

# Levy County, Florida



## Request for Proposals

**Project 25 Public Safety**

**Voice Radio Communications System**

**Functional Specification**

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**Prepared by**



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## 1. Functional Specifications

These functional specifications describe the general, functional, and operational requirements of the desired system. While not a design, these specifications provide requirements for system architecture, performance, and support, as well as system implementation, testing and acceptance of the new system.

The term “Selected Vendor” refers to the prime contractor awarded this project and all subcontractors hired by the prime contractor. All RFP requirements throughout the rest of this section referred to as the “Selected Vendor” apply equally to the prime contractor and all subcontractors. The “Selected Vendor” shall have a current Contractor’s License for all areas where work will be performed.

### 1.1 System Overview

Levy County, Florida (County) intends to procure and implement an integrated public safety wireless communication system that will provide first responders real time operable and interoperable voice and low speed data services that support day-to-day, mutual aid, and task force operations. The integrated public safety wireless communication system shall consist of:

- A. Six-channel P25 Phase 1 (FDMA) – 700 MHz simulcast/multicast radio system
- B. Microwave backhaul network providing connectivity between the control and radio sites
  - a. Note: The County also has access to dark fiber providing connectivity between the dispatch center and Bronson tower site.
- C. Six-operator position dispatch console system, including backup radio control stations and logging recorder system
- D. Fire station and personnel alerting solution
- E. Network Management System (NMS) capable of monitoring and controlling above systems
- F. Field/subscriber radios (portable, mobile, and control station radios)
- G. Site upgrades, including, but not limited to, equipment shelters, grounding updates, generators, and AC/DC power systems





## **1.2 Project Scope**

- A. The Selected Vendor shall furnish all equipment, materials, labor, transportation, and storage facilities, which are necessary to complete the specified work, and required for a fully functional system meeting all requirements of this RFP.
- B. The Selected Vendor shall design, install, and test all required equipment and parts.
- C. All equipment, antennas, parts, and accessories shall be new.
- D. The Selected Vendor shall, at a minimum, be responsible for providing the following project components:
  - 1. Project management
  - 2. Frequency search, coordination, and FCC licensing
  - 3. Site and radio path surveys
  - 4. Engineering and system design
  - 5. Tower structural analyses (for all sites requiring the installation of new antennas or the relocation of existing antennas)
  - 6. Detailed drawings and design submittals
  - 7. System installation and construction management
  - 8. Software installation and equipment programming
  - 9. Acceptance testing (factory, site, radio coverage, radio path, route, system and burn-in)
  - 10. Cutover
  - 11. Training
  - 12. Decommissioning, removal, and disposal of legacy equipment
  - 13. Hardware and software warranty and maintenance, including spares and parts support







- E. The existing land mobile radio (LMR) and microwave/fiber backhaul systems shall support operations during the implementation and testing of the new systems.
- F. The Selected Vendor shall plan, coordinate, and conduct all work with minimal interruption of service to the existing mission critical systems. All required outages shall be scheduled in advance with the County.
- G. All outages or system resource reduction from current system operations require a detailed plan of action with contingencies identified and approved by the County prior to execution.
- H. The Selected Vendor shall not perform any work until the County has approved the Selected Vendors migration and cutover plans.
- I. The LMR and microwave backhaul systems shall be fault tolerant and contain no single point of failure that would disrupt communications.
- J. Critical hardware shall use devices such as redundant hot standby cards, and power supplies to prevent any single points of failure.

### **1.3 Standards and Guidelines**

- A. The Selected Vendor shall comply with the applicable portions of the following standards, rules, regulations, and industry guidelines (presented here in alphabetical order; not reflective of priority):
  - 1. American National Standards Institute (ANSI)
  - 2. American Society of Testing Materials (ASTM)
  - 3. Federal Aviation Administration (FAA)
  - 4. Federal Communications Commission (FCC)
  - 5. Institute of Electrical and Electronics Engineers (IEEE)
  - 6. International Building Code (IBC)
  - 7. National Electrical Code (NEC) (NFPA-70)
  - 8. National Electrical Manufacturer's Association (NEMA)
  - 9. National Fire Protection Association (NFPA) 1221
  - 10. Telecommunications Distribution Methods Manual (TDMM)





11. Telecommunications Industry Associations (TIA)
  12. Underwriters Laboratories, Inc. (UL)
- B. The Contractor shall comply with applicable industry best practices for cable installation and management in equipment racks and/or cabinets and within equipment rooms and/or shelters, as outlined in the following standards:
1. ANSI/TIA-942 - Telecommunications Infrastructure Standard for Data Centers
  2. ANSI/BICSI N1-2019 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
  3. ANSI/NFPA 70 - the National Electrical Code® (NEC®), Article 392 Cable Trays
  4. IEEE 802.3ba-2010 - IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 4: Media Access Control Parameters, Physical Layers, and Management Parameters for 40 Gb/s and 100 Gb/s Operation
  5. ISO/IEC 14763-2:2019 - Information technology — Implementation and operation of customer premises cabling — Part 2: Planning and installation
  6. UL 60950-1 - Information Technology Equipment - Safety - Part 1: General Requirements
  7. UL 62275 - Cable Management Systems - Cable Ties for Electrical Installations
  8. UL 2024 - Cable Routing Assemblies and Communications Raceways
- C. The Selected Vendor shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in at least one of following standards:
1. Motorola R56 - Standards and Guidelines for Communication Sites (latest revision)
  2. Harris Site Grounding and Lightning Protection Guidelines (AE/LZT - 123 4618/1 - latest revision)





3. MIL-STD-188-124B - Grounding, Bonding, and Shielding for Common Long Haul/Tactical Communications Systems Including Ground Based Communications-Electronics Facilities and Equipment
4. Other contractor / industry standard - the Selected Vendor shall provide to the County for review and approval.

