is 1 & 5/8" AVA7-50 Helix cable. At 824 MHz the cable's attenuation is 0.614 dB every 100ft.

The receive transmission line proposed for each site is 7/8" AVA5-50FX Helix cable. At 824 MHz the cable's attenuation is 1.077 dB every 100ft.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Note: The transmit transmission line proposed for each site is 1 & 5/8" AVA7-50 Helix cable. At 824 MHz the cable's attenuation is 0.614 dB every 100ft.

The receive transmission line proposed for each site is 7/8" AVA5-50FX Helix cable. At 824 MHz the cable's attenuation is 1.077 dB every 100ft.

All connectors used shall be state-of-the-art characteristic while exhibiting the least loss. Connectors must be of non-ferrous construction and of similar metallic composition to avoid an oxidation effect. No splices or adapters shall be used except as specifically authorized by the County for special "in-building" or similar installations. However, it is permissible to utilize different connectors on opposite ends of a cable to avoid the use of adapters. When transforming from one diameter cable to another, it is acceptable to use flange reducers, so long as the cable V.S.W.R. specification is not changed. The Offeror shall state the size and type of all connectors/jumpers/suppressors/etc. being proposed at each site as well as the loss characteristics of all proposed connectors/jumpers/suppressors/etc. The Offeror shall provide a comprehensive copy in both hard copy and electronic formats of its most current standard, field-tested communications system installation guidelines that will be used to govern all field installation work. The Offeror shall perform line sweeps for all transmission line systems and provide the comprehensive sweep and return loss data as part of the field as-built documentation package.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.8 Transmitter Combiner

The Offeror shall design an appropriate number of transmitter combiners (and circulators if required) for all radio transceiver sites by optimizing the insertion loss characteristics, available number of antenna mounting locations at each site, and system availability requirements. The proposed combiners must be capable of accommodating and sized appropriately to include all NPSPAC conventional mutual aid channels currently licensed at specific sites throughout the Region.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Combiners shall have no frequency-sensitive interconnection cabling and shall have no requirement for channel assignments in numerical order.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall state the manufacturer and model number of the transmitter combiner(s) at each site and provide complete specifications and feature documentation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The transmit combiners are manufactured by Motorola Solutions have the model number CA00879AA. Refer to the table below to the combiner specifications.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: The transmit combiners are manufactured by Motorola Solutions have the model number CA00879AA. Refer to the table below to the combiner specifications.



Parameter (6-way combining)	Combiner Spec Limit	Typical
Tuning Range	762-776 MHz, 851-870 MHz	
Insertion Loss (150 kHz spacing)	4.8 dB	2.5 dB
Insertion Loss (250 kHz spacing)	4.3 dB	2.0 dB
Insertion Loss (500 kHz spacing)		1.8 dB
Insertion Loss (3000 kHz spacing)		1.7 dB
Frequency stability over power and temperature	± 40 kHz	
Max input power per channel (7/800)	100W RMS	
Max input power per channel (900)	120W RMS	
Max input PEP per channel	240 W	
Peak Instantaneous Power	32 kW	
Output VSWR max	1.8:1	1.4:1
Tx-Tx Isolation (150 kHz spacing)	32 dB	40 dB
Tx-Tx Isolation (250 kHz spacing)	35 dB	44 dB
Tx-Tx Isolation (500 kHz spacing)		49 dB
Tx-Tx Isolation (3000 kHz spacing)		63 dB
Input VSWR max	1.33:1	1.2:1
Min channel spacing	150 kHz	
TX Rejection in RX Band	40 dB	54 dB
Input connector (on Circulator)	QN	
Output connector	7/16	
Size	6 rack units	

5.4.9 Receiver Multicoupler

The Offeror shall provide a multi-channel receiver multicoupler system for all radio transceiver sites. The County requires a receiver multicoupler design that is field- ready for the integration of all County trunked channels plus all NPSAC conventional mutual aid channels currently licensed at specific sites throughout the Region. Ultimately, the proposed receiver multicoupler system shall be capable of expanding to at least 16 channels to maintain alignment with the required number of trunked channels offered by the network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall state the manufacturer and model number of the receiver multicoupler system being proposed at each site and provide complete specifications and feature documentation. The specifications shall include information on filtering used for this configuration.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The receiver multicouplers are manufactured by Motorola Solutions. There are two types of Receiver Multicouplers: Site RMC and Cabinet RMC used in each site. The Cabinet RMC has gain and splitting capability for up to six base radios. The cabinet RMC can only be placed in the card cage of the GTR 8000 Expandable Site Subsystem. The Site RMC has gain and splitting capability for up to four outputs (each output is for a cabinet). These outputs are typically connected to the input of a Cabinet RMC.

Refer to the table below to the combiner specifications.

Parameter	Site RMC Spec Limit	Site RMC Typical
Frequency range	776-902 MHz	
Attenuator range	0-31 dB	
Default attenuator setting 700/800/900 UHF	1 dB 4 dB	
Default Gain: 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs	9.0 dB 11.8 dB 11 dB 11.5 dB	10.5 dB 12.3 dB 12.4 dB 13.0 dB
Noise Figure 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs	2.6 dB 2.6 dB 2.8 dB 2.7 dB	2.0 dB 2.0 dB 2.1 dB 2.1 dB
Third Order output intercept 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs		23 dBm 25 dBm 28.5 dBm 29 dBm
Output Port to Port Isolation	30 dB	
Input connector type	QMA	
Output connector type Primary Output Expansion Outputs	QMA BNC (3)	
VSWR	1.5:1	1.5:1

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: The receiver multicouplers are manufactured by Motorola Solutions. There are two types of Receiver Multicouplers: Site RMC and Cabinet RMC used in each site. The Cabinet RMC has gain and splitting capability for up to six base radios. The cabinet RMC



can only be placed in the card cage of the GTR 8000 Expandable Site Subsystem. The Site RMC has gain and splitting capability for up to four outputs (each output is for a cabinet). These outputs are typically connected to the input of a Cabinet RMC.

Refer to the table below to the combiner specifications.

Parameter	Site RMC Spec Limit	Site RMC Typical
Frequency range	776-902 MHz	
Attenuator range	0-31 dB	
Default attenuator setting 700/800/900 UHF	1 dB 4 dB	
Default Gain: 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs	9.0 dB 11.8 dB 11 dB 11.5 dB	10.5 dB 12.3 dB 12.4 dB 13.0 dB
Noise Figure 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs	2.6 dB 2.6 dB 2.8 dB 2.7 dB	2.0 dB 2.0 dB 2.1 dB 2.1 dB
Third Order output intercept 700/800/900 Primary Output 700/800/900 Expansion Outputs UHF Primary Output UHF Expansion Outputs		23 dBm 25 dBm 28.5 dBm 29 dBm
Output Port to Port Isolation	30 dB	
Input connector type	QMA	
Output connector type Primary Output Expansion Outputs	QMA BNC (3)	
VSWR	1.5:1	1.5:1

5.4.10 Receiver Pre-Amplifier

The Offeror shall provide equipment that utilizes low noise tower-top-mounted amplifiers, if needed, to provide for a balanced system. Redundant amplifiers and window filters shall be used in the tower-mounted assembly. The system shall have the following features:

- A. Amplifier Bypass - the system shall be equipped to bypass around the amplifier system such that the main line, jumper assemblies, and antenna may be tested.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- B. Hot-Standby Amplifier - the system shall be equipped with at least one hot- standby amplifier.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- C. Automatic Switchover - Automatic switchover to the standby amplifier(s) shall be provided, and the means to accomplish the switchover shall be described in the response. Any performance degradation as a result of switchover shall be explained. Manual switchover also shall be provided at the control panel with indication of the amplifier in use.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- D. Test Port - the system shall be equipped with a test port and test line to allow the frequency performance of either amplifier to be tested from the equipment shelter.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- E. Alarming - the system shall be equipped to provide complete system operation alarming for all modes of operation to both the NMS and local on- site service technicians. The base unit of the pre-amplifier shall offer independent, front-panel LEDs to quickly gauge normal or abnormal station operation when on-site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- F. Variable Attenuation - the system shall be equipped to provide variable attenuation capabilities to uniquely optimize the receive performance characteristics at each site in the context of overall balanced system performance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- G. Power - the system power supply shall be of completely solid state design and shall operate from nominal 120 VAC/60 Hz single phase (with grounding) to be protected by an uninterruptible power supply (UPS). Optionally, a secondary DC power supply is encouraged to enhance the probability of maintaining receiver pre-amplifier during a major commercial power failure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror shall state the manufacturer and model number of the tower-top amplifier system being proposed at each site. One (1) spare tower-top amplifier assembly shall be provided for every unique tower-top amplifier configuration within the proposed network. All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The proposed TTA system is manufactured by Bird Technologies and the part numbers are 428D-83I-01-C-110 and 428D-83I-01-T.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: The proposed TTA system is manufactured by Bird Technologies and the part numbers are 428D-83I-01-C-110 and 428D-83I-01-T.

5.4.11 Base Station Transceiver Design

The Offeror shall provide the following base station transceiver design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Base Station Transceiver Architecture

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Site Topology with Proposed Connectivity and Interfaces (MNC, NMS, timing reference, multiplexer)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System License Matrix/Structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Layouts/Racking and Physical Dimensions (Size, Weight, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Equipment Electrical, Grounding, and HVAC Requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

5.4.12 Base Station Transceiver Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the base station transceiver subsystem that can be supplied for review and understanding.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: No optional Base Station features included.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: No optional Base Station features included.

6.0 DISPATCH CONSOLE REQUIREMENTS

6.1 GENERAL REQUIREMENTS

The Offeror shall provide a complete primary radio dispatch console subsystem for the County Sheriff's Primary Dispatch Center. The County requires a total of eight (8) new radio console positions that are networked and integrated with the proposed County radio communications system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Each console position shall be fully interchangeable and field reconfigurable through the NMS and a corresponding centralized dispatch subsystem configuration database. The County requires a comprehensive suite of dispatch console features, as defined in this section and in previous sections, to interoperate with and manage the entire subscriber fleet.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall review the existing County dispatch consoles and entire complement of legacy equipment to be controlled by the new dispatch consoles. The County requires a state-of-the-art communications console subsystem that is highly available and "user-friendly," incorporating radio control in a manner that shall provide for efficient and simple operation by the dispatchers in any combination of functions available including the use of wireless headsets. The proposed console equipment shall provide all of the necessary functions to control and monitor County radio system and related subsystems. No loss of functionality shall be experienced upon migration from the existing dispatch console platform to the proposed dispatch console platform.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

For testing and demonstrations, the Offeror shall provide eight (8) compatible headsets that interface with E-9-1-1 call taker phone system and radio consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The console system shall utilize TCP/IP over Ethernet in a client/server architecture to the greatest extent possible for maximum network flexibility, configurability, and expandability. All consoles shall be equipped to transmit and receive with console priority on every trunked and conventional resource accessible to the console. Every dispatch console shall be equipped to transmit and receive on clear and encrypted resources (using any combination of encryption keys or algorithms deployed in the subscriber radios). Every dispatch console shall be equipped with instant call playback functionality for reviewing previous conversations and transmissions. Any console shall be equipped to intercom another console in a half- duplex or full-duplex mode. The proposed NMS subsystem shall provide complete administration and fault management control over the entire dispatch console subsystem. Radio subscriber unit assets and dispatch consoles shall utilize a common APCO P25 ID scheme and a common alphanumeric alias ID database. The Offeror is responsible for populating all subscriber unit and console configuration and asset databases per the final County fleetmap prior to system cutover.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror's proposed console subsystem shall be entirely IP-based. Based on County functionality and feature requirements, the Offeror shall determine what platform meets or exceeds these County specifications. However, the County requires the Offeror to provide complete supportability and upgradeability for fifteen years after final system acceptance as defined throughout this specification, so the Offeror shall not propose any console product that is at the end of its product life cycle roadmap.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide a comprehensive matrix of standard and optional features associated with the proposed console subsystem. The Offeror shall provide comprehensive detail on the proposed console system architecture and any feature licensing structures all in the context of the console product life cycle roadmap. The Offeror shall define all limitations and operational constraints with the proposed console system architecture. The Offeror shall provide a detailed list of any special requirements needed for the installation and operation of the dispatch console equipment as deemed necessary. The Offeror also shall define the compliance and overall readiness (down to the



feature level) of the proposed dispatch console subsystem with respect to the APCO Project 25 Console Sub- system Interface (CSSI).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.2 INTERFACE TO VOICE RADIO SYSTEM

The Offeror shall integrate the dispatch console subsystem with the radio system fixed infrastructure through highly available (99.9999% availability) microwave and/or fiber optic transport interfaces. The Offeror shall fully identify the required network backbone transport and topology requirements to facilitate the proposed dispatch console subsystem. The Offeror shall fully define all site interconnection bandwidth and throughput requirements to support the proposed dispatch console subsystem. The network backbone timing and switching requirements shall be fully defined. The Offeror shall define the proposed dispatch console subsystem's compatibility with various types of site interconnection media: microwave radio, fiber, PSTN leased line, satellite, broadband cable, etc. Private or leased telephone lines as a means for primary connectivity are not desired unless the Offeror and commercial carrier can jointly demonstrate an extraordinary level of reliability relative to the operation of the PSTN circuits including the delivery of a service level agreement (SLA) that guarantees system availability at not less than 99.9999%.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Microwave backhaul for the alternate offer has 99.999% availability.

Stand-by or backup radio control stations shall be incorporated into the design to ensure the ability to transmit and receive on all 700 MHz and 800 public safety voice spectrum allocations and all trunked talkgroups and conventional resources in the event of a console subsystem failure. The backup control stations shall be integrated with the dispatch console electronics and equipped with both headset and handset functionality for dispatch flexibility and shall provide either a digital or tone remote control interface. PTT unit ID and alias information shall be provided to the dispatcher in all modes while operating the backup control stations. Trunking signaling information and advanced functionality tones (i.e., emergency, unit paging, individual call, etc.) shall be provided to the dispatcher in all modes while operating the backup control stations. The dispatcher shall be equipped



to access all clear and encrypted trunking and conventional resources in any mode while operating the backup control stations. Backup control stations shall be able to be physically remotored from the dispatch console position while the handset and headset interfaces are available at the dispatch console position. One backup control station and associated accessories/peripherals shall be provided for each dispatch console position. Backup control stations shall be installed in a manner consistent with the installation of all other fixed network infrastructure (i.e., single point grounding, lightning/surge protection, plenum-rated cable as required, RF shielding, etc.) and the backup control stations shall have antennas mounted to reliably access the County network from multiple RF sites in any communications mode. All backup control station audio shall be logged at the logging recorder for all positions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.3 DISPATCH CONSOLE FEATURES AND PERFORMANCE REQUIREMENTS

In addition to the suite of features and functionality outlined in earlier sections, the Offeror shall provide the following features, characteristics, and functionality with each proposed dispatch console and the entire subsystem:

- High quality, reliability, and availability to meet 24/7/365 continuous duty public safety dispatch standards (e.g. redundant power supplies, redundant processors, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The console PC workstation and the VPM hardware do not have redundant power supplies or processors, but they are high quality and reliable components that are designed to meet 24/7/365 continuous duty.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The console PC workstation and the VPM hardware do not have redundant power supplies or processors, but they are high quality and reliable components that are designed to meet 24/7/365 continuous duty.



- Meets or exceeds all FCC, EIA/TIA, IEEE and APCO standards

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola's ASTRO 25 system and subscribers are designed to the Project 25 TIA-102 standard documents. Motorola takes great care in designing our systems to meet or exceed the needs of the users and the applicable industry standards. Motorola's end user equipment also exceeds many of the Military Standards for harsh environments. When shipping products and installing buildings and towers, Motorola meets all the legally required standards and regulations. However, Motorola cannot sign up to all standards and regulations created by the organizations listed above without an exhaustive list of each standard and regulation. If there are specific standards or regulations that are of concern to Lake County, Motorola would be happy to discuss them.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola's ASTRO 25 system and subscribers are designed to the Project 25 TIA-102 standard documents. Motorola takes great care in designing our systems to meet or exceed the needs of the users and the applicable industry standards. Motorola's end user equipment also exceeds many of the Military Standards for harsh environments. When shipping products and installing buildings and towers, Motorola meets all the legally required standards and regulations. However, Motorola cannot sign up to all standards and regulations created by the organizations listed above without an exhaustive list of each standard and regulation. If there are specific standards or regulations that are of concern to Lake County, Motorola would be happy to discuss them.

- Conform to local PSTN requirements as necessary

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- State-of-the-art design with distributed processing and multi-tasking capability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Redundant and fault-tolerant configuration/network server(s) with mirrored databases

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment to interface with base stations and/or radios having non-IP based control capability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Continuous and automatic console diagnostics interfaced to proposed NMS and separate craft interface

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.



Motorola provides the diagnostics on the Network Management Server, but does not have a separate craft interface for the console.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola provides the diagnostics on the Network Management Server, but does not have a separate craft interface for the console.

- Digital audio processing with adjustable AGC level settings on an individual console basis
Modular construction throughout

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Main/Standby 120VAC/60 Hz power source(s) for all common infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Gooseneck microphone

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dual headset jacks (for training purposes) each with integrated telephone answering capability (switchable and independent headset interface for telephone/radio)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dual-pedal footswitch

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- 12/24-Hour clock/month/day/year status synchronized to master network clock

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Select and Unselect speakers with adjustable volume controls for individual resources

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Physical or software-based VU meter to gauge audio levels

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- 19" (minimum) color flat panel touch screen monitor at dispatch positions and complete mounting compatibility with the proposed console furniture

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Mouse and keyboard

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Internal and external paging encoders and single icon/button capability that provides current VHF paging and group paging functionality with industry-standard paging formats (Quik-Call, Plectron, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

MCC7500 consoles have integrated paging encoder and can interface to external paging encoders as well.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

MCC7500 consoles have integrated paging encoder and can interface to external paging encoders as well.

- Auxiliary input/output interfaces (minimum combination of 16 inputs/outputs per position)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Monaural, noise-cancelling, over-the-head Plantronics-style (or equivalent) wireless headsets with integrated PTT switch and ability to switch between radio and telephone (Qty eight (8) total for compatibility test)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.



Motorola will provide wireless headsets for compatibility testing, however they are not certified at this time.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola will provide wireless headsets for compatibility testing, however they are not certified at this time.

- Compatibility with Headsets in use at the County Primary Dispatch Center Remote dispatch position capabilities for expansion to other facilities

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- User-friendly, field-reconfigurable independent GUI interface(s) for each console position

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Password-protectable console positions with comprehensive event log to note specific dispatcher time/date usage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Full interoperability between IP-based, digital trunked and conventional subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Interface to all proposed single and multiple site trunked and conventional systems (as required based on design)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fully-equipped individual conventional channel and talkgroup controls

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Access to any combination of clear/encrypted digital system talk- paths/resources

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Access to any combination of clear/encrypted conventional analog and digital system talk- paths/resources

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Interface to new logging recorder as defined in this specification (e.g. trunked, conventional, and telephone resources)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Access and control of single and multi-frequency base stations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console-enabled cross-patch function between trunked digital talkgroups and digital/analog conventional stations (permanent and dynamic patch equipped)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Patch and Multi-Select with and without group regrouping

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console-enabled announcement group functionality

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Console-enabled emergency activation/acknowledgement/reset functionality definable by talkgroup resource

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console-enabled multiple alert tone generation (at least three unique tones)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Alphanumeric aliasing of all individual radio subscriber unit and console ID's

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console-to-console intercom and console-to-base station transceiver site intercom

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.



Motorola's solution provides intercom between consoles, however, it does not currently provide intercom between a console and digital base station.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola's solution provides intercom between consoles, however, it does not currently provide intercom between a console and digital base station.

- Message history display of at least 50 previous time-stamped call transactions/events

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console-enabled transceiver repeat-enable and repeat-disable functionality for trunked and conventional resources

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Full-duplex audio (console outbound transmit capability while receiving inbound audio from subscriber unit)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Parallel operator usage status visual indication on each resource (i.e., busy indicate)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Acoustic and RF cross-mute capability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Call activity indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Configurable supervisory position takeover and individual position enable/disable functionality

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Independent inbound audio receive visual indication on each console resource

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Configurable time duration all-mute capability of all unselected resources

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support for main/standby conventional resource interfaces with on- screen console switching mechanism

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- General and instant transmit functionality

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- PTT relay and wiring from each console position to turn on/off individual, external County-provided console activity lights

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Support for integrated PSTN-to-console interface (at least one analog phone line) so that console resources can be patched to PSTN resources and console dispatcher can utilize PSTN resources through dispatch console electronics.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



6.4 DISPATCH CONSOLE CONFIGURATION AND INTERFACE REQUIREMENTS

The Offeror shall provide a centralized console subsystem configuration management database that is integrated with the proposed network infrastructure and radio subscriber configuration database(s). The console subsystem shall consist of a client/server architecture that facilitates a single, common database entry (i.e., unit IDs, aliases, network access privileges, GUI/screen configurations, etc.) for radios, infrastructure, and consoles that is propagated throughout the communications network in real-time. All configuration, administrative, and alias changes shall take effect in real-time without propagation delay and/or data buffering.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The dispatch console subsystem shall be equipped to provide maximum flexibility and interchangeability for all dispatch consoles. Dispatch consoles shall be field- reconfigurable through a common configuration management application that defines GUI/screen layouts, overall subsystem functionality, console privileges, and subscriber databases. No hard-coding of functionality or features shall occur for an individual console so that each position remains flexible enough to serve any operational role in the event of crisis or console position failure. At a minimum, access to the centralized configuration management application(s) shall be provided to each dispatch facility within the County radio system with the proper administrative logon(s).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The dispatch console GUI shall provide adequate screen resolution and useable window “real-estate” to provision all County trunking and conventional resources (i.e., mutual aid stations, paging, etc.) across multiple active folders, tabs, etc. for organizational and layout purposes. Each console position layout shall be equipped to permit/deny a dispatcher to reorganize (in real-time) console resources across organizational groupings within a pre-defined screen layout template. Console layout templates shall be password-protectable (as required) to ensure that only authorized personnel have access to specific resources (i.e., encrypted resources).



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Client dispatch consoles shall be equipped to function equivalently while networked to the redundant/fault-tolerant configuration management server(s) and/or while severed from the network using console layout templates and alias databases archived locally on the dispatcher client workstation. Client switching between the redundant/fault-tolerant configuration management server(s) shall be seamless and require no user intervention in the event of an online server failure. All configuration and alias databases shall be mirrored on redundant and/or fault-tolerant configuration management server(s) for maximum console subsystem availability and failure preparedness.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each console position shall provide real-time audible and visual feedback as to the networked status of the console and overall mode of system communications. All fallback modes of system communication shall be communicated to each dispatch screen in real-time so that a dispatcher's operational behavior can be adjusted as necessary to stay in constant communications with all field users.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Per logon ID, client dispatch consoles shall be equipped to disable all computer applications deemed irrelevant to the real-time voice dispatching mission. The County requires the ability to deactivate miscellaneous computer applications (e.g., embedded games, productivity applications, network explorer, etc.) as required upon field installation so as to increase dispatch position availability and prevent dispatchers from becoming distracted while performing the real-time voice dispatching mission. A software-based instant recall recorder (IRR) application shall reside on all console positions and shall be implemented in a manner for easy dispatcher access in time of crisis. The IRR application shall be accessible through the standard windows minimize/maximize utility and also shall be configurable to reside in an unobtrusive stay-top configuration for immediate dispatcher access.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All distinct console functionality shall be defined and accessible through intuitive icons and/or user menus for quick access to necessary functionality. Each console position shall be equipped to provide the dispatcher with an embedded “Help” application that utilizes a search engine/topic index. The “Help” utility shall be configurable to turn on or off as the network administrator deems appropriate (i.e., training purposes).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each dispatch console position shall be equipped to log the unique transaction data (i.e., time, date, resource ID, PTT-ID, alias, channel assigned, encryption status, start of call, end of call, length of call, call type, assigned infrastructure resources, console ID, etc.) associated with every talkgroup and conventional conversation made from that console position. This transaction data shall be archived in *.csv (Comma Separated Value) or equivalent format to local and/or network repositories. The Offeror shall define the availability of any dispatch console subsystem APIs that will facilitate the customization and retrieval of real-time console transaction information.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5 CONSOLE POSITIONS AND COMMON ELECTRONICS

6.5.1 Description

If proposed, common console electronics shall be housed in open, 19"-wide steel relay racks or vented cabinets in the County Radio System Sheriff's Primary Dispatch Center Equipment Rooms. Adequate space for front and rear servicing shall be provided. The Offeror shall provide the recommended floor space and the minimum footprint, to scale, for the proposed electronics equipment and associated hardware as well as all environmental considerations for the entire dispatch console subsystem (i.e., power requirements/consumption, heat load, physical dimensions, weight, etc.).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The console electronics shall contain the various microprocessor trunked base station transceiver and conventional mutual aid interfaces, console interfaces, auxiliary input/output functions, and other interfaces needed for proper and efficient system operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



To minimize dispatch operator confusion and subsequent errors, operators shall be able to perform all dispatch operations by either looking only at the LCD touch screen or with a screen-coordinated keyboard. The touch screen interface shall be designed to expose the operators to the minimum number of controls necessary to operate the console efficiently. The touch screen interface shall be implemented by a combination of a mouse and a keyboard.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5.2 Reliability

The console system shall be designed such that no single failure point of any module or component results in a catastrophic failure, or disables more than one operator console or channel simultaneously. Reliability may be achieved through a distributed architecture, redundancy, or a combination of both. Any duplication of circuits, or multiple level redundancies, required to attain this level of performance shall be provided.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola's proposed solution provides maximum redundancy however due to shared use of LAN switches there could be situations where the failure of a LAN switch may result in multiple operator positions being disabled simultaneously. Motorola has designed Lake County's console site with three separate LAN switches so that no more than one-third of the total operator positions will be disabled simultaneously due to a single point of failure. That is, three OP positions will be connected to LAN Switch 1, other three OP positions to LAN Switch 2 and remaining two OP positions will be connected to LAN Switch 3. Failure of a LAN Switch will render only two or three OP positions inoperable, without affecting the operation of other OP positions. Motorola has included a spare LAN switch to expedite restoration in this unlikely scenario.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola's proposed solution provides maximum redundancy however due to shared use of LAN switches there could be situations where the failure of a LAN switch may result in multiple operator positions being disabled simultaneously. Motorola has designed Lake County's console site with three separate LAN switches so that no more than one-third of



the total operator positions will be disabled simultaneously due to a single point of failure. That is, three OP positions will be connected to LAN Switch 1, other three OP positions to LAN Switch 2 and remaining two OP positions will be connected to LAN Switch 3. Failure of a LAN Switch will render only two or three OP positions inoperable, without affecting the operation of other OP positions. Motorola has included a spare LAN switch to expedite restoration in this unlikely scenario.

6.5.3 Power Supply

Electrical power losses or surges must not affect system operations or alter the system software or operating parameters at the radio dispatch positions. External power to the console shall be a nominal, single phase 120 VAC/60 Hz. AC power for all remote dispatch equipment in the dispatch centers will be backed up with a UPS and emergency generator system to be provided by the County. The Offeror shall provide a detailed HVAC (BTU) and AC power load calculation matrix for all proposed electronics with its proposal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the detailed power load calculation matrix.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for the detailed power load calculation matrix.

The power subsystem for the console servers shall include hot standby power supplies. The transition from the primary to the hot standby power supply(s) shall not cause the consoles to lose and/or reset any functional and/or operational capabilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola has included the price for optional UPS to fulfill this requirement in the Cost Proposal in Package 3 Section 2.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola has included the price for optional UPS to fulfill this requirement in the Cost Proposal in Package 3 Section 2.



Console operators shall be alerted of the transition to the standby power supply(s) through the NMS and also shall be alerted of the failure of the standby power when the primary power supply(s) is in use.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5.4 Auto Diagnostics/Self Healing and Diagnostic Features

Due to the critical nature of the 9-1-1 communications services provided by the dispatchers, a high degree of reliability of the dispatch console equipment is required. The system shall be equipped with a self-diagnostic application which shall continuously monitor and verify the correct operation of the console system, including each operator position. Diagnostic capability shall be distributed among independent and redundant subsystems and shall not rely on one central diagnostic circuit.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each message on the console system shall include a Cyclic Redundancy Check or its functional equivalent. All data messages between the common console electronics equipment and individual dispatch positions shall include checksum security measures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The console electronics shall periodically run audio diagnostics to confirm proper operation and network connectivity. Both the NMS and individual console workstation shall be notified through audible and visual alerts. Fault-minimizing routines shall be automatically activated and diagnostic information shall be logged. Diagnostic messages shall be presented in an easy-to-read text format, which shall enable non-technical dispatch personnel to intelligently evaluate the situation and minimize disruption to normal operations. Diagnostic systems that require the dispatcher to cross-reference an error code to a fault message are not desired.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A high degree of modularity is required to reduce the number of subsystems affected by a single component failure. Repair of subsystems without totally disabling the console system shall be required, as continued console operation is necessary during repair. The console system shall be interfaced with the NMS terminal to supply statistics and diagnostics identifying console subsystem failures and for the purpose of making service-related inquiries.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5.5 Sub-system Statistics

The NMS terminal shall provide the following performance statistics on console activity by stored or ad-hoc queries:

1. Number of PTTs by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

2. Total transmit time by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3. Total receive time by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

4. Number of emergency alarms/calls by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



5. Number of individual calls by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6. Number of telephone interconnect (as provided) calls by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7. Number of system busies by position and by talkgroup/channel

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8. An average of all of the above

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

9. List the above by hour of the day.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10. Number of Fire/EMS pages by position.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe the retention time and granularity of detail the proposed system will provide for items 1-10 above.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



6.5.6 Grounding

The County requires that all Offeror-provided dispatch console equipment be connected to a common single-point ground system for all communications equipment. Exothermic welding and/or mechanical bonding shall be used to connect all equipment grounds to the single point grounding system. The Offeror shall provide all grounding leads and connectors/lugs of sufficient gauge to properly bond all equipment to the single point grounding system installed or utilized.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5.7 Dispatch Console Design

The Offeror shall provide the following dispatch console subsystem design information and documentation details based upon County requirements and specifications:

- System Functional Block Diagrams

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Network Topology with Proposed Connectivity (LAN/WAN)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Network Traffic Baseline/Utilization Baseline

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System License Matrix/Structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Layouts and Physical Dimensions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Electrical and HVAC Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.5.8 Dispatch Console Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the dispatch console subsystem that can be supplied for review and understanding.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

See System Description(s) in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

See System Description(s) in Package 2 Section 3.

6.6 OTHER REQUIREMENTS

Specific cable lengths and routing configurations will differ from each dispatch console location. The Offeror shall inspect the existing dispatch center (or architectural plans as available) to investigate all requirements to ensure a fully functional dispatch console subsystem.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.6.1 Cabling

The following subsections highlight the cabling requirements for console and related equipment. The Offeror shall utilize this and any information obtained during the site visits (or plan review) to determine specific requirements. Most, if not all, cabling within the County Sheriff's Primary Dispatch Center will be routed under raised computer flooring in cable troughs. Cabling shall be riser or plenum rated as required by the installation.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall be responsible for the design and installation of all required electrical, alarm, and interface wiring to commission the dispatch console subsystem. Such design shall be submitted to the County for approval prior to installation. All cabling between the common electronics, other system components, microwave transport/multiplexers, PSTN, and control lines shall be connected at a demarcation point or patch panel consisting of an integrated or pre-wired connectorized panel (e.g., ADC Telecommunications, AMP, Ortronics, etc.) where feasible. Primary and secondary surge suppression shall be provided for all interface and demarcation cabling. All telephone circuits shall be equipped with surge suppression to prevent accidental damage to radio communication system and dispatch console subsystem equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Circuit identification (i.e., to/from, purpose, etc.) shall be provided on all connectorized panels and cabling. All cabling shall be terminated with appropriate connectors for ease of field installation and shall be terminated to the nearest 1-foot length. All cabling used for system interconnection shall be tested during factory staging of the system. A description and detailed wiring diagram of each cable, adapter, and connectorized panel utilized shall be provided. All cabling shall be accounted for in a detailed matrix for each site and network node. All cabling shall be labeled at each end.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



6.7 LOGGING RECORDER (Optional Purchase)

The Offeror shall provide pricing for a new computer-based, networked digital logging recorder system to be installed at the County Sheriff's Primary Dispatch Center . The new logging recorder system shall provide the ability to log all radio and telephone traffic in real-time. Both trunking and conventional radio traffic shall be logged by the new recorder. All dispatch console select audio and backup control stations also shall be logged by the new recorder. All call-taker 9-1-1 and administrative telephone traffic shall be logged by the new recorder. The proposed logging recorder system shall be equipped to archive radio and telephony audio traffic to various storage media: internal, redundant hard drive(s), CD-R/W, and/or DVD-R/W devices. The proposed logging recorder system shall store the real-time audio in a variable bit rate, industry-standard, digital format (i.e., WAV, AAC, MP3, AIFF, WMP, etc.) that can easily be transferred over an Ethernet-based computer network for easy playback.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.7.1 Logging Recorder Capacity

The dispatch console subsystem shall provide logging recorder audio outputs for monitoring and logging dispatcher/radio traffic on a conventional radio channel basis, trunked user group basis, individual call basis and on an individual operator position basis. All recorder audio modes shall consist of transmit and receive audio for a particular radio channel/user group regardless of selected channel status of operator console. Dispatch console position audio shall consist of the operator's transmit audio and selected receive audio. The recorded audio outputs shall be free of any control and functional tone signals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A minimum recording capacity of any combination of 255 simultaneous sources of audio (i.e., dispatch console, trunking resources, individual calls, conventional resources, 9-1-1 telephone, administrative telephone, ringdowns, etc.) shall be provided. RAID Level 5 (or greater) hard drive storage methodology shall be utilized to provide fault-tolerant audio/data storage. The logging recorder system shall be sized to provide online and immediately accessible storage of at least 15,000



channel-hours before external storage/archival required. This storage threshold must be expandable to higher storage capacities and the Offeror shall define storage options and upgrade strategies to enable greater future capacity.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

RAID1 drives are used within the loggers.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

RAID1 drives are used within the loggers.

6.7.2 Logging Recorder Network

The new logging recorder system shall be of a client/server architecture that facilitates the access, playback, and transfer of digital audio files across a TCP/IP- over-Ethernet computer network. All of the new lookup/playback workstations shall be networked. The logging recorder subsystem also shall be designed to facilitate a number of County-intranet client workstations to access the archived audio through a properly provisioned firewall or security appliance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The County requires two (2) fully-functional logging recorder client lookup/playback workstation(s) and/or software. The two will be provided at the County Sheriff's Primary Dispatch Center and located at the dispatch director's discretion. At minimum, the fixed logging recorder client playback workstations shall be equipped with 21" flat-screen LCD monitor.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The client workstation requires the comprehensive ability to lookup, playback, and write to transferable media. The County also requires the ability for up to ten (10) additional simultaneous County-intranet users (existing County computers) to have remote access/lookup/playback functionality through a secure logging recorder gateway. This will provide access at each dispatcher location as well as two additional.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system equipment/pricing matrices. The Offeror shall propose optional incremental expansion of recorder audio outputs and simultaneous recording capacity in the design proposal. The Offeror shall be responsible for fully testing and configuring all spare equipment for any of the proposed subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.7.3 Logging Recorder Features and Performance Requirements

The following list represents the minimum functionality, performance, and quality requirements that shall be included in the logging recorder system. The list is not necessarily totally inclusive of all requirements since the Offeror may offer additional functionality in its standard logging recorder offering. The following section briefly defines the required functionality, performance, and quality of the specific requirements in this list:



- High quality, reliability, and availability to meet 24/7/365 continuous duty public safety dispatch standards (e.g. redundant power supplies, redundant processors, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Meets or exceeds all FCC, EIA/TIA, IEEE and APCO standards

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Conform to local PSTN requirements as necessary

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- State-of-the-art design with distributed processing and multi-tasking capability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Redundant and fault-tolerant configuration/network server(s) with mirrored databases

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Servers are configured with redundant power supplies and hot-swap RAID1 (mirrored) hard drives.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Servers are configured with redundant power supplies and hot-swap RAID1 (mirrored) hard drives.

- Capability for any combination of client workstations to access the logging recorder simultaneously for real-time monitoring or historical playback

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The proposed solution is licensed for 2 concurrent users for full search & replay and 10 instant playback users.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed solution is licensed for 2 concurrent users for full search & replay and 10 instant playback users.



- Capability for each dispatch position to instantly play back from their positions the most recent 60 minutes of telephone and radio audio from their respective positions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

10 concurrent licenses are included.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10 concurrent licenses are included.

- Access workstations capable of running Microsoft Windows-based operating system and archiving to CD-R/W or DVD-R/W

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiple search and playback techniques: console position, subscriber/console unit ID and/or alias, emergency call, talkgroup, multigroup/announcement group, individual call, telephone interconnect call, encrypted call (as required), time/date, call length, channel resource, site resource, ANI/ALI data, annotations, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Capability to package a group of independent, specific calls into a consolidated call sequence for documenting/describing a situation or event

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to activate data compression to maximize data storage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Redundant internal/mirrored hard drives or suitable automatic backup scheme to prevent loss of data

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- System notification to user and network administrator that storage threshold is close to being exceeded to prompt permanent archiving

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The internal logger hard drive storage is automatically stored to an archive device (DAT drive on the IP Logger or the RDX drive on the NRX) and then, eventually, automatically over written. Consequently, no alarm is generated when the internal storage is full because it is always operating in a full mode, with the oldest recordings being overwritten.

Notification is generated if a archive storage device is getting full.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The internal logger hard drive storage is automatically stored to an archive device (DAT drive on the IP Logger or the RDX drive on the NRX) and then, eventually, automatically over written. Consequently, no alarm is generated when the internal storage is full because it is always operating in a full mode, with the oldest recordings being overwritten.

Notification is generated if a archive storage device is getting full.

- FIFO overwrite when storage threshold is exceeded

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- OX-activation and/or ability to set audio level threshold for recorder activation to tailor recording style per channel/track

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Redundant 120 VAC/60 Hz power supplies for all common and core equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Synchronized to master system clock

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capable of logging any combination of system talkgroups and conventional resources per the ultimate system fleetmap

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Capability to annotate specific calls and/or call sequences using free text

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to lookup call annotations for specific calls and/or call sequences

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Capability to add audible time/date stamping using a pre-recorded voice watermark

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- User-friendly, field-reconfigurable independent GUI interface(s) for each lookup/playback position

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Password-protectable lookup/playback positions with comprehensive event log to note specific authorized user time/date usage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Full interoperability between IP-based, digital trunked and conventional subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.7.4 Logging Recorder Interfaces

The proposed logging recorder system shall provide the necessary radio and telephone interfaces to concatenate comprehensive call processing data (both radio and telephone) with the specific audio calls. Time synchronization of the logging recorder system with the master system clock and the telephone system is required so that all call sequences can reliably and accurately be re-constructed. The logging recorder system shall be equipped to receive real-time call processing data from the radio communications system and the County Sheriff's Primary Dispatch Center Call-Taker Telephone System for advanced call lookup/playback functionality based on lookup criteria such as: talkgroup, channel, time, date, call length, radio/console unit ID, radio/console alias, specific call type, assigned network resources, annotations, ANI/ALI information, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

The data that the logging recorder is capable of capturing is subject to that information being made available to the logging recorder system. All metadata associated with radio transmissions that are recorded will be captured within the logger's database and will be available as search criteria. This includes:

Field Name	Description
URID	The radio resource on which the call was made.
Resource Alias	The user defined label of the resource, e.g. TG-001 .
CallType	The type of call. Can be: Group Call
CallPriority	The priority of the call. Can be: Normal Emergency
Call Handle1:2:3	A unique ID used to match call control messages with their audio streams.
Audio Encoding	The type of radio channel the call was transmitted on. Can be: Analog Digital
Unit ID	The ID of the Radio or Console that initiated the call.
IndividualAlias	The user label of the Radio or Console that initiated the call.
Encryption State	Identifies if the call is encrypted. Can be: Clear Coded
Secure Key	The secure key number used to encrypt the call (not the key itself).
Frequency	The frequency channel that the call occurred on. For conventional resources that support the Frequency Select feature.
FrequencyAlias	The user defined label of the Frequency.
PrivateLineCode	The Private Line code of the resource. For conventional resources that support the Private Line Select feature.
PrivateLineAlias	The user defined label of the Private Line code.
ZoneID	The Zone in which the call was started
ZoneAlias	The Zone alias (user defined label)
SiteID	The RF Site (within the Zone) in which the call was started
SiteAlias	The Site alias (user defined label)
Audio Availability	Indicates whether audio for the call was logged and if not, the reason why.

For 9-1-1 calls, ANI/ALI information is captured from the 9-1-1 server. This data includes the full NENA Phase 2 list of data, including latitude and longitude for cell phone calls, and ALI re-bid information.

ALTERNATE OFFER:

Please see above response under MAIN OFFER.



Logging recorder audio demarcations from the radio and telephone networks shall be made in the County Sheriff's Primary Dispatch Center equipment rooms via wall-mounted or rack-mounted punchblocks. The Offeror shall provide all necessary logging recorder cabling and connectors to/from the demarcation punchblocks. The Offeror shall provide all necessary radio communications system cabling and connectors to/from the demarcation punchblocks. The County will provide all necessary telephone cabling to/from the demarcation punchblocks. The Offeror shall provide all surge suppression, grounding leads, and connectors/lugs of sufficient gauge to properly bond all logging recorder equipment to the single point grounding system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.7.5 Logging Recorder Management/User Partitioning

The logging recorder subsystem shall support multiple levels of access that are protected in a manner allowing users to control, monitor and use software applications that have been partitioned and provisioned for specific use by the end-user. The Offeror shall provide a detailed description of this capability by defining the levels of partitioning and security, total number of end-users, the total number of simultaneous users with independent views, and the method used to achieve this requirement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The proposed Inform solution can support up to a maximum of 10,000 individual user accounts. Each user account is identified with a unique user name and the account is password protected. Each account is then configured with a range of privileges that are appropriate to that user's access requirements. This can range from full system access, such as would be given to a System Administrator to basic search and replay of calls from one resource (channel/talk group) with or without the ability to save recordings as .wav or .wma files.

Users who need to replay radio recordings may be limited to a specific set of Talk Groups – this is typically referred to as Agency Partitioning and is useful where multiple agencies share one common radio system with one IP Radio Logger capturing all radio traffic.

The proposed Inform solution is designed such that the system is accessed via Microsoft Internet Explorer. This allows any user to access the system from anywhere, provided the user has access to a workstation PC that is capable of reaching the Inform server via a network or VPN connection. At any time, the System Administrator can limit which



workstations have access to the system. The system can be configured such that only specific workstations can access the system.

User access is tracked and logged within the system's Audit Log.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed Inform solution can support up to a maximum of 10,000 individual user accounts. Each user account is identified with a unique user name and the account is password protected. Each account is then configured with a range of privileges that are appropriate to that user's access requirements. This can range from full system access, such as would be given to a System Administrator to basic search and replay of calls from one resource (channel/talk group) with or without the ability to save recordings as .wav or .wma files.

Users who need to replay radio recordings may be limited to a specific set of Talk Groups – this is typically referred to as Agency Partitioning and is useful where multiple agencies share one common radio system with one IP Radio Logger capturing all radio traffic.

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User access is tracked and logged within the system's Audit Log.

End-users shall be located at different locations such as dispatch centers, offices, maintenance facilities, and other remote sites. Therefore, this user partitioning feature must be provided to remote locations in order to allow restricted access to the overall radio network. User functionality and passwords must be configurable through a network administrator/superuser (root level) login. Superuser (root level) login and password must be re-configurable in the event of a network security breach. The logging recorder subsystem shall provide the administrative functionality to disable in real-time specific client workstation(s) and user login(s) as necessary in the event of malicious or unwanted activity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



6.7.6 Time Synchronization

The proposed logging recorder subsystem shall be time synchronized using a common timing reference scheme for the entire network (i.e., GPS, NTP, WWVB, etc.). All call transactions and network alarm events shall be time/date stamped with the master system clock for accurate logging recorder call archiving. Any logging recorder internal status/error logging capability shall be synchronized to the same master system clock for accurate diagnostic and troubleshooting and correlation to NMS alarm data information. In the event of master clock failure, the logging recorder subsystem shall provide a free-running clock which is originally disciplined from the master system clocking reference. The Offeror shall define the time synchronization methodology for the proposed logging recorder subsystem.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The proposed solution will have all servers synchronized to a master NTP time reference delivered to the system over the LAN.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed solution will have all servers synchronized to a master NTP time reference delivered to the system over the LAN.

6.7.7 Equipment Housing

The logging recorder common equipment shall be permanently housed in an EIA/TIA standard 19"-wide steel relay rack or 19"-wide stationary steel cabinet in the County Sheriff's Primary Dispatch Center equipment room. All logging recorder equipment shall provide a grounding lug or connection that facilitates a single point grounding methodology within the County Sheriff's Primary Dispatch Center. The logging recorder equipment shall provide front and rear access for cabling and service purposes. Power, audio, and data cabling interfaces to/from the logging recorder shall be supported from above using either overhead/aerial cable tray or from underneath via computer flooring.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

All system servers are standard rack servers using the 19" EIA/TIA mounting rails. Cabling to the loggers is via the rear of the servers. The servers are up to 28" deep, consequently a minimum of 30" rack depth is required.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All system servers are standard rack servers using the 19" EIA/TIA mounting rails. Cabling to the loggers is via the rear of the servers. The servers are up to 28" deep, consequently a minimum of 30" rack depth is required.

6.7.8 Diagnostics/Alarm Interface

Service alignment, level setting, programming and diagnostic information of all essential logging recorder circuits/modules shall be provided through both a local and centralized (off-site location) craft interface. This functionality shall be accessible and adjustable electronically by service personnel via both an RS-232 connection and Ethernet interface. The craft interface connections shall be accessible without the need to remove chassis shields or equipment circuit boards. Any external configuration software, hardware and/or interface cables needed to perform these functions shall be specified and provided. The proposed logging recorder subsystem also shall be interfaced via SNMP and discrete alarm relays to the NMS subsystem for comprehensive diagnostic and troubleshooting through the unified NMS terminal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Access to the system servers is via a remote desk-top software application or via locally connected Monitor/Mouse/Keyboard with a KVM used to support multiple servers as necessary.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Access to the system servers is via a remote desk-top software application or via locally connected Monitor/Mouse/Keyboard with a KVM used to support multiple servers as necessary.

6.7.9 Logging Recorder Design

The Offeror shall provide the following logging recorder subsystem design information and documentation details based upon County requirements and specifications:



- System Functional Block Diagrams

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Network Topology with Proposed Connectivity (LAN/WAN)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Network Traffic Baseline/Utilization Baseline

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System License Matrix/Structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Layouts and Physical Dimensions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Electrical and HVAC Requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

6.7.10 Logging Recorder Optional Features

The Offeror shall provide a detailed list and explanation of optional features for the logging recorder subsystem that can be supplied for review and understanding.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

NICE Inform includes the following applications:



Reconstruction (Inform Lite Reconstruction is included with proposal, upgrade to full Inform Reconstruction described below available as upgrade option)

The tool for search and replay of audio across the system. Familiar in appearance to users of Scenario Replay, Reconstruction includes many features and enhancements to increase user satisfaction and productivity.

Organizer (not included with proposal, but available as upgrade option)

The tool for the management and distribution of recordings and ancillary material. Organizer is an application that streamlines the recording distribution process, increasing responsiveness to requests and improving the reliability and repeatability of results. Organizer operates within the NICE Inform audit and security model, ensuring traceability of actions and strict access control to sensitive material.

Monitor (not included with proposal, but available as upgrade option)

This tool provides real time access to ongoing calls. The NICE Inform Monitor application provides a way to view real time activity on a group of channels. One or more channels can be selected for monitoring. The monitored channels are mixed together to provide a local audio output on the workstation which is only a few seconds behind the actual conversation.

Monitor also includes rapid access to recent calls on one or more channels, providing an easy way for a supervisor to quickly come up to speed on a developing situation.

Verify (included with proposal)

Verify is the instant replay feature within the Inform application suite, providing fast access to up to 50 resources for up to the past 8 hours.

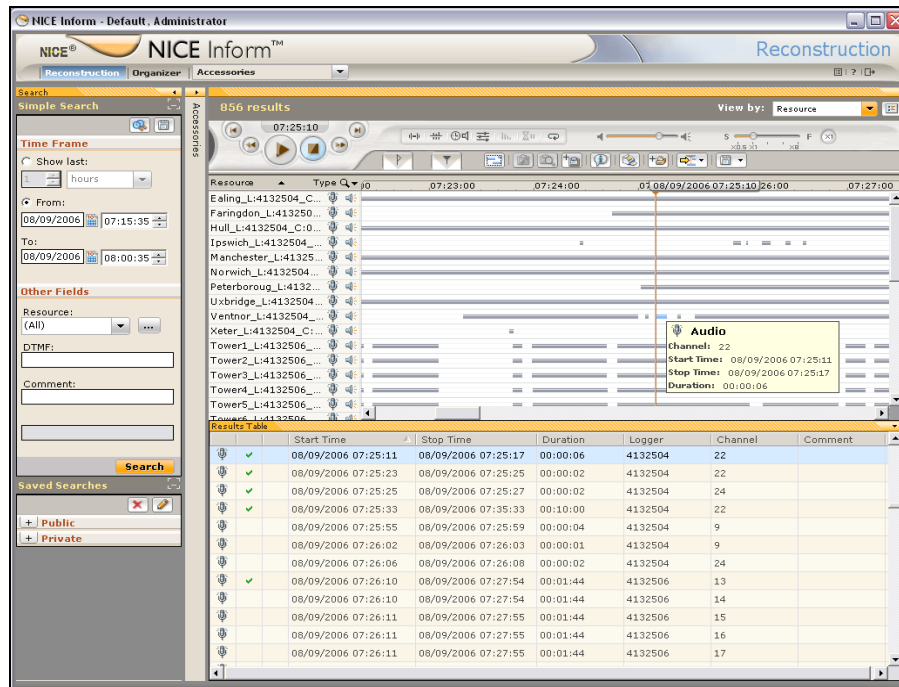
Media Player (not included with proposal, but available as upgrade option)

NICE Inform Media player is a true standalone application which enables recipients of a distributed incident to view the incident transactions in a synchronous format, similarly to the view provided within the Organizer module. It is distributed as an executable file negating the requirement to download it and therefore not imposing on any organizational IT security policies.

Audit Trail (included with proposal)

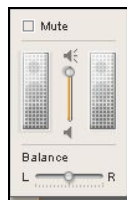
The NICE Inform Audit Trail viewer provides access to the detailed audit history of user actions stored within the NICE Inform server, including security events, administrative changes and user actions such as playback of audio.

Reconstruction



Reconstruction provides a combination of graphical and list displays of the recordings – giving a visualization of the recordings and the detail to investigate more closely. Reconstruction includes many powerful features, designed and developed with the user in mind in order to facilitate an easy and effective work process. Some of these features are:

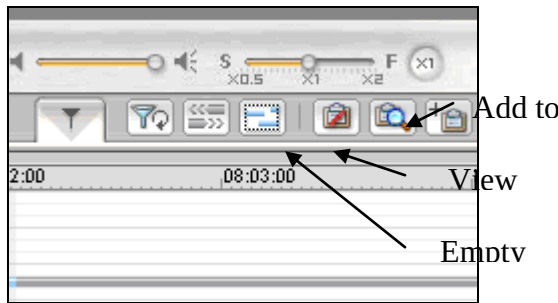
Playback Volume and Balance Control Per Recorded Channel - When replaying multiple audio channels mixed together and synchronized in real-time, users can dynamically control audio settings for each channel independently. Users can therefore quickly gain an understanding of both the incident communication as a whole and each audio recording individually.



Volume and Balance Control

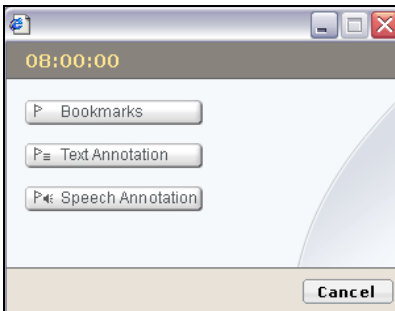
Clipboard – The clipboard enables the user to keep a selection of search results on hand, while performing a new search or reviewing additional audio. The clipboard is particularly useful when the user finds that an incident involves a longer time frame or a wider number of channels than expected – all relevant audio from the first search can be placed on the clipboard, a new search performed with the new criteria and the combined results are now available for replay and further analysis.





Clipboard

Annotations – During the review of the audio, users can add text and/or speech annotations to store further details or notes on the entire audio segment or on specific points in the recording. Annotations are marked as flags on the graphical view of recordings, so users can quickly refer to them. Bookmarks – annotations without text or speech – can also be added. Users can search for annotations at a later date, including annotations made with Last Message Replay.

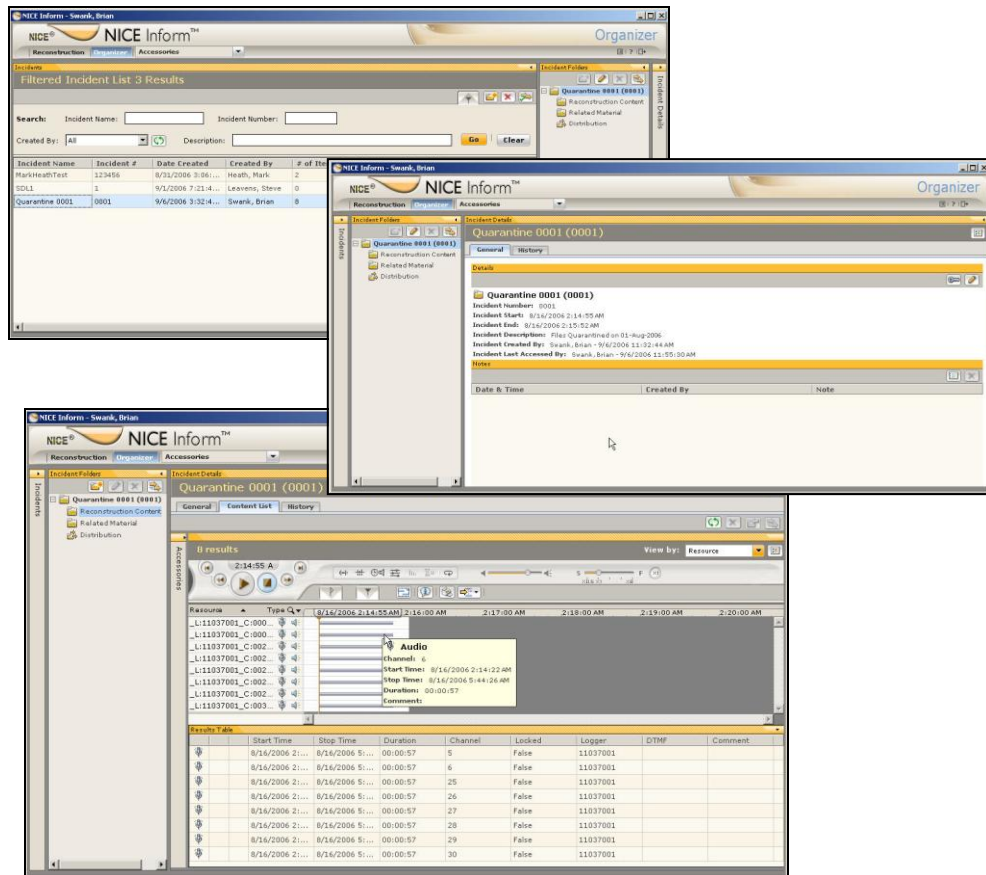


Annotations

Organizer

Organizer is an advanced incident management module. Authorized users can store, access and manage multiple collections of specified recordings digitally replicated from the recorder that captured them. Recordings can be placed into an incident individually, or a collection of recordings can be given a name and managed collectively by that name. The incident storage area is independent from the normal recording storage area.

Audio that is within an incident can be replayed in just the same way as audio in the online store, with the same flexible user interface.



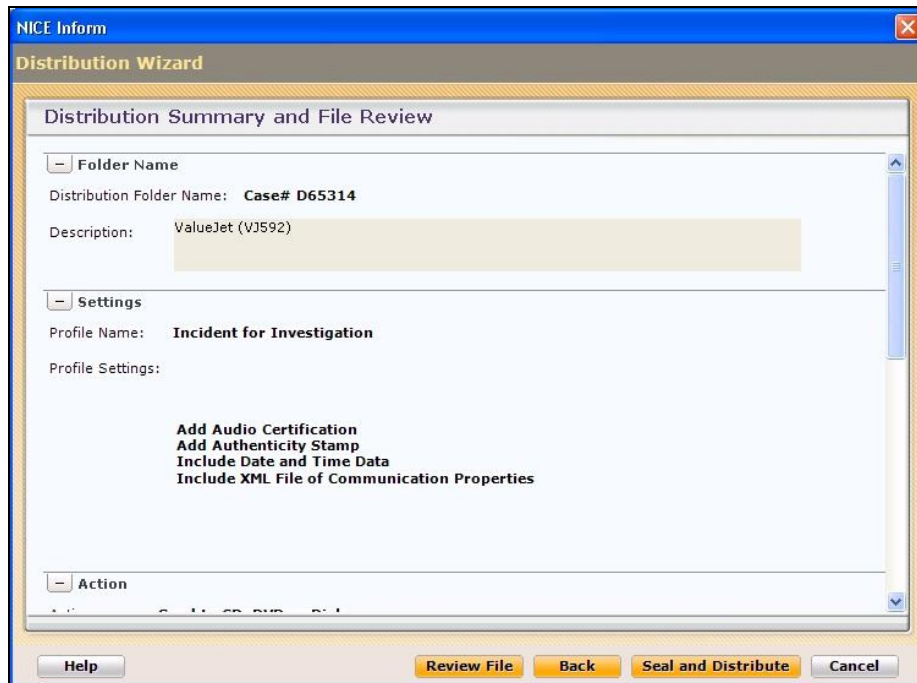
Incident List, Folders and Content Interfaces

The Organizer application includes further unique features:

- **Organization of Incident Information in Folders** – This provides a central location where all the incident recordings and related information are stored. This saves time and reduces errors, as users can refer to one location for all incident information rather than to multiple sources. Incidents can be accessed from any workstation. An authorized user, who has been granted the appropriate access privileges, can refer to the folder quickly and save time and effort in reconstructing the incident audio again. User privileges to access specific incidents may be independently defined for each incident.
- **Comment/Notes Functionality** – An authorized user has the ability to add notes to each incident folder and to individual recordings within the quarantine folder, providing an explanation or reason for the inclusion of that material in the incident.
- **Managing Additional Information** – Any other files or documents related to the incident can be imported to the incident folder to maintain, manage and secure all information about an incident in a single location. For example, the audio request that generated the creation of the incident folder could be saved alongside the incident recordings to provide a single location for all data concerning the incident
- **Automated Distribution Process** – A wizard-guided distribution process simplifies the work for the user and wraps all incident material in one exported media file, including optional certification messages recorded by the user. Distribution profiles can be configured in advance to ensure consistency and repeatability when preparing audio for distribution.



Profiles may be created for court purposes, where all audio is merged into a single file with certification messages added before and after the audio, or for investigative purposes, where all audio is kept separate and additional information is provided in an html page. Incidents may be distributed multiple times, in multiple formats, without the need to search the logging system each time.



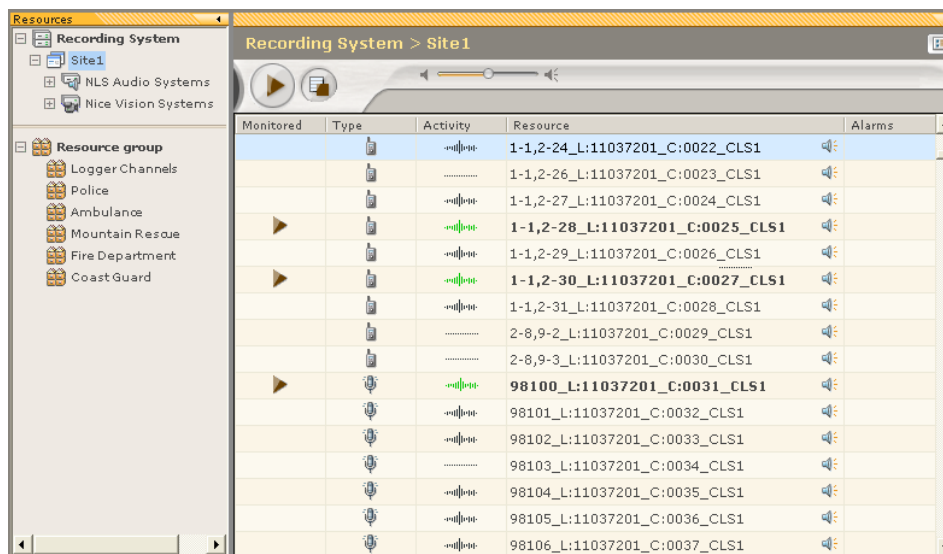
Distribution Wizard

- *Log of Distributed Material – This further enhances traceability of distributed material. If the incident information is requested again, the user can quickly find the original recreation in the Organizer application rather than go through the reconstruction and reproduction process again. If the distributed audio is questioned, for example, as to whether it is complete, the original recordings that made up the distributed audio are still available for reference and verification.*
- *Distribution Authentication – When recordings are distributed they are saved as files in a folder that is given the name of the distribution. Also contained in this folder are other files that describe what the recordings contain. Each file that is saved has a hash code generated using the SHA-1 algorithm, which is stored in the NICE Inform server as part of the information kept about the distribution. To authenticate a distribution, the user opens the authentication dialogue and selects the relevant incident distribution folder. The distribution is then checked against the information stored on the server, including the quantity, names and recalculated hash codes of all the files in the distribution. The results of the verification, including any differences, are reported to the user.*
- *Access Control to Evidence – Privilege-based access to incident folders is supported, with the ability to define unique user security access lists for each incident.*

- **History of Actions** – An audit trail is kept of every action taken on any of the recordings. This provides the ability to follow up and view actions taken by authorized users concerning the material of interest.

Monitor Application

Monitor provides real time access to ongoing calls and a way to view real time activity on a group of channels. One or more channels can be optionally selected for monitoring and provides a local audio output on the workstation which is only a few seconds behind the actual conversation.



NICE Inform Monitor

Inform Verify Application

NICE Inform Verify is an application designed to provide a verification tool for call takers within a Control Centre concerning recent telephone calls that they have just been engaged with.

The application will enable the user to search up to 5 resources at a time over a pre-defined period (usually 30 minutes). This will provide a list of calls and also associated call data such as start time, durations, stop time, caller ID etc. associated with the user at that specific position.

As with the primary Inform application the Inform Verify application is client server based and the software is provided by the main Inform server. This will benefit the user and administrator in that any software updates are sent from the central server and the users are centrally administered and audited within the Inform administration functions.

The Graphical User Interface (GUI) (please see figure 14) has been developed to be touch screen sensitive and also resizable so that it may fit in and around other applications utilized by call takers.





Inform Verify Application View

Inform Media Player

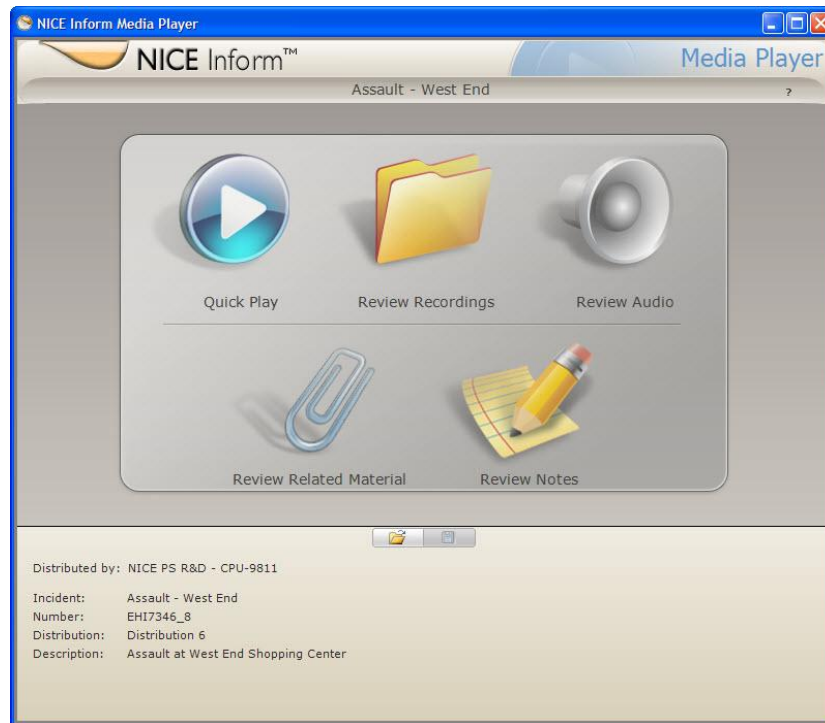
The NICE Inform Media player is a true standalone application which enables the recipients of a distributed incident from the Organizer module to view the incident transactions in a synchronous format. It is distributed as an executable file negating the requirement to download it and therefore not imposing on any organizational IT security policies.

The display of the GUI is very similar to the Organizer view in order to provide continuity of the application branding but, more importantly, to provide an easy understanding between the distributor and the recipient of the material being reviewed.

It has been designed with 'review' in mind. This means that all editing functionality has been removed in order to ensure that the distribution remains as a whole. The distribution has also been encrypted in order to enhance security of the content within the distribution (which in most cases is extremely sensitive).

Additionally, there is authentication associated with each of the files within the distribution and the Inform Media Player utilizes its own authentication function to detect whether files have been tampered with, deleted or modified in any way. It will then notify the reviewer and provide the option to continue opening the distribution, based on the fact that it may be incomplete.

Any related materials and associated notes with the incident folder are also forwarded to the recipient for review purposes.



NICE Inform Media Player View

ALTERNATE OFFER:

Please see response above under MAIN OFFER.

6.8 DISPATCH CONSOLE SUBSYSTEM MANUFACTURING SUPPORT AND DOCUMENTATION

6.8.1 Factory Testing

The console system shall undergo extensive integrated factory testing with a staging and customer witness prior to shipment. This testing shall encompass all parts of the console equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

6.8.2 Dispatch Console and Logging Recorder Operator's Instruction Tutorial

A customized dispatch console and logging recorder operator's instruction tutorial with associated embedded video demonstrations shall be clearly written and illustrated to instruct radio dispatch personnel in the proper use of all provisioned features available at the consoles. County-specific drawings and/or photographs shall show the location of all operator controls and tools. This manual shall be provided in addition to all other installation and training manuals furnished.



MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will provide training via video and instruction manual, however we do not provide embedded video demonstrations.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola will provide training via video and instruction manual, however we do not provide embedded video demonstrations.

A quantity of 15 dispatch console and logging recorder operator's instruction tutorials shall be furnished. These instruction books shall be provided in both original file format (e.g., MS-Word, PowerPoint, Visio, Macromedia, etc.) and in *.PDF (Portable Document Format) format to be readable with the Adobe Acrobat Reader software. Three (3) DVD-ROM copies and 12 paper hard copies shall be supplied at least one month prior to individual dispatcher training. There shall be no copy restrictions or licensing requirements for information provided as a system reference or used for training purposes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

6.8.3 Installation and Maintenance Manuals

The installation and maintenance manuals shall be clearly written and illustrated to instruct a radio technician skilled in the trade to unpack, assemble, and interconnect the various system components to prepare the system for operation. All base station site/console interconnect wiring, console and auxiliary function wiring shall be customized and included as part of this manual and its attachments.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

As-built documentation will be provided.

ALTERNATE OFFER:

Fully Compliant.

As-built documentation will be provided.



The maintenance manual shall be written and illustrated such that a radio technician skilled in the trade can service any portion of the system to the component level, if desired. The manual shall include the theory of design for each unit, a schematic diagram of each assembly, assembly drawings of each circuit board, detailed part numbers where applicable, the description of each component used and the name and part number of the original component manufacturer to facilitate locating parts locally. The manual and its attachments shall include complete system configuration data, programming data, and customized as-built drawings. Where applicable, such information also shall be supplied for any items furnished as part of the system but not manufactured by the Offeror. A quantity of six (6) installation/maintenance manuals shall be furnished in complete, bound paper format and three (3) in CD-ROM electronic format. These instruction books shall be available in a *.PDF (Portable Document Format) format to be read with the Adobe Acrobat Reader software. There shall be no restrictions or licensing requirements for information provided as reference or used for training purposes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The console and logging recorder manufacturer (if other than the Offeror) shall maintain a complete set of original, customized County reference documentation for the system, to be supplied upon request as individual replacement sheets or complete replacement manuals. The manufacturer shall certify that this support will be available.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Prior to system acceptance and subject to field review, the Offeror shall provide customized "As-Built" drawings for all radio dispatch and logging recorder subsystem equipment supplied in response to this specification. Six (6) sets of documents with reproducible drawings shall be supplied. Three (3) CD-ROM copies shall be supplied with all as-built files provided in both original file format (e.g., MS-Word, Excel, Visio, AutoCAD, etc.) and in *.PDF format (Portable Document Format). There shall be no restrictions or licensing requirements for information provided as reference or used for training.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



7.0 BACKBONE TRANSMISSION SYSTEM REQUIREMENTS

The Offeror shall provide a turnkey, high capacity, redundant interconnecting backbone network to connect all system radio sites and dispatch centers into an integrated communications network. Such a system may make use of the existing County tower facilities as deemed feasible.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola is providing a loop protected 45 MB Ethernet microwave backhaul solution incorporating G.8032 Ethernet Ring Protection. Motorola has provided preliminary path calculations and path profiles supporting our design.

ALTERNATE OFFER:

Fully Compliant.

Motorola is providing a loop protected 45 MB Ethernet microwave backhaul solution incorporating G.8032 Ethernet Ring Protection. Motorola has provided preliminary path calculations and path profiles supporting our design.

The Offeror shall provide the most cost-effective solution to the County, providing that such a solution meets the reliability and availability criteria of a public safety communications system. The transmission network shall be designed with the maximum redundant path capability, such as path diversity or loop switching, etc., to ensure the highest levels of availability. A loop topology and loop switching is the County's preferred methodology.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The transmission network shall employ the industry standard digital hierarchy. The Offeror shall provide all necessary interface equipment and cabling to interconnect the transmission network. This interface equipment shall include any channel banks and multiplexers if required. The Offeror shall indicate the multiplex and channel bank capacity requirements at each of the proposed sites, i.e. 1 T-1, 8 T-1, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



The Offeror shall research the County's existing microwave backbone in order to determine which of its existing microwave and facilities, if any, can be re-used in the deployment of the new microwave backbone. The Offeror shall specify which components of its existing microwave backbone, if any, can be re-used or up-graded in the new system deployment. Further details on the existing backbone can be obtained during the site visits.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide itemized unit pricing, design methodology, system solutions, and microwave path design calculations for the purpose of allowing the County to compile information and solutions in order to support the final radio system design. The Offeror shall interconnect the radio communications system with microwave and/or fiber optic facilities. The systems shall support ring redundancy or hot-standby redundancy, alternate routing, and future growth. The County expects that the Offeror will propose the backbone infrastructure that provides the greatest amount of redundancy and reliability while meeting the capacity requirements of the network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall describe the entire interface, capacity, operational, and performance requirements to allow the microwave system and/or the fiber optic system to support the proposed system. The Offeror also shall describe the interconnection requirements between the radio system with both the microwave and associated fiber optic systems. Items such as bit error rates, synchronization, switch timing, alternate routing, delay requirements, and any other topics that shall affect the performance of the radio systems must be discussed and conclusively defined as part of the Offeror's response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Offerors shall provide detailed path profiles and path availability calculations for all proposed microwave paths. The Offeror is responsible for proposing all tower site selections in order to meet 1) County two-way radio coverage specifications, and 2) microwave path integrity and reliability.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

7.1 DIGITAL MICROWAVE NETWORK

7.1.1 General

The requirements stated herein represent a functional specification for a new or upgradable multi-band, packet IP or hybrid packet IP and TDM, digital microwave communications network to support the County radio system as specified elsewhere in this document.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall be responsible for the design, upgrading and delivery of the microwave system, as well as for installation, optimization, and performance verification testing of the complete network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



This section defines the technical requirements for the major equipment items comprising the digital microwave network. Minor equipment and hardware including wiring, connectors, cabling, fuses, circuit breakers, brackets, fasteners, power supplies, converters or conditioners, and other items which are necessary to provide a complete and fully functioning system shall also be furnished and installed by the Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All equipment furnished by the Offeror shall be new, meet the requirements of this specification and the manufacturers' published specifications, comply with all Federal, State, and County laws, rules, regulations, and ordinances, be in operable condition at the time of delivery, be finished (painted or surface treated in accordance with manufacturers' standard practices), reflect high quality workmanship throughout, and be suitable for the intended purposes delineated herein.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.2 System requirements and configuration

7.1.2.1 Topology

Offeror shall design the microwave system by optimally using existing communications towers, equipment, buildings and other structures as may be useful and economically desirable. Offeror may also propose new towers as needed, provided that the proposed project schedule appropriately considers potential delays in their permitting and construction and the reality that in some jurisdictions local permits may not be attainable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



The topology of the microwave system shall be designed by the Offeror to efficiently achieve the connectivity required by the proposed land mobile radio system. Full connectivity of all traffic shall be provided at the radio system master network controller site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Although some spur paths may be required, ring protection shall be used to the maximum extent practical to provide the greatest reliability and protection against catastrophic equipment failure or complete site loss. Fiber optic cable is used in the current system and may be required for connectivity to the County Sheriff's Primary Dispatch Center . Fiber optic cable may be incorporated into the microwave network design and implementation to the extent that 1) it meets all other requirements for connectivity, quality, reliability and availability and 2) its use is approved by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.2.2 Frequencies, bandwidths, licenses and technical parameters

The Offeror shall develop a system layout and frequency plan which will provide the most reliable propagation using available frequencies, while appropriately considering rain fading characteristics of the various frequency bands in the area of operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Applications for frequency coordination and FCC (Federal Communications Commission) licensing for the microwave radio paths shall be prepared and filed by the Offeror . The results of the required frequency engineering analysis and the applications for FCC authorization shall be provided to the



County for review and execution prior to filing with the FCC. The Offeror shall be responsible for the cost of microwave frequency coordination and any FCC filing fees that may be imposed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The RF paths planned for the digital microwave network shall utilize FCC Part 101 frequencies assigned for full-period service in available 6, 10.7-11.7 or 18 GHz frequency bands.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

To the greatest extent possible, consideration shall be given to minimizing differences in product lines and equipment types while maximizing availability and performance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Split system microwave radios are forbidden (NOT ALLOWED) in the following areas 1) anywhere a climbing certification is required for craft personnel to legitimately access the equipment 2) on rooftops and buildings that high winds can restrict access 3) anywhere special equipment (cranes, lifts, extension ladders, climbing gear, etc.) is needed to access the outdoor equipment 4) anywhere access to the outdoor equipment requires climbing through windows, crawl spaces or over other equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Split system microwave radios are allowed to the extent that 1) the outdoor RF equipment can be accessed by craft personnel not requiring a climbing certification 2) the outdoor RF equipment can be accessed by no more than a six (6) foot step ladder 3) a flat working surface large enough to accommodate the step ladder, craft person, tools and other equipment is located no more than eight (8) foot below the outdoor RF equipment 4) access to the outdoor equipment is by typical pedestrian stairs and foot path 5) the outdoor equipment location does not fall into the forbidden category above.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Where ring protection is achieved, non-redundant radios may be provided, so long as the specified network availability requirement is met.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Wherever ring protection is not provided, frequencies subject to rain outage shall be minimal. and radios shall be configured as monitored hot standby (MHSB) or MHSB with space diversity, as required. Spurs shall be limited to no more than two (2) hops in any one linear spur and must meet the specified network availability requirement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

In the case of highly critical sites connected by a spur a fiber connection must be designed and installed to provide alternate route protection.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The system shall be designed with sufficient capacity to accommodate the traffic requirements of the radio system plus a minimum of 25 percent growth to each site. Offeror shall provide a detailed connectivity map for the microwave system, including equipped but unused ports for future expansion.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The system shall support data rates to efficiently use the available spectrum and bandwidth, while meeting the capacity requirements of the radio system plus interfaces with any additional base radios, network control equipment and any other additional components or network resources that may be identified by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The “network” consisting of one or more of the following; microwave star configuration, microwave backbone configuration, microwave loop configuration, microwave spurs, telco connections, fiber links, etc.) must be designed for an overall minimum of 99.999% availability.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Network availability calculations must include; 1) Mean time between failures on all critical components (microwave equipment, fiber equipment, power systems, etc.) 2) mean time to restore failure for each critical component 3) path reliability 4) maintenance schedules 5) be calculated using the appropriate formulas found in TeleSciences Microwave reference guide titled Reliability Analysis of Microwave systems See Appendix E.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.2.3 Path Design

Path design data shall be provided to the County for all proposed paths. This shall include path profiles, reliability calculations, radio and antenna details, and all other supporting data.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

Offeror shall include a tree growth factor of 20 ft. to be added to measured tree heights at critical points along all microwave paths. Path profile data sheets included with final path engineering documents shall clearly denote the tree growth factor used at each critical point.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All paths in the system, including rings and spurs, shall be designed for a minimum two-way path reliability of 99.9999% per year using the Vigants model in TIA TSB-10-F. The 10E-6 BER receiver threshold specified for full modulation shall be used as the outage point calculation. Path reliability must be calculated without adaptive modulation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All paths in the system, including spurs and rings, shall have a required long-term, unfaded RBER (residual bit error rate) of $\leq 10E-11$.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All paths in the 11 GHz and 18 GHz bands and any band where rain outage is a significant factor, shall be designed for a minimum rain availability of 99.9999% per year, using Crane 96 rain rates appropriate to the area. Offeror shall be responsible for the complete design of all microwave paths. If criteria other than those defined in this paragraph are proposed, Offeror shall provide in the proposal a discussion of all specific differences and why those are being suggested in place of those following. For calculating path clearances on non-diversity paths or top dishes on space diversity paths, the worst case of 0.3 F1 @ K=2/3rds and F1 @ K=4/3rds shall be used. For diversity paths (top to bottom dishes) clearance shall be as provided for in ITU-R Rec. P.530-11.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

7.1.2.4 Physical Path and Site Surveys

The Offeror shall be responsible to perform physical path surveys to locate obstructions on the paths and to ensure that proper path clearances are maintained in the design. Offeror shall guarantee the paths clear of any and all obstructions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall be responsible to provide all personnel, maps, proper instrumentation and any other equipment or material necessary to perform the physical path and site surveys. In executing the path surveys, if a particular location along the path is already developed with existing structures not likely to be rebuilt or extended/expanded, the shall state the pre-existence of these objects. Also, Offeror shall search for existing construction plans, permits, etc. for proposed structures along the projected path. If new structure(s) are proposed, the Offeror shall take the new construction into account in the microwave path calculations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide results of the physical path surveys of every path. These submittals shall provide, as a minimum, the following information:

- Verified site geodetic coordinates in NAD83 formats

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Verified ground elevations along paths

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Obstruction heights along microwave paths

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Path profile characteristics, vertical and horizontal path clearances at critical points along the path, potential vertical and horizontal reflection points and natural/manmade shielding along the paths are to be identified /noted and discussed in detail

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide results of physical site surveys of every site. These submittals shall provide, as a minimum, the following information and material:

- Verified site geodetic coordinates in NAD83 formats

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Verified site elevations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- General site characteristics: access, nearest utility power location, soil conditions, surrounding land features, and optimum positioning for new towers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Location map plotted on USGS 7.5 min map

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Proposed plot plan

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



7.1.3 General Equipment Requirements for All Sites, specifically including NOC

All materials, design, and construction procedures shall be in accordance with all applicable federal, state, county and local building codes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Redundancy of radios and all other equipment shall be provided such that no single failure will disrupt more than a single Ethernet or TDM port, assuming normal ring availability and operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Equipment to be used at all of the remote sites and in the County Sheriff's Primary Dispatch Center shall be provided in racks to the maximum extent practical, except for alarm and control computers and video monitors, which may be better suited for desk-top placement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Shielding and filtering shall be provided to prevent interference from, or to, other radio frequency equipment installed near or in the vicinity of the proposed equipment. The equipment shall meet or exceed spurious frequency emissions, conducted or radiated, as outlined in Part 15 of the FCC Rules and Regulations, Subpart J, Class B Computing Devices. Equipment shall be operationally compatible with the types of equipment located in the typical operational environment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Installation of all electrical equipment, power distribution, lighting and outlet assemblies, alarm and grounding systems, including associated wireways, and wiring, shall comply with the most recent edition of the following requirements:

National Electrical Code (NEC),

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All electrical equipment and devices shall be listed, approved, or certified by Underwriters Laboratories (UL), or other Nationally Recognized Testing Lab (NRTL).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All microwave system equipment, microwave path design and construction shall comply with the latest editions of the following applicable rules, regulations, standards, and specifications:

Federal Communications Commission (FCC) Rules, Part 2

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Rules, Part 15, Subpart B for Class A devices

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola is providing some Class B antennas for the alternate offer.