### **1.4 Network Security Requirements**

- A. The Selected Vendor shall comply with the following security standards and industry guidelines, as applicable, provided here in no weighted order or priority:
1. FIPS PUB 140-2; "Security Requirements for Cryptographic Modules"
  2. ISO/IEC 27000:2009; "Information Technology - Security Techniques - Information Security Management Systems - Overview and Vocabulary"
  3. ISO/IEC 27001:2005; "Information Security Management Systems - Requirements"
  4. ISO/IEC 27002:2005; "Code of Practice for Information Security Management"
  5. ISO/IEC 27005:2008; "Information Security Risk Management"
  6. ISO/IEC 27010:2012; "Information Technology - Security Techniques - Information Security Management for Inter-Sector and Inter-Organizational Communications"
  7. ISO/IEC 27031:2011; "Guidelines for ICT Readiness for Business Continuity"
  8. ISO/IEC 27032:2012; "Information Technology - Security Techniques - Guidelines for Cybersecurity"
  9. ISO/IEC 27033; "Information Technology - Security Techniques - Network Security"
  10. ISO/IEC 27035:2011; "Information Security Incident Management"
  11. ISO/IEC 18043; "Selection, Deployment, and Operations of Intrusion Detection Systems"
  12. ISO FCAPS; "Fault management, Configuration management, Accounting management, Performance management, Security management"
  13. ITIL Version 3; "Service Design, Section 4.6 Information Security Management"





- B. Routing and switching equipment shall employ Open Systems Interconnection (OSI) model Layer 2 and Layer 3 security best practices to minimize different types of attacks on the data link layer and to filter network traffic on the network layer.
- C. The system shall utilize secure protocols (SNMPv2, SNMPv3, SSHv2 and HTTPS) for network management, configuration, alarms and events.
- D. The Selected Vendor shall supply, install, and configure virtual private network (VPN) hardware and software to allow multiple levels of remote secure access of system RF and control infrastructure equipment.
- E. The Selected Vendor shall supply, install, and configure firewall protection system(s) and intrusion detection system(s).
- F. The Selected Vendor shall supply, install, and configure anti-virus and anti-malware software on all supplied servers and workstations. Anti-virus and anti-malware software shall include all definition updates during the warranty period.
- G. The Selected Vendor shall provide operating system patches for all supplied commercial off the shelf products during the warranty period. The system patches provided shall be no more than one version and/or 8 weeks older than the Software OEM releases.

### ***1.5 Governing Codes and Conflicts***

- A. If the requirements of this RFP differ with those of the governing codes and regulations, then the more stringent of the two shall apply.
- B. If the requirements of this RFP conflict with those of the governing codes and regulations, the Selected Vendor is responsible for identifying the conflict and resolving to the satisfaction of the County.





## **2. Project 25 Trunked Radio System**

### ***2.1 General Requirements***

- A. The radio system shall comply with applicable TIA-102 (P25) standards as published at the time of proposal. If revised or new TIA-102 standards are published after the proposal date that affects the designated system components, the Vendor shall work with the County to determine an agreeable solution to be compliant with the revised or new standards.
- B. The system shall be built as a P25 Phase 1 trunking system and support P25 Phase 2 operation via software upgrade.
- C. The system shall provide a P25 technology solution capable of operating with all P25 Compliance Assessment Program (CAP) compliant radios.

### ***2.2 P25 System Equipment***

#### ***2.2.1 System Control Equipment***

- A. The system control equipment shall serve as the central control for all subsystems of the P25 network.
- B. The system control equipment shall consist of redundant equipment.
- C. The system control's redundant equipment shall provide all operations and functions independent of the other.
- D. Geographically diverse system control equipment is not required but, if proposed, shall meet the following requirements:
  - 1. Activation of geographically diverse system control equipment shall not require human intervention to operate in the event of a failure.
  - 2. Activation of geographically diverse system control equipment shall not result in any reduction of services or functions of the system control equipment.





### **2.2.2 Simulcast Equipment**

- A. The system shall include all necessary simulcast components and signal processing elements required to optimize voice quality in coverage overlap areas.
- B. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.
- C. Simulcast systems shall operate without the need for manual optimization and system/subsystem alignment.
- D. The system shall include redundant simulcast control equipment located at geographically separated sites or distributed across the network.

### **2.2.3 Receiver Voting Equipment**

- A. Receiver voting equipment shall monitor all receivers in the simulcast cell and select the best signal for processing and rebroadcast through the network.
- B. Receiver voting equipment shall continue to operate in the event of failure of, or lost connectivity with other control elements.
- C. Receiver voting shall include redundant control equipment located at geographically separated sites or distributed across the network.

### **2.2.4 Radio Frequency (RF) Site Equipment**

#### **2.2.4.1 Repeaters/Base Stations**

- A. Repeaters/base stations shall:
  - 1. Comply with Part 90 FCC Rules and Regulations.
  - 2. Be FCC type accepted for the appropriate frequency band and type of service.
  - 3. Comply with appropriate TIA 102 and similar standards.
  - 4. Be solid state in design and function and must operate in the temperature range of -20°F - 140°F without degradation.





5. Consist of modular components or field replaceable units allowing for in the field repairs whenever possible.
6. Use linear power amplifiers.
7. Shall be implemented as P25 Phase 1 (FDMA) stations and support software P25 Phase 2 (TDMA) operation via a software upgrade.

#### **2.2.4.2 Antenna Systems**

- A. Antenna systems shall:
  1. Provide the required guaranteed coverage.
  2. Match the antenna design used for all coverage modeling.
  3. Meet applicable FCC rules and regulations.
- B. If the system design includes the use of tower top amplifiers (TTAs), the amplifiers shall be equipped with dual amplifiers, and a by-pass mode of operation. TTAs shall be installed with test lines.
- C. Low passive intermodulation (PIM) antennas shall be used to the greatest extent possible.
- D. Antennas shall be selected to perform in and endure the anticipated environmental conditions, as per TIA-222, current version.
- E. Transmission line type and length shall be appropriate given the radio band, to provide the required coverage. Lightning protection and grounding devices shall be used as per the appropriate industry standard(s) and manufacturer requirements.
- F. Combining equipment shall be used to minimize the number of transmit and receive antennas to the greatest extent possible.

#### **2.2.4.3 Interoperability Gateways**

- A. Each RF and dispatch site shall be equipped with an Interoperability Gateway device capable of supporting up to eight RF devices at each site.
- B. Each RF and dispatch site shall be equipped with a multi-band (V/U/7/800) control station/console.





- C. The Interoperability Gateway devices shall allow for dispatch control of the multi-band control station/consolette.
- D. A minimum of 16 talkgroups/channels shall be available for each multi-band control station/consolette from the dispatch consoles.
- E. The Selected Vendor shall be responsible for installation of the interoperability gateways, control stations/consolettes and associated antennas, lines, and grounding

### **2.2.5 Fire Station Alerting**

- A. The County currently utilizes two-tone, tone and voice paging to alert the County's fire stations and associated personnel. Most of the fire stations and personnel utilize Motorola Minitor series pagers. The County anticipates replacing these pagers with Project 25 supported devices enabling stations and personnel to be alerted as needed. The proposed fire station alerting system shall:
  - 1. Be supported by the proposed Project 25 system.
  - 2. Provide station alerting for single stations as well as groups of stations.
  - 3. Provide personnel alerting of individuals based on fire station assignment.
  - 4. Provide the dispatcher with the ability to easily alert station(s) and assigned personnel and provide voice announcement.
- B. Appendix C contains a list of Levy County Fire Stations requiring a Fire Station Alerting solution.

### **2.2.6 Dispatch Console System**

#### **2.2.6.1 General Requirements**

The dispatch console system shall support dispatch operations for the current dispatch centers and local PSAPs.

- A. The current dispatch center is located at: 9050 Northeast 80<sup>th</sup> Avenue, Bronson, Florida
- B. The dispatch console system shall be equipped with six operator positions.







- C. The dispatch console system shall support dispatch consoles directly connected to the trunked radio network via the backhaul/interconnection network.
- D. The dispatch consoles shall use IP connectivity for all voice, data, control, and parallel console status information.
- E. The dispatch console system must not contain any single point of failure which would disable more than a single operator position or channel resource.
- F. The County has deployed fiber connectivity between the Dispatch Center and the nearby Bronson Tower Site. The Selected Vendor shall provide the required hardware to complete the connection between the dispatch site and the equipment proposed for the Bronson Tower Site.

#### ***2.2.6.2 Dispatch Console System Operator Equipment Requirements***

- A. The dispatch console system operator equipment shall meet or exceed the following requirements:
  - 1. All dispatch console equipment supplied shall operate 24 hours a day, 7 days a week, 365 days a year.
  - 2. The operator positions shall be proposed with a display monitor of 25" or less (LCD/LED) with resolution of 1920 x 1080 or better.
  - 3. Console shall be capable of displaying all dispatching functions on a single display unit.
  - 4. Console shall allow authorized personnel to determine which functions are available at each operator position.
  - 5. Console shall provide an individual unit ID and text alias readout for calling units and a stacking display to reflect at least the last ten unit calls for the visible channels/talkgroups.
  - 6. Console dispatch position keyboard interface shall be compatible with standard PC USB keyboards.
  - 7. Console dispatch position shall be proposed with a standard 101-key PC keyboard and a standard mouse/pointer device.
  - 8. Operators shall be able to perform console functions by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button.
  - 9. Custom mice, trackballs, and accessories may be proposed.





10. Each operator position shall be equipped to support all required trunked, conventional, and interoperable resources.
11. Each operator position shall have a high-quality gooseneck microphone.
12. Each operator position shall have a heavy-duty footswitch to allow operators to key the selected channel hands free.
13. All computers supplied shall be based on current production processors running a currently supported operating system. The County reserve the right to specify or supply the computer platform(s) in accordance with the County standards. All computers shall be certified for the latest version of operating system available at the time of acceptance.
14. The failure of one or more console positions should have no effect on the remaining console positions.
15. Equipment shall enable operators to acoustically cross-mute channels to eliminate acoustic feedback between operators.
16. Console positions shall respond appropriately to the activation of an emergency alarm by field units.
  - a. Dispatch console system operator positions shall provide an audible alert, provide a visual alert of an emergency activation, and display unit ID of calling unit.
  - b. Dispatch console system operator positions shall have the ability to acknowledge the emergency alarm.
  - c. The unit ID and alias for an unacknowledged emergency alarm shall not scroll from the unit ID display.
17. Console positions shall decrypt and encrypt secure voice communications.
  - a. P25 Advanced Encryption Standard (AES) 256-bit
  - b. A distinctive icon shall signify encrypted channels.
  - c. Each console position shall support multiple encryption keys (minimum of eight keys)