Rules, Part 101, Fixed Microwave Services

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Bellcore Technical References and Advisories and Compatibility Bulletins:

GR-1089-CORE – Electromagnetic Compatibility and Electrical Safety General Criteria for Network Telecommunications Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TR-NWT-000063 – NEBS Generic Equipment Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TR-TSY-000499 – Transport Systems Generic Requirements (TSGR) Common
Requirements, Issue 2

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TA-TSY-000752 – Microwave Digital Systems Criteria

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TR-TSY-000009 – Asynchronous Digital Multiplexer Requirements and Objectives

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

This standard applies to external multiplexers. AVIAT Networks Eclipse platform can interface seamlessly with OEM multiplexers that provide native TDM (T1, E1, DS3, E3, OC-3, STM-1) or Ethernet.

ALTERNATE OFFER:

Conditionally Compliant.

This standard applies to external multiplexers. AVIAT Networks Eclipse platform can interface seamlessly with OEM multiplexers that provide native TDM (T1, E1, DS3, E3, OC-3, STM-1) or Ethernet.



American National Standards Institute (ANSI), EIA/TIA and other standards:

T1.105 – Digital Hierarchy Optical Interface Rates and Formats Specifications

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

This standard applies to external SONET ADMs. AVIAT Networks Eclipse platform can interface seamlessly with OEM SONET ADMs as transparent OC-3 transport for bridging external SONET ADMs.

ALTERNATE OFFER:

Conditionally Compliant.

This standard applies to external SONET ADMs. AVIAT Networks Eclipse platform can interface seamlessly with OEM SONET ADMs as transparent OC-3 transport for bridging external SONET ADMs.

T1.106 - Digital Hierarchy Optical Interface Specifications (single mode) T1.102 – North American Digital Hierarchy – Electrical Interfaces

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

This standard applies to external SONET ADM. AVIAT Networks Eclipse platform can interface seamlessly with OEM SONET ADM Single mode optical interfaces.

ALTERNATE OFFER:

Conditionally Compliant.

This standard applies to external SONET ADM. AVIAT Networks Eclipse platform can interface seamlessly with OEM SONET ADM Single mode optical interfaces.

T1.102 – North American Digital Hierarchy – Electrical Interfaces

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



T1.313 – Electrical Protection for Telecommunications Central Offices and Similar Type Facilities

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

T1.333 – Grounding and Bonding of Telecommunications Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

T1.334 – Electrical Protection of Communications Towers and Associated Structures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

T1.403 – Extended Superframe Format Interface Specification

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Extended Superframe (ESF) is supported for B8ZS configurations and Superframe for AMI configurations.

ALTERNATE OFFER:

Conditionally Compliant.

Extended Superframe (ESF) is supported for B8ZS configurations and Superframe for AMI configurations.



ANSI-J-STD-607-A-2002 - Commercial Building Grounding and Bonding Requirements For Telecommunications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TIA/EIA-222 (latest version) – Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

RS-252- (latest version)– Standard Microwave Transmissions Systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

TSB-10-F – Interference Criteria for Microwave systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



EIA-195 (latest version)– Electrical and Mechanical Characteristics for Terrestrial Microwave Relay System Antennas and Passive Reflectors

MOTOROLA RESPONSE

MAIN OFFER:

N/A

ALTERNATE OFFER:

N/A

EIA- 210 (latest version)– Terminating and Signaling Equipment for Microwave Communications Systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

EIA-310 (latest version)– Racks, Panels, and Associated Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

IEEE 1588 (latest version) - Precision Clock Synchronization Protocol for Networked Measurement and Control Systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



C37.90.1 – Surge Withstand Capability Tests

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola complies with EN 301 489-4 and GR-1089-CORE while C37.90.1 was tested for a single configuration and would require testing under proposed configuration. Equipment provided is the same as the compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola complies with EN 301 489-4 and GR-1089-CORE while C37.90.1 was tested for a single configuration and would require testing under proposed configuration. Equipment provided is the same as the compliant.

C37.90.2 – Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola complies with EN 301 489-4 and GR-1089-CORE while C37.90.2 was tested for a single configuration and would require testing under proposed configuration. Equipment provided is the same as the compliant configuration.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola complies with EN 301 489-4 and GR-1089-CORE while C37.90.2 was tested for a single configuration and would require testing under proposed configuration. Equipment provided is the same as the compliant configuration.

7.1.4 Equipment Requirements for Microwave Sites

7.1.4.1 Common

All indoor equipment intended for operational microwave sites shall be provided in 7 foot tall, EIA standard, 19” equipment racks.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each rack shall have a separate fuse panel with alarm and a ground bar.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Alarming for the microwave DC power is provided via MOSCAD environmental alarming system.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Alarming for the microwave DC power is provided via MOSCAD environmental alarming system.

Redundant equipment shall have dual, independent power feeds from separate circuit breakers and power panels to ensure that no single point of failure will cause a disruption of service.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

The feed from the substation will be non-redundant.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The feed from the substation will be non-redundant.

All indoor microwave site equipment shall operate within the full specification requirements over a temperature range of 0° to 55° C with up to 95% humidity (non-condensing).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.4.2 Microwave Radio Specifications

The equipment shall be designed and manufactured for continuous duty operation in a fixed station application, be of all solid state design, and have an expected operational service life of at least 15 years with proper maintenance and service.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All radios shall be compliant with FCC Rules and Regulations, Part 101 and type- accepted for its intended use, specifically including spectral density requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

MHSB (monitored hot standby) receivers shall be provided with an asymmetrical RF directional coupler having less than 1 dB loss to the preferred receiver and 7-10 dB to the non-preferred receiver.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Switching between redundant receivers in MHSB or SD (space diversity) configurations shall employ hitless switching, causing no errors in the data throughput.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Microwave radios configured as MHSB shall have the capability to automatically switch far end transmitters via a control signal through the reverse path when the BER of both receivers exceeds 10E-5.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radios configured for space diversity shall include an adjustment for Differential Absolute Delay Equalization (DADE) to account for different waveguide lengths for space diversity antennas.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Minimum additional functional requirements for each microwave radio shall include:

Forward error correction (FEC)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Time domain and slope equalizer (ATDE) Automatic Transmitter Power Control (ATPC)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radios shall be designed for traffic consisting either fully of IP packets or a hybrid mix of TDM and IP packets.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.4.3 Service Channel and Orderwire

The digital service channel shall employ radio overhead or payload overhead to permit a minimum of one voice circuit and two independent RS-232C data transmission circuits between all sites without consuming payload capacity.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The service channel shall be interconnected between radios to prevent loss of channel connectivity in the event of loss of any single spur or ring radio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each site shall be equipped with a complete orderwire / voice maintenance channel unit with selective call and “all-call” features, and including a speaker, ringer, and DTMF handset.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A PBX station interface shall be provided at the MNC to allow any orderwire station on any (assuming multiple independent rings) orderwire system to be interconnected with other PBX station users. Interface shall be capable of both inbound and outbound calls.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.4.4 Radio Control and Monitoring Functions

All microwave radios shall have local, on-site provisioning, control, and monitoring capability via a keypad, craft interface terminal or simple computer terminal provided at each site. This capability shall:

- allow configuration of software-programmable radio parameters, monitoring of radio status and faults, and observation of various traffic performance measurements,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- provide access to the same information from any other radio at any site in the system, and

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Operate independently of the centralized SNMP network management system (NMS), specified elsewhere in this RFP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Offeror shall supply a list of alarms, programmable parameters, and manner of access for each type of microwave radio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

At least 32 external alarms and at least 8 external control points (for environmental alarm and control) shall be provided for each site, in addition to those internal ones employed for radio and routers/switches alarm and control. Each external alarm or control interface shall use a dry contact interface.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radio status and performance information shall also be made available via a network management system (NMS), specified elsewhere in this RFP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



7.1.4.5 Traffic interfaces and access

Where MPLS is used it shall provide automatic traffic rerouting around an equipment failure and/or unavailable path(s) and restore affected connections in 50 msec or less (Fast Reroute (FRR) or MPLS local protection).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A minimum of 4 Quality of Service (QoS) classes shall be provided throughout the network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All Ethernet interfaces shall be via front-panel RJ-45 jacks with auto-negotiating ports.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

If any DS-1 interfaces are required by the traffic plan, a DSX access panel shall be provided at every affected microwave site and shall serve as the demarcation point between the microwave network and the radio system. The DSX panel shall provide access to every DS1 circuit dropped at the site, whether subsequently connected to a DS1 interface to another microwave radio, to a radio system base station, to a channel bank or to a router. Jacks for line, equipment and monitor shall be provided for each circuit, allowing for isolating and testing in either direction.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Sufficient quantity and stability of precise timing sources shall be provided and employed to ensure synchronization of all nodes in the system, sufficient for the needs of the LMR system and other traffic. Offeror shall explain in detail and show in a timing diagram where clock sources will be employed and how system synchronization will be achieved.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The traffic interface router/switch equipment shall have a network management system (NMS), specified elsewhere in this RFP, independent of, but similar to, the radio NMS.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Loopback test capability shall be provided at each site for each connection port. Loopback shall be controllable locally and from the remote end of a circuit, as well as from its NMS master.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.4.6 DC Power System

All microwave site equipment (i.e., radios, alarm and routers/switches and except for the waveguide dehydrator) shall be powered by a positive-ground, 48-volt battery system furnished by Offeror. Each system shall include batteries, battery rack or mounting hardware, float-type battery charger, low voltage disconnect, and DC load center.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The entire DC power system shall be sized to accommodate the number of electrical circuits and the electrical load of the equipment specified in this project plus a future growth of 50% of load and circuits.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Each battery charger shall:

Be modular and sized to power the full load (including the future growth identified above), as well as recharge a fully discharged battery in less than 24 hours.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Have sufficient filtering and regulation to power all or any portion of the load without the need for batteries.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Be provided with dual AC input circuits and circuit breakers (such that there will be no single point of failure), DC circuit breaker, DC voltmeter, DC current meter, current limiting and high voltage shutdown circuitry and continuous float voltage adjustment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Have separate dry-contact alarm points for, as a minimum, low voltage, high voltage, charger failure and loss of AC input.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Operate from 120 VAC and served by two different phases, as appropriate to the site installation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Employ redundant rectifier modules, provided on a 1:N basis, such that no single failure shall overload the remaining system, even including the future growth, as defined above.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each battery system shall:

Be modular and of the stationary, sealed, valve-regulated, maintenance-free type

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Be designed for a minimum 20-year life expectancy

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The DC Power Rack will support 32 minutes of backup time and the life of the battery will be 10 years.

Have sufficient capacity to provide a minimum of 8-hours operation of the Offeror- furnished microwave station equipment including the future growth identified above.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The DC Power Rack will support 32 minutes of backup time and the life of the battery will be 10 years.

Include secure mounting rack or facilities and include protection from ruptured battery cells.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Not require venting facilities or a special battery room.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A rack-mounted DC load center with circuit breakers shall be provided with the DC power system to provide protected DC distribution to all -48 VDC-powered equipment, including future growth.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

An automatic low-voltage disconnect shall be provided to protect the batteries from over discharging.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



7.1.4.7 Network Management Systems (NMS)

Two separate but parallel NMS functions shall be provided, one for the radio network and one for the IP router/switch interfaces. Each NMS shall terminate at the MNC and may either be integrated into the NMS for the LMR radio system or be fully independent, so long as the functionality is provided.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All available alarms from ancillary and environmental alarms shall be wired to NMS remotes and configured into the NMS master for appropriate display and functioning. These alarms shall include, but not be limited to:

- Loss of AC power,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Low battery voltage,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- High battery voltage,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Loss of waveguide pressure,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fuse alarm for each rack,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Door open,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Tower light controller failure, if applicable,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- High temperature building,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Low temperature building,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Smoke detector alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.4.8 Antenna System Requirements

Microwave antennas shall be selected by Offeror and be FCC-Part 101-Category “A” compliant, parabolic dishes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Waukegan, Gurnee Toll, Antioch WT, Beach Park WT and Highwood WT sites have VHLP3 Antennas which are 3’ and Class B rated. All other tower sites use 6’ Class A rated antennas.

All microwave antennas, regardless of size and frequency band, shall be provided with protective radomes, standard four-inch pipe mounts, dual side struts and ice shields.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Antennas, side struts, ice shield mounts, transmission lines and grounds shall be attached to the tower in accordance with the manufacturer's instructions and relevant EIA/TIA standards.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Antenna systems shall use standard waveguide sizes and rectangular flanges of a consistent type to the maximum extent practical, so as to minimize sparing and tool costs.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All transmission lines shall be either pressurized, jacketed, copper elliptical waveguide or jacketed, copper coaxial cable in continuous lengths without splices and shall be installed in accordance with manufacturers' specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Where transmission lines consist of elliptical waveguide, it shall be of premium quality, use pre-tuned connectors, and include rigid (if required) and flexible waveguide sections that provide a measurable return loss equal to or greater than 23 dB, as measured at the antenna port of the radio. Flex waveguide shall not be used outdoors.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each waveguide shall be uniquely and permanently identified at each site at 4 points: the radio, the wall feedthrough (both inside and outside), and the bottom of the vertical run.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

An AC-powered, automatic dehydrator of the mechanical, non-desiccant type, and all accessory equipment, including line monitoring for each waveguide and an overpressure relief valve, shall be provided for every microwave site with a pressurized feedline.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The dehydrator shall provide the necessary capacity for all of the waveguides and feedhorns with an anticipated leak rate of 1%, and provide sufficient capacity to maintain a stable pressure during a 19°C (35°F) temperature drop in 60 minutes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All dehydrators shall provide dry contact alarms for at least low pressure, high humidity and excess run time alarms.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.5 Testing and Inspection Requirements

7.1.5.1 General

The ultimate acceptance for the microwave system shall be its functional suitability to meet the operational requirements of the mobile radio system, which it was designed to support. That being the case, despite any testing, reviews, or demonstrations of the microwave system, acceptance or approval of it may be withdrawn or superseded at any time if operational requirements of the radio system are found unfulfilled by the microwave system. Those requirements may necessitate additional equipment or modification of the microwave system at any time that then-current system is found lacking. Offeror shall make any and all such changes, as may be required at no cost to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Within 60 calendar days after final radio system design, for every piece of equipment provided, the Offeror shall provide six (6) paper copies and six (6) soft copies, e.g., .pdf files on CD-ROM, of the following items for review by the County:



- Manufacturer's Product Literature,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's Performance Data Sheets,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's Published Standard Warranty,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Samples of all relevant manufacturer's standard factory test and inspection forms,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Complete Set of System Configuration Drawings, including an index listing,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Final Design Equipment List, organized by site,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Final Design Equipment List, organized in a sortable, Excel spreadsheet format with equipment line items as rows and site designations as columns.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- The microwave system acceptance process consists of several steps itemized as follow:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Review final equipment list for each site, including description, OEM name, model number, quantity, software revision number,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Review relevant manufacturer's standard factory test data sheets,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Determine specifications to test or demonstrate and where each should be performed,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Develop field test procedure,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Perform field test procedures until confirmation of compliance is obtained,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Determine compatibility and similarity with current microwave system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Assuming that manufacturer's quality assurance program satisfies the County's requirements, redundant verification of manufacturer's standard production test measurements will not be required. However, some sampling, as directed and observed by the County, may be required and shall be accommodated by Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

7.1.6 Microwave Field Testing

Complete documentation of Field Test results shall be provided by the Offeror upon completion of testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The following tests, in addition to other standard manufacturer's test procedures, shall all be performed:

Antenna system:

- Each path shall be aligned and tested to conform with engineering design and path survey calculations,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Each antenna waveguide shall be swept and plotted in accordance with manufacturer's specifications. Measured return loss shall be a minimum of 23 dB across the entire frequency band as defined by manufacturer.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Antenna waveguide shall be pressurized in accordance with manufacturer's specifications and leak down tests will be performed to ensure the leak rate does not exceed manufacturer's specifications,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify waveguide pressure alarm to NMS master,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Verify the correct antenna sway brace and ice shield configurations,

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify proper grounding and waveguide support

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify proper labeling of each waveguide at each required point

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Power Plant:

- Measure and record individual cell and power plant total output voltages

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Set and verify alarm thresholds on battery charger in accordance with manufacturer's specifications. Verify alarm indication on NMS

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radios:

- Transmitter: Measure and record transmit power and frequency; verify operation of ATPC, if and where used.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Receiver: Measure and record RF receiver local oscillator frequency; verify MHSB, and/or space diversity error-less receiver switching and operation of reverse path protection, as applicable

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- The fade transmit margin shall be measured to the 10E-6 threshold and relevant AGC voltages and RSL readings recorded. Results shall be tabulated, compared with calculated predictions, summarized, and signed by Offeror's test team and submitted to the County for approval.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- RFC 2544 Ethernet testing must be performed for all radio hops utilizing Ethernet connectivity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Overall RF system:

- A zero (0) BER test shall be performed for 24 hours on each microwave hop. The test maybe conducted as an overall network test but must be broken down to the hop level if there is a bit error reported at the end of the test.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- RFC 6349 Ethernet testing must be conducted across the network if Ethernet is used.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

NMS:

- Verify each environmental alarm from each site, specifically including: open door, AC power failure, high temperature, low temperature, smoke detector, battery charger failure, low waveguide pressure, tower light alarm, and fuse panel alarm, as applicable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify reporting and proper display, acknowledging, logging and storage of all alarms by alarm system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Routers/switches, timing and synchronization:

- Verify proper connectivity and operation using Ethernet (EN) or TDM DS-1 (as appropriate) test set at demarcation points on a loopback basis, as well as a point-to-point basis from each site to ensure absence of timing problems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify proper automatic, alternate-route ring switching in all rings and that connections are maintained on each equipped connection, as applicable

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Verify operation of timing network in normal and backup (failed master clock module) modes in all ring configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Total microwave system availability test: After completion of installation and all other testing, a 7-day period shall begin during which all equipment must perform failure-free.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.0 SUBSCRIBER RADIO EQUIPMENT (OPTIONAL PURCHASE)

Offerors shall propose and provide pricing for various types of radio subscriber equipment and devices for the different agencies and participants on the County radio communications system. On an indefinite delivery and indefinite quantity basis, County members intend to procure radio subscriber units that require a variety of different features and options depending on the various user departments and their respective operational needs. The County encourages the Offeror to recognize a logical distinction in the tier and pricing of proposed subscriber radios along a public safety and non-public safety agency basis.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Public safety radios shall, in general, be of a higher tier and include a larger suite of features, functionality, and overall design to withstand the harsh operating environments encountered by the first-responder community. Non-public safety radios also shall be of high quality and design, but, in general, a non-public safety class of radio shall not require as advanced a feature set and overall capacity as a public safety radio. The County also recognizes a further distinction between high-tier and mid-tier subscriber units based on the overall mode capacity of the radio. The County requires the Offeror to provide a matrix of features, functionality and capacity of various radio tiers as part of their response. Assumptions have been made as to the availability of specific accessories for the various radio configurations, and no equipment availability assumption shall be interpreted to imply the preference of any specific Offeror. The Offeror assumes responsibility for mapping and categorizing the proposed subscriber radios to address the County's organizational strategy of low-, mid-, and high-tier radios in mobile and portable radio families. The Offeror shall thoroughly describe the features and functionality provided with each proposed subscriber unit.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please refer to Motorola Subscriber feature and functionality matrix.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please refer to Motorola Subscriber feature and functionality matrix.

Subscriber units are required in a variety of different configuration packages: mobiles, portables, control stations, vehicular adapters, remote desksets, and optional vehicular repeater systems (as necessary). Offerors shall provide all cables (antenna, battery, control head[s], chargers, etc.), mounting hardware, antennas, fusing facilities, installation and programming services, and accessories to provide a completely functional subscriber unit. Offerors are responsible for assessing and delivering all programming and installation services necessary to deploy and commission all radio subscribers obtained through this procurement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1 GENERAL REQUIREMENTS

The subscriber radio equipment shall consist of an integral radio set, capable of frequency synthesis of multiple RF channels, with automatic channel switching under the control of external channel(s) and/or internal channel switching logic. Additionally, the radio shall include such other items as are necessary for a complete, highly reliable, two-way analog and digital radio suitable for communications in a multi-channel trunked and conventional system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All radio subscriber system parameters (programming personality) shall be software configurable without the need to replace internal components for parameter configuration. In addition to the suite of features and functionality outlined in previous sections, the Offeror shall provide all features, characteristics, and functionality with all proposed radio subscriber equipment necessary to meet or exceed County radio system specifications. The units shall be feature and function compatible with all fixed equipment supplied under this contract. The Offeror shall provide a comprehensive feature and functionality matrix for each proposed subscriber unit by type.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All radio subscriber internal software shall be downloadable from a programming device (i.e., laptop, PDA, etc.) without the need to replace internal components for new software versions. Offerors shall propose radio subscribers equipped for over-the-air reprogramming of both system configuration parameters and internal operating software to be purchased at the option of the County. The Offeror is responsible for developing, implementing, and documenting the comprehensive County programming fleetmap to utilize in the provisioning of radio subscriber, dispatch console, and NMS configuration databases. The Offeror shall populate all required databases with final County fleetmapping and ID information to fully commission the radio communications system. Any equipment programming changes required to make the subscriber equipment, console, MNC, and NMS databases match the final version of the system fleetmap shall be executed at the expense of the Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The subscriber units shall be of current hardware and software production at the time of final system acceptance, and shall be capable of withstanding the harsh environment associated with use in emergency service vehicles. At a minimum, the mobile and portable equipment shall meet or exceed the MIL-STD-810E "Environmental Test Methods and Engineering Guidelines" specification, with some of the criteria noted as follows:

- Method 506.3 Rain - Procedure I - Blowing Rain

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Method 509.3 Salt Fog

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Method 510.3 Sand and Dust Procedure I - Blowing Dust

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Method 514.4 Vibration Procedure I, Category 10 - Minimum Integrity
Test (3 axes)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Method 516.4 Shock Procedure I - Functional Shock

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All subscriber radio equipment also shall meet or exceed the requirements of the latest version of TIA/EIA-603 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards" when operated in the analog mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The radio subscriber units shall support all analog and digital communications within this system and compatible systems operating in the 700 and 800 MHz frequency bands. The subscriber units shall provide FM analog communications within this system when involved in a call from an analog unit on conventional mutual aid repeater and/or simplex channels.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: Over the-air programming and Radio Management are offered as an option to the Motorola subscriber units.

The radio subscriber units shall be equipped to concurrently priority scan both conventional channels and trunked talkgroups (at least 8) in both clear and encrypted voice. The radio subscriber units also shall be equipped to concurrently scan between trunked talkgroups on compatible trunked systems in both clear and encrypted voice. Channel or trunked mode scanning shall be completed in the minimum time necessary to reliably deliver audio traffic to the radio subscriber.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide the maximum scan time required between trunking and conventional reception. The scan shall be a selectable priority which means that the transmitter channel or talkgroup selected by the user is configurable to be the priority channel or talkgroup.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.



The timing performance of scanning operations will depend on numerous factors, including how many conventional channels are in the scan list, whether there is radio activity or interference, system coverage, and configurable settings in the subscriber. Scanning conventional channels takes approximately 30 msec per channel where there is no activity. When switching to scan the trunking control channel the duration the radio listens to the control channel before returning to conventional scanning is configurable, with a minimum of 1 second. Priority scan is not available when scanning trunking and conventional.

The subscriber units shall provide an ESN (Electronic Serial Number) for lookup and validation purposes by the fixed network infrastructure. The subscriber units shall provide a multi-point data port to multiple external peripherals. The subscriber units shall provide the functionality to be placed in a listen-only mode (no transmit capability) from the network management system on a dynamic basis.

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Note: This is a proprietary feature from the Harris Corporation and it is not defined as part of the P25 Standards, and, as such, is not applicable to Motorola's offering.

ALTERNATE OFFER:

N/A

Note: This is a proprietary feature from the Harris Corporation and it is not defined as part of the P25 Standards, and, as such, is not applicable to Motorola's offering.

While in the listen-only mode, the receiver would still be capable of receive operation but the radio would not be capable of transmitting in any mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant .

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Audible and Visual Signaling

The subscriber units shall support audible and visual signaling to and from subscriber units for functions as described below. Radio users also shall be able to select and unselect audible and visual signaling (i.e., surveillance, covert operations, etc.) or any or all of the default types of signaling described below. The mandatory default audible and visual signaling shall include the following



standardized signals and the Offeror shall thoroughly define the nature and characteristics of each type of signaling scheme:

- Emergency Activation/Reception

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dynamic Regrouping

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant .

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Individual Call

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant .

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Telephone Interconnect Call

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Selective Alert

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Console Alert Tone(s)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Subscriber-Generated Evacuation Tone

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Mode Announcement (voice directory for programmable radio modes)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Failure Modes (e.g., loss of trunking control, loss of wide area communications, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Trunks Busy

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Callback

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Battery Life Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Charging Mode Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Transmit and Receive Indicate

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Programming Mode Activation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Software Upgrade Mode Activation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Feature Acknowledgment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Channel Beacon

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Voice Communications Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Data Communications Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Priority Scanning

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Home Mode Activation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Talkaround/Direct Mode

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Ready-to-Talk

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Vehicular Repeater Mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.1 FCC Regulatory Compliance

All proposed subscriber equipment shall be type accepted under current FCC Rules and codified regulations in concert with the APCO Project 25 specification. The Offeror shall define the Type Acceptance designation and FCC Emission Designators for all proposed radio subscriber equipment. The Offeror shall provide detailed performance specifications for all proposed radio subscriber equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please refer to the provided specification sheets in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please refer to the provided specification sheets in Package 2 Section 3.

8.1.2 Electrical & Mechanical

The subscriber radio equipment shall be state-of-the-art, frequency synthesized, and microprocessor based. All configurable operating parameters shall be stored in electrically-alterable, non-volatile memory technology. All radio operating frequencies, features, functions and other operating parameters shall be field- configurable via PC-based programming equipment. The physical and electrical architecture of the equipment shall be such that addition of user features and/or functions at future dates shall not require the addition and/or replacement of circuit cards within the proposed radios.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference which may be caused to/by electrical equipment co-located and/or adjacent to this equipment. Similarly the radios should be capable of shielding from electromagnetic pulse radiation (EMP) resulting from the detonation of a nuclear device or other pulse generating device.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Per Addendum #2, response to question 21, the last sentence above is no longer applicable.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Per Addendum #2, response to question 21, the last sentence above is no longer applicable.

Power loss and/or replacement of the portable unit's battery shall not alter the operating software and/or configuration parameters. Radios shall be equipped to operate with Nickel-Cadmium, Nickel-Metal Hydride, and Lithium Ion battery technologies. The County requires any proposed radio and battery technology to optionally meet the Factory Mutual rating for intrinsically safe operation. The County requires the Offeror to supply the highest capacity battery that operates within the County operating environment, for each proposed variety of subscriber radio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The unit shall perform a self-diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters and internal hardware. At the conclusion of a successful test, no operator intervention shall be required. A self-diagnostic test that is unsuccessful shall notify the operator with an error message or fault code.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The radio housing shall completely integrate the radio transmitter unit(s) and receiver unit(s). All subscriber units shall be designed so that they are protected from damage if power is applied in reverse polarity or pins of connecting cables are shorted together.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Access and ease of operation are critical to the users and the maintenance personnel. Offerors are to provide information and details on all vehicular mounted equipment, particularly equipment mounted in the passenger compartment. The equipment housings shall be suitable for mounting on vertical or horizontal surfaces. The equipment housings shall be suitable for trunk mount and dash mount vehicle configurations. Remote mounted transceivers for mobile radios shall be interconnected to their respective control heads through a weatherproof, control cable connectorized at both ends.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Mobile transceiver radios shall support weatherproof dual control heads, siren/PA assemblies, and motorcycle configurations. The radio cabinet(s), control heads, and ancillary installations must be a package that can be mounted inside or outside of the vehicle without restricting the use of the front seat by a driver and one passenger or interfere with air bag deployment. Mobile and portable transceiver radios shall be inherently compatible with optional handheld control heads and vehicular repeater assemblies as required.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall describe variations for shock mounting, stabilization, tilts and swiveling with locks, and customized mounting for different vehicle models and types. Prior to the deployment of any radio subscriber equipment, the Offeror is responsible for developing County-approved installation prototype(s) for each unique radio configuration. The Offeror is solely responsible for providing all of the necessary labor and services associated with the installation and programming of all subscriber radios. The Offeror is solely responsible for all subscriber equipment installation, programming, and flash upgrading required to remedy any hardware or software defect or bug encountered at any time throughout the project implementation. All radio installation and programming activities shall be performed in a facility approved by the County to simplify equipage and deployment logistics. The Offeror is responsible for the removal and inventory of all legacy County subscriber units following a successful system cutover and reliability test period as defined by the County. The Offeror shall separately delineate the costs of installation per radio and the costs of de-installation/removal per vehicle.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: Motorola subscribers comply shock mounting, stabilization, tilts and swiveling with locks, and customized mounting for different vehicle models and types per MIL-STD specifications.



8.1.3 Subscriber Operational Characteristics

All proposed subscriber radios shall be equipped to operate on all 700 MHz and 800 MHz public safety voice spectrum allocations per FCC and P25 channel spacing requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Communications modes shall include P25 digital trunking and conventional operations. Communications modes also shall include analog/digital conventional operations. Trunking modes shall be half-duplex in normal mode. Conventional modes shall include both half-duplex and simplex as programmed. All programmable modes shall function in either clear or encrypted mode as programmed. All modes of operation shall be programmable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Squelch modes provided by the equipment shall include: carrier, continuous tone coded, and continuous digital coded squelch. Squelch modes shall be “field programmable” by channel.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Unit identification modes shall include on a standard basis for all display radios: Unit ID upon Push-To-Talk, Emergency Unit ID, Selective Alert, Telephone Interconnect (optionally), and Alphanumeric Text Messaging (optionally).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All subscriber units shall be programmable for a variable duration transmit time- out-timer for continuous activity to prevent stuck microphone, dead key or abusive key-up scenarios.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All mobile and control station subscriber units shall be programmable for a minimum variable RF Output Power between 5-30 Watts across the entire frequency operating range.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All portable subscriber units shall be programmable for a variable RF Output Power between 1-3 Watts across the entire frequency operating range.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Mobile speaker audio output shall be 10 Watts, minimum.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

Production COTS

ALTERNATE OFFER

Fully Compliant

Production COTS.

Portable speaker audio output operating in a vehicular adapter shall be 5 Watts, minimum.

MOTOROLA RESPONSE

Fully Compliant.

Developmental.

ALTERNATE OFFER

Fully Compliant.

Developmental.

Handheld radios, not operating in a vehicular charger or adapter, should provide not less than 500 milliWatts of audio output.

MOTOROLA RESPONSE

Fully Compliant.

Production COTS.



ALTERNATE OFFER

Fully Compliant.

Production COTS.

Specialized radio accessories to support motorcycles, special weapons teams, bomb technicians, and other first responder specialists shall be made available. The Offeror shall provide a comprehensive list of compatible accessories with unit pricing for all proposed radio subscriber units.

MOTOROLA RESPONSE

Fully Compliant

Production COTS

ALTERNATE OFFER

Fully Compliant

Production COTS.

All proposed subscriber radios shall be equipped with a button or switch that activates a programmable “Home” mode or preferred channel with a single key, button press, or switch change.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

Production COTS

ALTERNATE OFFER

Fully Compliant

Production COTS.

All proposed public safety “mid-tier” subscriber radios shall be equipped with not less than 256 modes or total channel capacity. All proposed public safety “high- tier” subscriber radios shall be equipped with not less than 512 modes or total channel capacity. All proposed “non-public safety-low-tier” subscriber radios shall be equipped with not less than 64 modes or total channel capacity.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All proposed subscriber radios shall be equipped with a button or switch that activates the emergency mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed portable subscriber radios shall be less than 1.5 lbs in total weight with attached battery (not to include external accessories).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed portable subscriber radios shall be equipped to provide a minimum duty cycle of 12 hours using a 5/5/90 (5% Transmit/5% Receive/90% Idle) operational behavior model.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror shall offer portable subscriber radios with both ¼ and ½ wave antenna options.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide both transmit and receive audio control to customize the equalization and audio gain control associated with the subscriber radios to optimize the overall subscriber audio quality. The Offeror shall identify the appropriate subscriber audio gain control and equalization settings as part of the overall system design and fleetmapping process.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios and associated accessories shall be equipped to operate consistently and reliably according to manufacturer and system specifications in environmental conditions ranging from -30 degrees Celsius to +60 degrees Celsius at a 90% non-condensing humidity level.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios with display capabilities shall utilize a hardened LCD display capable of withstanding non-abusive vibration and direct impact encountered in the normal daily radio use without being rendered inoperable. The LCD displays shall provide configurable contrast levels to



enable proper usage in direct sunlight and low-light operating conditions. All display radios shall provide user-enabled backlighting for nighttime and low-light usage.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed non-public safety tier (low-tier) portable subscriber radios shall be capable of using a standard noise-cancelling, remote speaker microphone.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed public safety tier (mid-tier and high-tier) portable subscriber radios shall be capable of using noise-cancelling, remote speaker microphones that provide an emergency button, discrete volume control, rotary channel selector knob, and audio earpiece jack.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All proposed portable subscriber radios shall be equipped with a personal, desktop- style single battery charger and spare battery of the same type and duty cycle rating as the primary battery provided with the radio.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed portable subscriber radios shall be equipped with a standard belt clip in addition to any accessories that may be requested by the County for use with the portable radios.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped with a configurable button keypress timer to optimize the intended activation and clearing of emergency mode. The timer shall range from 0-to-3 seconds.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Note: The configurable long keypress timer for the emergency button ranges from 0-6.25 seconds.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Note: The configurable long keypress timer for the emergency button ranges from 0-6.25 seconds.



All proposed subscriber radios shall be equipped to mute all radio tones and/or audio when operating in covert or sensitive tactical situations (e.g., surveillance, SWAT, etc.).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed portable subscriber radios shall be equipped to provide an audible and visual battery status indication to warn of battery depletion and need to charge.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide a configurable minimum and maximum volume setting for the radio so as to be able to customize audio levels for various operating environments.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide configurable button, switch, and menu layouts to customize the radio operational characteristics for the various users and agencies. All buttons, switches, and menu items that are labeled or inscribed shall match the programmable functionality so as not to confuse the radio operators.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide multiple configurable groupings of talkgroups and channels to uniquely organize the available modes programmed into each radio. Each grouping shall be accessible through any defined combination of button, switch, or menu item setting. Trunking and conventional channels shall be capable of being interleaved within a programmable grouping.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide user-definable, priority scan functionality for all systems and channels programmed into the radio. Radio scan lists shall include at least eight (8) talkgroups or members each. Any combination of talkgroups and conventional channels shall be definable in a scan list.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All proposed subscriber radios equipped for encrypted operation shall provide both infinite key retention capability and volatile key retention modes of operation which must be configurable in the individual radio programming.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide a keypad lock functionality to prevent inadvertent mode or switch activation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be equipped to provide password-protection (on a configurable radio programming basis) to gain access to the radio for normal system usage.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All proposed subscriber radios shall be equipped to provide selective radio disable/inhibit, uninhibit, and dynamic regrouping functionality in conjunction with the system NMS and dispatch consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All proposed subscriber radios shall be flash-upgradeable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.4 Mobile Subscriber Units

8.1.4.1 Power Supply

The equipment shall operate from an external negative ground primary power source supplying a nominal 12 VDC.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All power circuits shall provide for reverse polarity protection and each power cabling assembly shall be properly fused and grounded.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Mobiles shall be equipped to operate in both a continuous mode (always powered on) or in a switched mode (powered down with an ignition sense) as required on an individual basis by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

There may be a limited number of units requiring positive ground kits as determined at time of installation. Unit costs related to these kits shall be clearly and individually identified in the pricing section of the Offeror's response. If there is also an incremental installation cost related to the positive ground vehicles, the costs also shall be clearly and individually identified in the response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



8.1.4.2 Mobile Equipment Housing

The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Palm microphones, external speaker housings and transceiver housings shall be constructed of high impact polycarbonate plastic or other suitable high impact material.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Trunk-mounted transceiver housings shall be equipped with a base plate. The base plate shall allow for the removal of the transceiver from its mounted location for replacement or servicing. Removal of the transceiver from the base plate shall not expose its internal circuitry.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.4.3 Mobile Radio Features

All mobiles shall be equipped with a backlit, alphanumeric character LCD display providing at least 12 characters to identify the operating folder/zone and trunked talkgroup and/or conventional channel



mode. As a standard option, keypad configurations shall conform to the North American telephone keypad standard numerical and symbol layout.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The LCD display shall provide contrast adjustment and its brightness shall be user adjustable. The LCD display shall be equipped for dimming and complete turn-off for surveillance and covert operations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Mobiles shall be offered with the capability of interfacing to the following accessories and ancillary assemblies as required by the County: horn and lights activation relays, siren/PA control head, status/message control head, external emergency switch or button, motorcycle assembly, dual control head-single radio, multi-band radio-single control head, handheld control head/keypad microphone, and a stationary mobile control station.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All mobiles shall be equipped with an external data port for connection to test equipment, radio programming devices, mobile data devices, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

On dual control head units, the switch to enable or disable scanning shall be field programmable or designated by the user.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

On dual control head units, each control head shall be equipped with a switch to takeover control of the unit.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

On dual control head units, transmit and receive audio shall, at all times, be available from both front and rear positions regardless of the position of the takeover control switch.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.4.4 Mobile Radio Accessories

The units shall be equipped with a palm type microphone with coiled cord. The microphone shall be of the modular connector, plug-in type. Remote units for outside vehicle use shall have, at a minimum, a weatherproof rating.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Each unit shall be equipped with an in-vehicle speaker. The speakers shall be of the modular connector, plug-in type. Remote speakers for outside vehicle use shall have, at a minimum, a weatherproof rating.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Dual control heads shall be available for specialized fire apparatus, EMS ambulances, and other unique applications as defined.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Most mobile radios shall require the installation of a weatherproof, center-of-the-roof-mounted, low-profile 3dB gain type antenna operational across the entire 764-861 MHz frequency range per current FCC requirements. The Offeror shall work with the County at the time of radio installation to define the re-use of an existing hole for antenna installation and possible temporary use of a magnetic mount antenna for the legacy radio to facilitate the cutover process and minimization of holes cut into the vehicle, as well as for low profile antennas where necessary. The Offeror shall define the unit cost for a magnetic mount antenna with associated cabling operational across the entire 764-861 MHz frequency range per current FCC requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Mobile radios shall be offered which are compatible with the installation of common fire/emergency services apparatus headset intercom systems (e.g., David Clark, Firecom, etc.). The Offeror shall completely integrate and wire all new subscriber radios with the various headset interfaces in use or intended for use as required to fully complete a vehicle installation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.4.5 (Option) Installation of Mobile Radios

As an option, the Offeror shall describe the requirements for the installation of mobile radios in vehicles of all types (cruisers, sedans, utility vehicles, fire apparatus, ambulances, etc.). This information shall include a description of any certifications required by the installation technician that ensures the mobile radio will be installed appropriately with all warranty/maintenance requirements protected.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.5 Portable Subscriber Units

8.1.5.1 Power Supply

The equipment shall operate from an internal battery power source. All power circuits shall provide for non-destructive reverse polarity and overcharge protection.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.5.2 Portable Radio Equipment Housing

The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment. The housing shall be constructed of high impact polycarbonate plastic or other suitable high impact material.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Removal of the battery from the unit shall not expose its internal circuitry and all battery leads/external connection points shall be properly sealed and covered to prevent any internal moisture damage to the radio.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.5.3 Portable Radio Features

All portables shall be equipped with a backlit, alphanumeric character LCD display providing at least 8 characters to identify the operating channel grouping and trunked talkgroup and/or conventional channel mode. As a standard option, keypad configurations shall conform to the North American telephone keypad standard numerical and symbol layout.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The LCD display shall be top or front-mounted.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The LCD display shall provide contrast adjustment and its brightness shall be user adjustable. The LCD display shall be equipped for dimming and complete turn-off for surveillance and covert operations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All portables shall be equipped with a top-mounted rotary volume control knob.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All portables shall be equipped with a primary, top-mounted trunked talkgroup or conventional channel selector knob.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All portables shall be equipped with an external data port for connection to test equipment, radio programming devices, mobile data devices, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All portables shall be equipped with a user-operated, color-coded switch or button to activate the radio's emergency status mode.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Portables shall be offered with the capability of interfacing to the following accessories and ancillary assemblies as required by the County: man-down emergency activation switch, public safety speaker microphone (i.e., elevated antenna at shoulder height), multiple unit charger/conditioner, surveillance headsets/earpieces, Bluetooth accessories, RF adapter switch for vehicular mobile adapter assemblies, GPS-speaker microphones, bone microphones, and temple transducers.