18. Each operator position shall have the ability to utilize both a headset (wired and/or wireless) and a stationary gooseneck type microphone for transmitting audio.
  19. Each operator position shall support a single headset capable of both telephone and radio use.
  20. The dispatch console system shall provide an instant recall recording capability for each operator position.
    - a. Instant recall recording shall provide an interface to provide connection to the console operators' microphone audio, the selected radio channel receiver audio and telephone audio.
    - b. Playback shall be available on the operator position.
- B. Conventional resources (e.g., repeaters, base stations, and control stations) capable of operating on multiple frequencies and/or modes shall be reconfigurable to select the desired transmit frequency / mode (select channel).
- C. An audio level meter shall be provided showing the level of transmitted voice.
  1. The audio level meter shall also indicate the level of receive audio present on the selected channel/talkgroup.
- D. Operator positions shall have the ability to independently set each channel/talkgroup volume level. Minimum audio levels should be capable of being set to avoid missed calls.
- E. Operator positions shall have the ability to mute or un-mute audio from unselected channels/talkgroups. The operator's monitor shall indicate muted audio status.
- F. Selected audio and unselected audio shall be presented from separate speakers.
- G. Operator positions shall have the ability to select multiple channels/talkgroups for broadcast to several channels/talkgroups at once.
- H. Operator positions shall have the ability to process P25 Phase 1 and Phase 2 calls.
- I. Operator positions shall provide the ability to alert individual, groups or all fire stations and fire station personnel.





- J. Operator positions shall have the ability to patch two or more conventional resource channels and/or trunking talkgroups so that users may communicate directly.
- K. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.

### ***2.2.6.3 Dispatch Console System Configuration Requirements***

- A. The dispatch console system shall support new features and screen configurations through software programming and not reconfiguration of hardware.
- B. The dispatch console system shall support the capability to program, store, retrieve, and edit multiple, custom operator screens and configurations for each operator position.
- C. Operator positions display configurations and alias database shall be stored locally, at each position, or on a centrally located server.

### ***2.2.6.4 Dispatch Console System Headset Requirements***

- A. Two headset jacks, configurable for 4-wire or 6-wire, shall be provided for each dispatch operator position and it shall allow the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset.
  - a. The headset jack box will also have a volume knob to control the received radio volume.
  - b. A headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the console's select speakers.
- B. Selected Vendor shall provide Plantronics HW540 Encore Pro Headsets with the wireless Plantronics headset base 12 P2CA12/CD or comparable wireless headsets.

### ***2.2.6.5 Backup Solution***

- A. The backup solution shall:





1. Maintain dispatch operations in the event of a dispatch system, individual position or multiple position failure.
2. Not be dependent on the primary dispatch console system for operations.
3. Allow users to change channels/talkgroups at dispatch positions without affecting other dispatch positions.
4. Be capable of operation in trunking and conventional modes.
5. Support fire station alerting
6. Have the capability of initiating a private radio call and call alert.
7. Be capable of operating with a headset and with a conventional speaker and microphone.

### **2.2.7 Logging Recorder System**

- A. The Selected Vendor shall upgrade the existing NICE logging recorder to incorporate the capabilities of recording and playing back all P25 talkgroups (AES encrypted and clear) and conventional resources.
- B. The current recorder is a NICE Inform Recorder version 9.0.3.75 UP 5.
- C. The logging recorder upgrade shall interface directly with the trunked radio system for audio and P25 data. Recorders that only interface through the dispatch consoles or the console subsystem are not acceptable for trunked radio system recording.
- D. The logging recorder shall store a minimum of 80,000 channel-hours and shall store two calendar years of data.
- E. The logging recorder shall interface directly with the trunked radio system for audio and P25 data. Recorders that only interface through the dispatch consoles or the console subsystem are not acceptable for trunked radio system recording.

#### **2.2.7.1 Transferable Storage Requirements**

- A. The logging recorder shall have, as a minimum, the ability to transfer files by the following methods:
  1. USB connected flash/thumb drive
  2. Internally connected CD/DVD drive





3. Network attached storage (NAS)
- B. The logging recorder shall support the ability to retrieve recordings and write them to portable storage media in standard digital media formats (e.g., .wav, .wmv, .mov, .avi, mp4) for playback.

### **2.2.7.2 Search Requirements**

- A. The logging recorder shall provide the following search and playback parameters including the following:
1. Time and date
  2. Duration
  3. Channel ID(s)
  4. Console position(s)
  5. Individual call(s)
  6. Subscriber unit ID(s)
  7. Talkgroup ID(s)
  8. Radio ID and alias data
- B. The logging recorder shall provide the ability to combine any number of search criteria into a single search.
- C. The logging recorder shall be able of searching and playing all channels/talkgroups simultaneously.

### **2.2.7.3 Playback Requirements**

- A. The logging recorder shall allow users to set markers within a recording and the search and replay function shall be able of displaying the markers when playing back.
- B. Automatic gain control (AGC) shall be available for all replayed audio. The system administrator shall have the ability to enable or disable AGC.
- C. The logging recorder shall provide the ability to display and save all recordings associated with an incident to a single directory or location.





- D. The logging recorder shall provide the ability to playback recordings in mixed mode, where the recordings are replayed as they occurred or in sequential mode.
- E. The logging recorder shall provide the ability to vary the playback speed of each recording without pitch distortion.
- F. The logging recorder shall allow telecommunicators and supervisors to assemble single or multimedia recordings into an event and generate reports for analysis.
- G. The logging recorder shall allow users to locate, assemble, play, and export any recorded data in a single audio (.wav) or standard multimedia file (e.g., .wmv, .mov, .avi, mp4) for playback.
- H. The logging recorder shall playback assembled single and multimedia events using an integral or external player.
- I. The logging recorder shall allow users to easily switch between recorded source data, and the assembled event file(s).
- J. The logging recorder shall log the source recordings, the sequence in which users assemble them, and all metadata associated with the records for audit purposes.
- K. The logging recorder shall allow users to generate custom reports.
- L. The proposal shall detail the types of reports generated by the logging recorder

#### **2.2.7.4 Instant Recall Requirements**

- A. The logging recorder shall support Instant Recall. Instant recall shall provide users the ability to instantly replay a message from any PC connected and authenticated on the IP network interfaced with the system.
- B. Instant Recall shall allow users to skip forward, skip backward, pause, stop, and play recordings.
- C. Similar to normal playback mode, Instant Recall shall allow users to control the speed of the replay without pitch distortion.
- D. Instant Recall shall allow users to access all calls recorded within the previous 24 hours.





- E. Instant Recall shall be configurable to allow access to a group of channels/talkgroups from each dispatch console position.

## 2.3 Radio Coverage

### 2.3.1 Coverage Requirements

- A. The radio system design shall serve the geographical boundaries of Levy County, Florida
- B. “Shape” (.SHP) files are available for importing the service area boundary(s) into a modeling program.
- C. DAQ as defined in this document applies to both inbound and outbound communications. Table 1 lists DAQ values and definitions.

**Table 1 – DAQ Values and Definitions**

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

- D. The system shall provide talk-in and talk-out radio coverage that meets or exceeds the requirements specified in Table 2 for mobile and on-street portable (worn in a belt case on hip per TSB-88.1-D Table D 5), with 95% reliability and a DAQ of 3.4 or better.







**Table 2 – Geographic Area Coverage Percentage**

<b>System</b>	<b>Coverage Zone</b>	<b>Geographic Area Coverage Percentage</b>
P25 Trunked	Levy County	95

- E. Coverage design, implementation, and testing for the system shall adhere to Telecommunications Systems Bulletin (TSB) TSB 88.3 - Wireless Communications Systems Performance in Noise and Interference-Limited Situations Part 3: Recommended Methods for Technology Independent Performance Verification, current version.
- F. Base station radio output power and Effective Radiated Power (ERP) levels and antenna height and gain shall be the maximum as permitted by FCC rules and regulations, unless system engineering determines that a lower height or ERP is sufficient (such as for tower top amplifiers (TTAs) or to minimize simulcast interference).
- G. Coverage guarantees shall apply to both P25 Phase 1 and Phase 2 modes.
- H. The Selected Vendor shall complete radio coverage testing with witnesses from the County, utilizing Bit Error Rate (BER) testing. The Selected Vendor shall submit appropriate documentation confirming lab testing of the Bit Error level for the portable radio, which will yield the equivalent of a DAQ 3.4 audio quality. Likewise, the Selected Vendor shall test the system to that level.

### **2.3.2 Coverage Maps**

- A. The Selected Vendor shall:
  - 1. Employ a suitable coverage prediction model using appropriate terrain and land cover data for the environment.
  - 2. Provide a detailed description of the propagation models used and the assumptions made in preparation of the coverage maps.
  - 3. Include coverage statistics that account for geographic, population, and coverage on major roads.
  - 4. Submit both talk-out and talk-in system composite coverage maps for all proposed design configurations.





- B. All talk-out and talk-in coverage maps shall be clearly labeled and show system gain calculations for each of the following:
  - 1. Mobile radios – standard dash or trunk mount with a unity gain antenna mounted in the center of the roof.
  - 2. Standard portable radio outdoors – a portable radio worn at hip level in a belt case with proposed antenna
  - 3. Standard portable inside a 12 dB loss building – a portable radio worn at hip level in a belt case with proposed antenna.
- C. All maps shall clearly delineate the difference between areas predicted to be equal to or greater than DAQ 3.4 equivalent coverage and areas that do not meet coverage requirements using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.
- D. The Selected Vendor shall include the effects of simulcast interference in all coverage maps.
- E. Coverage maps shall be provided in two formats:
  - 1. 11"x17" (minimum) full color hardcopy format
  - 2. In PDF file format with an image resolution greater than 600 dpi when printed at 11"x17" on a flash drive
- F. The Selected Vendor shall provide Esri shapefiles of all proposed coverage footprints. Each shapefile should be descriptively named (e.g., Portable On-Street Talk-Out Coverage) and should contain metadata detailing specifics about the coverage that is contained within the shapefile (e.g., displayed coverage  $\geq$  DAQ 3.4).
- G. All maps shall include a background layer suitable for the County's reference (e.g., topographic map, roads, and rivers).
- H. Link budgets shall be provided, clearly defining the following minimum information, relating to each map and each site:
  - 1. Propagation model
  - 2. Simulcast timing parameters (if applicable)
  - 3. Design target





4. ATP target
  5. Faded performance criteria
  6. Inferred noise floor
  7. Base station / repeater transmit power output
  8. Antenna gain (transmit and receive)
  9. Antenna down tilt (if applicable)
  10. Antenna height
  11. Transmit site effective radiated power (ERP)
  12. Receiver sensitivity
  13. Tower top amplifier gain
  14. Total antenna system gains, or losses
  15. Calculations utilized to determine antenna system gains, or losses
  16. Mobile and portable antenna height for talk-out and talk-in
  17. Mobile and portable transmit output power
  18. Loss factors used for portable radios
- I. The Selected Vendor shall use 30-meter United States Geologic Survey (USGS), North American Datum (NAD)-83 terrain elevation data for coverage simulations. Alternatively, the Selected Vendor may use 3 arc-second data where 30-meter data is not available.