MOTOROLA RESPONSE

MAIN OFFER

Conditionally Compliant

Developmental.

All proposed portable Motorola subscribers offered offer multiple unit charger/conditioner, surveillance headsets/earpieces, bone microphones, and temple transducers.

The public safety microphone is offered with the APX 6000 Li and APX 7000 portable series. The APX 4000 and APX 4000 Li portable series are not compatible with a public safety microphone.

The man-down emergency activation switch, Bluetooth accessories and GPS-speaker microphones are offered with the APX 4000, APX 6000 Li and APX 7000 portable series.



The APX 4000 Li portable series are not compatible with man-down emergency activation switch, Bluetooth accessories and GPS-speaker microphones.

The RF adapter switch for vehicular mobile adapter assemblies is a feature currently in the planning phase for the APX 6000 Series and planned for a future release. This product is not planned for the APX 4000 Li, APX 4000 or APX 7000 Series.

ALTERNATE OFFER

Conditionally Compliant

Developmental.

All proposed portable Motorola subscribers offered offer multiple unit charger/conditioner, surveillance headsets/earpieces, bone microphones, and temple transducers.

The public safety microphone is offered with the APX 6000 Li and APX 7000 portable series. The APX 4000 and APX 4000 Li portable series are not compatible with a public safety microphone.

The man-down emergency activation switch, Bluetooth accessories and GPS-speaker microphones are offered with the APX 4000, APX 6000 Li and APX 7000 portable series. The APX 4000 Li portable series are not compatible with man-down emergency activation switch, Bluetooth accessories and GPS-speaker microphones.

The RF adapter switch for vehicular mobile adapter assemblies is a feature currently in the planning phase for the APX 6000 Series and planned for a future release. This product is not planned for the APX 4000 Li, APX 4000 or APX 7000 Series.

8.1.5.4 Portable Radio Accessories

All portables shall be equipped to operate in a tri-chemistry, ruggedized, pocket- style vehicular mobile charger that does not cover up the LCD display. The vehicular charger shall operate from the vehicle's battery, and provide a charger/conditioning system for the portable radio battery. The charger shall be mechanically configured to provide electrical contact to the radio battery upon insertion of the radio or separate battery into the charger. Rapid battery charging shall be possible whether the battery is out of or attached to the radio. The proposed vehicular charger shall be compatible with every proposed portable radio type, and different vehicular chargers shall not be required based upon the radio or battery type.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

All portables operate in a dual-chemistry, ruggedized, pocketstyle vehicular mobile charger that does not cover up the LCD display. Motorola proposed portable subscribers are offered with LiIon and NiMh batteries.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

All portables operate in a dual-chemistry, ruggedized, pocketstyle vehicular mobile charger that does not cover up the LCD display. Motorola proposed portable subscribers are offered with LiIon and NiMh batteries.

All portable batteries shall be equipped to operate in a tri-chemistry, pocket-style vehicular mobile travel charger. The vehicular travel charger shall operate from the vehicle's cigarette lighter/accessory connector, and provide a charger/conditioning system for the spare portable radio battery. The proposed travel charger shall be compatible with every proposed portable radio type, and different travel chargers shall not be required based upon the radio or battery type.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

All portable batteries operate in a dual-chemistry, pocket-style vehicular mobile travel charger. Motorola proposed portable subscribers are offered with LiIon and NiMh batteries.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

All portable batteries operate in a dual-chemistry, pocket-style vehicular mobile travel charger. Motorola proposed portable subscribers are offered with LiIon and NiMh batteries.

Portables shall be offered with the capability to operate in a tri-chemistry, ruggedized, pocket-style portable vehicular adapter that converts the portable radio into a quasi-mobile radio configuration as required by the County. The portable vehicular adapter shall operate from the vehicle's battery, and provide: an external, roof-mounted antenna system, external mobile-style audio speaker, handheld microphone, and battery charger/conditioning system for the portable radio battery. The charger shall be mechanically configured to provide electrical contact to the radio battery upon insertion of the radio or separate battery into the charger. Rapid battery charging shall be possible whether the battery is out of or attached to the radio.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Developmental.



APX 6000 Series Vehicular Adapter will provide the ability for an APX 6000 series portable radio to adapt and connect to the vehicle antenna, mobile microphone and loudspeaker while also charging the radio. Motorola is currently planning to develop a dual-chemistry vehicular adapter product in a future release for the APX 6000, APX 6000 Li and APX 6000 XE Series. It will support 800MHz and FDMA operation.

ALTERNATE OFFER:

Conditionally Compliant.

Developmental.

APX 6000 Series Vehicular Adapter will provide the ability for an APX 6000 series portable radio to adapt and connect to the vehicle antenna, mobile microphone and loudspeaker while also charging the radio. Motorola is currently planning to develop a dual-chemistry vehicular adapter product in a future release for the APX 6000, APX 6000 Li and APX 6000 XE Series. It will support 800MHz and FDMA operation.

All portables shall be equipped to operate in a tri-chemistry, ruggedized, pocket- style 120VAC multiple unit charger that can simultaneously charge/condition a minimum of six portable batteries of any chemistry type. The proposed multi-unit charger shall be compatible with every proposed portable radio type, and different multi-unit chargers shall not be required based upon the radio or battery type.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Developmental.

APX 6000 Series Vehicular Adapter will provide the ability for an APX 6000 series portable radio to adapt and connect to the vehicle antenna, mobile microphone and loudspeaker while also charging the radio. Motorola is currently planning to develop a dual-chemistry vehicular adapter product in a future release for the APX 6000, APX 6000 Li and APX 6000 XE Series. It will support 800MHz and FDMA operation.

ALTERNATE OFFER:

Conditionally Compliant.

Developmental.

APX 6000 Series Vehicular Adapter will provide the ability for an APX 6000 series portable radio to adapt and connect to the vehicle antenna, mobile microphone and loudspeaker while also charging the radio. Motorola is currently planning to develop a dual-chemistry vehicular adapter product in a future release for the APX 6000, APX 6000 Li and APX 6000 XE Series. It will support 800MHz and FDMA operation.



8.1.6 RF Control Stations

The County requires wireless access to the trunked system from various fixed facilities throughout the County. The Offeror shall be responsible for assessing, deploying, testing, and documenting all control station installation efforts. Control station installation efforts shall include: all mounting, 120VAC electrical and power supply wiring, grounding, surge suppression, antenna and transmission line cabling, connectorization, attenuation, audio and accessory cabling, radio programming and optimization necessary to fully commission each control station.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All control station radios shall meet all mechanical, electrical and operational requirements previously specified for “Mobile Subscriber Units.” All control stations, with the exception of the dispatch center backup control stations or specialized digital remote control deskset interfaces, may be of an adapted mobile configuration with dedicated desktop microphone. The Offeror shall be responsible for coordinating control station installations with the respective user agencies.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The control stations throughout the County shall be integrated to mimic the functionality that currently exists at each facility and shall provide continuity of operation throughout the cutover period. Each control station also shall be equipped with control station desktop and handset-style remote control unit if currently utilized.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.7 Subscriber Unit Inventory

The Appendix D of this specification identifies quantities of subscriber units for the intended user agencies of the proposed trunked system. Offerors are required to study the enclosed inventory in order to properly quantify and price the necessary equipment for this proposal. The quantities described relate to those radios that may be purchased by the County or member localities. In addition to radios acquired by the County, the Offeror should anticipate that an additional, yet unknown number of radios will likely be purchased by other governmental agencies interoperating within the County network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.1.8 System Programming

The Offeror shall provide six (6) complete sets of programming hardware and software for all subscriber equipment initially ordered. This equipment complement shall include all hardware and software necessary to program, troubleshoot, and flash upgrade each proposed subscriber unit type. Any system-specific programming keys and/or software authentication files shall be included so that the County can uniquely provision its entire subscriber unit fleet internally following final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Prior to final system acceptance and at the County's determination, the County requires the Offeror to program the most current County fleetmap information and flash upgrade all radio subscriber units purchased as part of this procurement so that the radio software/firmware is consistent with subscriber units shipping from the manufacturer's factory at that time.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Throughout the fifteen-year manufacturer support period, the Offeror shall produce a semi-annual product bulletin for each proposed subscriber unit type that thoroughly defines the available flash upgrades and notes all product enhancements/bug fixes contained in the specific flash upgrade. Throughout the manufacturer support period, the County shall be entitled to receive at no charge the appropriate quantities of any subscriber unit flash upgrade kit that addresses an identified product defect or bug fix.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.



8.2 SUBSCRIBER RADIO DESIGN

The Offeror shall provide the following radio subscriber fleet information and documentation details based upon County requirements and specifications:

- Fleetmap/Programmable ID Plan

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Subscriber Unit Fleet Inventory by Serial Number, Part Number, Options

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provisioning Databases/Radio Personalities/Firmware Versions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Subscriber Unit License Matrix/Structure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Installation Prototypes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Control Station Configuration/Antenna Orientation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Layouts and Physical Dimensions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Electrical, HVAC, and Floor Loading Requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.3 SUBSCRIBER SOFTWARE/HARDWARE ROADMAP

The County intends to maximize and protect its subscriber radio purchase investment. The Offeror is required to provide support for the proposed subscriber unit fleet offering for a period of not less than fifteen (15) years from the date of final system acceptance. The offering consists of all hardware, software, cabling, and services rendered to implement the proposed radio subscriber unit fleet.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or



foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.

Offeror support is defined as the ability of the Offeror to remedy to County satisfaction any hardware and/or software problem with any subscriber equipment and services provided as part of this offering. Offeror support shall take the form of a 24x7x365 technical support hotline, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or spare/replacement equipment and software for the proposed offering for not less than fifteen (15) years from the date of final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform. Within the 15 year manufacture support period, Motorola will offer the APX Series or an equivalent product.



The County requires the Offeror to provide a comprehensive product roadmap (noting timetable of initial release through end of Offeror supportability) for the proposed subscriber unit fleet defining the product life cycles of all major components and ancillary accessories. The County further requires the Offeror to define the OEM status of all of all major subscriber unit components and ancillary accessories.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola's APX Series of Portable and Mobile products are Motorola's latest generation of P25 capable products and are available in multiple models and configurations for both portables and mobiles. Currently, Motorola is still in the development phase for the APX series of products and is still introducing newer versions and variations including the recently released APX 4500 Mobile, APX3000 Covert Radio, O2 /O7 color display rugged controlhead, APX 4000Li portable, the APX4500Li mobile. Upcoming releases include the APX Multiband DVRS solution, and Dual Radio solution.

Many enhancements and improvements to the products will be part of every upcoming release. These features may be customer specific or in support of product requirements or user experiences. We would be happy to discuss these with you under non-disclosure agreement.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola's APX Series of Portable and Mobile products are Motorola's latest generation of P25 capable products and are available in multiple models and configurations for both portables and mobiles. Currently, Motorola is still in the development phase for the APX series of products and is still introducing newer versions and variations including the recently released APX 4500 Mobile, APX3000 Covert Radio, O2 /O7 color display rugged controlhead, APX 4000Li portable, the APX4500Li mobile. Upcoming releases include the APX Multiband DVRS solution, and Dual Radio solution.

Many enhancements and improvements to the products will be part of every upcoming release. These features may be customer specific or in support of product requirements or user experiences. We would be happy to discuss these with you under non-disclosure agreement.

8.4 SUBSCRIBER RADIO OPTIONAL FEATURES

The Offeror shall provide a detailed list (with associated pricing) and explanation of optional features and accessories for all proposed subscriber radios that can be supplied for review and understanding.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

8.5 EXISTING SUBSCRIBERS

The County currently owns a large quantity of subscriber radios that are capable of being upgraded to P25 operation. The Offeror shall provide unit pricing for all software and services required to provide this upgrade and shall ensure that the upgraded subscriber units are properly programmed to operate on the proposed P25 system. In addition, the Offeror may propose trade-in credits/discounts for replacement subscriber units. Subscriber unit types and quantities are addressed in the Appendix D of this document.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall ensure that all upgraded subscriber units include all features and functionality of current, pre-upgraded subscriber units on the County system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

9.0 REDUNDANCY AND BACKUP CONSIDERATIONS

All critical components of the proposed system infrastructure shall be designed with extraordinary redundancy and fault tolerance in order to provide a high system availability of 99.9999% for the County users. System Availability shall be defined by the following equation:

$$\text{System Availability} = 100 * \left(1 - \frac{\text{Unavailable Time}}{\text{Total Time}} \right)$$



where ‘UNAVAILABLE Time’ is the total time in which any simulcast cell or multicast site experiences a Severity 1 failure as defined in Section 2.7.9 of this document. In accordance with this definition, the Offeror shall provide its approach and method for calculation of the unavailable time.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola’s proposed Microwave and existing MNCs are 99.9999% compliant. Motorola ASTRO 25 systems are very highly reliable networks with standard redundancy for the most critical components and optional redundancy for other components. Motorola analyzes the reliability of system components and how they contribute to the overall system availability during the product specification and design process. Our sophisticated availability modeling analysis considers the entire system design, from the Master Site call processing equipment, to the backhaul links, to the antennas on the towers. The proposed simulcast system is predicted to be able to achieve a system availability of greater than 99.99683%. The RF distribution systems (antennas, Tx combiners, Rx multicouplers) at the RF sites are the biggest obstacle to achieving a high system availability. With redundant RF distribution systems a system availability of 99.999% could be achieved. Most customers choose not to implement redundant RF distribution systems because there is a point of diminishing returns where the extra costs do not justify the potential risk. Redundant RF distribution system could require larger towers and additional costs for leased sites. Motorola predicts system availability with the following calculation:

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTTR} + \text{MTBF}}$$

Motorola considers the system to be available as long as Wide Area Trunking operation is maintained at all the RF and Dispatch sites. Site Trunking and Failsoft are typical fallback modes when Wide Area Trunking cannot be maintained. Motorola would prefer working with you to understand your specific availability concerns to determine which of the various availability features Motorola offers which will best fit your needs.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola’s proposed Microwave and existing MNCs are 99.9999% compliant. Motorola ASTRO 25 systems are very highly reliable networks with standard redundancy for the most critical components and optional redundancy for other components. Motorola analyzes the reliability of system components and how they contribute to the overall system availability during the product specification and design process. Our sophisticated availability modeling analysis considers the entire system design, from the Master Site call processing equipment, to the backhaul links, to the antennas on the towers. The proposed simulcast system is predicted to be able to achieve a system availability of greater than



99.9683%. If redundant Site Gateways were chosen to be implemented at all the remote RF sites, a system availability of greater than 99.99683% could be achieved. The RF distribution systems (antennas, Tx combiners, Rx multicouplers) at the RF sites are the biggest obstacle to achieving a high system availability. With redundant RF distribution systems a system availability of 99.999% could be achieved. Most customers choose not to implement redundant RF distribution systems because there is a point of diminishing returns where the extra costs do not justify the potential risk. Redundant RF distribution system could require larger towers and additional costs for leased sites. Motorola predicts system availability with the following calculation:

$$\text{Availability} = \frac{\text{MTBF}}{\text{MTTR} + \text{MTBF}}$$

Motorola considers the system to be available as long as Wide Area Trunking operation is maintained at all the RF and Dispatch sites. Site Trunking and Failsoft are typical fallback modes when Wide Area Trunking cannot be maintained. Motorola would prefer working with you to understand your specific availability concerns to determine which of the various availability features Motorola offers which will best fit your needs.

At a minimum, the proposed system shall include the necessary redundancy as feasible for all core components, radio network controllers, base station transceivers, networking equipment, switching infrastructure, servers, backbone infrastructure, console electronics, power supplies, etc. to maintain the high system availability and trunking operations. In the event that the proposed system design and architecture does not lend itself to hot-standby or fault-tolerant redundancy, the Offeror shall identify and include pricing for an appropriate spares complement to quickly remedy a system problem. Single point failures shall be addressed in the proposed design and the Offeror maintains responsibility for guaranteeing, through a comprehensive single point failure analysis that no such system vulnerability exists.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Such redundant equipment shall be in a hot-standby mode until such time as a failure requires that the redundant components be enabled. Enabling or switching over of redundant radio network controllers and subsystem components shall be automatically performed by the proposed radio system upon failure detection. The physically diverse distribution of redundant key components, whenever practical, is desired by the County. The Offeror shall provide MTBF and MTTR data for the proposed system network elements and provide performance metrics from actual customer and



development systems that support the ability to achieve the system availability required by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola would be happy to discuss MTTR statistics dependent upon the final configuration.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola would be happy to discuss MTTR statistics dependent upon the final configuration.

9.1 INFRASTRUCTURE REQUIREMENTS

Critical infrastructure and subsystem components of the radio system infrastructures shall be designed with redundancy in order to provide high system availability and dependability. The Offeror shall offer fault-tolerant, distributed processing and hot- standby equipment configurations as feasible. The County requires a system that will not suffer a loss of wide-area, County trunking functionality resulting from the failure of a single system component or network element. Sufficient redundancy and fault tolerance must be designed and provided so that fully-functional trunking operations will continue without interruption to existing communications.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

When switching from active to standby Zone Controllers, all consoles, RF sites, and subscribers will return to wide area operation, typically in 20 seconds, but less than 75 seconds. During this switching the system will transition through Site Trunking operation, which results in the dispatch console positions not having direct wireline access to the RF sites for this short period of time. The typical fallback mode for dispatch consoles during Site Trunking is to use control stations for the key talkgroups. A manual switch of system controllers can be performed from a NMS Client by user with the proper login credentials. Subscriber radios and consoles will not be forced to re-affiliate or re-register with the network during the transition between controllers.



ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

When switching from active to standby Zone Controllers, all consoles, RF sites, and subscribers will return to wide area operation, typically in 20 seconds, but less than 75 seconds. During this switching the system will transition through Site Trunking operation, which results in the dispatch console positions not having direct wireline access to the RF sites for this short period of time. The typical fallback mode for dispatch consoles during Site Trunking is to use control stations for the key talkgroups. A manual switch of system controllers can be performed from a NMS Client by user with the proper login credentials. Subscriber radios and consoles will not be forced to re-affiliate or re-register with the network during the transition between controllers.

The County further requires that any system component, cabinet, or power distribution design, that could render the system or 20% of its channel resources useless or unavailable for communication from a single failure, shall incorporate redundancy sufficient to eliminate this vulnerability and to maintain at least 80% of its channel resources useful and available for communication.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola is proposing spares for system restoration.

The County also requires redundancy and fault-tolerance to be implemented in the design so as to guarantee that a single network element or component failure does not render more than two dispatch operator positions inoperable simultaneously.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola's proposed solution provides maximum redundancy however due to shared use of LAN switches there could be situations where the failure of a LAN switch may result in multiple operator positions being disabled simultaneously. Motorola has designed Lake County's console site with three separate LAN switches so that no more than one-third of



the total operator positions will be disabled simultaneously due to a single point of failure. That is, three OP positions will be connected to LAN Switch 1, other three OP positions to LAN Switch 2 and remaining two OP positions will be connected to LAN Switch 3. Failure of a LAN Switch will render only two or three OP positions inoperable, without affecting the operation of other OP positions. Motorola has included a spare LAN switch to expedite restoration in this unlikely scenario.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola's proposed solution provides maximum redundancy however due to shared use of LAN switches there could be situations where the failure of a LAN switch may result in multiple operator positions being disabled simultaneously. Motorola has designed Lake County's console site with three separate LAN switches so that no more than one-third of the total operator positions will be disabled simultaneously due to a single point of failure. That is, three OP positions will be connected to LAN Switch 1, other three OP positions to LAN Switch 2 and remaining two OP positions will be connected to LAN Switch 3. Failure of a LAN Switch will render only two or three OP positions inoperable, without affecting the operation of other OP positions. Motorola has included a spare LAN switch to expedite restoration in this unlikely scenario.

The County requires the necessary redundancy and loop transport topology so that a single network element/component failure or path fade does not orphan a network node or RF site and diminish radio coverage. The system shall provide the necessary redundancy and fault-tolerance to ensure that two-way digital voice communications remain operational even in the event of the loss of any individual site (although it is understood that coverage may be slightly diminished around the failed site if a specific site has been rendered totally inoperable).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The vendor shall include in its failure analysis the effect on coverage of a loss of each RF site. This effect shall be stated in terms of the percentage of coverage area lost for a portable on-hip, in a swivel case, talk-in/talk-out, at the required reliability.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please refer to maps in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please refer to maps in Package 2 Section 3.

For redundant system controllers, both controllers shall remain on-line in continuous duty operation with real-time, parallel updating of static and dynamic system data so as to provided minimal disruption of service in the event of a failure of the active (as opposed to standby) controller equipment. Switching from active to standby operation shall be fully automatic, with audible and visual indication of the switchover provided to the NMS workstations as well as to the supervisory dispatch console positions. The Offeror shall specify the amount of time it will take between primary controller failure and backup controller switchover. Remote switching functionality from main to standby controller operation shall be provided at the NMS clients and supervisory console as a manual override to automatic switchover. The Offeror also shall specify the period of time required and the procedure for manual switchover to redundant system controller(s). No loss of system functionality shall be experienced during the transition from an active to a standby network controller. Subscriber radios and dispatch consoles shall not be forced to re-affiliate or re-register with the network upon transitioning from active to standby network controllers.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

When switching from active to standby Zone Controllers, all consoles, RF sites, and subscribers will return to wide area operation, typically in 20 seconds, but less than 75 seconds. During this switching the system will transition through Site Trunking operation, which results in the dispatch console positions not having direct wireline access to the RF sites for this short period of time. The typical fallback mode for dispatch consoles during Site Trunking is to use control stations for the key talkgroups. A manual switch of system controllers can be performed from a NMS Client by user with the proper login credentials. Subscriber radios and consoles will not be forced to re-affiliate or re-register with the network during the transition between controllers.



ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

When switching from active to standby Zone Controllers, all consoles, RF sites, and subscribers will return to wide area operation, typically in 20 seconds, but less than 75 seconds. During this switching the system will transition through Site Trunking operation, which results in the dispatch console positions not having direct wireline access to the RF sites for this short period of time. The typical fallback mode for dispatch consoles during Site Trunking is to use control stations for the key talkgroups. A manual switch of system controllers can be performed from a NMS Client by user with the proper login credentials. Subscriber radios and consoles will not be forced to re-affiliate or re-register with the network during the transition between controllers.

Real-time notification and current system operating status information shall be made to all dispatch consoles and NMS client workstations when the system has entered any degraded mode of system communications so that operational user behaviors may be modified to work around the specific failure. All user radios also shall be presented in real-time with audible and visual alerts that indicate the current mode of system communications if any system failure mode has been instantiated.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

In the extremely unlikely event that failures shall cause system users to operate in conventional mode until trunking operation recovery can be made, the Offeror shall describe the failure logic in complete detail, the mode of operation during such conditions, as well as the recovery process in the proposal responses. All failure modes shall be designed such that wide-area coverage and dispatcher connectivity are maintained throughout the County. Despite the possible loss of trunking functionality, the system fallback modes of operation shall deliver conventional talk-and-listen digital voice functionality throughout the County. Feature sacrifices shall be described in detail for infrastructure, consoles, and subscriber units for all primary and fallback modes of communication. As a last resort, individual sites shall be equipped to provide repeated conventional digital voice functionality throughout the coverage area delivered by that respective site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall design and implement the County fleetmap to take advantage of all failure modes of communication so that voice communications are preserved to the greatest extent possible. The Offeror shall describe the redundancy and preventive measures built in to the system design so that high availability and dependability levels can be met. The County considers this detail extremely important in the analysis and evaluation of the Offeror's proposal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please refer to Package 2 Section 3 for details.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please refer to Package 2 Section 3 for details.

9.2 COMPREHENSIVE REDUNDANCY DESIGN

The Offeror's design for redundancy shall be comprehensive and incorporate support for every component required for network operation. The power systems required to support network components must include a comprehensive redundancy plan that prohibits failure to power the network's components. Infrastructure support elements such as system performance monitoring, HVAC, and structure security must also be supported.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



9.3 INTERCONNECTION LINKS

The Offeror shall describe all levels of link redundancy supported or required by the system and define the point-to-point link capacity impact on the microwave system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

9.4 PHYSICAL SECURITY AT NETWORK SITES

In addition to proposing a design that provides network redundancy, the Offeror also shall consider the issues of physical security and redundancy in alarms, etc. employed to protect the system from abuse or external attack. Proximity, intrusion, and other alarms shall incorporate a design to minimize the potential of damage from the disablement of any single alarm device. In the transmission of network alarm data, redundancy in the network used for signaling alarms and fault events to the NMS client workstations is desired.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.0 COMMUNICATION SITE FACILITIES/SITE IMPROVEMENTS

10.1 SCOPE OF WORK

The Offeror shall be responsible for the following:

- As necessary, the deployment of new tower and shelter facilities equipped with commercial and emergency backup power to support the proposed radio system plus specified expansion margins.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

We are fully compliant for backup power. In the alternate option, we provide 75% expansion space margin.

- As necessary, the refurbishment or enhancement of existing tower and shelter facilities equipped with commercial and emergency backup power to support the proposed radio system plus specified expansion margins.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Design, procurement, manufacturing, shipping, installation, and testing of all materials and equipment necessary to complete the site readiness work.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- As necessary, the design and preparation of all proposed sites in accordance with all applicable ordinances and regulations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Submittal for approval of all details, cut sheets, and drawings of proposed equipment and control systems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Disposal and removal of debris and refuse from each site, as the result of performing any work, including any components removed from towers as authorized by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All Federal, State, County and local municipality permits, licensing and required authorizations of any kind including, but not necessarily limited to: NEPA, State Historic Preservation, Zoning/Planning, FAA, FCC, DOT, NFPA, OSHA, etc.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Compliance with all codes, safety regulations, and ordinances in accordance with the requirements set forth in the specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.2 GENERAL SITE WORK

The following requirements are specified for the communication facilities at all new and existing sites proposed by the Offeror for use as part of the County radio communications system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.2.1 Summary of Work

- Site work includes: all clearing and earthwork; geotechnical analysis, excavating and backfilling; compacting and grading; stone surfacing and fencing; drainage and landscaping; and tower/shelter/generator foundation work. Further site and communication facility work required by the County may include:

MOTOROLA RESPONSE

MAIN RESPONSE:

Fully Compliant.

Production COTS.

ALTERNATE RESPONSE:

Conditionally Compliant.

Production COTS.



- Design and implementation of 100-foot x 100-foot (as feasible) site compounds including fencing, stone surfacing, and access road. (New sites only)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

All site compounds are existing, some Municipal Water Tanks and are close to 100x100 where feasible.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

All site compounds are existing, some Municipal Water Tanks and are close to 100x100 where feasible.

- Design, manufacturing, delivery and installation of pre-fabricated, hardened concrete shelters.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Design, manufacturing, delivery and installation of self-supporting towers and ice bridges.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No proliferation of new towers.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No proliferation of new towers.



- Design and installation of all foundations including required soil exploration and geotechnical analysis.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Design, manufacturing, delivery and installation of generators and associated fuel tanks.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Design of fuel tanks for the main offer will be below ground.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Design of fuel tanks for the alternate offer will be above ground.

- Design and implementation of single point grounding system for entire site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Coordination of electrical power and utilities to the site.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Permits and approvals required for site work.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Coordinate telephone line service as required.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide security hardware to protect sites.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Documentation of all construction efforts.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.3 EXISTING FACILITY UPGRADES

To support the proposed system, the County anticipates the ability to re-use some or all of the current shelters and system infrastructure, including sites that are leased by the County, that serve the current network. Re-use of any of the existing infrastructure may require facility enhancements, site owner approvals and/or upgrades to adequately support the new network. Site upgrades shall be implemented in a non-intrusive manner so that the existing network experiences no system disruption while commissioning the proposed system in parallel. The Offeror shall be responsible for thoroughly identifying, documenting, and implementing all required upgrades, approvals, modifications, and enhancements necessary to fully commission the proposed County radio communications system at existing facilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall be responsible for all site surveys, structural analyses, and feasibility studies to determine the complete suitability of existing and candidate tower/shelter locations to serve the proposed network. To minimize the proliferation of towers within the County, the Offeror is encouraged to identify any existing commercial towers and sites which could be used to support the Offeror's proposed design.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4 GENERAL REQUIREMENTS

The Offeror shall engineer, furnish, and install complete and fully operational RF and microwave sites necessary to support the proposed radio system. If new or upgraded sites are proposed by the Offeror, all site design work shall conform to these specifications and be stamped by a professional engineer with an active State of Illinois certification. An Illinois-registered land surveyor or civil engineering firm shall prepare all site plans.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall be responsible for a complete and fully operable installation in accordance with the latest version of the National Electrical Code, local building codes, environmental laws, zoning and planning regulations or ordinances, land use restrictions, Federal Aviation Administration and Federal Communications Commission rules and regulations, Illinois Department of Transportation regulations governing road access and entry, and all other applicable local, state or Federal codes, regulations, laws and/or ordinances. In the event of conflicting requirements the most stringent interpretation shall apply except as permitted by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Materials furnished by the Offeror shall be new and of first quality as defined in industry standards. The Offeror shall not make substitutes unless prior approval has been obtained from the County Project Manager.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror assumes full responsibility for materials and equipment employed in construction of the project and agrees to make no claims against the County for damages to such materials and equipment except for those, if any, caused by the County, its employees or agents. The Offeror shall be responsible for storage of all materials purchased and turned over to the Offeror by the County and shall receive all delivered items by contractors at the job site or at a staging area to be furnished by the Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

On a daily basis (or sooner if directed by the County Project Manager), the Offeror shall clean up and remove from the work site all rubbish and construction debris, resulting from project work. The Offeror shall supply a dumpster or similar trash storage/removal device wherever a substantial amount of construction debris is generated. Upon completion of work, the entire job site areas shall be left clean and free of trash, debris, mud, dirt, dust, scrap materials, and excess materials. Construction work zone signs, tape, and pedestrian barriers shall be utilized at all times to prevent unwarranted site access.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radio equipment shelters and equipment rooms shall be thoroughly cleaned (including walls and floors) to the satisfaction of the County Project Manager upon completion of installation and construction work.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall coordinate the work of all the trades under its responsibility to ensure that interference between electrical conduits, cable support trays, grounding wire, structural, and the radio system components shall be avoided so that the project is completed within budget and schedule.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall keep current, marked-up prints of all Project Drawings. Markings indicating changes to the drawings shall be red or green and clearly visible. Six (6) complete sets of Final Site Facility "As-Built" drawings (containing all construction and design drawings for: towers, shelters, electrical, site plans, foundations, mechanical, fire suppression, site photos, alarm systems/annunciators, test results, permits, etc.), free of all field mark-ups, shall be furnished to the County Project Manager at the completion of the project. Original Project Drawings also shall be supplied on three (3) separate CD/DVD RW disks in native file format(s) (i.e., MS- Word, MS- Excel) as utilized so that drawings may be modified at some point in the future by County system management personnel.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.1 Stone Surfacing

The Offeror shall install stone surfacing to a minimum depth of three (3) inches within the fenced in site area. Material shall be ¾-inch broken stone with 10% binder material. Two layers of polypropylene liner shall be installed under the stone for foliage suppression. Prior to the laying of any surfacing material, an EPA- approved defoliant or herbicide shall be applied over the area to eliminate the proliferation of weeds and unwanted foliage.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola contractors will provide, as standard protocol, minimum 6' of ¾ stone material with 10% binder. Where Permissible, EPA approved herbicide shall be applied in a minimum of 10 lbs product per acre prior to 1 layer of geo-textile fabric to aid in drainage.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola contractors will provide, as standard protocol, minimum 6' of ¾ stone material with 10% binder. Where Permissible, EPA approved herbicide shall be applied in a minimum of 10 lbs product per acre prior to 1 layer of geo-textile fabric to aid in drainage.

10.4.2 Fencing

For all newly-proposed sites, the Offeror shall provide hot-dipped galvanized, 8- foot high chain link security fencing with top-mounted razor wire around the entire site compound perimeter (as determined by the ultimate site plan which ideally will be approximately 100-foot x 100-foot in area) with both a 16-foot vehicular gate and a 4-foot pedestrian gate. Fencing shall be not less than a 9 gauge, 2-inch zinc coated diamond mesh. Corner, line posts and gateposts (2½-inch, 2-inch and 4-inch diameters respectively) also shall be hot-dipped galvanized. Top rail (1¼", 17 gauge), brace rails (1¼-inch, 17 gauge), and tension wire (7 gauge) at bottom of fence to touch grade are required. Truss rods (3/8-inch) with turnbuckles shall be integrated as required to strengthen each individual fencing section design.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.



Production COTS.

Motorola will match fencing at proposed existing sites feature barbed wire. No new towers are to be built as part of this proposal. Shelters will be added to existing facilities.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola will match fencing at proposed existing sites feature barbed wire. No new towers are to be built as part of this proposal. Shelters will be added to existing facilities.

- The mesh fencing material shall be secured to terminal posts using stretcher bars and steel bands and line posts using wire clips.

Individual fencing sections shall be no wider than 10-foot before a line post, gate post, or corner post is required.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- The top of the fencing shall have razor wire with 45-degree extension arms pointed outside the fence area. The bottom of the fencing shall be a knuckled finish and touch the finished grade of the compound being pulled taut enough so that no compound intrusion can be gained from the bottom of the fence.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Existing facilities feature barbed wire as a safety deterrent.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Existing facilities feature barbed wire as a safety deterrent.



- Gates shall be provided with a positive-type latching device needed for padlocks. A plunger rod and catch are also required to secure gate in the open position with a mushroom cap at the base of the plunger rod. Gates shall expose no more than 4 inches between the opening to prevent intruder access.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All fence posts shall be secured using minimum 30-inch deep by 1- foot wide footers set in a suitable concrete mix for fence stability.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Fence posts shall be bonded to the site grounding system using an exothermic welding process (Cadweld).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- The Offeror should propose a design that affords maximum protection to the site based upon experience in other high security environments.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Combination locks, with County-specified codes, shall be provided for all gate entrances.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.3 Grounding Systems

All power feeders and branch circuits shall contain an equipment grounding conductor which shall have green-colored THWN/THHN insulation or green identifying tape at both ends and which shall be suitably terminated to an equipment ground bus or device screw terminal at both ends.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

At any site at which building structural members are used for grounds, connections to those main structural steel members shall be made with exothermic ("Cadweld", Burndy, or equivalent) type connectors. Any paint or fire-retardant material shall be scraped away down to bare metal (for good metallic contact) before applying the connection. Surface preparation recommendations for the exothermic welding process to be used shall be followed.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All connections to ground halos shall be made as straight as possible with a minimum number of bends. Minimum bending radius of any ground wire shall be one foot.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A ground ring consisting of a #00 AWG tinned, bare copper wire shall be installed in a trench at a depth of not less than 30" below final grade or below the frost line (whichever is lower) at a maximum distance of 2 feet from the foundation of the equipment building where the equipment is installed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate offer will use #2 AWG below grade for ground ring.

If soil conditions allow, the ground ring shall be supplemented with copper clad steel ground rods. The ground rods shall have a minimum length of 10 feet and a minimum diameter of 3/4 inches. The use of ground rods will ensure contact with unfrozen soil during the winter season. All ground rods and ring shall be interconnected (including AC power service and telephone ground rods) to form a single, electrically contiguous site ground ring grid of 5 ohms (or less) resistivity. Megger ground



testing shall be performed on the final installation with test results supplied to the County and the results shall read a resistivity of 5 ohms or less. At least two grounding system inspection wells shall be provided at each tower/shelter facility.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate offer will use rods of 8' length (Industry standard).