## **2.4 Capacity**

- A. The system capacity shall assume all subscriber units using the P25 Phase 1 mode only.
- B. The capacity of the system shall be less than or equal to 1% Grade of Service (GoS).
- C. The Selected Vendor shall disclose all assumptions and calculations to the County for validation.
- D. The County estimates that 1,000 local subscriber units will be placed into service on the system. The County anticipates a 2% per year subscriber unit growth over the next 10 years.





- E. The County estimates that up to 5,000 units may use proposed system for interoperability with local subscriber units.
- F. Respondent shall provide the number of radio subsystems, channels, sites, radios, and talkgroups that the radio and dispatch console system is equipped to support, as proposed, including software licenses as applicable.
- G. Respondent shall provide the maximum number of radio subsystems, channels, sites, radios, and talkgroups that their radio and dispatch console system can accommodate with the addition of hardware and/or software (i.e., the maximum possible expansion).
- H. The Selected Vendor shall include the necessary radio system hardware and software (including licenses) to support the projected daily and interoperable subscriber unit, including 2% annual unit growth. License costs for different breakpoint quantities of subscriber units are highly preferred.

## **2.5 Site Selection**

- A. The Selected Vendor shall use existing sites to the greatest extent possible. The County prefers the following priority for site selection:
  - 1. Levy County owned sites
  - 2. Existing Levy County leased sites
  - 3. Existing sites owned by other government agencies
  - 4. Existing privately held communications sites
  - 5. Greenfield sites
- B. Appendix A provides a list of Levy County owned sites and existing sites leased by Levy County. The Selected Vendor shall consider these sites but is not obligated to use them in their design. The Selected Vendor shall verify all information provided.
- C. If the Selected Vendor selects non-County owned site(s), the Selected Vendor shall conduct due diligence and provide letters from the site owner(s) to Levy County that state:
  - 1. The owner is willing to lease space at the site to Levy County.





2. Site owner is willing to provide last known structural review of the site as well as any proposed improvements by other entities at the time of the request
  3. Space is available on the tower at the Selected Vendor defined heights, and space is also available for equipment in an existing room, or space is available for a shelter to be placed within the secured site area.
- D. If the Selected Vendor identifies a greenfield option in the proposed system design, the Selected Vendor must provide “documentary evidence” that they have communicated with the landowner and that a potential lease agreement is a possibility to pursue.

## **2.6 Field/Subscriber Radio Equipment**

### **2.6.1 General Requirements**

- A. Subscriber units shall have been successfully tested to operate on the radio systems of at least three different manufacturers through the P25 CAP process.
- B. All subscriber units shall include the following minimum capabilities:
  1. Shall be P25 certified to support P25 Phase 1 and Phase 2 digital trunked operations on 7/800 MHz private land mobile radio channels.
  2. Shall be capable of placing and receiving analog 7/800 MHz conventional mode calls.
  3. Shall be capable of placing and receiving digital 7/800 MHz conventional P25 mode calls.
  4. The subscriber unit software shall be flash programmable for adding future software/firmware enhancements and features.
- C. All subscriber units shall be FCC Type Accepted.
- D. All subscriber units shall support scanning of both trunked talkgroups and conventional channels (within one group) including: scan groups of 16, priority scan, and scan selection shall be retained during power-off/on (power-on default shall be the last operator selection).
- E. All subscriber units shall allow users to configure or alter scan operations including the definition of a scan list.





- F. Two (2) full sets of programming cables and software shall be provided for programming the proposed subscriber units.
- G. All subscriber units shall support the requirement that they be programmed by only those individuals who are authorized to do so.

### **2.6.2 Portable Subscriber Units**

- A. All portable subscriber devices shall provide the following capabilities:
  - 1. Push-to-talk switch
  - 2. On-Off/Volume knob, mounted on top
  - 3. Minimum of two soft keys
  - 4. Minimum of 3 navigation keys
  - 5. Emergency button, mounted on top with easy access
  - 6. Top-mounted switches allowing use of "banks" of channels/talkgroups, each bank consisting of a minimum of 16 channels/talkgroups
  - 7. Front display with two lines of text (minimum 12 characters per line) and status icons for battery status and in-range/RSSi indicator
  - 8. Top display with single line of text (minimum 8 characters)
  - 9. Display shall be readable in all conditions from direct sunlight to total darkness
  - 10. Internal GPS unit capable of transmitting unit's GPS location information via the P25 radio system.
- B. All portable subscriber radios shall be equipped with a flexible, covered antenna (readily removable utilizing a screw-in connector). Antennas proposed shall be utilized in coverage maps as well as coverage guarantees.
- C. All portable subscriber radios shall be equipped with standard-capacity batteries that, when starting with a full charge, allow operations for 12hours at a duty cycle of 5% transmit, 5% receive, and 90% idle.
- D. Portable subscriber radios shall be OPTIONALLY equipped with high-capacity batteries that, when starting with a full charge, allow operations for 16 hours at a duty cycle of 5% transmit, 5% receive, and 90% idle.