The following requirements shall govern the deployment of the single point grounding system for the communications facility:

The minimum requirements for the quantity of ground rods shall be based on the following: (1) at least one ground rod at each corner of the shelter shall be installed; (2) the maximum distance between ground rods shall be 16 feet; (3) at least one ground rod shall be installed directly below the transmission line entry port; (4) the top of ground rods shall be 30" below grade; (5) the ground rods shall be bonded to the external shelter ground ring using an exothermic welding process, for example, Cadweld; (6) the Offeror has the discretion to determine the type of connector to use in the welding process.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

An anti-oxidant compound shall be applied to a bonding connection point after the bond is completed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All connections to the ground ring shall be such that the ground wires are as straight as possible avoiding sharp bends.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- The exterior ground ring shall be bonded to the copper strap or grounding wire descending from the shelter's bulkhead panel.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- The internal ground ring (halo) shall consist of #2 AWG (or larger) tinned bare solid or stranded copper conductor, running continuously along the shelter wall, at a maximum of 6 inches below the ceiling. Insulated mounting standoffs shall be installed every 18 inches or as required to accommodate bends and avoid sag. The internal shelter halo shall contain an intentional break of approximately 4-6 inches to prevent a grounding loop.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- The transmission line entry port shall be installed directly beneath the internal ground ring (halo) at a point to be mutually agreed upon between the Offeror and the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- The ice bridge shall be installed between the tower and equipment shelter to protect all transmission line and equipment interconnected between the tower and shelter. All ice bridge equipment shall be grounded to the exterior single point ground.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- An internal and external copper ground buss bar (that is electrically contiguous) shall be installed such that it is located directly beneath the transmission line entry port. The ground bars shall be wall-mounted on insulators, and shall be pre-drilled to provide adequate internal and external ground connections for each incoming coaxial transmission line. The ground bar may be integrated with a cable entry panel or other special fabricated panel, which will support gas tube surge arrestors for each coaxial transmission line to be installed. The internal ground bar shall be directly connected to the internal ground ring using an insulated #2 AWG (or larger) stranded conductor.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The following connections shall be made directly to the internal ground ring (halo) using green jacketed/insulated #6 AWG or greater stranded copper wire (except where noted):

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Ventilation louvers and sheet metal duct-work.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Metal doors shall be grounded to the door frames using flexible copper conductors, and door frames shall be connected to the internal ground ring (halo) with green insulated #2 AWG stranded conductor.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Air conditioning and heating units.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Fire suppression equipment and piping.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Tower lighting system equipment and controls.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Telephone terminal block enclosure, Telco repeaters and line surge protectors (#6 AWG is recommended).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



All microwave and radio system infrastructure equipment racks/cabinets, shelves, annunciator panels, and cable trays.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Generators may have a separate ground system that ultimately must be connected to the single point ground system via the external ground ring.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All exterior (building entry) metallic conduit feeds (i.e., telco service, electrical service, tower lighting, etc.) that enter the shelter.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Coaxial transmission line, microwave waveguide, and lightning arrestors.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All power distribution equipment such as breakers panels, disconnects, transfer switch, surge suppressors, conduits, UPS, battery racks shall be bonded to the grounding system. All power distribution neutral cabling shall be individually bonded to the ground as feasible.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All connections made to the bulkhead panel(s) shall use non-oxidizing material. The type of connectors to be used to ground the equipment to the internal ground ring (halo) shall be of the split-bolt, bronze mounting lug, and the parallel connector types, for example, BURNDY KSU or equal. These connecting wires shall be such that sharp bends are avoided.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- The shelter external and internal ground rings shall be bonded together with #2 AWG bare solid tinned copper wire. The entrance to the equipment shelter ground system shall be made through a 3/4 inch PVC pipe terminated with bushings 6 inches above the finished floor (AFF) and 6 inches below finished grade (BFG). The PVC pipe shall follow the contour of the foundation. Each ground wire shall terminate at the corner ground rods and shall be bonded. The ground wire shall run vertically along the wall supported by 2-inch insulated standoffs similar to T&B, TY-RAP nylon standoff brackets (short). The PVC pipe shall be sufficiently filled with a duct sealing compound, O-Z/GEDNEY DUX1 or equivalent, through the interior side of the shelter (this compound shall act as a water stop and moisture barrier). Alternatively, the Offeror may use a Polyphaser Earthed Entrance Panel which will connect to the ground ring with copper strap, to which may be attached the halo and other internal building ground connections.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.4 Ground Resistance Testing

A component of the system acceptance test plan to be completed by the Offeror shall be the testing of all existing grounding systems and any grounding systems installed, or utilized, for equipment associated with this procurement. This includes grounding at all base stations, dispatch centers, control stations and microwave terminal/repeater sites associated with this procurement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All grounding systems shall be tested using an AEMC, or equivalent, clamp-on ground resistance tester and Biddle 500V Null Megger or equal (3-terminal fall-of- potential method). The resistance to ground shall measure 5 ohms or less.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Ground tests shall be conducted in the presence of a County installation representative and results shall be recorded on a form approved by the County Project Manager. These forms shall be included as a part of the acceptance test documentation and are a component of final acceptance of the radio communications system.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.5 Lightning Protection

The County requires the Offeror to significantly reduce possible system damage and failure due to lightning strikes or induced currents. The Offeror shall adhere to current best engineering practices in providing maximum protection to sensitive electronic equipment. At a minimum, the Offeror shall comply with the following lightning practices. The County requires the Offeror to supply, in electronic format, its current internal Site Installation Best Practices Guidebook(s) and/or Communications Site Installation Standard manual(s) for review by the County Project Manager.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.5.1 Tower Lighting Control

Tower lighting controls shall be equipped with gas tube surge arrestors which will prevent a lightning strike to the tower or lighting system from back feeding into the electrical distribution system of the equipment shelter. This device shall shunt surges to the tower grounding system, and shall protect the tower lighting controller. An acceptable protector is Polyphaser IS-7WFU (single flasher unit) or IS-12WFU (dual flasher unit).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No tower lighting proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



No tower lighting proposed.

10.4.5.2 Radio Frequency Transmission Lines

Each transmit transmission system shall be protected by coaxial surge/lightning protectors, Polyphaser IS-CT50HN or equivalent, between the transmitter combiner output and the antenna. Lightning arrestors shall be grounded to the bulkhead panel or interior ground bar as appropriate.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

On each receive transmission system with a tower mounted amplifier, a Polyphaser IS-DC50LN series lightning arrestor, or equivalent, shall be installed in the transmission line.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Control stations shall be equipped with a coaxial lightning arrestor, Polyphaser IS-50NX-C2 or equivalent. These lightning arrestors shall be grounded to a 5/8-inch x 8-foot driven ground rod by a #2 AWG tinned solid copper wire attached to the rod using a bronze transition clamp.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Each transmission line shall be grounded at a point above the bend required to exit the tower-mounted cable ladder to the ice bridge leading to the radio equipment shelter or room. Each transmission line system also shall be grounded to the exterior shelter grounding buss bar near the shelter waveguide feedthrough/bulkhead leading to the radio equipment shelter or room. Each transmission line system also shall be grounded to the interior shelter grounding buss bar near the shelter waveguide feedthrough/bulkhead exiting the radio equipment shelter or room. These grounds shall be installed in accordance with the manufacturer's specifications, and shall be sealed against entry of moisture at any location where the outer sheath of the transmission line has been cut or removed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.5.3 AC Power Supply for Electronic Equipment

All AC-powered equipment to be installed in equipment shelters or rooms shall be equipped with a surge arrestor, (MOV/SAD/gas tube combination), in addition to any surge protection equipment which may be installed across the shelter/room power mains.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.5.4 Telephone Circuits/Low Voltage Wiring

All telephone company circuits or other twisted pair cable that may enter an electronics equipment room or shelter shall be protected with gas tube surge arrestors. These arrestors shall be intrinsic to the punch blocks being used and shall be grounded to the equipment shelter/room ground ring.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.5.5 GPS Receivers

If GPS receivers are used as frequency/time references in the proposed system, the antenna line shall be equipped with a gas tube surge arrestor, Polyphaser IS- MR50LNZ+6 or +15, or equivalent.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.6 Wiring and Devices

Power conductor insulation shall be color coded (with tape at each termination end). Identification shall be by color tape (e.g., black-phase A, red-phase B, blue-phase C, white-neutral and green-ground). Branch circuit conductors shall be labeled (using Brady or approved equivalent wire markers) at each end with the appropriate circuit numbers. Generator set and A/C unit control wiring shall be labeled with the terminal numbers corresponding to the Offeror's wiring diagrams furnished with the equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All outlet boxes shall be surface-mounted metallic and suitable for the quantity of devices enclosed. Faceplates shall match the outlet boxes and identified circuit per building scheme. The outlet boxes shall be marked with the associated circuit numbers which shall follow the same numbering convention utilized in the breaker panel(s).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Radio equipment power feeds (from UPS power panel) shall contain separate identifiable white neutral conductors. Common or shared neutrals for these protected loads are unacceptable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All wire for power, lighting, control and grounding systems shall be stranded copper with UL THWN/THHN 600V insulation, sizes as indicated. Minimum size for power shall be #12 AWG and minimum size for controls shall be #14 AWG.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Electrical equipment, such as UPS, generator, A/C (air conditioning units), heater, etc. shall be wired in accordance with manufacturer's wiring diagrams furnished with the equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.6.1 Commercial Power

The County will assist in arranging for commercial power installation to the meter at each base station/microwave radio site; however, the Offeror has ultimate responsibility for coordinating electrical service and any other commercial facilities necessary to fully commission the site. The Offeror has the discretion to select single-phase or three-phase electrical service as required by the proposed system design, but the County encourages the use of at least 200 Amp single-phase service where feasible (and 400 Amp service if required to meet expansion requirements). The County requires the Offeror to size the incoming commercial service to at least double the channel capacity of the proposed system without the need to modify the proposed service. The County requires the Offeror to identify the required service, factoring in the expansion requirements, for each new or existing site in the proposed network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror is responsible for supplying one service meter, as deemed sufficient by the electrical service provider, for County usage. The site compound meterboard shall be weatherproof, consist entirely of galvanized steel construction (no plywood to be used), and be capable of withstanding sustained winds of up to 95 mph. The location of the meterboard shall be at the front of the site compound nearest the vehicular gate in a logical, unobstructing location with close proximity to the incoming electrical service.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror is responsible for all power installation services past the service meter bay. Power feeds shall be buried and shall enter the building through minimum 4- inch conduits (Schedule 40 PVC



is suitable) and an elbow described in the equipment shelter specification. All conduits feeding the equipment shelters shall be completely waterproof with gaskets and designed not to allow any water to ever enter the shelter. If a main cutoff switch is required outside of the shelter, this disconnect switch shall be padlocked with a Best lock (or equivalent) keyed to County's specification.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.4.6.2 Conduits and Raceways

All wiring inside of the building/shelter shall be enclosed in EMT (electrometallic tubing) with compression type fittings (setscrew type fittings are unacceptable). EMT shall be surface-mounted in a neat, professional manner and done so as not to create an effective ground loop that undermines the functionality of the internal grounding halo. UL-approved locknuts and grounding bushings (or EMT box connectors) shall be used at boxes and equipment enclosures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All wiring outside of the building/shelter shall be enclosed in heavy wall galvanized rigid steel conduit with gasketed fittings. Weatherproof grounding type hubs shall be used at boxes and equipment enclosures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- All wall penetrations shall be sealed with weatherproof compounds and 20-year silicone caulk, or equivalent. Empty, future use conduits that are exposed to exterior shall be sufficiently capped and waterproofed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Telephone company cable(s) shall be enclosed in GRS conduit.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Flexible metallic conduit (UL "Sealtite" or approved equal) with UL fittings shall be used as final connections to all mechanical vibrating/rotating machinery (A/C units, heaters, motors, transformers, UPS and generator set, etc.).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All new conduit routings shall be horizontally and vertically straight, neat in appearance, indicative of professional workmanship and conform to existing conduit routings. Where existing conduit supports are adequate, there shall be used. If new supports are required, these shall be installed at intervals in accordance with the NEC. Only structural members suitable for



conduit supports shall be used; piping, HVAC ducts etc. shall not be used for conduit supports. Conduit support intervals shall be based on the NEC Table 346-12.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Minimum size conduit shall be ½-inch diameter NPT trade size.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Pre-fabricated equipment distribution panels are acceptable for providing AC power to individual pieces of equipment. All electrical circuits shall be uniquely labeled at breaker panel and at connection point closest to equipment connection.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All unused or future use conduit shall be provided with nylon pull rope to facilitate cable pulling.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Quantity two (2) 4-inch buried Telco Schedule 40 PVC conduits shall enter the equipment shelter at a point near the shelter entrance and connecting back to an area near the electrical service meterboard that will serve as the PSTN distribution point for the entire site compound. The Telco conduit shall be provided with nylon pull rope to facilitate cable pulling and both ends shall be capped and waterproofed initially.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- All buried conduits for commercial service, exterior generator, and/or tower lighting controls shall be of Schedule 40 PVC or equivalent and sized to accommodate any extra cabling necessary. All buried conduit shall be sealed with weatherproof compounds and 20-year silicone caulk, or equivalent.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5 EQUIPMENT SHELTER SPECIFICATIONS

10.5.1 General Description

For each site proposed by the Offeror that does not involve an upgraded or refurbished equipment shelter, the Offeror shall deliver in turnkey fashion a pre-fabricated, bullet-proof, high-wind resistant, concrete electronic equipment shelter with associated concrete foundation and ancillary equipment. The specifications included herein relate to minimum requirements and the Offeror shall thoroughly define all features, options, and specifications related to the proposed pre-fab concrete shelters.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate will not feature bullet resistant doors.

10.5.2 Reference Standards

Unless otherwise modified herein, materials, design and construction procedures shall be in accordance with ANSI/NFPA-70, National Electrical Code, all federal, state and local building codes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.3 Submittal

The Offeror shall prepare and submit for approval, six (6) sets of engineering drawings of each shelter depicting its overall dimensions, electrical layout, equipment materials list, and general floor plan. These construction drawings shall be used, as required, for obtaining zoning/planning and building permits.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



10.5.4 Design Specifications

10.5.4.1 Dimensions/Construction

For all new sites, the County requires the minimum equipment shelter to be sized at 12-foot (W) x 28-foot (L) x 10-foot (H), but the proposed shelter shall be sized at an area of not less than is required to house all newly-proposed equipment plus the future space for a minimum of 100% system equipment racking expansion. All shelters shall provide a minimum of 9.5-foot interior ceilings. The building and generator foundations shall be rebar-reinforced, concrete slabs installed in compliance with local building codes and meeting or exceeding a minimum compressive strength of 3000psi at 28 days. All above grade concrete work shall be formed and finished with a ¾-inch chamfer at all exposed edges. The foundation design shall be of a type to prevent the entry of rodents and pests into the shelter. A 40-inch (W) x 48-inch (L) x 12-inch (D) concrete entrance pad/stoop shall be installed at the entry door. The Offeror shall provide a detailed description of the equipment building being proposed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate will feature 12x16 MSB shelter with 75% growth factor (size is the only differentiator between main and alternate offer).

Shelter construction shall be exposed, washed concrete aggregate exterior with several coats of waterproof stain. The roof shall be a troweled surface exhibiting a 2-to-3-inch overhang around the perimeter of the building. Roofing shall be designed to prevent penetration by ice falling from the tower at the site. The roof shall be sloped to prevent accumulation of water and large accumulation of snow. The base of the shelter that sits on the foundation shall be caulked around the perimeter with an exterior grade 20-year caulk that matches the color of the exterior finish. Interior walls shall be designed to allow mounting of electrical and electronic equipment using standard fasteners. Interior walls and ceiling shall be constructed of not less than 5/8-inch thick plywood with covered paneling. Interior walls and ceiling shall be insulated at a minimum with 1.5-inch thick R-11 grade foam insulation. Interior flooring, ceiling, and walls shall be reinforced with steel rebar as necessary to meet or exceed the proposed system design equipment loads. Interior flooring shall be covered with static-dissipative white industrial grade vinyl tile applied in 1-foot square tiles, mounted over the concrete subflooring. Base cove moldings of 4-inch or greater size shall be installed around all perimeter walls for a finished look that matches the chosen tile color scheme.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.2 Design Loads

The shelter shall be minimally designed to withstand wind speeds of 150 miles per hour (mph). The shelter roof shall be designed to minimally withstand a load of 150 pounds per square foot (psf). The shelter floor shall be designed to minimally withstand a load of 300 pounds per square foot (psf) while factoring in all anticipated equipment floor loading for each site. The shelter shall be minimally designed to meet seismic performance categories A-E. As a minimum ballistic protection requirement, the shelter should meet Underwriter's Laboratory Standard 752 Level Eight (8) related to rifles and Level six (6) relative to shotguns.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Alternate offer does not provide bullet-proof doors.

10.5.4.3 Doors

One 40-inch (W) x 84-inch (H) door shall be provided for entry in to the equipment room. The exterior door shall be of steel/aluminum design with a solid core. Doors shall be equipped with a Best mortise lockset and a single cylinder deadbolt lock. The lockset shall be protected on the exterior by an anti-prying plate. Hinges shall be tamper resistant to prevent removal of the pins from the outside of the shelter. The exterior doorway entrance and stoop shall be protected by an overhang or drip awning/canopy affixed to the exterior of the shelter to prevent water entry into the building. Doors shall be sealed using adjustable weather stripping and an adjustable saddle.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Alternate offer does not provide bullet-proof doors.

10.5.4.4 HVAC

Low ambient temperature air conditioning/heating equipment shall be provided. Electric heat strips or other devices shall be provided which will maintain the interior temperature of the shelter between 55 and 85 degrees Fahrenheit when outside temperatures are -20 degrees Fahrenheit or greater. Relative humidity shall be maintained at a level acceptable to the equipment to be furnished in this procurement. Redundant, exterior vertically wall-mounted HVAC units shall be utilized (or acceptable equivalent) to provide air conditioning/heating reliability in each shelter. The shelter shall provide an adjustable thermostat and the HVAC units shall provide a standard lead/lag switch control unit. Separate circuit breakers for each unit shall be installed in the main load panel. The outside portions of the units shall be weather-, rodent-, and tamper-proof. Air handling returns shall automatically louver and close in the event of a fire suppression activation so that a fire suppression agent discharge is not dissipated to the exterior. The HVAC units shall be designed to facilitate easy technician maintenance and preventive maintenance access for filter, compressors, etc. The HVAC unit shall be sized to meet the equipment loads specified in the proposal plus excess future capacity to support 100% system equipment racking expansion of the same equipment type. All HVAC equipment shall be supported by the emergency power generator. The HVAC system shall provide dry closure alarm relay indications to the site alarm system and the NMS when a failure of either HVAC unit has occurred.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.5 Power

A 120/240-VAC Single Phase service of not less than 200 Amps shall be provided under normal conditions to all equipment shelters unless specific site design criteria necessitates 3-Phase service. The AC service shall be sized to meet the specific equipment loads specified throughout the proposal plus excess future capacity to support 100% system equipment racking expansion of the same basic equipment type. AC power shall enter the shelter through a waterproofed, entrance elbow, which can be rotated to accommodate connection to conduit from the power company feed. A main fused cutoff/disconnect switch shall be provided outside the shelter with a provided enclosure lock, followed by a primary interior load center distribution panel backed up by emergency generator power which provides a minimum of forty (40) branch circuit breakers each rated for 20 Amps or greater.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The shelter shall be equipped with a properly-sized, interior uninterruptible power supply (UPS) and compatible exterior backup emergency generator configuration to support all of the shelter equipment in the event of loss of commercial power. The shelter shall be equipped with one or more wall-mounted UPS sub-panel(s) physically located in a logical fashion to minimize conduit runs and bends in order to serve rack-mounted equipment situated in the shelter. Each individual UPS sub-panel shall provide a minimum of thirty (30) branch circuit breakers each rated for 20 Amps or greater.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The shelter power distribution scheme shall provide for an emergency generator automatic transfer switch that switches between commercial and generator power. Generator power shall be supplied by a properly-sized external liquid propane generator with a below grade fuel tank sized to provide three (3) days of continuous backup power. The shelter also shall be equipped with a pre-wired, exterior, mobile genset receptacle in the event that the primary generator is rendered inoperable and a mobile, transportable generator assembly needs to be connected to the shelter. The shelter UPS shall be equipped with a UPS Bypass Switch and cutoff for service mode and/or maintenance purposes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate will not feature Mobile generator receptacle or below grade fuel storage.

The interior equipment room AC power shall be distributed in minimum ½-inch EMT conduit with cable-tray or rack-mounted distribution panels over top of each equipment rack footprint with enough outlets to independently serve each piece of AC-powered equipment. Each outlet shall be served on separate circuits with each neutral separately grounded to the single point grounding system. Two (2), non-UPS but generator-fed wall-mounted duplex outlets at a height 2-feet above the finished

floor shall be located on each wall separated in a logical fashion to easily facilitate technician testing anywhere inside the facility. The string of wall-mounted duplex outlets shall be served by one primary 20 Amp breaker. Two (2), non-UPS but generator-fed wall-mounted, enclosed GFCI duplex outlet at a height 2-feet above the foundation shall be centrally located on each exterior wall separated in a logical fashion to easily facilitate technician testing anywhere outside the facility. The string of wall-mounted exterior GFCI duplex outlets shall be served by one primary 20 Amp breaker.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

One (1) wall-mounted, UPS-fed quad outlet shall be located near the shelter Telco service entry wall at a height of three (3) feet above the finished floor for PSTN power requirements. All -48 VDC rectifier and power supply circuits shall ultimately be connected to the primary load center (with properly sized breakers as defined in the system design) backed up by the emergency generator, and each -48VDC rectifier/charger shall be interconnected to the load center from overhead using Seal-Tite flexible conduit or equivalent. The primary load center also shall be sized to accommodate the tower lighting control equipment, a wall-mounted microwave dehydrator, the fire suppression control equipment, the HVAC system, UPS, and all lighting requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

An all-mode surge arrester device shall protect AC power mains. All electronic equipment in the shelter shall be protected by transient voltage suppressors. The primary suppression system shall be silicon avalanche diode type, with MOV backup (Northern Technology Model TCS250BL or equivalent). The TVSS units shall include a dry closure alarm relay, which shall be connected to the site alarm system and NMS.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All electrical equipment supplied shall be UL listed. The entire electrical installation and wiring shall be in strict compliance with the latest approved edition of the National Electrical Code and all state, County and local codes and ordinances.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.6 Waveguide/Transmission Line Entry

One (1) 16-port, 4-inch diameter waveguide feedthrough assembly (or greater) with opening caps shall be installed at the opening of the shelter adjacent to the waveguide/ice bridge from the tower, and in alignment with interior cable ladders arranged over the equipment rack space (e.g., Microflect B1447, Polyphaser Earth Entry Port, Andrew part number 204673-8, or equivalent). The feedthrough plate shall be equipped with rubber boots and with galvanized clamps to seal the coaxial transmission line to be supplied pursuant to this procurement. Blank cable boots shall be used to seal all unused entry ports (Andrew or Microflect). A quantity of sixteen such blanks shall be shipped installed on the waveguide entry panel to prevent entry of birds, insects, or rodents during shipping or installation of the equipment shelter. The waveguide entry port shall be attached to the exterior ground ring by #2 AWG solid copper wire or by copper ground strap.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.7 Cable Tray/Ladder

A minimum 24-inch wide cable tray ladder shall be installed over all equipment rack spaces, and to the telephone equipment panel, and to any future equipment expansion space in the shelter. Two (2) cable bridge sections shall be included to link each distinct ladder assembly above each equipment



racking row to facilitate minimal inter-racking cable runs. Cable tray sections shall be bonded to one another and to the building ground halo by #2 AWG copper wire and compression fittings. The cable tray ladder shall be suspended from the ceiling using a unistrut style hanging fastener and the ladder design shall support all equipment and power cabling to support the proposed system plus the stated expansion requirements. Corner clamps and bolts shall be used all cable ladder connection points to stabilize the entire ladder configuration. The ladder configuration shall be no lower than 8.5-feet above the finished floor and shall be designed not to obstruct any overhead lighting, fire suppression, or power cabling.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.8 Lighting

The shelter shall provide sufficient interior lighting to provide a level of 75 foot-candles at 3 feet above the floor. Light shall be provided by fluorescent fixtures using two standard four-foot tubes per fixture. The switch for the light fixtures shall be located inside and next to the entry door. Light fixtures shall be installed to the front and rear of electronic equipment racks to provide sufficient lighting for service personnel to perform equipment maintenance. In the event of loss of shelter power, the shelter shall be equipped with an battery-powered emergency exit sign and lamp to guide an individual safely out of the shelter. The emergency light fixture shall automatically sense the loss of shelter power and immediately activate.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Exterior lighting shall be provided adjacent to the entry door to the shelter and on the far side of the equipment shelter opposite the entry door to illuminate as much of the shelter area and site compound as possible. A photoelectric switch that allows automatic illumination and extinguishment at twilight and sunrise shall control this exterior lighting. Exterior lighting shall be rated at 100 Watts (or greater), heavy-duty, shatter, and tamper-resistant. All interior and exterior lighting shall be backed up by the emergency generator.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.9 Fire Suppression

Each new shelter shall be equipped with a complete FM-200 fire suppression system. Per NFPA guidelines, the FM-200 fire suppression system shall be engineered to discharge enough suppressive agent in the proper timeframes to extinguish a fire caused by the equipment associated with the new system as well as the future shelter racking expansion requirements. The Offeror shall conduct field testing of the FM-200 system to demonstrate that the engineered FM-200 system contains enough agent to dissipate a fire in the specified shelter volume within the NFPA-specified timeframes. The FM-200 fire suppression system also shall include: an interior and exterior horn and strobe assembly to warn/notify of discharge, ionization smoke detector, photoelectric smoke detector, abort station, manual release, pre-alarm bell, annunciator control panel with battery backup, and agent cylinder with associated piping. Other co-located environmental systems such as HVAC air flow systems, fuel control systems and ventilation systems shall be automatically coordinated with the activation of the fire suppression system to ensure expedient suppression of fire conditions per NFPA standard guidelines. The FM-200 system shall be backed up by the emergency generator. The FM-200 system shall be interconnected to the NMS system for remote monitoring and control.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Alternate will not feature FM-200 fire suppression.

10.5.4.10 Shelter Alarms

At a minimum, the following alarm inputs shall be installed and connected to a centralized shelter alarm punchblock which feeds the radio alarm system and NMS with individual alarm indications. The Offeror is responsible for identifying the alarm type (i.e., Normally Open, Normally Closed, etc.), interconnecting, and testing every shelter alarm point with the proposed system NMS.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Tower Light Alarms (Strobes, Marker Side Lights, Power Fail)

MOTOROLA RESPONSE

MAIN OFFER:

N/A

No newly constructed towers.

ALTERNATE OFFER:

N/A

No newly constructed towers.

- Fire/Smoke Suppression (Activation/Discharge, Power Fail, Smoke Detector, On Battery, Heat Detector)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Intrusion (Door Entry) Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- High Temperature Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Low Temperature Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- High Humidity

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Commercial Power Failure Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- TVSS Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Automatic Transfer Switch (Normal, Emergency)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Generator Alarms (Engine Run, Low Fuel, Oil Pressure High/Low, Overcrank, Overspeed, Engine Temp, Coolant Levels, Coolant Temperature High/Low, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Leak Detection/Water on Floor

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- HVAC Alarms (Compressor Fail, Power Fail, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- UPS Alarms (Summary Alarm, On Bypass, Battery Status Normal/Low, Normal On/Inverter, etc.).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.5.4.11 Miscellaneous

The proposed shelter also shall include the following miscellaneous equipment: CO2 fire extinguisher, dry chemical fire extinguisher, leak detection, document holder for as-built manuals, eye wash station with integrated water catch basin, interior and exterior RFI and FM-200 warning placards, tower ASR number sign, contact information sign, and wall-mounted tower lighting control boxes.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6 TOWER SPECIFICATIONS

10.6.1 New Tower Facilities

The County anticipates that the Offeror will be required to provide a number of new communications towers as part of the proposed design. The County prefers the use of self-supporting, lattice-style steel towers to minimize the site compound footprint, but properly-supported guyed towers shall be acceptable if the proposed tower meets all design requirements and if enough land is available. The Offeror shall provide a structural load analysis for all proposed structures. All new towers shall be designed to fully support the proposed system design antenna load (RF and microwave) including all transmission cables, miscellaneous appurtenances, amplifiers, ice shields, lightning rod, mounts, etc. For all new towers proposed, a structural load analysis is required to be compliant with TIA/EIA-222 (latest revision) factoring in as-built and future load considerations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

10.6.1.1 Structural Load Analysis – Existing Sites

For County-owned towers currently used in the existing radio system, a structural load analysis is required prior to deploying any additional load on the structure, either temporarily or permanently. For all other towers proposed in the above listed categories, a structural load analysis is required, compliant with TIA/EIA-222 (latest revision) to identify the baseline and future load capacities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.2 Reference Standards

Unless otherwise modified herein, materials, design and construction procedures for any towers proposed by the Offeror shall be in accordance with the latest version of Electronic Industries Association (EIA) standard EIA-222, Federal Aviation Administration (FAA) Advisory Circular AC 70/7460-1 (latest version), ACI/ASTM concrete standards and all applicable local codes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.3 Submittals

The Offeror shall prepare and submit to the County for approval, scale drawings of the tower depicting its overall height, the number and height of sections, the horizontal spread of each section, guy points (if applicable), antenna loading at specified heights, engineered failure points (if applicable), and obstruction lighting details.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

For each tower, the Offeror shall submit to the County for approval a profile view of the tower containing structural details and engineering notes as well as a comprehensive tower foundation design with a supporting geotechnical analysis. Any documentation on the tower needed by the County for planning approvals shall be supplied. Drawings shall be sealed by a registered professional engineer (structural) licensed in the State of Illinois.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4 Antenna Towers

10.6.4.1 Height

Tower heights, excluding appurtenances, shall be as specified by the Offeror to meet or exceed the specified system coverage performance levels.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.2 Materials

All galvanized steel materials used in the construction of the towers shall be new, and shall conform to the provisions of EIA-222 (latest version) with respect to physical properties, manufacture, workmanship and factory finishes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.3 Loads and Stresses

The design of the tower shall take into account dead and live loads induced by the structure itself and all appurtenances, and all stress applied to the tower and its appurtenances by wind forces. The



minimum safety factors listed by EIA-222 (latest version) shall apply under the most severe combination of dead load plus live loading. The proposed tower design shall factor in all applicable strength limit states and serviceability limit states as defined by the current version of EIA-222. Towers shall properly be categorized and reliability requirements determined appropriately per EIA-222 for each structure incorporating the relevant environmental loads for the County such as wind, ice, seismic, and foundation loading.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Wind loading and wind gust load factors shall be calculated per EIA-222 (latest version), with all appurtenances installed plus the required future system growth factor. The structures also shall be designed per EIA-222 (latest version) to withstand additional horizontal wind pressures and dead loading produced by the accumulation of radial ice. Each tower shall be designed to meet twist, sway and displacement specifications for all loading conditions as recommended by EIA-222 (latest version) for the antennas proposed by Offeror.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

10.6.4.4 Appurtenances

The proposed self-supporting towers shall be designed to support all required immediate and future appurtenances. Appurtenances include, but are not limited to, the following: antennas, antenna mounts, antenna platforms, microwave antennas and radomes, lighting, transmission line, transmission line hangers, cable ladder, climbing ladder and safety device, lightning rods, conduit, waveguide bridge, lighting control, amplifiers, and ice shields. The tower shall be equipped with an integrated lightning rod as necessary.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.5 Antenna and Transmission Line

The towers shall be designed to support, at minimum, the antennas and transmission lines proposed by the Offeror plus a future use growth factor. All transmission line assemblies shall be grounded to a copper grounding buss bar at the base of the tower at the junction between the waveguide ice bridge and the tower waveguide ladder. The copper grounding buss bar shall be affixed to the base of the tower to facilitate this grounding interconnection. All transmission lines shall be installed with a proper drip loop or bend radius at the tower base transition so as to prevent the flow of water into the shelter.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.6 Transmission Line Support

A 24-inch wide waveguide transmission line cable ladder pre-drilled, for universal snap-in hanger kits shall be installed along each face of the tower and each ladder assembly shall extend the entire height of the tower (as feasible). The cable ladder shall be of galvanized steel construction, and shall have mounting hardware of stainless steel or galvanized steel construction. No drilling of the tower legs or cross bracing shall be required to install the cable support device.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Transmission lines shall be attached to the transmission line cable ladder using stainless steel hangers and adapters of the appropriate size for the transmission line supplied. Hangers shall be Andrew models 43211, 42396A-1, 2, 4, 5, 9, or equivalent. Andrew E Angle Adapter, or equivalent, kits shall be used to attach the hangers to the transmission line support ladder. Hoisting grips also shall be used as necessary to properly support and install the transmission line assemblies.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Transmission line shall be supported on the cable ladder or ice bridge at intervals of not more than six feet, or as recommended for 100 mph wind with ½ inch radial ice. (Andrew LDF5-50A, if used, shall be supported at intervals of 5.5 feet or less; LDF4-50A should be supported at intervals of three feet or less).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A 12-foot high waveguide bridge/ice shield shall be installed between the tower and the equipment room/shelter to support transmission lines and to protect them from ice falling from the tower or antennas. The waveguide bridge shall be designed to accept support devices to properly attach the transmission lines at the intervals specified above. The waveguide bridge shall be supported by galvanized steel pipe columns if any horizontal span is 10 feet or greater, or if so required by local building codes. Galvanized steel construction shall be used for the entire waveguide bridge and its ancillary components. A 48-inch wide grip strut grating type of waveguide bridge is required to reduce snow accumulation. The Offeror shall provide the necessary suspended hanger kits for use with the waveguide bridge to properly secure all transmission line and tower cabling at maximum interval spacings of no more than 3-feet between the tower and shelter. Microflect waveguide cushions, hangers, and crosses are the preferred method of attachment to the waveguide bridge. The waveguide bridge shall be properly secured with concrete footers or piers of a depth not less than 30 inches, and every post of the waveguide bridge shall be bonded to the site single point grounding system.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.7 Lighting and Controls

The towers shall be lighted and/or marked in accordance with the applicable chapters of FAA Advisory Circular AC 70/7460-1G, or latest revision, as required by the particular Aeronautical Study performed by the FAA for each tower.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.

Activation of any required lighting systems shall be via a redundant light-sensitive, photoelectric type switch and controller which will activate the lights at dusk (or other cloud-darkened condition) and extinguish the lights at sunrise. If a dual lighting system is required at any site, the controller shall automatically switch from red lights at sunrise to strobe lights, and back to red lights when the sky darkens.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.



Wiring for the tower lighting shall be enclosed in rigid galvanized steel conduit, which shall be vented sufficiently to eliminate condensation buildup. Wiring and conduit shall be provided and installed in conformance with the tower manufacturer's specifications and in accordance with local electrical codes. Tower lighting control and electrical cabling shall be affixed with hanger kits to the tower waveguide ladder in the same manner as transmission line.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Existing lighting will remain in place.

The tower lighting control system shall be equipped to provide Form-"C" dry contact closure alarm indications of bulb failure for strobes, marker side lights, and power failure which shall be connected to the NMS system. The tower lighting control system also shall provide dial-up telco connectivity with a modem for remote diagnostics of the tower lighting system. All tower lighting control equipment shall be wall-mounted and installed inside of the pre-fabricated shelter in a manner so as not to obstruct any of the useable racking footprints. The Offeror shall properly ground all tower lighting control boxes and equipment to the facility single point grounding system. All tower lighting control equipment shall be backed up by the emergency generator power system.

MOTOROLA RESPONSE

MAIN OFFER:

N/A

No newly constructed towers. Existing tower condition will remain.

ALTERNATE OFFER:

N/A

No newly constructed towers. Existing tower condition will remain.

10.6.4.8 Ice Shields

Each tower shall be equipped with steel mesh ice shields to be installed above each of the microwave antennas to fully protect parabolic dishes, microwave antennas, and waveguide from falling ice. The ice shield shall cover the width and length of the dish, microwave antenna and cabling it is intended to protect.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.9 Climbing Ladder

Each tower provided shall be equipped with an OSHA-approved climbing ladder with safety climbing cable with belt that extends the entire length of the tower (as feasible).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.4.10 Grounding

The Offeror shall bond all tower legs to the site compound single point grounding system using a minimum #2 AWG bare tinned copper wire which shall be bonded exothermically (Cadweld) to the site ground ring. The entire perimeter of the tower foundation shall be surrounded by a ground ring using 3/4-inch x 10-foot copper clad ground rods spaced a maximum of 16-feet apart and interconnected using a minimum #2 AWG bare tinned copper wire. The tower ground ring shall be interconnected with the ground rings that surround the exterior generator and shelter to create a single point site compound grounding system. All grounding of the tower shall be in conformance with the specifications provided in ANSI/IEEE Std 142-1982, and the guidelines contained in this specification.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The alternate offer features 8' ground rods (Industry standard).



10.6.5 Scope of Work

10.6.5.1 Offeror Responsibility

The Offeror shall be responsible for: obtaining all permits/authorizations; designing and installing suitable tower foundations for all associated hardware and appurtenances; designing, manufacturing, shipping, and erecting the towers, for providing all project management, construction management, testing, and installation services necessary for tower erection and for site restoration/cleanup. The Offeror shall be responsible for ensuring that the tower meets or exceeds all design criteria, labor services, guarantees and installation requirements contained in these specifications, or in national or industry standards to which this specification refers.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.6.5.2 County Responsibility

The County will provide an installation representative as necessary to coordinate field installation activities and to act as a liaison between the Offeror, and the property owner (if the County is not the property owner).

MOTOROLA RESPONSE

Understood.

10.6.5.3 Scope

The work to be performed under this section of the specification shall include: site preparation, tower erection, installation of antennas, transmission lines, lighting systems, ice shields, climbing ladders, cable ladders, waveguide bridges, antenna support brackets, platforms, tower foundations, tower lighting controls, lightning rods, grounding systems, guy anchors (if applicable), and touch-up of any nicks in the galvanizing or paint. The Offeror is responsible to dismember and remove any existing antennae and support cables as required by the County if the re-use of a County tower is determined by the Offeror. The Offeror is responsible for all site/tower enhancements to existing facilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



10.6.5.4 Construction

Soil Analysis: The Offeror is responsible for geotechnical exploration at the locations of each tower leg, tower foundation or guy anchor point. A geotechnical engineer licensed in the State of Illinois shall be used to perform soil exploration and analysis. A copy of the soil reports prepared by the geotechnical engineer shall be furnished to the County by the Offeror prior to commencement of work.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Foundation Design: The proposal price for the foundation design will be assumed to be based on presumptive soil conditions as defined by the latest version of the EIA-222 standard. The County recognizes that the final foundation design and price shall be determined when the geotechnical report is provided to the Offeror. At such time as the geotechnical report is available for each site, presumptive soil conditions shall be compared to the actual soil conditions to adjust (positively or negatively) the final foundation design price.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

The Offeror shall meet or exceed the requirements outlined in the latest editions of ACI301 and ACI318 as it pertains to workmanship and materials. Concrete test cylinders shall be properly cast with copies of all test reports being provided to the geotechnical engineer for review and analysis. The Offeror maintains complete construction management and engineering responsibility for ensuring that the foundation and tower design(s) have been met and are in compliance with geotechnical reports during the tower foundation and erection process. All field certification and reports shall be provided to the County as performed.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Site Plan: A site plan shall be prepared for the County for site plan and conditional use permit approval at each site at which construction of a tower or installation of an equipment shelter is required. The Offeror shall install the tower and shelter in conformance with the site plan. The Offeror shall note that regardless of its size at the base, the tower shall be installed such that a minimum 10-foot spacing is maintained between the building and the tower face nearest the building.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Power: The Offeror shall be responsible for connecting to the commercial AC power at the meter. Temporary power may be required for the obstruction lighting on the tower during construction. The Offeror is responsible for arranging and installing this temporary power. Temporary obstruction lights shall be installed while the tower is being erected.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

FAA Notification: The Offeror is responsible for meeting all FAA required notifications and preparing, on behalf of the County, the Antenna Site Registration (ASR) for the location.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

No newly constructed towers are being proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

10.6.5.5 Painting

If the FAA Aeronautical Study requires any tower to be painted, the paint shall be applied at the factory with touch up painting to be completed at the site. Touch-up galvanizing, if needed, shall be done in dry weather. Galvanizing shall not be applied over wet surfaces. The County highly encourages the Offeror to avoid communication sites that require tower painting to minimize long-term maintenance costs.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

No newly constructed towers are being proposed.

10.6.5.6 Site Landscaping

The Offeror shall be responsible for landscaping, grading, and seeding of the disturbed soil. The Offeror shall adhere to any buffer zone and landscaping requirements as outlined in applicable local or State ordinances. The Offeror shall use fescue grass seed at all tower sites. The Offeror shall restore the site to its original condition and properly address all grading and drainage requirements to County satisfaction.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7 GENERATOR SPECIFICATIONS

The Offeror shall furnish standby emergency power generators where required and upgrade existing generators as required to meet the backup emergency power requirements for each site facility.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Motorola is not proposing new generators at the existing sites. At this time, Motorola does not anticipate any upgrades to existing emergency backup systems based on site walks.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Motorola is not proposing new generators at the existing sites. At this time, Motorola does not anticipate any upgrades to existing emergency backup systems based on site walks.

10.7.1 General Requirements

The Offeror has the responsibility to design, provide, install, and test a complete and operable standby, heavy-duty propane-powered generator designed for continuous operation over a multi-week period with associated automatic transfer switch inside each electronic equipment shelter used in the network. Equipment shall be factory tested new at 0.8 power factor for 3 hours, and shall be installed in a standard outdoor cabinet placed above an elevated steel fuel tank on a concrete pad foundation in the radio site compound. Generators provided by the Offeror shall be designed for the intended use of network support and shall include all necessary shielding to protect the network from electrical noise, if any, caused by the generator. The generator must be of a size as to fit within the shelter compound and provide sufficient room around the entire unit for technicians to perform maintenance on and fuel the device while it is in operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



10.7.1.1 Type of Generator

Generators shall be an exterior-housed, weatherproof, liquid propane-fueled four-cycle, engine-driven set with a low reactance brushless generator. Generator sets shall be equipped with a temperature compensated automatic voltage regulator with underspeed/overspeed protection function, a control panel, and high ambient temperature cooling system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The County reiterates the importance of providing a heavy duty generator designed for continuous operation over a multi-week period. As has been learned following major storms and other events of nature, electrical outages can last for protracted periods of time calculated in weeks instead of days. The proposed generators should be designed to continuously operate under full load for a period of up to fourteen days with a fuel tank capacity for seven days of continuous duty at full load.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

This statement conflicts with the three-day runtime mentioned in the specification above. Motorola proposes a three-day fuel storage, below grade, 100% load.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The Alternate offer features above grade fuel storage.

10.7.1.2 Ratings

Output power rating of the generator shall be based on the load requirements of the Offeror's proposed system equipment complement and shall provide for 100% excess expansion load capacity (above immediate site load requirements). The generator shall be capable of full single-phase output @ 1.0 pf.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Site conditions include the following:

Voltage Regulation: +/- 2% of rated voltage for constant load between no load and full load.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Frequency Regulation: .5% from steady state no load to steady state rated load.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Single Step Load Pickup: 100% of rated output power, less applicable de-rating factors, with the engine-generator at operating temperature.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



10.7.1.3 Generator Set Control/Alarms

The generator shall be a remote start type compatible with the automatic transfer switch to be supplied pursuant to this procurement. Manual starting and stopping also shall be provided from the generator control panel.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Specific generator control functionality shall include the following:

Cranking Control: Generator shall provide a minimum of three cranking cycles of at least 15 seconds before lockout and activation of an overcrank alarm condition.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Generator Protection Controls: (per NFPA 110). The generator shall shut down and lock out upon: (1) failure to start (overcrank), (2) overspeed, (3) low lubricating oil pressure, (4) high engine temperature/low coolant.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Alarms: Individual alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre- warning, high coolant temperature pre-warning, low



coolant temperature, low coolant level, utility power failure, generator overcrank shutdown, generator overspeed shutdown, low fuel and an alarm indication when the generator set is running. These individual alarm contacts shall be wired into and shall be reported to the NMS system being supplied pursuant to this procurement. All generator alarm wiring and sensor points shall be implemented and tested by the Offeror to both the interior shelter alarm punchblock and NMS system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Meters: Meters shall be provided to indicate output voltage, output current, running time, frequency/RPM. An AC rheostat shall be supplied for voltage adjustment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.4 Fuel Supply

The Offeror shall provide a below grade, painted and galvanized steel propane fuel tank for the generator near the equipment shelter and which is easily accessible for refueling. The fuel tank shall provide sufficient fuel to provide not less than three (3) days continuous operation of the generator set at full load under low ambient temperature (0 degrees Fahrenheit). The tank shall be filled completely at the time of final system acceptance. The fuel tank shall provide a visual analog fuel gauge meter or display to identify the available propane fuel level.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.



The alternate offer will provide an above-grade fuel tank.

The fuel tank and its lines shall be below grade and all fuel lines shall be insulated to reduce condensation at the regulator. Above grade components shall be protected from manmade assault or act of nature. All necessary regulators, drip pots, piping, meters, or other supplies needed for an installation which meets local fire and building codes shall be furnished and installed. The Offeror shall provide a full fuel tank at all sites at the time of final system acceptance. The fuel tank and generator shall both be bonded to the site compound single point grounding system using an exothermic connection (Cadweld) of #2 AWG tinned bare copper wire.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

The alternate offer will provide an above-grade fuel tank.

10.7.1.5 Exhaust System

A residential grade exhaust silencer shall be installed on the generator for noise suppression.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.6 Battery and Charger

A lead acid starting battery rated for the engine type to be supplied shall be furnished and installed with the generator set. This battery shall be float charged by a 10-amp voltage regulated charger, which is powered by 120 volts AC. Float, taper and equalize charge settings shall be provided.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Form-C alarm contacts shall be provided and connected to the shelter alarm and NMS system to report loss of AC power, low fuel level, status of battery charger, and power on conditions.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.7 Cooling System

A radiator-cooled engine is required. The radiator shall be filled with a water and coolant mixture in accordance with the engine manufacturer's recommendations. A thermostatically controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.8 Housing

The housing/mounting assembly shall be equipped with the proper bushings, springs and anchoring to properly support the generator while actively running. The weatherproofed generator housing shall provide the appropriate exterior screening and shielding to provide rodent control and eliminate rodent/pest access. The complete generator housing shall be bullet-resistant. The generator control panel and all access doors shall be secured by a key lock mechanism to prevent unintended generator access. The generator housing shall provide sufficient protection to the generator and internal electronics in the event of driving rain, hail, and blowing snow conditions.

MOTOROLA RESPONSE

MAIN OFFER:



Conditionally Compliant.

Production COTS.

Motorola fully complies to all of the above requirements, except the bullet-resistant generator housing which is not bullet resistant.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola fully complies to all of the above requirements, except the bullet-resistant generator housing which is not bullet resistant.

10.7.1.9 Foundation

The Offeror shall supply an exterior concrete pad foundation for the generator assembly in close proximity to the prefabricated equipment shelter. A minimum 6-inch concrete slab (or greater) rated at 3000 psi at 28 days installed over compacted soil shall be provided as the design load specifies for the generator. The proposal price for the generator foundation design shall be assumed to be based on presumptive soil conditions. The final foundation design and price shall be determined when the geotechnical report is provided to the Offeror. The Offeror shall meet or exceed the requirements outlined in the latest editions of ACI301 and ACI318 as it pertains to workmanship and materials. Concrete test cylinders shall be properly cast with copies of all test reports being provided to the Offeror's geotechnical engineer for review and analysis. The Offeror maintains complete construction management and engineering responsibility for ensuring that the generator foundation design has been met during the generator deployment process. All field certification and reports shall be provided to the County as performed.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.10 Documentation

The following documentation shall be supplied to the County for each generator set and transfer switch supplied or upgraded:

- Specification and data sheets for the exact type and model generator and transfer switch supplied pursuant to this procurement, including all options and accessories

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's certification of prototype testing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's warranty documents

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Shop drawings showing plan and elevation views of the equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Interconnection wiring diagrams showing all external connections required; with field-wiring terminals marked in a consistent point-to-point manner

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's installation instructions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Operator's and maintenance manuals that outline routine maintenance and troubleshooting procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Transfer switch manual and wiring diagrams.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.11 Warranty

A no-deductible warranty, which provides for on-site 24x7x365 service by a factory-authorized service contractor, shall be provided. This warranty shall provide coverage against all defects in materials and workmanship for a period of two years from the final acceptance date of the radio communications system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.1.12 Start-Up Service

A factory authorized service representative shall provide initial start-up service and shall conduct acceptance testing at each site at which generator equipment is installed. All testing shall be witnessed by the County and test records shall be furnished to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.2 Transfer Switch

An automatic transfer switch, which provides switching of the equipment shelter electrical load between commercial power and generator power, shall be supplied and installed for each generator set. The transfer switch shall be completely factory-assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources. Permanently-attached manual handles also shall be installed on the transfer switch. The switch shall provide positive mechanical and electrical interlocking and mechanically held contacts. Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The transfer switch shall be installed in a key-locking, UL-listed, wall-mounted NEMA cabinet. The transfer switch shall be fully wired and integrated with both the stationary exterior engine generator set and the mobile generator hookup receptacle (in case temporary genset has to be placed in service at site) in accordance with local electrical and fire codes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All transfer switches and accessories shall be UL-listed and labeled, tested per UL Standard 1008 and CSA Approved.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.2.1 General Specifications

Transfer switches shall be double-throw electrically and mechanically interlocked and mechanically held in both positions.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Form-C contacts shall be provided in each position for alarm reporting purposes to the shelter punchblock and NMS system. These contacts shall be connected and tested to the network alarm system for NMS reporting transfer status.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The transfer switch shall be continuously rated for operation in ambient temperature ranges of -30 to +60 degrees Celsius. Transfer switches shall be rated to carry 100% of the rated current in the enclosure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.2.2 Automatic Controls

Transfer switch control shall be solid state and designed for a high level of immunity to power line surges and transients. The device shall be tested in accordance with IEEE Standard 587-1980 (or latest revision). Controls shall have optically isolated logic inputs and isolation transformers for AC inputs. Relays shall be installed on all outputs.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Solid state undervoltage sensors shall simultaneously monitor all phases of the standby power source and the commercial power source. Pick-up and drop-out voltage settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Controls shall be provided with solid-state overvoltage sensors, adjustable from 100-130% of nominal input voltage to monitor the source. An adjustable time delay shall be provided.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Automatic controls shall signal the engine-generator to start upon signal from normal source sensors. A time-delay start, variable from 0 to 5 seconds, shall be provided to avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts, which have been factory wired to a field wiring terminal block.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The switch shall transfer when the emergency source reaches the set point voltage and frequency. A time delay shall be provided for transfer, which is variable from 0 to 120 seconds.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The switch shall retransfer the load to commercial power after a time delay retransfer. This time delay shall be variable (adjustable) from 0 to 30 minutes to avoid short engine run times. The retransfer time delay shall be immediately bypassed if the emergency generator fails.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

A control shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting on return to commercial power.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Power for transfer operation shall be from the source to which the load is being transferred.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Diagnostic indicators shall be provided to allow the last successful step in the sequence of control functions to be pinpointed. The present status of the control functions also shall be indicated. These functions, at a minimum, shall include:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Source 1 OK

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Start generator set

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Source 2 OK

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Transfer timing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Transfer complete

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Retransfer timing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Retransfer complete

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Timing for stop.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.2.3 Front Panel Control Devices

A key-operated selector switch shall be provided which will provide the following functions:

Test - to simulate commercial power loss to allow testing of the generator set with or without transfer of the load

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Normal - leaves the switch in its normal operating position

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Retransfer - a momentary position, which will provide an override of the retransfer time delay and cause immediate return to the commercial power source (if available).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.7.2.4 Exerciser Clock

The transfer switch shall be equipped with a digital, electronic exerciser clock which allows setting the day, time and duration of a generator set exercise/test period. Tests under load or with no load shall be selectable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8 UNINTERRUPTIBLE POWER SUPPLY (UPS) SPECIFICATIONS

UPS systems shall be furnished by the Offeror for each of the proposed base station transceiver sites. There shall be no potential for single point failure in the UPS design.

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

Production COTS.

Motorola proposes only 1 UPS per site, and in this case, the UPS itself is a single point of failure.

ALTERNATE OFFER:

Non-Compliant.

Production COTS.



Motorola proposes only 1 UPS per site, and in this case, the UPS itself is a single point of failure.

The proposed UPS system shall have minimum 4-hour battery back-up time assuming the initial and future expansion load criteria and shall incorporate single- phase input and output over current protection and maintenance bypass switch. The system shall be "on-line" ferro-resonant transformer technology or an alternate static Pulse Width Modulated (PWM) technology. The proposed UPS shall be UL 1778 and 1449 listed. Acceptable vendors are Powerware/Best, Liebert, APC, or an approved equivalent. The proposed UPS system shall be capable of battery backup expansion through the insertion of additional battery cabinets or modules.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1 General Requirements

The Offeror shall design, provide, install, and test a complete and operable UPS system for each electronic equipment shelter to be supplied pursuant to this procurement. Equipment shall be new, compatible with the proposed generators, and factory-tested with all results supplied to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.1 Ratings

The proposed UPS shall employ the latest, state-of-the-art, solid-state components incorporating microprocessor based Pulse Width Modulated (PWM) technology or ferro-resonant transformer design. The UPS system shall consist of free-standing cabinets consisting of a rectifier section, inverter section, batteries, isolation transformer, manual synchronized make- before-break bypass switch and input and output over current protective devices. The UPS also shall include all status and alarm displays, a remote interface communicator (typically RS-232 type), control devices, meters, components, cabling and connectors. Alarm monitoring and wiring shall be fully interconnected to both the shelter alarm punchblock and the NMS system.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS and associated components shall be housed in heavy-duty reinforced steel freestanding finished cabinets requiring front access only. Batteries shall be housed within the UPS or, if necessary, matching cabinetry.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS rating shall be based on the load requirements of the Offeror's proposed equipment and shall provide for 100% excess expansion load capacity (above immediate site load requirements). The proposed UPS shall be designed and field-tested by the Offeror to work in concert with the proposed generator equipment so that no power oscillation and unstable load transfer occurs due to UPS/genset incompatibilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.2 Description and Operation

The capacity of the UPS solid state rectifier section shall be sufficient to maintain the battery in a fully-charged condition and continuously supply the required load through the inverter while floating the battery.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The proposed UPS system shall not include any switching device or devices which will interrupt the continuity of power in any way.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The output voltage of the UPS shall be maintained within $\pm 3\%$ over the nominal output voltage under any load conditions within UPS rating and ambient temperature range specified.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS sine wave output shall have a maximum of 5% total harmonic distortion over the entire range of output voltage at any load or power factor.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS Automatic Frequency regulation shall maintain the output frequency to within ± 0.1 Hz for all combinations of temperature, input voltage variation and load variation. The UPS output shall not follow the reference source beyond $\pm 0.3\%$ Hz of nominal frequency. When input returns to normal, the UPS shall automatically synchronize to the line frequency.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS components shall be selected to provide sufficient voltage capability and ample current-carrying capacity to furnish reasonable margin for handling over-currents and minor voltage variations. In no case shall components be operated at greater than 80% of the device's maximum steady state rating.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS shall be capable of withstanding, without failure, short circuit currents and surges of magnitude and duration in accordance with ANSI/IEEE Standard C62.41, categories A and B.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS shall be capable of carrying 100% of the rated UPS output current continuously and shall be capable of carrying 150% of rated output current for approximately 10 minutes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS system transient response shall be $\pm 5\%$ from nominal peak voltage for 100% load step. Voltage recovery shall be within 4 msec. to $\pm 3\%$ of nominal voltage.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The UPS battery system shall be of the lead acid maintenance-free sealed, non-gaseous type with a minimum twenty (20) year life.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

- ***The batteries are lead acid maintenance free.***
- ***3 year full 10 year prorated on the battery cabinets.***
- ***2 years full on the internal UPS batteries.***

ALTERNATE OFFER:

Conditionally Compliant.



Production COTS.

- ***The batteries are lead acid maintenance free.***
 - ***2 year full on UPS internal batteries.***
-

The UPS rectifier shall maintain a DC output voltage regulation of $\pm 1\%$ with a maximum of 2% RMS ripple. The rectifier shall be of the solid-state full-wave SC bridge design to limit AC wave-shape distortion on the power system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

As a minimum, over-current protection (10KAIC circuit breakers or 100 KAIC C. L. Fuses) shall be provided for:

- AC Input

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Rectifier Input

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Inverter Input

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- AC Output

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Battery Input.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.3 Accessories

The following items shall be mounted on the instrument panel of the UPS cabinet via microprocessor-based LED or equal display (including lights/meters) for the following characteristics:



- Mode Select Switch (UPS Normal, UPS Bypass & Battery Modes)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Input AC Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Battery DC Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Rectifier DC Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Output AC Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Output AC Amperage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Output AC Frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Synchronizing verification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Low Battery DC Voltage Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Static Switch Position Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manual bypass Mode Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Float-Equalize Switch/Timer DC Circuit Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- % Rated Load Indication

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Battery back-up time available in Minutes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The following conditions shall have audible and visual alarms in addition to dry contacts to be integrated by Offeror with the County NMS system:



- Low & High Battery Voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Automatic By-pass operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Emergency Operation (UPS on Battery)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Rectifier/Inverter Failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Common Summary Alarm (Form "C").

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All external power and control connections shall be terminated on terminal blocks and identified clearly on wiring diagrams for the County's external connections. The UPS shall provide the ability to monitor the battery voltage and overall health of individual batteries/cells with an integrated battery monitoring system to easily identify compromised batteries.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola will terminate and identify all external power and control connections only.

The UPS cabinet and battery cabinet (if not in UPS cabinet) shall be provided with a ¼-inch x 1-inch copper ground bus with mechanical type lug connector to interface to the County's single point grounding system. The UPS manufacturer shall indicate on applicable drawing(s) requirements for neutral-ground bonding per UL Listing qualifying as "Separately Derived System" per NEC Art. 250.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.4 Remote Alarms

At a minimum for each UPS, the following alarms also shall be remotely and individually wired and tested by the Offeror to the shelter alarm punchblock and NMS system:

- Over-voltage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Load Drain

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Battery Normal

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Battery Low

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Summary Alarm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- On Bypass

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Normal/On Inverter.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.5 Documentation

The following documentation shall be supplied to the County for each UPS supplied:

- Specification and data sheets depicting dimensions, weight, location of conduit entry, grounding, and wiring requirements and details for bolting assembly frames to floor

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Schematic wiring diagrams showing input and output protective devices and field connections, battery connections, interconnect wiring, controls and instruments

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's certified standard factory test data

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's warranty documents

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Manufacturer's installation instructions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Manufacturer's Operating and Maintenance Manuals.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

10.8.1.6 Warranty

A no-deductible warranty that provides for on-site 24x7x365 service by a factory authorized service contractor shall be provided. This warranty shall provide coverage against all defects in materials and workmanship for a period of one (1) year from the acceptance date of the radio communications system. All batteries shall be warranted for twenty (20) years on a prorated basis from the acceptance date of the radio communications system. No batteries shall be shipped and installed until the UPS system can be properly integrated into the equipment shelter and commissioned for use/charging.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Two years full warranty will be provided on the internal UPS batteries.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Two years full warranty will be provided on the internal UPS batteries.

10.8.1.7 Start-Up Service

A factory authorized service representative working on behalf of the Offeror shall provide all electrical wiring necessary to commission the UPS, conduct an initial start-up service, and shall conduct acceptance testing at each site for which a UPS is installed. A complete load test of the UPS system shall be required which identifies actual field runtimes that meet or exceed manufacturer's specifications for the rated loads. The Offeror also shall conduct field testing of the UPS and generator under full rated load to ensure that complete compatibility between the UPS and generator equipment. All test records shall be furnished to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

11.0 SYSTEM ACCEPTANCE TESTING

The Acceptance Testing Procedure (ATP) for all systems shall consist of a series of tests, inspections, and verifications that are generally defined in this section. System acceptance testing shall be conducted at several distinct junctures in the project as the integration effort unfolds. Much of the proposed network shall be tested with County witness both in a factory staging environment as well as the ultimate field environment prior to final system acceptance. A subset of the equipment (e.g., generator, UPS, tower, antennas, fire suppression, tower lighting, transmission line, etc.) shall only be tested with County witness in the ultimate field environment as practical, but all manufacturer factory test data shall be supplied to the County in conjunction with the final field testing.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

ALTERNATE OFFER

Fully Compliant

The ATP testing process shall cover all factory and field testing procedures and those inspections that shall be made in order to show Offeror compliance to the solicitation specifications as well as to define each and every required subsystem interface. All ATP test scripts and testing methodologies are subject to the ultimate approval of the County prior to the conducting of any customer witness testing. This section briefly defines some of the testing requirements, but the final test plans shall not be limited to the guidelines contained in this document. At least forty-five (45) days prior to the conducting of any contractual factory or field functionality testing, the County and Offeror shall finalize the ATP for the equipment or systems under test. Based on field integration developments and scheduling, The County reserves the right to require the Offeror to test or verify the required performance of any subsystem or piece of equipment at any time as deemed necessary by the County. The County requires the Offeror to provide a comprehensive matrix of acceptance test scripts with explanation for factory staging, field staging, and coverage testing phases as part of this response to fully illustrate the depth at which the Offeror typically conducts acceptance testing to guarantee quality.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

ALTERNATE OFFER

Fully Compliant



The County's team and Offeror's representatives shall conduct these acceptance tests and inspections as defined. The results of the tests and the associated punchlist of outstanding items to be completed or re-tested shall be signed by both parties and forwarded to the County for review and acceptance. The outstanding items shall be resolved within seven (7) business days and these items shall be re-tested at no additional expense to the County. If the outstanding items have an effect on other previously performed tests, then re-testing of those tests also shall be included. Final acceptance of each individual subsystem shall include, but not be limited to, the list of tests and inspections contained in the following sections.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

ALTERNATE OFFER

Fully Compliant

11.1 DETAILED DESIGN

The County requires the Offeror to perform a comprehensive detailed design prior to the commencement of any manufacturing or field integration work. The County Project Manager will actively participate in the detailed design review of the system implementation with the Offeror, and the County shall provide signature signoff upon completion of this work effort to trigger the manufacturing and field integration process. Completion of the detailed design review process shall take place upon mutual agreement between the Offeror and the County. Detailed design documents shall be supplied to the County in both electronic (e.g., original native file format-MS Word, MS-Excel, AutoCAD, etc.) and paper format. The Offeror shall supply six (6) copies of the detailed design document in paper format and three copies in electronic (CD-ROM) format. The detailed design must include, at a minimum, the following items for every affected County site and network node:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Network and Subsystem Block Drawings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Line Item Equipment and Pricing Lists

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Infrastructure, Console, and Network Element Programming Parameters

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Console and MNC/NMS Database Parameters/Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Fleetmapping Parameters (Talkgroups, Radio Configuration Personalities, IDs, Features, Templates, GOS, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Transport Requirements (Design, DS0, DS1, DS3, STS-n, OC-3 Channelization, Switching Parameters)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Racking/Floorplan Drawings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Physical Site Requirements/Facilities/Tower Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Power and HVAC Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- MNC and Switch Layouts/Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Channel Bank and Multiplexer Layouts/Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Final Coverage and Site Configuration Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Final Microwave Path Design and System Availability/Reliability Calculations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Software Version Control/Equipment Hardware and Software Roadmaps
Network Timing Requirements/Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Antenna Subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Feature and License Matrices

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure Mode Analysis/System Availability

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- LAN/WAN Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- TCP/IP Network Addressing Scheme

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Preliminary Factory and Field ATPs

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Final Coverage ATP

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Preliminary Cutover Plan/Migration Strategy/Downtime Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Subscriber Equipment Installation Prototypes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Revised Statement of Work (if modified)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Operations, Administration, Installation, and Maintenance Manuals for all subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Change Orders

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Spares Equipment List and Pricing Matrix.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.2 SYSTEM STAGING

Any proposed system equipment that is reasonably capable of being integrated in a factory, laboratory staging environment shall be configured and installed in a manner conducive to testing hardware and software prior to being released to the field from the Offeror for installation and optimization. At a minimum, the staging of this equipment shall include: the labeled and pre-cut interconnect cabling, configured and certified software, completed configuration and provisioning databases, operational network backbone connectivity supporting all of the subsystems mentioned in the solicitation specifications, and all interfaces operational to demonstrate a working and fully integrated system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.2.1 Factory Staging

The Offeror shall provide comprehensive staging of the proposed equipment at or near the radio Offeror's primary land mobile engineering/manufacturing facility. The factory staging effort shall include all new components, subsystems, certified system software, and ancillary equipment required to complete the entire system, including but not limited to: microwave backbone, channel banks, frequency standards/GPS receivers, voting equipment, base station transceivers, transmitter combiners, receiver multicouplers, controllers, redundancy equipment, MNC and switching



infrastructure, networking equipment, dispatch consoles, logging recorder, system management equipment, NMS, alarm systems, programming equipment, interconnect equipment and cabling, simulated legacy equipment, power supplies, etc. A pair of each type and tier of proposed County subscriber radios purchased shall be provided for staging and testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

At staging, all equipment shall be set up in its ultimate configuration, as it will appear in the designated installation site. The system shall be tested in the staging area in such a manner as to minimize the actual installation and optimization time in the field. The final County system staging as-built documentation shall be available at the time of system demonstration and customer witness. Simulation of any existing County equipment required to demonstrate the system in staging shall be provided wherever possible.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

As part of the Offeror's proposal, a sample-staging document defining proposed staging tests shall be provided for County review. This document shall be considered for use in the development of the final factory acceptance test document which shall cover all subsystems, interfaces, required functionality, Offeror responsibilities, County responsibilities, staging requirements, test procedures, and documentation required for field release. The staging ATP documentation shall be made available to the County's project manager forty-five (45) calendar days prior to the date of the staging test for County review and refinement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



An example of the topic areas to be analyzed in depth shall include, but not be limited to, the following testing areas which must show conformance to all of the specifications contained in this document:

MOTOROLA RESPONSE

Understood.

- Subscriber equipment functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Dispatch console and logging recorder functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- MNC Controller and Switching infrastructure functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- NMS functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Base station transceiver functionality, optimization, and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- P25 and interoperability conformance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Microwave/fiber backbone functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure mode analysis and fallback/reliability testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.2.2 Equipment Cabling

The Offeror shall determine cable lengths between all interconnected equipment and cut cables to length to aid in field installation. Specific cabling shall be plenum rated as determined by site surveys and field analysis. Circuit identification shall be provided on the modular panels and the cabling using customized, circuit-specific labels that are consistent with all as-built documentation.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The use of any conventional, industry-standard type punch block is acceptable. All cabling shall be terminated with appropriate connectors for ease of field installation and shall be terminated to the nearest 1-foot length. All cabling used for system interconnects shall be tested during factory staging of the system prior to shipment to the field. All cable pinouts shall be provided with the staging as-built information.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All cables shall be clearly labeled on both ends with pre-printed (not hand-written) adhesive labels with "To-From" information to clarify interconnection for field installation and maintenance. Cable label information shall directly correlate to system documentation/drawings that define or depict the interconnecting cables (i.e. cable label text shall match drawing text). Cables that are not staged initially but installed in the field shall be equipped with the same cable label information as provided for every cable in staging. Cables that are modified or rearranged in the field shall be equipped with the same cable label information as provided for every cable in staging. A spare set of cable labels shall be provided with the final site documentation package as prepared in the field. Hand-written cable label markups is not acceptable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

A description and detailed wiring diagram of each modular panel and wiring adapter utilized shall be provided. The remote site equipment of the system shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming, and equipment configurations shall be completely integrated in the final configuration prior to shipment. Upon arrival to the final destination, the hookup of racks, external power, grounding and antennas to the site



equipment should complete the physical integration of the sites and allow the sites to be "on-air" ready. No additional work should be needed to ready the site for operation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Offerors are to describe in detail the manner in which the entire system shall be factory staged. The County's Project Team shall visit the Offeror's staging facility for the purpose of examining the system and witnessing a comprehensive factory acceptance test. The Offeror shall develop a functional test plan in the prescribed timeframes and schedule this factory visit at the appropriate time prior to field delivery. The County's project manager, prior to the actual test, shall approve the functional test plan. Final system drawings, cabling diagrams, interconnect cabling matrices, rack profiles, as-built photographs, level setting diagrams, software version control matrices, equipment programming and provisioning data, equipment jumpering and strapping, and interconnect diagrams shall be part of the staging as-built documentation and be available for viewing at time of factory staging visit.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.2.3 Hardware Testing

Each hardware component shall be inspected and tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.2.4 Software Testing

Each software feature and version shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.2.5 Factory Acceptance and Shipping

At the time that all equipment and subsystems are functioning as designed, the County shall inspect and witness the testing of the equipment as it is staged, cabled, tested, and burned-in per the agreed-upon factory ATP. At the successful completion of the staging demonstration and ATP, a County representative shall approve the shipment of the equipment to the County sites for installation. If the factory demonstration or staging effort fails to meet County's expectations, another date for re-testing and customer witness shall be set to repeat the event solely at the Offeror's expense which includes all transportation and lodging costs for the original County project team back to the staging facility. No system equipment, subsystem, or components shall ship from the staging facility without the County's express approval. Shipment can also be delayed if the project schedule has changed and the County requests a shipping delay.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Prior to shipment from the staging facility, all software/firmware version numbers, jumper configurations, and equipment programming data shall be recorded by the Offeror and recorded in the staging as-built documentation for verification in the field. An as-built manual shall be produced for each network site or node. Any changes to the system following shipping shall be properly recorded and updated in the final field as-built documentation in a manner consistent with the original staging as-built document. The use of hand-written labeling on equipment firmware is unacceptable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.3 FIELD ACCEPTANCE TESTING

At the time that all equipment and subsystems are functioning as designed in the field, the County shall inspect and witness the testing of the equipment as it is field- installed, cabled, tested, and burned-in per the agreed-upon field acceptance ATP. If the field ATP fails to meet County's expectations, another date for re-testing and customer witness shall be set to repeat the event solely at the Offeror's expense which includes all logistical costs to reproduce the field ATP. The County's team and system Offeror's representatives shall conduct these acceptance tests and inspections as defined.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The results of the tests and the associated punchlist of outstanding items to be completed or re-tested shall be signed by both parties and forwarded to the County for review and acceptance. The outstanding items shall be resolved within seven (7) business days and these items shall be re-tested at no additional expense to the County. If the outstanding items have an effect on other previously performed tests, then re-testing of those tests also shall be included. Final acceptance of each individual subsystem shall include, but not be limited to, the list of tests and inspections contained in the following sections.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The acceptance testing for all systems shall consist of a series of tests, inspections, and verifications that are highlighted in this section. The ATP shall cover all field testing procedures and those inspections that shall be made in order to show Offeror compliance to the solicitation specifications as well as define each and every required subsystem interface.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



All system equipment that comprises the proposed network shall be configured and installed in a manner conducive of testing hardware and software prior to beginning the field ATP. All optimization procedures shall be executed prior to conducting the field ATP and the final as-built documentation shall be complete and ready for County review.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

An example of the topic areas to be analyzed in depth in the field shall include, but not be limited to, the following testing areas which must show conformance to all of the specifications contained in this document:

MOTOROLA RESPONSE

Understood.

- Subscriber equipment functionality, programming, and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Dispatch console and logging recorder functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Legacy mutual aid interface infrastructure functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- MNC Controller and Switching infrastructure functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- NMS functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Base station transceiver functionality, optimization, and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Antennas and transmission line functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Coverage design verification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Site facilities functionality and performance (e.g., generators, UPS, tower lighting, HVAC, shelter alarms, fire suppression, grounding, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- P25 and regional interoperability conformance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Microwave/fiber backbone functionality and performance

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure mode analysis and fallback/reliability testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.3.1 System Testing Acceptance Sequence

Field system testing acceptance shall take place in the following sequence:

MOTOROLA RESPONSE

Motorola has provided a sample Acceptance Test Plan and Coverage Acceptance Test Plan as part of our proposal submission. These documents are included in Package 2 Section 3.

- Notification by the Offeror that the field installation is complete and site as-builts ready for review

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Completion of inspections by the County Project Manager

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Notification by Offeror that final punchlist is resolved and approved by the County and field acceptance tests can commence

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Microwave transport system testing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Hardware functionality and performance acceptance tests

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Software functionality and performance acceptance tests

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Interconnect testing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Coverage acceptance test

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- All testing punchlist and re-test items corrected and resolved by Offeror

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- 45-day system reliability performance test

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Offeror provides draft system acceptance test report

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Acceptance test results approval granted by the County Project Manager

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- All project deliverables and final as-builts received by Offeror

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- All implementation phase punchlist items resolved to County satisfaction.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- System testing acceptance granted by County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.3.2 Hardware Testing

Each hardware component shall be inspected and tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.3.3 Software Testing

Each software feature shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.3.4 Interconnect Testing

Interconnects are defined as the electrical connections between two subsystems; for example, the connection between a channel bank and the microwave multiplexer. Each system interconnect shall be tested per the ATP. A test procedure and checklist shall be used to perform these tests based upon the ATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4 MICROWAVE TESTS AND INSPECTION

The acceptance testing for all microwave backbone system equipment shall consist of a series of tests, inspections, and verifications that are highlighted in this section. The County's representative and the Offeror's representative shall conduct these tests and inspections as defined in the ultimate Acceptance Test Plan (ATP).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The microwave factory acceptance testing shall include simulated system conditions for hop-to-hop and end-to-end BER measurements and availability calculations. The field acceptance testing shall consist of actual path measurements to ensure compliance with system design requirements. Factory NMS testing shall simulate conditions of operational systems. The field acceptance testing shall consist of actual operational conditions. The tests and inspections listed in the following paragraphs shall be performed. Final Acceptance of each individual microwave line, section, and path shall include, but not be limited to, the following list of tests and inspections.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.4.1 Microwave Factory Acceptance Testing

The following tests, in addition to other standard manufacturer's test procedures and any County-required tests, shall be performed. Complete documentation of factory acceptance testing shall be delivered with each microwave terminal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.1 DC Power Supply Checks

Verify all DC power supply voltages in accordance with published specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.2 Perform/Verify Complete Terminal Provisioning

Provision microwave terminal and associated multiplexer in accordance with proposed County network.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.3 Receiver Checks

- Frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Sensitivity

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- AGC Calibration

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Alarm Adjustments/Verification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.4 Transmitter Checks

- Frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.5 Transmission Tests

- Orderwire Levels

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Modem Alignment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Elastic Store Alignment

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Motorola can perform this alignment, however it will not be needed for this project.



ALTERNATE OFFER:

N/A

Motorola can perform this alignment, however it will not be needed for this project.

- Reverse Channel Switch (MHSB only)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Alarms/Protection Switching

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Trunking System/Ring Switching Interconnection & Timing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.6 DS1 Data Transmission Tests

Utilize a BER test set to verify minimal 24-hour error-free operation of every OC-3, DS1, and Ethernet facility.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.4.1.7 Burn-In

Following the completion of all preliminary testing, the Offeror shall perform temperature cycling tests of each complete radio hop in accordance with manufacturer's published procedure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.8 Post Burn-In Tests

- RF Power Adjustment and APC Calibration

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Transmit Insertion Loss

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- PA Monitor Calibration

MOTOROLA RESPONSE

MAIN OFFER:

N/A



Motorola can perform this calibration, however it is not needed for this project.

ALTERNATE OFFER:

N/A

Motorola can perform this calibration, however it is not needed for this project.

- APC Hop Tests

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Receiver RSL Threshold and Voltages, AGC Curve Generation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Receiver Switching Tests

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Common Loss Switching Tests

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Alarms Checks

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Local and Remote Terminal Monitor Operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Radio Command Path Operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Orderwire Check

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- NMS Integration and Diagnostic Functionality

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.1.9 Final Adjustments

- Label Verification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- LO Frequency Adjustments

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Motorola can perform this adjustment, however it does not apply to this project.

ALTERNATE OFFER:

N/A

Motorola can perform this adjustment, however it does not apply to this project.

- Strapping/Configuration Verification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.4.2 Microwave Field Acceptance Testing

The following tests, in addition to other standard manufacturer's test procedures, must be performed. Complete documentation of field acceptance test results shall be provided to the County upon completion of testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.1 Path Alignment

- The Offeror shall be responsible to perform microwave dish alignments for all microwave paths

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Dishes shall be aligned for maximum AGC level

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- The Offeror shall provide all material, equipment, and personnel required to perform path alignments in accordance with path design criteria.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.4.2.2 Installation Inspection

Inspection of the completed microwave network equipment installation shall be performed to ensure compliance with standards set forth in final contract.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.3 Sweep Waveguide

- Antenna waveguide shall be swept and plotted in accordance with manufacturer's specifications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measured return loss shall be a minimum of 23 dB.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.4.2.4 Waveguide Pressurization Verification

- Antenna waveguide shall be pressurized in accordance with manufacturer's specifications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Waveguide leak down tests will be performed to ensure leak rate does not exceed manufacturer's specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.5 Power Plant Tests

- Measure and record individual cell and power plant total output voltages

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measure specific gravity of wet cell systems

MOTOROLA RESPONSE

MAIN OFFER:

N/A

Motorola is providing sealed maintenance-free Lead Acid batteries.

ALTERNATE OFFER:

N/A



Motorola is providing sealed maintenance-free Lead Acid batteries.

- Set float and equalize voltages on charger

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Set and verify alarm thresholds on charger in accordance with manufacturer's specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.6 DC Power Supply Voltage Checks

Verify all DC power supply voltages in accordance with published specifications.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.7 Transmitter Checks

- Measure and record Transmit Power

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Measure and record Transmit Frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Verify operation of APC

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Compare measured values to Factory Test Records.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.8 Receiver Checks

- Measure and record RF receiver local oscillator frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Measure and record IF frequency

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Verify error-less receiver switching

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Verify space diversity receiver switching as applicable

MOTOROLA RESPONSE

MAIN OFFER:

N/A

ALTERNATE OFFER:

N/A

- Compare measured values to Factory Test Records.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.4.2.9 Protective Switching Tests

- Verify protective switching operation, as applicable, for associated module failure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Verify operation of reverse path protection, as applicable

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measure reframe time and frame-lost seconds.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.10 Alarm Checks

- Verify individual alarm reporting for module faults, as applicable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.4.2.11 Radio Loop Back Checks

- Verify radio loopback capabilities, as applicable (local and remote IF, local and remote RF, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Loopbacks shall be performed with a BER test set for 15 minutes and results recorded.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.12 Fade Test

- Simulate path fade by use of a variable attenuator and BER test set

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measure and record AGC voltages and RSL at BER thresholds of 10-6 and 10-3

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Compare measured values to Factory Test Records and Path Calculation sheets

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measure and record T/I ratios in both directions on each path.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.13 Bit Error Rate

- BER test is to be performed for 24 hours on each microwave hop

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Test to be performed 12 hours on A side and 12 hours on B side, if applicable

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Unfaded RBER shall be <10-13

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Record results.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.14 Multiplex Checks

- Verify OC-3, DS1, and Ethernet facility operation using BER test set at DSX demarcations at origination and termination points

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Verify that synchronization is maintained on each facility equipped or unequipped.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.4.2.15 Synchronization

- Verify operation of synchronization network in normal and backup operating modes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measure timing jitter on a representative number and length of DS1 paths

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Inject timing jitter into a representative number and length of DS1 paths to verify input jitter accommodation in accordance with Bellcore TR-TSY-000499.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.16 Delay Measurements

- Delay measurement testing to be performed following integration of microwave and RF radio systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Tests to be performed on a representative number and length of DS1 and/or DS0 paths.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.17 Alternate Route Tests

- Verify automatic alternate route switching with uninterrupted radio system traffic.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.4.2.18 Audio Quality

- Audio quality measurements shall be performed following integration of microwave and RF radio systems per the RF radio manufacturer

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Tests shall be performed on a representative number and length of DS1 and/or DS0 paths.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

11.5 RF COVERAGE ACCEPTANCE TEST PLAN

The purpose of this RF Coverage Acceptance Test Plan (CATP) is to verify, through in-place testing, that the delivered radio system meets the performance specifications required under this solicitation. This section establishes the requirements with a generic, Offeror-independent methodology. The Offeror shall submit the appropriate and source-peculiar details in its offering to permit evaluation of compliance with this section.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Successful passing of the coverage portion of the ATP shall consist of a talk- out/talk-in (TO/TI) audio quality evaluation in addition to a minimum signal strength measurement. For all proposed service areas and operational characteristic/attenuation settings, both audio quality and signal strength tests must pass for each test location/grid to be considered a “Pass.” This coverage testing shall only pertain to the primary 800 MHz (700 MHz capable) trunking radio system and every associated transmission system. Grids with in-building tests must also satisfy the in-building testing requirements as defined below for the grid to be considered a “Pass.” Consistency of performance amongst all site transmission systems shall be tested and verified.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

ALTERNATE OFFER

Fully Compliant

This CATP shall not only verify compliance with the RF coverage requirements but also shall concentrate on the identification of locations where coverage does not meet the requirements. CATPs are generally developed to validate the accuracy of the Offeror’s propagation model and utilize statistical methods that do not take into account in-band interference levels similar to those found in the County. With the knowledge of the locations where coverage is not compliant with the solicitation, the County can take alternative action to have the Offeror enhance coverage within these locations or document those locations and provide this information to the emergency personnel responsible for those areas.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The CATP shall consist of the following tests for all proposed antenna systems utilizing the specified behavioral and operational guidelines of radio usage as defined previously in this specification:

MOTOROLA RESPONSE

Understood.