- E. Batteries shall connect securely to portable subscriber radios and shall not require the use of tools to attach or remove.
- F. All portable subscriber devices shall be equipped with chargers that operate from 110 VAC sources, support rapid charge of batteries (complete charge in 1 to 2 hours) and support both standard and high-capacity batteries with or without radios connected to battery.
- G. Internal speaker/ microphone shall include:
  - 1. Connection of an external speaker/microphone that mutes the internal speaker/ microphone
  - 2. Connection of an external earpiece that mutes the internal speaker
- H. Universal or individual connectors with the following features:
  - 1. Microphone and earpiece connections must be capable of supporting the following types of microphone/earpiece devices (including types used in surveillance):
    - a. External speaker/ microphone
    - b. Earpiece
    - c. Programming interface
- I. All Portable subscriber radios shall meet or exceed the following environmental specifications per MIL-STD-810E (or equivalent items in 810 F):
  - 1. Operating Temperature: -30 C to +60 C
  - 2. Low Pressure Operation: 500.3 Procedure II
  - 3. High Temperature, Storage / Operation: 501.3 Procedure I / II
  - 4. Low Temperature, Storage / Operation: 502.3 Procedure I / II
  - 5. Temperature Shock: 503.3 Procedure I
  - 6. Solar Radiation: 505.3 Procedure I
  - 7. Humidity: 507.3 Procedure II
  - 8. Dust, Blowing: 510.3 Procedure I
  - 9. Vibration: 514.4 Procedure I





10. Shock, Functional: 516.4 Procedure I
11. Rain, Blowing / Dripping Water (for metal case): 506.3 Procedure I / II
12. Salt Fog (for metal case): 509.3 Procedure I

### **2.6.3 Portable Subscribers - Models to be Proposed**

- A. Respondents shall propose, describe and price at least three "tiers" of portable radios to include:
  1. Law Enforcement Portable
  2. Fire Service Portable
  3. Public Service Portable
- B. Respondents shall provide information detailing the differences between the proposed portable subscriber models and how each model's features and functions are beneficial to the three user groups (Law Enforcement, Fire Service and Public Service)
- C. In addition to these three tiers, Respondents are encouraged to propose additional models that meet the minimum requirements of this functional specification.

#### **2.6.3.1 Portable Subscriber Radio – Law Enforcement Model**

- A. In addition to the general requirements for portable subscriber devices, the Law Enforcement model shall include the following capabilities:
  1. FDMA/P25 Phase 1 and TDMA/P25 Phase 2 trunking operation
  2. AES Encryption
  3. Multikey option
  4. GPS location services
  5. Surveillance mode allowing for covert operation (lights dimmed, tones muted, etc.)
- B. The Law Enforcement subscriber devices shall be provided with a remote speaker-microphone (heavy-duty, palm-type with push-to-talk switch, emergency button and self-retracting coil cord)







- C. As an OPTION, law enforcement models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage

### ***2.6.3.2 Portable Subscriber Radio – Fire Service Model***

- A. In addition to the general requirements for portable subscriber devices, the Fire Service model shall include the following capabilities:

1. FDMA/P25 Phase 1 and TDMA/P25 Phase 2 trunking operation
2. AES Encryption
3. Multikey option
4. GPS location services
5. Extended environmental specifications
6. Larger and easier to access knobs and controls.
7. Highly visible color(s)
8. Noise reduction technology for fire service environments

- B. The Fire Service subscriber devices shall be provided with a remote speaker-microphone designed for Fire Service operation including the following:

1. Extended environmental specifications
2. Larger and easier to access knobs and controls.
3. Highly visible color(s)
4. Emergency button

- C. As an OPTION, fire service models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage

### ***2.6.3.3 Portable Subscriber Radio – Public Service Model***

- A. In addition to the general requirements listed for portable subscriber devices, the Public Service model shall include the following capabilities:

1. FDMA/P25 Phase 1 trunking operation.
2. GPS location services





- B. The Public Service subscriber devices shall be provided with a remote speaker-microphone (standard-duty, palm-type with push-to-talk switch, emergency button and self-retracting coil cord)
- C. As an OPTION, public service models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage

#### **2.6.4 Mobile Subscribers Requirements**

- A. The Mobile subscriber radios shall be constructed with the following distinct components:
  - 1. A chassis configured for mounting in the trunk of a vehicle or other similar compartment.
  - 2. A control head configured for mounting in the dash in the front of a vehicle or, remote mounting (e.g., trunk) with a cable length of 17 feet minimum and a round-type cable with single protective outer sheath enclosing all other conductors.
  - 3. Options for multiple control heads controlling a single RF unit
  - 4. A microphone with a self-retracting coil cord that shall be 4 feet long (minimum) when extended
  - 5. An internal speaker of at least 5W or an external speaker
  - 6. Installation brackets and interface cables for all above components
- B. The mobile subscriber radios shall provide the following minimum capabilities for user controls and displays:
  - 1. Push-to-talk switch on microphone
  - 2. On-Off button
  - 3. Volume knob
  - 4. Rotary knob for mode or zone selection, each bank consisting of 16 channels/talkgroups
  - 5. Minimum five soft keys
  - 6. Emergency button
  - 7. External speaker