Please see Package 2 Section 3 for a sample Coverage Acceptance Test Plan.

OON-STREET TESTING INCLUDES:

- Appropriate On-street Signal Strength Levels

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- TO/TI Audio Quality Test

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Continuous Audio Quality Monitoring Test

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Per Addendum #3, the Continuous Audio Recording is not part of an acceptance test. It is for informational use only.

ALTERNATE OFFER:

Fully Compliant.

Per Addendum #3, the Continuous Audio Recording is not part of an acceptance test. It is for informational use only. Motorola considers this an optional test for the alternate offer and has removed this cost for the alternate offer.

- Continuous Receiver Desensitization Test

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

Motorola proposes to perform this test utilizing a spectrum analyzer, Iso-T, mobile radio, and Voyager.

One of the system channels will be monitored during this test. A Spectrum Analyzer with the ASTRO option will be connected into the Voyager test kit. This signal is injected into an antenna line with a 30 dB Iso-T. The antenna line is then connected to a portable radio. A computer equipped with Motorola's Voyager software is connected to the portable. A GPS receiver is also connected to the Voyager package to track the location of the interference. While driving, Voyager is set to take continuous samples on the test frequency and report it to the user as well as record into an external hard drive. This test will provide information on potential receiver desensitization measured by the test portable.

Additionally, should any areas of potential interference is found, we will work with the County to research the source and possible mitigations of the problem.

ALTERNATE OFFER

Conditionally Compliant

Motorola considers this an optional test for the alternate offer and has removed this cost for the alternate offer.

- Noise Floor Measurements.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will do noise floor measurements at each RF site.



ALTERNATE OFFER:

Fully Compliant.

Motorola will do noise floor measurements at each RF site.

IN-BUILDING TESTING INCLUDES:

- TO/TI Audio Quality Test for all Critical buildings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- In-building Signal Levels for all Critical Buildings appropriate for the system proposed

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Signal Levels and TO/TI Audio Quality Test with attenuated portable for the specified in-building coverage service areas described in 3.1.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.1 Test Teams

The test teams shall consist of County representatives and Offeror representatives. There shall be at least one test team located at the County Sheriff's Primary Dispatch Center and multiple test teams in the field. The County shall provide the drivers for the vehicular testing as well as participants for the critical in-building testing process. The driver shall only be responsible for the proper and safe operation of the vehicle and shall not participate in the audio quality testing. All



navigation directions shall be the responsibility of the Offeror's representative and is expected to be provided via the automatic computerized signal measurement system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Each member will classify a transmission as a "Pass" or "Fail". Then the test team must reach a consensus as to whether the test point is a "Pass" or a "Fail" in the event the message classification is not unanimous. When the talk-out test is conducted, the dispatch operator will state the following message: "Dispatcher to Portable Team. Grid Number #.[Random Test Language]. Grid number #, How do you copy grid number #?" When the talk-in test is conducted, the portable operator will state the following message: "Portable Team to Dispatcher. Grid Number #. [repeated Random Test Language]. Grid number #, How do you copy grid number #?" Each team member will then classify the message as "Pass" or "Fail". The speakers shall speak the test messages as clearly as possible and occasionally incorporate voice inflections characteristic of typical police and fire emergency transmissions. Tests may be repeated at any or all grids as determined by the County to reflect any differences between male and female voice characteristics.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The test language to be used shall be mutually agreed upon between the County and the Offeror prior to testing. The County shall provide a list of potential test messages representing commonly used dispatch language, void of acronyms, and not to exceed 10 seconds in length, for evaluation. From the potential list of messages, one hundred shall be selected as the pseudo-random messages to be used for testing purposes. The phrase to be used during each test will be determined by the speaker. The final list will be determined prior to testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.5.2 Test Equipment and Apparatus

The basis for this RF coverage design is a portable-on-street and portable-in- building design. Therefore, the Offeror shall execute the RF Coverage Test utilizing the portable radio operating configuration specified in this solicitation. It is understood that de-rating of the test portable is required to simulate the portable- on-street and portable-in-building design criteria for the appropriate test locations. The Offeror shall thoroughly describe and quantify any required de-rating of the test portable for accurate simulation, and the Offeror shall field verify, with County witness, all intended attenuation settings to demonstrate consistency between the intended de-rating and actual in-building loss conditions with the chosen operating configuration.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall be required to provide all test equipment associated with the CATP processes including all portable and mobile radios. These test radios shall ultimately be transferred to the County as part of its subscriber unit inventory. The radio equipment shall be configured with the most current software and firmware available at the time of testing. For in-building testing, this equipment shall include a test backpack system or mobile cart system, as appropriate. For on-street testing and simulated County 12 and 16 dB in-building testing, this equipment shall include any materials and equipment required to modify a standard vehicle such as DC to AC power inverters and the test equipment cabinet. The Offeror is required to install all test equipment and apparatus in the test vehicles with no damage and restore the vehicles to reasonable condition upon completion of testing. The Offeror shall verify proper calibration for all equipment utilized during the CATP and all test records and relevant data shall be provided to County in both paper and electronic format.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.3 Test Vehicle

The County shall provide all vehicles required for the coverage testing. It is anticipated that the standard test vehicle shall be sufficient to hold the test cabinet and equipment as well as team members plus sufficient room for occasional observers. The same vehicle types and equipment installation configuration shall be used throughout the CATP so that a consistency of data is ensured.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.4 Continuous Receiver Desensitization Test

The Offeror shall perform a continuous receiver desensitization test to identify any excessive interference or noise floor degradations that would impact the coverage margin requirements. This test can be used to identify intra-system interference, inter-system interference, co-channel interference and the more prevalent interference from in-band cellular systems. The results or the impact of this test is not a part of the pass/fail acceptance criteria. Since the impact of this interference is only applicable to receiver operation on the street, this data will only be accumulated for the on-street portion of this CATP. In the event that interference is revealed that is in excess of the Offeror's system design margins and assumptions, the County and Offeror shall investigate the source in order to mitigate the impact. The Offeror is required to assist the County as required in order to identify, characterize, and isolate the source of interference at these locations. The test data shall include the following information for each location measuring receiver desense greater than 6 dB. Only information available, on-site signage, and other methods of identification from outside the facility fence shall be required. No other effort need be expended in order to obtain the following information:

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

Motorola proposes to perform this test utilizing a spectrum analyzer, Iso-T, mobile radio, and Voyager.

One of the system channels will be monitored during this test. A Spectrum Analyzer with the ASTRO option will be connected into the Voyager test kit. This signal is injected into an antenna line with a 30 dB Iso-T. The antenna line is then connected to a portable radio. A computer equipped with Motorola's Voyager software is connected to the portable. A GPS receiver is also connected to the Voyager package to track the location of the interference. While driving, Voyager is set to take continuous samples on the test frequency and report it to the user as well as record into an external hard drive. This test will provide information on potential receiver desensitization measured by the test portable.

Additionally, should any areas of potential interference is found, we will work with the County to research the source and possible mitigations of the problem.

ALTERNATE OFFER

Conditionally Compliant

Motorola considers this an optional test for the alternate offer and has removed this cost for the alternate offer.



- Location Information (Latitude/Longitude by GPS)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Basic Geographical Address

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Basic Information on any cell sites in close proximity

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola will search the FCC database for cell site frequencies licensed in the area.

ALTERNATE OFFER:

Fully Compliant.

Motorola will search the FCC database for cell site frequencies licensed in the area.

- Wireless Carriers co-located on site

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Site Owner or Operator Identification

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Desired Signal Strength in dBm

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Measured Receiver De-sense in dB

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Three channels 500 kHz apart.

MOTOROLA RESPONSE

MAIN OFFER

Fully Compliant

Motorola proposes to perform this test utilizing a spectrum analyzer, Iso-T, mobile radio, and Voyager.

Additionally, should any areas of potential interference be found, we will work with the County to research the source and possible mitigations of the problem.



ALTERNATE OFFER

Conditionally Compliant

Motorola considers this to be an optional test for the alternate offer.

11.5.5 RF Signal Level Measurement and Bit Error Rate (BER) tests

The signal measurements test portion of the CATP is required in order to verify that the Minimum Received Signal Level (MRSL) is present in the specified number of test tiles, thereby proving that the coverage prediction model for each service area is accurate. This test verifies the Service Area Reliability of 95%+ for all required service areas, operating conditions, and County requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The test shall utilize a GPS-based computer automated signal measurement system tuned to channels keyed on every transmission system at each site that will average the carrier signal over a 40 wavelength sample, one sample per test tile. This test shall be utilized for both on-street, 12 dB and 16 dB service area testing. The testing of all Critical buildings shall not require GPS based signal measurement. BER data also shall be collected for information purposes for every transmission system at each site utilizing the GPS-based computer automated signal measurement system. The signal strength and BER data for each transmission system under test shall be collected, archived, and provided to the County on a daily basis during the CATP for each test location/grid in a *.csv (comma separated value) file format noting specific channel number, mean Lat/Lon, median Lat/Lon, grid number/coordinate, mean SSI in dBm, median SSI in dBm, mean and median BER, and SSI standard deviation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.5.1 Determination of Number and Size of Test Tiles

The Offeror shall ascertain the statistically correct number and size of test tiles. Consistent with this section, the County clearly requires square or rectangular grids or tiles to be defined. Tile sizes shall be 1/4 mile x 1/4 mile in dimension or greater.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The product of these computations will be a test tile definition as to number and size for the coverage area. In all cases, consistent with TSB-88.3-C §5.2.1, Estimate of Proportions, a confidence level not less than ninety-nine percent (99%) shall be utilized. The Offeror shall provide the proposed grid maps and overall number of grids for all respective service areas that form the basis for the Offeror's methodology to be utilized during the CATP.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.5.2 Reciprocity and System Balance

Under normal circumstances, a 800 MHz (700 MHz capable) system that is properly designed with high-gain tower-top amplifier systems and effective receiver voting will be talk-out limited in performance, that is, a portable that can "hear" the system will likely be successful in accessing the system. With this in mind, a talk-in RF signal measurements test would not be cost-effective. In order to eliminate this portion of the test, the Offeror shall provide a TO/TI signal analysis followed by field verification with this proposal which shall prove that all radio sites are indeed balanced from a TO/TI perspective. The tower-top amplifier analysis shall include a Noise Figure Calculation and multicoupler Inter-Modulation Rejection (IMR) Performance Calculation. This analysis is critical to show system design balance is feasible without sacrificing receiver sensitivity or exposing the receiver to intermodulation interference. A signal flow diagram is required that will outline the signal flow from base station transmitter to portable receiver port and portable transmitter to base station receiver port. All gains and losses along the path are to be shown. If the Offeror utilizes other signal processing that results in overall improvement in audio or signal quality, these enhancements should also be characterized and included in the calculations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola will provide this information once the contract is awarded.



ALTERNATE OFFER:

Fully Compliant.

Motorola will provide this information once the contract is awarded.

11.5.6 Talk-Out and Talk-in Audio Quality Test

“The delivered audio quality (DAQ) for digital and analog units must meet or exceed the DAQ 3.4 as per TIA Standard TSB-88-C, which is defined as “Speech understandable with repetition only rarely required. Some Noise/Distortion”.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

“Rarely” shall be quantified as not greater than 10% re-test. This means that a maximum of 10% of all the grids to be tested for that service area shall be allowed a repeated transmission within three feet of the original test location and shall be identified as a “pass-retry”. If the message meets or exceeds this criterion, as agreed by a majority of the test team, it shall be considered “passed”. If the message does not meet this criterion, as agreed by the majority of the test team, it shall be considered “failed”. The Offeror may then move no more than three feet in any one direction and repeat the audio test once. If this re-test meets or exceeds the original criterion, the tile is considered a pass and is recorded as a “retry-pass”. The test team may then move to the next test point. System access shall be reliable and per specified channel access timeframes within each test grid for the grid to be considered “passed” throughout all CATP service areas under test.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.7 In-Building Tests

11.5.7.1 Critical Buildings

As part of the initial system design and proposal response, the Offeror shall conduct a predictive analysis of all Critical Buildings based on the Critical Building List contained in the Appendix A of this document. Critical Buildings are all of those facilities that require mandatory 95% or greater coverage reliability on the ground floor and all above ground floors and in some cases floors below the ground floor. The Offeror shall test all Critical Buildings for signal strength and for talk-out



and talk-in audio quality during the CATP. The specification requires all Critical Buildings to provide 95% or greater in-building coverage reliability for both signal strength and audio quality. Should a Critical building fail to demonstrate adequate communication in 95% or more of its interior test locations, then that building shall be identified as a “failed” building.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The number of test points on each floor shall be agreed to by both the County and Offeror to validate the 95% coverage criteria. At a minimum, the four corners of each floor plus the center of each floor shall be tested. Stairwells, elevators, and below-grade areas are to be included in the testing methodology, but elevators and below-grade test points are not subject to be counted in the building reliability calculation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall take corrective action to meet the in-building coverage requirements of the failed building and re-test the building. In order to constitute acceptance, no Critical Buildings tested shall fail. Corrective action, system redesign, or the deployment of in-building solutions to remedy and re-test a coverage deficiency of a Critical building shall be at no cost to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall take corrective action to meet the in-building coverage requirements of the failed building and re-test the building. In order to constitute acceptance, no more than 5% of the area of any critical building tested throughout the County shall fail. This corrective action shall be at no cost to the County, for corrections or re-testing of the coverage ATP.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.8 Inaccessible Test Grids

Grids that are considered inaccessible by the test vehicle shall be discarded from the reliability calculations for RF coverage acceptance and neither counted as neither a pass nor a fail.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.9 CATP Submittal

The Offeror shall prepare and submit a detailed outline of the CATP with its proposal. This outline shall conform to the specifications set forth herein and shall be in sufficient detail that it may become a definitive section of the resulting contractual agreement once agreed to by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

A sample Coverage Acceptance Test Plan is located in Package 2 Section 3.

ALTERNATE OFFER:

Fully Compliant.

A sample Coverage Acceptance Test Plan is located in Package 2 Section 3.

11.5.10 Forms of Testing

The CATP shall consist of multiple forms of testing generally described as Automated Signal Strength ("Automated"), Talk-Out/Talk-In Delivered Audio Quality ("DAQ"), Continuous Audio Quality ("Audio Quality"), Noise Floor, and Subscriber Receiver Desense ("Desense") testing. Successful completion of all forms of testing is required as a part of system acceptance testing. In each and every instance, however, DAQ testing and BER testing shall prevail as the determining criteria in the derivation of specific service area coverage reliabilities in order to gauge the Offeror's compliance with the coverage specifications and shall constitute coverage acceptance.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Per Addendum #3, question 53, the coverage acceptance testing includes DAQ, RSSI, and BER records (information only).

ALTERNATE OFFER:

Fully Compliant.

Per Addendum #3, question 53, the coverage acceptance testing includes DAQ, RSSI, and BER records (information only).

11.5.11Schedule

Coverage acceptance testing shall be scheduled by mutual agreement as soon as practical following commissioning and testing of the Fixed Network Equipment ("FNE" or "Backbone"). All contractual coverage testing shall occur while the forestation in the coverage area exhibits a full foliage condition (beginning of May through September).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.12Coverage Testing as a Part of Final System Acceptance Testing

RF Coverage Testing is a subset of total final system acceptance testing. Once the Offeror has completed testing in accordance with the approved CATP and the CATP results are accepted by the County, the Offeror shall have satisfied all RF system CATP elements required for final system testing acceptance so long as the requirements set forth in this section continue to be met.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.5.12.1 FNE Integrity

The FNE must remain essentially unmodified from the configuration which existed at the time of CATP, continuing through successful completion of final system acceptance testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.12.2 RF System Configuration

The RF system actually tested must remain essentially unmodified from the configuration which existed at the time of CATP, continuing through successful completion of final system acceptance testing.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.5.12.3 Documentation

The Offeror shall provide all CATP test data in final report fashion to the County for review. The final CATP test report shall include all measured data in paper and electronic format, final coverage maps noting Pass/Fail for each test location/grid for all transmission systems and service areas, final coverage maps indicating retry metrics, In-Building test reports and test log sheets, final map noting all inaccessible grids according to the coordinate grid structure, final coverage maps noting SSI and BER data according to the coordinate grid structure, final coverage maps noting receiver desense and noise floor data according to the coordinate grid structure, and final talk-out/talk-in coverage modeling maps using measured field data to calibrate or discipline the original modeling projection to portray as-built coverage conditions for each transmission system and service area.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



11.5.13 Remedies For Coverage Failure

Remedies for coverage failure shall address the entire problem area and not be limited to correcting a portion of the failed area. Remedies may not degrade areas of coverage that were previously accepted. A retest of coverage shall be conducted in any area (previously failed or not) potentially affected by the remedy in order to verify that the composite coverage is maintained. All remedies must meet the performance, feature-functionality, and reliability requirements of the specification. These remedies may include the following:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Modification of antenna or transmitter configurations, as long as those modifications comply with regulatory and zoning restrictions placed on the County, at no additional cost to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Complete integration of remote simulcast sites or multi-cast sites, at no additional cost to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.6 45-DAY RELIABILITY PERFORMANCE TEST

Upon completion of cutover, a complete system performance reliability test shall be executed that will consist of 45 consecutive days of uninterrupted system operation. During this test period, the Offeror shall keep detailed records of any failures or adjustments of the system or subscriber units.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The specific parameters governing the pass/fail criteria of the 45-day reliability test shall be determined by mutual agreement between the Offeror and the County at least ninety (90) days in advance of the reliability test period. The test shall be considered a failure if any of the following events occur and the test will be repeated from the beginning, at the discretion of the County at the sole expense of the Offeror. At a minimum, the proposed system or any subsystem experiences a significant failure that results in:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure or loss of any 25 features, functions or capabilities

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure of MNC system control equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure of site control and transport equipment

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure of 20% of the channel assets anywhere in the system

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure of two or more dispatch console positions

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure of logging recorder

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Loss of coverage due to orphaning of site

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Failure of same device two or more times during the reliability performance test

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Failure to restore a non-critical failure, as defined in the warranty section of this solicitation, according to the contracted response time.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

11.7 AS-BUILT DOCUMENTATION

The County requires the Offeror to deliver a comprehensive as-built design package prior to the final system acceptance process. Completion of the system documentation process shall take place upon mutual agreement between the Offeror and the County. As-built design documents shall be supplied to the County in both electronic (e.g., original native file format-MS Word, MS-Excel, AutoCAD, etc.) and paper format. The Offeror will supply six (6) copies of the as-built design document in paper format and three copies in CD-ROM electronic format. The as-built design documentation must include, at a minimum, the following items for every affected County site:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Network and Subsystem Block Drawings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Comprehensive Equipment Lists/Inventory

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Infrastructure, Console, and Network Element Programming Parameters

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Console and MNC/NMS Databases/Provisioning Parameters

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Fleetmapping Parameters (Talkgroups, Radio Configuration Personalities, IDs, Features, GOS, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Transport Requirements (Design, DS0, DS1, DS3, STS-n, OC-3 Channelization, Switching Parameters)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Scaled Racking/Floorplan Drawings

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Physical Site Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Power and HVAC Requirements

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- MNC Controller and Switch Layouts/Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Channel Bank and Multiplexer, Multiplexer, Layouts/Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Channel Bank and Network Element Programming
Images/Scripts/Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Network Timing Requirements/Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- LAN/WAN Design

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- TCP/IP Network Addressing Scheme

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Network Traffic Utilization/Bandwidth Consumption/Throughput Assessment for Each Network/Quality of Service/Packet Loss Metrics

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Completed Testplans and Results

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Final RF Propagation Coverage Maps for all Configurations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Antenna and Transmission Line Mounting Locations/Azimuths/Tower As-Built

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Equipment Configuration, Installation, Administration, Maintenance, Troubleshooting Manuals (both OEM and Offeror equipment)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Password Matrix for all Network Elements and Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Level Setting and Optimization Documents/Procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Equipment Jumpering/Switch Setting/Board Version Documentation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Software Version Control Matrix

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Cabling/Interconnect Wiring Matrices and Spare Cable Labels

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Punchblock Wiring Matrices

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- PSTN Circuits/Interfaces

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Training Guides

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Change Orders

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Meeting Minutes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Spares Equipment List.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

12.0 SYSTEM SHIPPING AND INSTALLATION

The Offeror is responsible for the shipping, unloading, permitting, storage, and installation of all proposed equipment. The following paragraphs describe the details of the Offeror's logistical responsibilities.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



12.1 SHIPPING

The Offeror is responsible for providing safe and legal transportation and delivery of all materials provided within this specification from the place of origin to designated locations within the County. No equipment shipments shall be made without the approval of the County.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All packaging of material shall conform to good packing practices to protect against any possible shipping damages. Deliveries shall be made to ensure that the system is installed to meet the County's critical dates as defined in the final implementation schedule.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall indicate how equipment or systems shall be delivered (i.e. identifying the carrier and method of transport) and will notify the County's Project Manager of shipping dates. The County's Project Manager shall be informed of any changes in shipping dates. All bills of lading and shipping information shall be archived and provided to the County Project Manager. The Offeror shall create a comprehensive system inventory database of all equipment and associated serial numbers to supply to the County in both native electronic file format and paper copy.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Title to and ownership of the equipment shall remain with the Offeror until the equipment is delivered, successfully installed, operational, tested for use at the radio site as characterized in the Acceptance Test Plan, and accepted by the County.



MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola proposes that title to the Equipment will pass to Customer upon shipment and that risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Title to Software will not pass to Customer at any time.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola proposes that title to the Equipment will pass to Customer upon shipment and that risk of loss will pass to Customer upon delivery of the Equipment to the Customer. Title to Software will not pass to Customer at any time.

Charges for freight express, cartage, or packing shall not be allowed or paid by the County unless otherwise expressly stated by the County. Every package, bill of lading, shipping memorandum, and invoice must be marked with a purchase order number of the purchaser. An itemized delivery ticket, bearing the County's purchase order number must be left with the goods to ensure their receipt. If a carrier makes delivery, an itemized delivery ticket must be attached to the outside of the package.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.2 RADIO SYSTEM SHELTER/EQUIPMENT ROOM INSTALLATION

All installation work performed shall be in accordance with laws, regulations, and ordinances of all state, county, local, and federal agencies. The Offeror shall provide all the necessary personnel, tools, equipment, and transportation for the successful installation of all equipment provided under this solicitation procurement.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror (and any subcontractors) performing the installation shall be required to provide a Certificate of Insurance indicating the coverage limits as outlined by the County. The Offeror shall bear responsibility for the safety of its workers and all others during the implementation phase of this solicitation contract.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror is responsible and shall provide all the hardware, training, and supplies necessary for the proper and complete installation of their equipment. The Offeror bears sole responsibility for providing a turnkey installation of all proposed equipment. Optimization, troubleshooting, and adjustment of each subsystem shall be the Offeror's responsibility. This responsibility includes any changes and/or additions to the systems in order to meet performance criteria. Any additional equipment required after the proposal is awarded to meet the system performance criteria of the defined standards and/or specifications will be at the sole expense of the Offeror unless the County authorizes a change order.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All existing radio communications systems shall remain fully operational during installation of the new radio systems and until the County decides to de-commission legacy gear. Because existing systems support public safety operations, interruptions in service due to Offeror or Offeror activities cannot be tolerated. If interruptions in service are deemed by the Offeror to be unavoidable, written notification detailing the nature and duration of such interruptions shall be provided in advance of the disruption to the County for review and approval.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



Equipment shall be installed in a neat and highly professional manner, in accordance with good practice, by competent technicians or mechanics. Personnel designated by the County shall provide inspection and approval of all installations. Such approval shall be limited in scope to the specific subsystem physical installation, and shall not be construed to imply full acceptance of the system or subsystem.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Subcontractors performing installations of any equipment or any subsystem shall be identified in the Offeror's response. All subcontractor installation experience and qualifications (with at least three different customer references) to perform the tasks associated with this procurement shall be outlined in the proposal response.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

References for Motorola and subcontractors are included in Package 2 Section 2.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

References for Motorola and subcontractors are included in Package 2 Section 2.

Notwithstanding the details presented in these specifications, the Offeror bears responsibility to verify the correctness of the material lists and suitability of devices proposed to meet the intent of the specifications. The Offeror shall be responsible for providing or arranging for all parts necessary for the equipment and its installation, up to and including final system acceptance.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



The Offeror, without any claim for additional payment, shall provide any equipment or parts required to provide a complete and operational system, and not specifically mentioned herein. It shall be understood that the final contract and agreement contemplates and requires the "turnkey" construction and installation of a completely operational system, which meets the standards of the County. In concert with all specifications and functional requirements outlined in this specification, the Offeror shall deliver the appropriate intra-system physical, logical, and functional interfacing necessary to deliver a complete and fully functional network.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.2.1 Equipment to be Installed

At a minimum, the Offeror shall install the following system equipment on and into the appropriate equipment shelters and equipment rooms:

- Radio Base Station Transceivers

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Antennas and Transmission Systems

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Combiners and Multicouplers

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Radio Switching and Routing Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- MNC, Controller, and NMS Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Dispatch Consoles/Logging Recorder/Furniture

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Channel Bank Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Microwave Backbone and Multiplexer Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Power Supplies

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Environmental Control Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Emergency Power Systems

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Equipment Racks

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Interconnect Cabling/Demarcation Blocks/Equipment

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Lightning and Surge Protection/Grounding Connections to Site Ground.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All equipment racks shall be mechanically bonded to the equipment shelter's internal ground system using green insulated stranded copper wire. All ground connections are to be made with minimum length conductors and vertical or horizontal runs where possible. Ground conductors shall have a minimum-bending radius of eight (8) inches. Ground conductors routed in cable trays parallel with transmission lines, telephone lines, power lines, etc., shall be separated by a distance of more than 6 inches. End-to-end cable routing diagrams shall be supplied for all shelter and equipment room installations.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall install any additional equipment not included in the list above that is required for a complete and fully functional system. The Offeror shall coordinate with any landlords/site owners for all installations in shelters or equipment rooms not owned by the County.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.3 DISPATCH CONSOLES

12.3.1 General

The installation of the new dispatch consoles and associated equipment shall be provided by the Offeror at all designated locations. The Offeror shall supply and install all required punchblocks, terminal strips and interconnect cables needed to interface the new console electronics to the new or existing facilities such as radio equipment, telephone equipment, logging recorder equipment, and auxiliary function and control circuits.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All new console cabling, including those which are to terminate at the existing punchblocks, shall be labeled with pre-printed adhesive cable labels. The markers shall be placed at each cable end, adjacent to the connector or plug. All cables and/or cable bundles shall be hidden from view and will be neatly secured by means of plastic tie wraps. End-to-end cable routing diagrams shall be supplied for all shelter and equipment room installations.



MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All cabling to the operator positions and to console electronic equipment shall be provided with sufficient slack to permit movement of at least ten (10) feet in any direction, especially as it pertains to console workstation furniture capable of being raised or lowered by a dispatcher.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.3.2 Physical Interface Requirements

At a minimum, the Offeror shall be responsible for all physical interface(s) between the radio system, communications consoles, and ancillary equipment.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The physical interfaces are expected to include, at a minimum, the following:

- Wire connections from telephone company provided circuit termination block(s) to the appropriate console punchblock(s)

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Wire connections from logging recorder circuit termination block(s) to the appropriate console punchblock(s)/terminal strips

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Wire connections from audio and NMS circuit termination block(s) to the appropriate console punchblock(s)/terminal strips

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Wire connections from headset and footswitch circuit termination block(s) to the appropriate console punchblock(s)/terminal strips

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Wire connections to the corresponding terminal and source locations on the voting comparator (if utilized), audio distribution network, interfaces and the consoles

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Proper termination of all used and unused I/O ports on the voting comparator (if utilized) and audio distribution network.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.3.3 Functional Interface Requirements

At a minimum, the Offeror shall be responsible for the functional interface(s) between the radio system, communications consoles, and ancillary equipment. The functional interfaces are expected to include, at a minimum, the following:

- Adjustments and optimization of the input and output signal level(s) between dispatch consoles and the audio distribution network/voting comparator (if utilized)

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Adjustments and optimization of the output signal level(s) from the consoles to the audio distribution network and/or voting receivers to the comparator (if utilized)

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Adjustments and optimization of the input and output signal level(s) between the corresponding conventional channel interface and dispatch consoles

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Optimization of the necessary base station control format(s) (e.g., tone, DC, relay, etc.)

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Optimization of all data interfaces for NMS and API control (e.g., SNMP, TCP/IP, RS232, RS485, etc.).

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

12.4 MOBILE/VEHICULAR AND CONTROL STATION RADIOS

The Offeror shall perform all mobile radio installations and de-installations in locations within the County that shall be subject to County approval. Pricing shall include all of the appropriate installation costs including mobile radio antenna (typically center-mounted in roof but subject to specific installation conditions). The Offeror shall work with the County at the time of radio installation to define the re-use of an existing hole for antenna installation and possible temporary use of a magnetic mount antenna and associated transmission line for the legacy radio to facilitate the cutover process and minimization of holes cut into the vehicle. The Offeror shall define the unit cost for a magnetic mount antenna and RF cable operational across the entire 764-861 MHz frequency range per current FCC requirements.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall inspect all existing mobile installations to develop an Installation Guideline Manual for all common and specialized vehicles and apparatus as well as control stations. The manual shall include digital photographs with detailed explanations to ensure consistent, high-quality installations across the entire fleet. The manual shall discuss the existing radio system installations, the units to be removed and the units to remain (if any). This manual shall be supplied to the County at least six weeks prior to commencing any mobile and control station installation activities.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola looks forward to discussing this in further detail.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola looks forward to discussing this in further detail.

The mounting assembly, which may consist of the mounting tray, radio control head, and its external interfaces (i.e., roof-mounted antenna, logic unit, etc.) shall be configured such that all testing, diagnostic, and alignment ports (including antenna connectors) are easily accessible. The finished



assembly shall be secured and remain in a fixed and motionless position under all operating conditions, excluding physical vehicle accident.

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

All coaxial cable connectors shall be soldered to its cable or to its interface circuitry. Crimp-style connectors for this application are acceptable. Low loss Teflon antenna cable is preferred. Cabling internal and external to the vehicle shall be dressed in flex loom where feasible with all cabling neatened and secured to prevent damage or disturbance to the vehicle operator. Weatherproofing of all exterior connections shall be provided to maximize the lifetime and performance of the entire vehicular radio assembly. All antenna assemblies and connections shall be tested for adherence to manufacturer's specifications and operating guidelines.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All wiring shall be appropriately dressed and connectorized in accordance with good engineering practices. All main power leads shall be connected as close as practical to the battery using approved methods and hardware. Each main power lead shall be attached to its own in-line fuse rated for the maximum current drain of the associated circuit. Obtaining power by connecting to existing radio equipment or any other device is unacceptable. All ground connections shall be provided from the main battery. Bonding to the vehicle frame is not acceptable.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All cabling that is exposed shall be dressed with a flexible tubing and secured to the vehicle frame by tying to any stationary support element using solid copper wire or fasteners. Plastic tie wraps should be used within at least 2 feet of the end connection points in areas not directly exposed to the weather.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The cable length shall allow repositioning the equipment within a radius of 5 feet to allow for changing operating conditions. A representative from each County subscriber agency shall inspect the first installation of equipment. A County representative will inspect each vehicular installation. Each vehicular installation shall successfully complete an operational performance test and shall be approved via signature of the County inspector. The Offeror is responsible for the removal and inventory of all legacy County subscriber units following a successful system cutover and reliability test period as defined by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The mobile assembly shall be positioned on a mounting assembly. The mounting plates, base plates, brackets, etc. shall be a minimum 18-gauge steel construction. The support bar, of similar high steel gauge construction, bolts, support plates, etc., shall be coated with a high quality black matte finish. The finished assembly shall be secured and remain in a fixed and motionless position under all operating conditions, excluding physical vehicle accident.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

13.0 SALVAGE OPERATIONS

The Offeror is responsible for removing all existing or legacy equipment no longer required to remain in operation in order to meet the performance requirements of this specification. All removed or de-installed equipment shall be properly stored at a location provided by the County. The Offeror shall provide the County with a detailed inventory list of all equipment including model number, serial number and location of removal. The County encourages the Offeror to offer a salvage credit in its proposal for the Offeror to take possession of any desired salvaged material.

MOTOROLA RESPONSE

MAIN OFFER:



Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

3.2 WARRANTY AND SUPPORT REQUIREMENTS

14.0 WARRANTY MAINTENANCE AND SYSTEM SUPPORT

14.0 WARRANTY MAINTENANCE AND SYSTEM SUPPORT

The Offeror guarantees that all equipment supplied pursuant to this solicitation will be new and of first quality throughout. The system warranty shall commence on the day that the County grants final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

All items (material and labor) shall be warranted for a minimum of one (1) year after the date of final system acceptance, unless otherwise specified in the specification. This warranty shall include repair or advanced replacement of any defective equipment, system, subsystem, hardware and/or software which becomes defective through normal wear and usage or is deemed as such between the County and the Offeror. The Offeror shall guarantee an on-site, two-hour response time to any County site, network node, or subscriber radio installation to remedy a failure during the system warranty and maintenance period.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.



Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

When parts under warranty are replaced, the County requires that the replacement part also be new and not factory-refurbished. The Offeror shall fully integrate and test all spare parts prior to final system acceptance. No replacement parts shall be integrated that provide less functionality or diminished capacity than the original equipment to be replaced. A new twelve-month warranty period should begin when a new part is installed as a replacement to a defective part under warranty. All warranty and maintenance issues shall be tracked by the Offeror and its service organization using an electronic database that the County can query at any time.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Replacement parts will be new or factory refurbished to meet or exceed factory specifications. The warranty period for any replaced parts will not be extended beyond the original warranty expiration date.

Motorola will provide the County with access to the Motorola Online (MOL) database. This database contains information concerning warranty and post warranty cases that are being tracked. A description of the Motorola Online System has been included in this proposal.

ALTERNATE OFFER:

Conditionally Compliant.

Replacement parts will be new or factory refurbished to meet or exceed factory specifications. The warranty period for any replaced parts will not be extended beyond the original warranty expiration date.

Motorola will provide the County with access to the Motorola Online (MOL) database. This database contains information concerning warranty and post warranty cases that are being tracked. A description of the Motorola Online System has been included in this proposal.

Offeror support is defined as the ability of the Offeror to remedy to County satisfaction any hardware and/or software problem with any equipment and services provided as part of this offering. Offeror support shall take the form of a 24x7x365 technical support hotline, two-hour on-site response time, advanced board replacement, product engineering, field service technicians, and field engineering. Offeror support also requires the Offeror to be able to provide new and/or equivalent



spare/replacement hardware and software equipment for the proposed offering for not less than fifteen (15) years from the date of final system acceptance. Equivalent spare/replacement hardware and software provided during the entire support timeframe shall not necessitate any platform upgrade or subsystem reconfiguration.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will be the sole point of responsibility for resolution of all maintenance matters. All issues will be resolved to the point of restoring the equipment to the specifications or functionality as contracted.

Motorola's support program for the warranty and post warranty period includes: 24x7x365 remote monitoring and technical support, on-site infrastructure repair and advanced board replacement. These programs are supported by product engineering, field service technicians and field engineering. Refer to response to 14.4, Warranty and Maintenance Performance Levels, for specific on-site response times.

Please refer to the response to 14.2, Equipment Support, for details of the hardware and software support available for the 15 year period requested.

While it is unlikely that spare parts and /or replacement hardware will necessitate a platform upgrade or subsystem reconfiguration, Motorola cannot provide any guarantees that such work will not be required. Motorola will advise the County if any such hardware upgrades are required.

ALTERNATE OFFER:

Conditionally Compliant.

In most cases, replacement parts will be available for 7 years after the cancellation of a product. Equivalent spare/replacement hardware and software provided during the support timeframe may necessitate a platform upgrade or subsystem reconfiguration

Motorola will be the sole point of responsibility for resolution of all maintenance matters. All issues will be resolved to the point of restoring the equipment to the specifications or functionality as contracted.

Motorola's support program for the warranty and post warranty period includes: 24x7x365 remote monitoring and technical support, on-site infrastructure repair and advanced board replacement. These programs are supported by product engineering, field service technicians and field engineering. Refer to response to 14.4, Warranty and Maintenance Performance Levels, for specific on-site response times.

Please refer to the response to 14.2, Equipment Support, for details of the hardware and software support available for the 15 year period requested.

While it is unlikely that spare parts and /or replacement hardware will necessitate a platform upgrade or subsystem reconfiguration, Motorola cannot provide any guarantees that such work will not be required. Motorola will advise the County if any such hardware upgrades are required.



14.1 SYSTEM SOFTWARE AND HARDWARE WARRANTY

The equipment supplied pursuant to this solicitation and any subsequent agreement is warranted by the Offeror to be free from defects in materials, workmanship and otherwise for one year from final acceptance of the proposed system unless otherwise provided in this solicitation and any subsequent agreement.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall warrant that the system and each component of the system shall perform in strict accordance with the requirements of this solicitation and any subsequent agreement and shall be completely free of system defects, including latent defects for at least one year after the date of final system acceptance. Unless otherwise provided herein, all equipment shall be warranted for a period of one year after the date of final system acceptance. The warranty period for non-Offeror manufactured equipment is as specified by its manufacturer, but not less than one year after the date of final system acceptance. The Offeror maintains sole responsibility for settling and coordinating all warranty issues with OEM Offerors on behalf of the County throughout the entire warranty and maintenance period.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

ALTERNATE OFFER:

Conditionally Compliant.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

The proposed system release/platform being offered shall not be the last of its type or version with regard to future software and hardware compatibility. The next software release compatible with the system shall not require new hardware to support the existing functions of the system. In the event that parallel system software development has been undertaken by the Offeror, and the software release in the County's system is abandoned (no further development or support) or obsoleted, the



Offeror shall completely upgrade the County's system to the surviving software release at no expense to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola provides periodic System Enhancement Releases (SER). These SERs should not require hardware upgrades to support the existing functions of the system. Major System releases may require hardware upgrades. However most of the hardware upgrades required would be covered under the SUA II program.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola provides periodic System Enhancement Releases (SER). These SERs should not require hardware upgrades to support the existing functions of the system. Major System releases may require hardware upgrades. However most of the hardware upgrades required would be covered under the SUA II program.

At no additional cost to the County, the Offeror shall provide and completely integrate all hardware, firmware, software releases or patches that are required to correct any latent functionality or software defect that may exist in the proposed system (including system failures resulting from software problems, functionality fixes, and software upgrades to the County's system), for a fifteen (15) year period from the date of final system acceptance. This responsibility is to include any upgrades to fixed network equipment, system management systems and subscriber units. For the life of the contract and the contract maintenance period, the Offeror shall provide, at a minimum, the opportunity to refresh software for all system and subscriber equipment on a semi-annual basis to take advantage of enhancements and defect resolutions.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant

The proposed Motorola manufactured Fixed Network Equipment (FNE) and system management systems are fully compliant, however, Motorola manufactured subscriber radios are planned for seven to ten year cycles between refreshes to support existing features and functionality. As such, Motorola cannot provide assurances for the availability of hardware and software upgrades for the proposed APX subscriber units over the entire fifteen (15) support period requested. The proposed APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform.

Please see Package 2 Section 3 for detailed maintenance and warranty information.



ALTERNATE OFFER:

Conditionally Compliant

The proposed Motorola manufactured Fixed Network Equipment (FNE) and system management systems are fully compliant, however, Motorola manufactured subscriber radios are planned for seven to ten year cycles between refreshes to support existing features and functionality. As such, Motorola cannot provide assurances for the availability of hardware and software upgrades for the proposed APX subscriber units over the entire fifteen (15) support period requested. The proposed APX Series is Motorola's 4th generation of ASTRO 25 subscriber platform that provides P25 Phase 2 support as well as backwards compatibility with P25 Phase 1 and Legacy system protocols. The APX platform was launched in 2009 with the APX 7000/7500 Multiband series. With additional offerings that include the APX 6000/6500, APX 6000/6500 Li, APX 4000/4500, and APX 4000/4500 Li there are no anticipated or foreseeable cancellation dates for this new and growing subscriber platform.

Please see Package 2 Section 3 for detailed maintenance and warranty information.

In the event a defect is found in another customer or field system that utilizes the same or similar release as the County's system, the Offeror shall notify and advise the County of the defect and when a new hardware, firmware, software release or patch will be available to correct the problem. At such time, the County shall decide whether it will require an upgrade prior to observing the defect. Notification should occur regardless of whether the County is currently affected by this defect. The Offeror shall be responsible for providing monthly product quality bulletins for all Offeror and OEM equipment and software contained in the proposed network in electronic fashion to the County Project Manager and System Manager during the course of system implementation and the entirety of the warranty and contract maintenance phases.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The software release in the County's system at the time of final system acceptance shall be the latest version available at the time of shipment from the Offeror's development and manufacturing facility. The Offeror assumes responsibility for all equipment and services to implement the latest system and subscriber equipment software versions prior to final system acceptance. Under all warranties provided, all parts shall be replaced free of charge including labor. The Offeror may replace equipment, software or components rather than repair them, at the Offeror's option.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The software release will be the latest version compatible with the STARCOM21 host network. STARCOM21 follows even release years.



ALTERNATE OFFER:

Fully Compliant.

The software release will be the latest version compatible with the STARCOM21 host network. STARCOM21 follows even release years.

Whenever defective work (and damage resulting from such a remedy) has been corrected, removed, or replaced under warranty, the warranty period with respect to such defective work shall be extended for an additional period of one (1) year after such correction or removal and replacement has been satisfactorily completed.

MOTOROLA RESPONSE

MAIN OFFER:

Non-Compliant.

The warranty period for any replaced parts will not be extended beyond the original warranty expiration date.

ALTERNATE OFFER:

Non-Compliant.

The warranty period for any replaced parts will not be extended beyond the original warranty expiration date.

14.2 EQUIPMENT SUPPORT

The Offeror shall warrant support in the form of replacement parts for all system and subscriber hardware and software equipment for fifteen (15) years from the last date of manufacture of the product. The Offeror shall use commercially-reasonable efforts to identify and to obtain replacement parts to meet or exceed the County's specific maintainability requirements. The Offeror shall electronically issue all product cancellation notices to the County Project Manager and System Manager throughout the entire system implementation and maintenance periods. The Offeror shall provide product cancellation notices within two weeks of the official announcement. These cancellation notices serve the basis for the fifteen (15) year support guarantee. The Offeror is responsible throughout the project implementation and contract maintenance period for remedying and re-designing, at no cost to the County, any system design affected by the cancellation of equipment or software which reduces the fifteen (15) year product support guarantee. Prior to final system acceptance, no equipment or software shall be included with the system offering that has been identified or announced for cancellation.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will use commercially reasonable efforts to provide replacement parts for Motorola manufactured subscriber equipment for five (5) years and for Motorola manufactured fixed infrastructure equipment exclusive of third party IT equipment (e.g. servers, pc's) for seven (7) years, both from the date of last manufacture. Motorola reserves the right to supply either assemblies or piece parts.



To sustain the ASTRO 25 Platform lifespan, Motorola makes on-going investments to regularly refresh the underlying components to address normal technology obsolescence and apply security safeguards. Both software and hardware updates are incorporated into major system releases which Motorola provides one to two times per year. Depending on the system configuration, system release updates may be accomplished in single jumps that span 1 to 4 system releases. By making regular updates to their system, The County can extend supportability well beyond the above stated timelines.

ALTERNATE OFFER:

Exception.

Unless otherwise indicated in Motorola's proposal, the warranties set forth in the Motorola terms and conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties. Motorola disclaims all other warranties or conditions, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Motorola will use commercially reasonable efforts to provide replacement parts for Motorola manufactured subscriber equipment for five (5) years and for Motorola manufactured fixed infrastructure equipment exclusive of third party IT equipment (e.g. servers, pc's) for seven (7) years, both from the date of last manufacture. Motorola reserves the right to supply either assemblies or piece parts.

To sustain the ASTRO 25 Platform lifespan, Motorola makes on-going investments to regularly refresh the underlying components to address normal technology obsolescence and apply security safeguards. Both software and hardware updates are incorporated into major system releases which Motorola provides one to two times per year. Depending on the system configuration, system release updates may be accomplished in single jumps that span 1 to 4 system releases. By making regular updates to their system, The County can extend supportability well beyond the above stated timelines.

14.3 SPARE PARTS INVENTORY

The cost for replacement parts shall be quoted as part of the Offeror's proposal. Parts pricing shall be in the form of a standard discount off of the OEM or Offeror's list price equivalent to those provided to dealers or Offeror-authorized service shops. This discount level shall be part of the attached pricing sheets. The Offeror also shall provide a comprehensive pricing matrix or book defining the OEM and Offeror list prices for all relevant hardware and software for the proposed system platform. This comprehensive pricing matrix shall serve as the definitive ordering guide for all future system and subscriber equipment purchases. The parts pricing level shall remain intact for a period not less than fifteen years following final system acceptance.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



Spare parts required for this system shall include sufficient parts, modules and components to restore the system to full redundancy during a system or subsystem failure. The Offeror shall fully integrate and test all spare parts prior to final system acceptance. When not specifically addressed in this specification, the Offeror shall recommend and price accordingly the spares necessary to maintain the required availability levels for the various subsystems.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

14.4 WARRANTY MAINTENANCE PERFORMANCE LEVELS

Normal, non-critical warranty maintenance shall be performed during normal business hours of 8:00 am-5:00 pm M-F. Some equipment and subsystems deemed critical by the County shall be protected by warranty and extended maintenance that provides guaranteed response and restoration times on a 365-day by 24-hour basis. The following lists identify response and maintenance performance level required for the various subsystems:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

24-hour by 7-day – 30-minute phone response, 2-Hour On-Site Response, 2-Hour repair:

- Voice Radio System Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola recommends, and has included in the Alternate offering, the current STARCOM21 support plan of 4 hour response, 24x7.



- NMS System Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Microwave Backbone/Transport

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Dispatch Console/Logging Recorder Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.



Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Tower/Shelter Subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Emergency Power Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.



ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

10-hour by 5-day – 4-Hour On-Site Response, 8-Hour repair:

- Subscriber Units (Mobile, Portable, Control Stations)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets for Motorola manufactured subscriber units. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Non- Compliant.

Motorola has not included on-site response or on-site repair for Motorola manufactured subscriber units. As requested below, failed Motorola subscriber radios will be collected weekly from a designated County location, repaired at the centralized Motorola Depot and returned to the designated County location.

On-site response for Control Stations will be covered under the warranty and post warranty services. Repair times will be based on a best continuous effort basis.

- In-Building Systems (if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets for In-Building Systems. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets for In-Building Systems.



Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Vehicular Repeaters (if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets for Motorola manufactured subscriber units. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time targets for Motorola manufactured subscriber units. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

- Alternative Support Systems and Specialized Equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time target. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola has included the required warranty and post warranty support services required to achieve the phone response and on-site response time target. Motorola expects that on average these targets should be achieved. Repair times will be based on a best continuous effort basis.

Malfunctions that cannot be immediately or unequivocally diagnosed and pinpointed to a certain item of equipment or service shall require the immediate participation of all service Offerors until responsibility for the problem has been established. In no instance shall the failure to resolve the issue of responsibility relieve any of the Offerors of the mutual obligation to restore system operability with the least impact on the availability of the system to the end-users. The Offeror shall be the sole point of responsibility to resolve any and all maintenance matters to the satisfaction of the



County. The Offeror shall guarantee that the turn-around time for all subscriber equipment repairs requiring factory depot involvement shall be no more than 7 calendar days.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The turn-around time for Motorola-manufactured mobiles and portables will be less than 7 calendar days. Non-Motorola manufactured subscribers are not covered by this maintenance program.

ALTERNATE OFFER:

Fully Compliant.

The turn-around time for Motorola-manufactured mobiles and portables will be less than 7 calendar days. Non-Motorola manufactured subscribers are not covered by this maintenance program.

Proposals shall provide a complete description of the intended preventive maintenance methodology and shall specify the frequency of preventive maintenance required for all proposed equipment and systems. Preventive maintenance shall be performed according to a schedule that is mutually acceptable to the County and the Offeror. The Offeror shall include in its proposal an example of an actual, completed preventive maintenance regimen representative of what will be provided with the proposed system and corresponding maintenance phases. The schedule shall be consistent with the operation requirements of the County and shall be based upon the specific needs of the equipment being maintained. The Offeror and/or service provider shall be responsible for collecting failed subscriber units and delivering repaired subscriber units to a location designated by the County on as-needed basis.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Failed Motorola subscriber radios will be collected weekly from a designated County location, repaired at the centralized Motorola Depot and returned to the designated County location.

The Offeror shall include in its proposal a description of any remote administration and maintenance service arrangements that will be provided with the proposed system. The qualifications and individual resumes (noting years of experience, training, schooling/degree, customer references, etc.) of all proposed maintenance service provider staff shall be provided in the Offeror's proposal response. All service providers may be required to submit to routine background investigations conducted by the County to ensure system integrity in concert with security policies and initiatives. In the pricing response, the Offeror shall quote the annual costs for comprehensive, turnkey system and subscriber equipment maintenance for all proposed equipment for a period of fifteen (15) years



following final system acceptance noting all available discounts, incentives, and economies of scale. The Offeror also shall include a standard contractual service agreement and associated comprehensive, detailed statement of work with the maintenance quotation.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola affirms that it checks the criminal records of all applicants for felony convictions and misdemeanor convictions involving a violent act or threat of violence within the seven (7) years prior to employment, where permitted by law. If Motorola is awarded the contract, Motorola agrees to discuss the need for background screening of Motorola employees and to negotiate a contractual provision that is mutually acceptable and compliant with applicable law. However, in no event can Motorola agree to waive the rights of its employees, nor can Motorola provide the Customer with any information protected by law, including but not limited to background check data.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola affirms that it checks the criminal records of all applicants for felony convictions and misdemeanor convictions involving a violent act or threat of violence within the seven (7) years prior to employment, where permitted by law. If Motorola is awarded the contract, Motorola agrees to discuss the need for background screening of Motorola employees and to negotiate a contractual provision that is mutually acceptable and compliant with applicable law. However, in no event can Motorola agree to waive the rights of its employees, nor can Motorola provide the Customer with any information protected by law, including but not limited to background check data.

14.4.1.1 Warranty and Maintenance Service of FNE, Mobile, and Portable Radios

The Offeror shall indicate the name and address of the factory authorized repair and service facilities proximate to the County. The Offeror shall indicate the level of support that can be provided by these facilities in support of warranty and maintenance requirements for the FNE, mobile, portables, consoles, microwave, and other components to be provided under this solicitation.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola intends to use two service partners in support of the Lake County system. The Motorola Field Service Organization (FSO) will have first line responsibility for the Dispatch Centers and all Remote Site Equipment, excluding Microwave. Motorola's Service Partner, Chicago Communications will have first line responsibility for the Microwave Systems, Mobiles, Portables, Control Stations and all in building Bi Directional Amplifiers. Addresses for both service partners are provided in the table below.



ALTERNATE OFFER:

Fully Compliant.

Motorola intends to use two service partners in support of the Lake County system. The Motorola Field Service Organization (FSO) will have first line responsibility for the Dispatch Centers and all Remote Site Equipment, excluding Microwave. Motorola's Service Partner, Chicago Communications will have first line responsibility for the Microwave Network and all in building Bi Directional Amplifiers. Addresses for both service partners are provided in the table below.

The Offeror shall complete the following table to provide information relative to the factory authorized center(s). The Offeror also shall provide at least three customer references with contact information for each of the qualified service facilities listed below so that the County may independently assess the customer satisfaction levels achieved by these firms. The Offeror also shall provide the number of local service personnel available to respond during non-business hours to a major outage.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Please refer to the table below. Customer references are as follows:

<i>Motorola FSO:</i>	<i>City of Elgin</i>	<i>Mike Bayer</i>
	<i>DuPage County</i>	<i>Brian Tegtmeyer</i>
	<i>NWCD</i>	<i>Cindy Barbera-Brelle</i>
<i>Chicago Communications:</i>	<i>Cook County</i>	<i>Wally Klinger</i>
	<i>IDOT District 1</i>	<i>Scott Mitchell</i>
	<i>SEECOM</i>	<i>Linda Luehring</i>

ALTERNATE OFFER:

Fully Compliant.

Please refer to the table below. Customer references are as follows:

<i>Motorola FSO:</i>	<i>City of Elgin</i>	<i>Mike Bayer</i>
	<i>DuPage County</i>	<i>Brian Tegtmeyer</i>
	<i>NWCD</i>	<i>Cindy Barbera-Brelle</i>
<i>Chicago Communications:</i>	<i>Cook County</i>	<i>Wally Klinger</i>
	<i>IDOT District 1</i>	<i>Scott Mitchell</i>
	<i>SEECOM</i>	<i>Linda Luehring</i>



Item	Service Facility #1	Service Facility #2
Name	Motorola Field Service Organization	Chicago Communications, LLC
Address	1301 East Algonquin Road	200 Spangler Avenue
City/State	Schaumburg, IL 60196	Elmhurst, IL 60126
Number of available technicians trained in proposed system platform	7 Technicians & Network Mgrs.	11 Technicians
Years of operation for service facility	18 years	9 years
Number of 800 MHz trunked systems supported by the facility	One*	Four (4)*
Guaranteed on-site emergency response time to County	2 Hour	2 Hour

****Many of the past 800 MHz maintenance customers have migrated over to the STARCOM network***

The Offeror shall provide 24/7/365 remote system monitoring by personnel located in a continuously staffed system monitoring center, which center shall operate 24 hours per day, 365 days per year. The Offeror shall provide in its response a detailed description of the remote system monitoring center and shall allow a tour of this Center should the County so desire.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

14.5 WARRANTY MAINTENANCE PERFORMANCE REPORTS

The Offeror shall furnish the County with a monthly report of all system and subscriber equipment maintenance requests and resolutions during the warranty and contracted maintenance periods. The Offeror's proposal must include information that will be provided in their reports as well as actual sample warranty maintenance report forms used for other active Offeror customers. At a minimum, the following data is required:

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The assigned Motorola Customer Support Manager will work with the County to determine the format and level of detail required in the monthly reports.



ALTERNATE OFFER:

Fully Compliant.

The assigned Motorola Customer Support Manager will work with the County to determine the format and level of detail required in the monthly reports.

- Date and time notified

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Date and time of arrival on site

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Description of equipment and malfunction reported

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Original equipment manufacturer (OEM)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Diagnosis of failure and corrective work performed

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Root cause analysis

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Date and time failure was corrected

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Charges for service (if applicable)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Name of person/technician performing service.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

14.6 TEST EQUIPMENT

When not specifically addressed in this specification, the Offeror shall recommend, organize uniquely in the equipment list, and price accordingly the test equipment necessary to properly maintain the network infrastructure, various subsystems, and the active subscriber unit fleet. The same level and types of test equipment mandated by the Offeror for its own service organizations shall be identified and priced as an option for the County. All test equipment shall be delivered new and of first quality with the proper calibrations. The Offeror shall present a matrix of all recommended test equipment with an explanation of purpose and need as it applies to maintaining the proposed system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola has provided a complete list of the Test Equipment required to support the network.

ALTERNATE OFFER:

Conditionally Compliant.

Test equipment will not be required to support the Lake County Fixed Network Equipment. Motorola's Service Partners that are providing the warranty and post warranty support of the Lake County System will provide the necessary test equipment.

3.3 TRAINING REQUIREMENTS

15.0 OPERATIONAL, TECHNICAL AND USER TRAINING

The Offeror shall fully describe all proposed and available training courses. This shall include, at a minimum, classroom style instruction, operational style classes, a detailed training plan, description of available training material, resume of potential course instructors and a customer reference list of trained personnel (to include: names, telephone numbers, company, and system description).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.



ALTERNATE OFFER:

Fully Compliant.

Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.

The Offeror shall train County employees, County contractors, and County designees. The Offeror shall permit videotaping of training sessions for use within the County for re-fresher training. All written and presentation training materials shall become property of the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The following sections describe the radio system operational, maintenance, and user type of training that is required for the system. The Offeror shall complete development of the entire customized County training program prior to completion of the Detailed Design Review process.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

15.1 RADIO SYSTEM OPERATIONAL TRAINING

The Offeror shall provide on-site, customized operational training for up to twelve (12) students. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. The Offeror shall propose a training schedule that correlates to the implementation schedule. The Offeror's highly skilled personnel, familiar with the same equipment as that being implemented, shall conduct the training. This training shall be designed for administrators, agency coordinators, and system managers that require a solid, high-level understanding of the radio system and all supporting infrastructure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



The Offeror shall provide one (1) set of manuals per student plus an additional six (6) sets of manuals. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) and read with the Adobe Acrobat Reader software. Twelve (12) CD-ROM copies shall be supplied.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror's program shall include training in orientation, management, and operation of all equipment provided under the following items:

- Overview of the Radio System

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Use of Radio System/Consoles

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.



- Use of Microwave System

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Use of Diagnostic Tools

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Fleetmapping

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Database Management and Network Administration

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Use of NMS/Alarm Monitoring Equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Familiarization and Orientation with Communication Facilities

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Reporting and Utilization Analysis.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.



The Offeror shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's actual system/equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The training shall be designed so that, upon completion, a user will be qualified to comprehend radio system management, the network, fallback design, perform system diagnostics, and operate the subscriber units. The Offeror's highly skilled personnel shall conduct the training. Instruction material should be included as a part of each course and shall become property of the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

15.2 RADIO SYSTEM MAINTENANCE TRAINING

The Offeror shall provide on-site, customized training for up to Six (6) people. Training shall include system orientation, management, operation, and maintenance of all system infrastructures and associated system equipment provided. The training shall include education on the theory of operation and practical maintenance procedures for the entire system infrastructure and all systems contained therein. This training shall be designed primarily for technical and telecommunications personnel within the County that may require sufficient education to assist in the restoration of the system during a failure.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However,



Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

The training shall be designed so that upon completion, a technician will be qualified to perform all levels of installation/setup, optimization, troubleshooting and maintenance of the system infrastructure and subscriber units to the board level. The Offeror's highly skilled personnel shall conduct the training. Instruction material should be included as a part of each course and will become property of the County. Since this training is customized to the County's proposed system design, the Offeror shall provide technicians from the assigned local maintenance service provider shop to attend this training at no additional cost to the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

The Offeror shall provide one (1) set of manuals per student plus an additional six (6) sets of maintenance manuals. Additionally, all maintenance manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) and readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be made available.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The course content shall include the following, at a minimum, for all network subsystems:

- As-Built documentation structure, numbering system, and configuration control system

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.



Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Principles of digital transmission and RF troubleshooting

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Level setting

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Network traffic analysis and bandwidth utilization measurement

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Block diagram and circuit description - all units

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Installation and turn-on procedure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Service alignment and testing procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.



Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Troubleshooting and fault diagnosis to unit and board level

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Test equipment configuration and usage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Unit replacement procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Operating and safety procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Subscriber equipment repair and programming

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Motorola offers Level 1 training for subscriber repair.

ALTERNATE OFFER:

Fully Compliant.

Motorola offers Level 1 training for subscriber repair.

- NMS design and use

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However,



Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Network security

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Client/server architecture and network administration

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Database maintenance and optimization

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.



- Software refresh and flash upgrades

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- System restoration and failure modes

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Shelter subsystems maintenance and operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- In-Building systems (if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Traffic continuity procedures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

The Offerors shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's system/equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

15.3 RADIO SYSTEM MANAGEMENT TRAINING

The following section describes the Radio System Management system operational, administrative, and diagnostic type of training.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.



The Offeror shall provide on-site training for Twelve (12) people. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. Ongoing training opportunities for new or updated components via Internet or CD-based self-paced programs developed by the Offeror are also encouraged by the County. The Offeror shall provide on-site training for Twelve (12) people in orientation, management, operation, and maintenance of all radio system management subsystems and associated network elements. The training shall include education on the theory of operation and practical administration and maintenance procedures for the entire system infrastructure and all systems contained therein.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall conduct comprehensive classroom operator training for the communications management personnel operating and administering the new radio system. This training shall be conducted in a classroom environment, using training aids, and a comprehensive model of the entire radio system. Training aids such as videos, system diagrams, training manuals showing working functionality and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a customized system management training manual. In addition to the system management training manual, an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software shall be provided. Twelve (12) hard copies and six (6) CD-ROM copies shall be supplied. The Offeror shall provide, in addition to the customized training plan, and handout material, three (3) DVD copies that would instruct a user on the operational functions and features of the proposed radio system and subscriber unit fleet.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

The course content shall include the following, at a minimum, for all network subsystems:



- As-Built documentation structure, numbering system, and configuration control system

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Block diagram and system description

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Installation and as-built documentation comprehension and analysis

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola subcontractors perform the installation of the radio network equipment for STARCOM21.

- Radio programming and fleetmapping

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Use of software applications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Troubleshooting/diagnosis to element level

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Training organization delivers Troubleshooting/diagnosis training to the board level.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Troubleshooting techniques and use of NMS

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Console configuration and management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

- Logging recorder configuration and management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- In-Building systems (if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Microwave backbone training

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Database development, optimization, and management

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Shelter subsystems operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

- Failure mode analysis.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Conditionally Compliant.

Motorola maintains and manages the STARCOM21 radio network, therefore, under the alternate offer, infrastructure training is not required; providing cost savings. However, Motorola is providing training for Lake County-owned subsystems, for example: dispatch consoles, logging recorders and subscribers, etc. See Cost Proposal in Package 3 Section 2.

The Offeror shall submit a resume, a list of training classes, and prior client references that have been trained by the Offeror's training personnel. The County shall interview the Offeror's training team, and shall mutually agree on the training package and the qualifications of the training personnel prior to the development and execution of the customized County training program.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.

ALTERNATE OFFER:

Fully Compliant.

Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.

15.4 USER TRAINING – “TRAIN THE TRAINER”

15.4.1 On-Site Radio Usage Training

The Offeror shall provide on-site, “Train the Trainer” type courses for the following categories of equipment:

- Subscriber Mobiles

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Subscriber Portables

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Subscriber Control Stations

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.



- Vehicular Repeaters (if utilized)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

- Alternative Support Systems and Specialized Equipment (if utilized).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Training shall include system orientation and familiarization that includes theory of operation discussion and equipment demonstration. The training shall be designed so that, upon completion, each student will be qualified to train system end-users on the customized County operation of the specific equipment. For example, the student shall be qualified to train County first-responders and general government users on the operation of all proposed mobiles and portables. The Offeror shall customize all “Train the Trainer” courses per County satisfaction in conjunction with the specific programming and configuration parameters utilized by the County.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide training for up to three (3) classes of ten (10) students per class. The Offeror’s highly skilled personnel shall conduct the training. Instructional material shall be included as parts of each course and will become property of the County. Training aids such as videos, system diagrams, training manuals showing working functionality and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a personal “Trainer’s Guide” training manual. In addition to the “Trainer’s Guide” training manual, an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software shall be provided. Thirty (30) hard copies and thirty (30) CD-ROM copies shall be supplied. The Offeror shall provide, in addition to the training plan, and handout material, three (3) DVD copies that would instruct a user on the operational functions and features of all proposed radio system subscriber units.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

15.4.2 On-Site Dispatch Console Operator Training

The Offeror shall conduct comprehensive, dispatch console operator training in nine (9) separate sessions. Training sessions shall be coordinated for all of the dispatch personnel before the new console system is placed in service. Sessions are to be scheduled so that all personnel can be coordinated into one of the sessions with minimum impact on shift personnel. This training shall be conducted in a classroom environment, using training aids, and actual County dispatch radio consoles. Training aids such as videos, system diagrams, training manuals showing functionality, and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Additionally, there shall be six (6) master quality hard copies of the Dispatcher Operator Training manual for future reference and follow-up training. The County intends to duplicate these “masters” for distribution to other personnel as personnel requirements change. In addition, the Operator's Training manual shall be available in a *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be supplied. There shall be no restrictions or licensing requirements for information provided as reference or used for future training purposes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

Additional training classes also shall be conducted using operational console equipment and ancillary subsystem equipment required by the dispatch personnel (e.g., logging recorder, NMS, etc.). All required training shall be conducted in the County Sheriff's Primary Dispatch Center utilizing the proposed system consoles. Each trainee shall become thoroughly familiar with the operations of the new console to become experienced and fully qualified to operate the new consoles.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide a list of course objectives and core competency skills for each of the training sessions prior to completion of the Detailed Design Review. The Offeror shall provide, in



addition to the training plan and handout material, six (6) DVD copies that would instruct the user on the customized use of the operational functions and features of the County console system.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall submit a resume, a list of training classes, and prior client references that have been trained by the proposed training personnel. The County shall interview the Offeror's training team, and shall mutually agree on the training package and the qualifications of the training personnel prior to the development and execution of the training program.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.

ALTERNATE OFFER:

Fully Compliant.

Please see Package 2 Section 3 for detailed Training information and courses proposed. Training personnel are assigned based on availability at the time of training scheduled. We will be happy to provide resumes and references at the time of scheduled training.

15.5 MICROWAVE SYSTEM TRAINING

The following sections describe training for microwave maintenance and operation.

MOTOROLA RESPONSE

Understood.

15.5.1 Microwave System Maintenance Training

The Offeror shall provide on-site microwave backbone system training for up to six (6) people and shall be coordinated with the comprehensive Radio System Maintenance Training Program. Training shall include system orientation, theory of operation, management, customized operation, and maintenance of all system infrastructures, and associated proposed subsystem equipment. The training shall include education on the theory of operation and practical maintenance procedures for the entire microwave system infrastructure and all ancillary subsystems contained therein.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide six (6) sets of manuals for the training course. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Six (6) CD-ROM copies shall be supplied.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The customized course content shall include the following, at a minimum for all microwave subsystems:

- As-Built documentation structure, numbering system, and configuration control system

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Principles of digital microwave transmission and loop microwave topology

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Block diagram, wiring, and circuit description-all units/subsystems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Level setting and RF troubleshooting

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Multiplexer provisioning, cross-connects, and configuration

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Installation and turn-up procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Test equipment configuration and usage

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Alignment and testing procedure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Troubleshooting and fault diagnosis to unit and board level

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Unit replacement procedure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Preventive maintenance procedures

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Orderwire, DC Plant, Pressurization operation and troubleshooting

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Operation and safety

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Failure mode analysis

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Traffic continuity procedures.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide a list of courses required along with the duration (hours, days, weeks, etc.) cost for each course. Whenever possible, the training should be conducted with substantial hands-on involvement using the County's actual system/equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

15.5.2 Microwave System Operational Training

The Offeror shall provide on-site operational training for up to twelve (12) people and shall be coordinated with the comprehensive Radio System Operational Training Program. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. The Offeror shall propose a training schedule that correlates to the implementation schedule. The Offeror's highly skilled and experienced personnel shall conduct the training.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide twelve (12) sets of manuals for the training class. Additionally, all manuals shall be provided in an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software. Twelve (12) CD-ROM copies shall be supplied.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror's program shall include customized training in orientation, management, and operation of all equipment provided under the following items:

- Theory of operation

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- FCC licensing

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Use of microwave terminals

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Use of diagnostic tools

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Use of alarm monitoring equipment

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Use of orderwire

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide an overview of the microwave network

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide an understanding of the alternate routing and failure mode analysis

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Provide an understanding of traffic management and provisioning.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

The Offeror shall provide a list of customized courses required along with the duration (hours, days, weeks, etc.) cost for each course. All training shall be conducted on-site with substantial hands on involvement using the County's system and ancillary equipment.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

3.4 REMAINING POINT BY POINT REQUIREMENTS

16.0 DETAILED EQUIPMENT LIST BY SITE/NETWORK NODE

The Offeror's proposal shall contain detailed equipment lists with unit cost/line item pricing as required in the solicitation specifications. The detailed equipment list shall be easily cross-referenced to the Offeror's itemized pricing sheets (see Appendix F for pricing and equipment list requirements).

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Lake County's specification has provided specific pricing/equipment list requirements and we will be following those required documents.



ALTERNATE OFFER:

Fully Compliant.

Lake County's specification has provided specific pricing/equipment list requirements and we will be following those required documents.

Detailed equipment lists shall be provided by radio sites and/or each network node, and the lists shall include details of requirements needed for the installation and operation of the equipment as deemed necessary. Equipment lists also shall contain all radio subscriber information organized by the County agency/user group. Equipment lists shall make clear distinctions between hardware and software with unique versions or types delineated.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The equipment list shall contain equipment OEM and Offeror model numbers with associated options, OEM and Offeror nomenclature/description, quantities and/or amounts ordered, OEM and equipment Offeror, manufacturing facility location/origination, planned site and/or node for installation, and the associated cross reference to the provided pricing sheet items. The Offeror must provide this detailed equipment list as part of their technical support and documentation response to the solicitation specifications. Failure to comply with the equipment list and pricing matrix requirements will lead to a dismissal of the Offeror proposal for non-compliance.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Production COTS.

Motorola will provide all above information upon request after DDR.

ALTERNATE OFFER:

Conditionally Compliant.

Production COTS.

Motorola will provide all above information upon request after DDR.

Detailed Design Review (DDR) and final system as-built information also shall contain system equipment lists in the same format as the original proposal response for straightforward tracking of project change orders and equipment reconciliation. Spare equipment and test equipment shall be uniquely noted and organized separately in the proposal response and all subsequent equipment list iterations. Pricing discounts and incentives shall be clearly noted, if applicable, for all equipment list items. The Offeror bears sole responsibility for delivering all equipment, software, and services



necessary to fully commission a system that meets or exceeds the specifications outlined in this document.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

17.0 DETAILED SITE LAYOUTS BY EQUIPMENT RACKS

The Offeror shall provide, as part of the proposal response and subsequent DDR process, scaled equipment rack profiles and layouts and scaled floorplan drawings indicating dimensions and the model numbers of all equipment specified. Equipment rack numbers shall identify all proposed site equipment racks with detailed rack profiles identifying all proposed equipment. These layout drawings shall be provided by site and cross-referenced to the detailed equipment list.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

As part of the proposal response, the proposed design also shall demonstrate the space in each facility available for future growth. Each Offeror also shall provide all equipment specifications including: equipment AC and DC power consumption; commercial and backup power requirements and load; emergency backup runtimes for UPS, generator, and -48V batteries; heat dissipation; size; rack or cabinet height/width/depth; floor loading; weight and environmental requirements in a spreadsheet format by rack and site noting every piece of equipment. Detailed Design Review and final system as-built information also shall contain system layout and racking information in the same detailed format as the original proposal response for straightforward tracking of all design changes.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

18.0 SYSTEM PERFORMANCE GUARANTEES

The Offeror shall provide a thorough description of all equipment, subsystems, RF coverage and system-related guarantees that are part of its offering. These guarantees shall be clearly defined for the County's review and comments. The County expects these guarantees to cover terms, conditions,



and timeframes for each type of guarantee. The Offeror shall provide all types of guarantees as part of the response support material.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

The warranties set forth in the Motorola Terms and Conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties.

ALTERNATE OFFER:

Fully Compliant.

The warranties set forth in the Motorola Terms and Conditions are the complete proposed warranties for the equipment, software, services and other deliverables and are given in lieu of all other warranties.

18.1 EQUIPMENT AND SOFTWARE

The County requires the Offeror to respond to equipment guarantees by defining each guarantee by product offering. The Offeror shall list each product and define the guarantee as it applies to each product offered. All equipment, at a minimum, must meet published specifications and/or solicitation specifications in order to meet or exceed product performance. The Offeror is required to provide published specifications as part of the response support material. The Offeror shall provide MTBF and MTTR data for all proposed equipment to support performance reliability and availability guarantees.

MOTOROLA RESPONSE

MAIN OFFER:

Conditionally Compliant.

Motorola will provide specification sheets for all products included. MTBF and MTTR will be provided upon request after DDR.

Category	Product	MTBF-hours	Method
Base Radio			
	GTR 8000 Base Radio	225,000	Field Data
	GTR 8000 X-Hub	1,000,000	Field Data
RF Control			
	GCP 8000 Site Controller	175,000	Field Data
	GCM 8000 Comparator	300,000	Field Data
Network			
	GGM8000 Transport Eq.	876,000	Field Data
	GGM8000 CCGW (v.24)	438,000	Field Data
	S6000 Router	150,000	Field Data



Category	Product	MTBF-hours	Method
Dispatch			
	Voice Processor Module (VPM)	219,000	Field Data
	GCP 8000 Conventional Site Controller	175,000	Field Data

ALTERNATE OFFER:

Conditionally Compliant.

Motorola will provide specification sheets for all products included. MTBF and MTTR will be provided upon request after DDR.

As part of the proposal response, the Offeror shall provide a comprehensive history of the proposed system platform history in terms of defect resolution and platform enhancements since the platform was initially introduced. Subsequent to the proposal submission, the Offeror shall provide all system platform and equipment performance history upon County request and on a quarterly basis, at a minimum, in both paper and electronic format.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

18.2 SUBSYSTEMS

The Offeror shall provide guarantees on each subsystem offered as part of the Offeror's response. The Offeror shall list each subsystem and clearly define the guarantee as it applies to the proposed subsystem. Each subsystem must meet or exceed the solicitation specifications and performance requirements in order to be accepted as a compliant guarantee.

MOTOROLA RESPONSE

Understood.

18.3 RF COVERAGE

The Offeror shall guarantee RF Coverage as specified in the solicitation specifications. The Offeror shall submit a RF coverage guarantee that is based on the coverage predictions. The Offeror must utilize the system design, coverage predictions, and coverage acceptance testing as the minimum elements of the RF Coverage guarantee.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.



ALTERNATE OFFER:

Fully Compliant.

Any and all changes in system design that may be necessitated due to the system's inability to meet the system coverage performance criteria shall be provided by the Offeror at the Offeror's sole expense. Any additional sites or changes in antennas that may be required to correct deficiencies where the Offeror has failed to satisfy the coverage requirements of this solicitation and any resulting agreement shall be provided by the Offeror at the Offeror's sole expense. Any modifications of antenna or transmitter configurations by the Offeror to address coverage issues shall comply with all regulatory and zoning restrictions placed on the County. All design changes must be properly coordinated by the Offeror at no cost to the County to comply with the requirements of NPSPAC Region 54 and neighboring NPSPAC regions. The entire system implementation effort and field equipment configuration shall be in strict compliance with all FCC and Region 54 guidelines and authorizations.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

19.0 EXPANSION AND MIGRATION CAPABILITIES

The Offeror shall provide detailed information on the expansion and scalability capabilities of the proposed system and ancillary subsystems. These details shall include the following items that facilitate a total County understanding of the Offeror's offering as related to expansion capabilities.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for detailed System Descriptions for the entirety of Section 19.0.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

Please see Package 2 Section 3 for detailed System Descriptions for the entirety of Section 19.0.



- Maximum Number of Sites/Subsystems (Multi-Cast, Simulcast, RFSS, etc.)

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Talkgroups

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Unit IDs

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Dispatch Consoles

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Channels/Talk-Paths

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of NMS Clients/Concurrent Applications

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Discrete Alarm Points Per Site

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Maximum Number of Conventional Mutual Aid Interfaces

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Console Auxiliary Inputs/Outputs

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Logging Recorder Channel Hours

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Encryption Keys Manageable by Infrastructure

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Expandability of Microwave Network

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Upper and Lower Limits of the Controllers and Network Elements Inputs and Outputs

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Maximum Number of Control Channels

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



- Impact to the System Architecture

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Impact to System Access

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Impact to Other Support Systems

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Impact to Shelters

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.



ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Impact to Towers

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- Impact on Existing Users

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.

- System Expandability Incremental Costs

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

Production COTS.

ALTERNATE OFFER:

Fully Compliant.

Production COTS.



20.0 SYSTEM OWNERSHIP

In the event that the Offeror's proposal response is developed using a Offeror- owned, existing commercial, or a joint venture/limited ownership network, the division of ownership, liabilities, access, and control of the proposed system solution meeting the solicitation specifications shall be clearly and thoroughly defined for the County. This may also include Offeror offerings of access to rights- of-way, subscriber units, frequencies, and software.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror shall provide a definition of specific ownership and the terms and conditions that are being offered to the County. All costs, life-cycle analysis, and contractual terms shall be defined by the Offeror's description of the offering.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

The Offeror is expected to provide a detailed cost analysis based on the life expectancy of the proposed system. The Offeror shall define the system's life expectancy and cost analysis based on sound business practices and professional criteria as related to telecommunication networks and the County's demonstrated procurement practices.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

20.1 SITES

If the Offeror proposes the use of privately-owned sites which are not part of the County's suggested sites as contained in the solicitation, the Offeror shall provide a detailed disclosure on the ownership and associated costs. These costs, terms, leasing arrangements, etc., must be clearly defined as part of the Offeror's proposal. If the Offeror determines that raw land must be acquired to facilitate a new communications site, the Offeror shall identify and define all costs, terms, leasing arrangements associated with the raw land as part of the Offeror's proposal.



MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

20.2 TOWERS

If the Offeror proposes the use of privately-owned towers, the Offeror shall provide a detailed disclosure on the ownership and associated long-term costs. These costs, terms, leasing arrangements, access, etc., must be clearly defined as part of the Offeror's proposal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

20.3 INFRASTRUCTURE

If the Offeror proposes the use of privately-owned infrastructure, the Offeror shall provide a detailed disclosure on the ownership and associated costs. These costs, terms, leasing arrangements, access, etc., must be clearly defined as part of the Offeror's proposal.

MOTOROLA RESPONSE

MAIN OFFER:

Fully Compliant.

ALTERNATE OFFER:

Fully Compliant.

20.4 FREQUENCIES

If the Offeror proposes the commercial acquisition of frequencies to construct the radio network by means of leasing, renting, or selling, the Offeror shall clearly define the ownership and associated costs. These costs, terms, leasing arrangements, use, etc., must be clearly defined as part of the Offeror's proposal.

MOTOROLA RESPONSE

MAIN OFFER:

- ***Fully Compliant.***



ALTERNATE OFFER:

Fully Compliant.

20.5 SOFTWARE

If the Offeror proposes software to support the radio network by means of leasing, renting, or selling, the Offeror shall clearly define the ownership and associated costs. The Offeror shall provide definitions of software upgrades, fixes, and enhancements. These costs, terms, leasing arrangements, use, etc., must be clearly defined as part of the Offeror's proposal. As deemed necessary by the County to protect its investment, the Offeror shall provide the necessary source code for all software to be kept in escrow.

MOTOROLA RESPONSE

Conditionally Compliant.

Any Motorola Software, including subsequent releases, is licensed to Customer in object code form and solely in accordance with Motorola's Software License Agreement. Motorola does not offer to make source code available for escrow. Any Non-Motorola Software is licensed to Customer in accordance with the standard license, terms, and restrictions of the copyright owner unless the copyright owner has granted to Motorola the right to sublicense the Non-Motorola Software pursuant to Motorola's Software License Agreement, in which case Motorola's Software License Agreement will apply and the copyright owner will have all of Licensor's rights and protections under the Motorola Software License Agreement. Non-Motorola Software may include Open Source Software. All Open Source Software is licensed to Customer in accordance with the provisions of the standard license of the copyright owner and not the Motorola Software License Agreement.