8. Display with two lines of text (minimum 12 characters per line) plus one line of icons and one line of menus.
  9. Display shall be readable in all conditions from direct sunlight to total darkness.
- C. All mobile subscriber radios shall meet or exceed the following environmental specifications per MIL-STD-810E (or equivalent items in 810 F):
1. Operating Temperature: -30 c to +60 C
  2. Low Pressure Operation: 500.3 Procedure II
  3. High Temperature, Storage / Operation: 501.3 Procedure I / II
  4. Low Temperature, Storage / Operation: 502.3 Procedure I / II
  5. Temperature Shock: 503.3 Procedure I
  6. Solar Radiation: 505.3 Procedure I
  7. Humidity: 507.3 Procedure II
  8. Dust, Blowing: 510.3 Procedure I
- 14.Vibration: 514.4 Procedure I
1. Shock, Functional: 516.4 Procedure I
  2. Rain, Blowing / Dripping Water (for metal case): 506.3 Procedure I / II
  3. Salt Fog (for metal case): 509.3 Procedure I
- D. The Selected Vendor shall be responsible for programming and installation of mobile subscribers. Installations shall include the following:
1. Installation of new antennas and lines, power cords and any control cables required for a complete working unit.
  2. Maintaining and providing to the County a log containing serial numbers, vehicle number, date of installation, forward and reflected power readings, and radio ID numbers.
  3. Removal and retention of legacy units and associated wiring in a secure location until turned over to the County or retained by the Selected Vendor in the event a trade-in is offered.





4. The Selected Vendor shall maintain and provide to the County an inventory of all legacy units removed from service.

### **2.6.5 Mobile Subscribers - Models to be Proposed**

- A. Respondents shall propose, describe and price at least three "tiers" of mobile radios to include:
  1. Law Enforcement Mobile
  2. Fire Service Mobile
  3. Public Service Mobile
- B. Respondents shall provide information detailing the differences between the proposed mobile subscriber models and how each model's features and functions are beneficial to the three user groups (Law Enforcement, Fire Service and Public Service)
- C. Respondents shall bid a minimum of these three models ("tiers") of mobile radios; however, they are encouraged to propose more than three so long as they meet or exceed the following requirements.
- D. Mobile radio antennas shall be Laird Phantom TRA(B)7603 or equivalent low-profile antenna.

#### **2.6.5.1 Mobile Subscriber Radio – Law Enforcement Model**

- A. In addition to the requirements listed for all subscriber devices, the Law Enforcement model shall include the following capabilities:
  1. FDMA/P25 Phase 1 and TDMA/P25 Phase 2 trunking operation
  2. AES Encryption
  3. Multikey option
  4. GPS location services
- B. As an OPTION, law enforcement models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage





### **2.6.5.2 Mobile Subscriber Radio – Fire Service Model**

- A. In addition to the requirements listed for all subscriber devices, the Fire Service model shall include the following capabilities:
  - 1. FDMA/P25 Phase 1 and TDMA/P25 Phase 2 trunking operation
  - 2. AES Encryption
  - 3. Multikey option
  - 4. GPS location services
- B. Extended environmental specifications
- C. As an OPTION, fire service models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage

### **2.6.5.3 Mobile Subscriber Radio – Public Service-Model**

- A. In addition to the requirements listed for all subscriber devices, the Public Service model shall include the following capabilities:
  - 1. FDMA/P25 Phase 1 trunking operation.
  - 2. GPS location services
- B. As an OPTION, public service models shall be capable of operating over Wi-Fi and LTE systems when roaming out of LMR coverage

### **2.6.5.4 Mobile Subscriber Radio – Control Station Option**

- A. A Control Station option shall be available allowing for use within a building or fixed location. The control station option shall provide the following:
  - 1. The control station shall be configured/equipped as a single unit containing the radio chassis and a DC power supply.
  - 2. The control station shall be provided with an outdoor permanently mounted antenna, associated coaxial cables and grounding.
  - 3. As an option a console style stations may be proposed.
- B. Control Stations may be utilized for Fire Station Alerting purposes providing all the requirements of the Fire Station Alerting solution are provided.





### **2.6.6 Subscriber Radios - Multiband OPTIONS**

- A. Respondents shall also provide pricing for all-band and portables and mobiles. All-band devices shall operate in the VHF, UHF, and 7/800 MHz bands and support P25 Phase1 and Phase 2 (FDMA and TDMA) trunking.

### **2.6.7 Subscriber Radios - Programming Equipment**

- A. The Selected Vendor shall also include three (3) full sets of programming equipment to support the proposed subscriber radios. This includes programming cables and programming software. Respondents shall provide the PC requirements.

## **2.7 Paging Devices**

- A. The County currently operates a VHF analog paging system alerting tone and voice pagers utilizing two tone sequential paging tones and dispatcher voice.
- B. The County anticipates the use of the P25 system for alerting pager devices.
- C. Respondents shall propose 30 pager devices capable of operation in the 700/800 MHz spectrum.
- D. These pagers shall be capable of decoding existing two-tone sequential paging tones as well as decoding digital P25 messages.
- E. Respondents shall describe how the dispatch consoles and P25 system will alert single and groups of pagers.





### **3. Microwave Backhaul System**

This section describes the general, functional, and operational requirements of the desired microwave radio backhaul system. While not a design, this RFP specifies requirements for system architecture and performance including redundancy, capacity, and path availability.

#### **3.1 General Requirements**

- A. The microwave backhaul system shall be configured using ring protected architecture to provide route diversity and minimize single-points-of-failure.
- B. The Selected Vendor shall be solely responsible for the new microwave backhaul system performing as specified in this RFP and to be compliant with all new or modified FCC radio station licenses.
- F. The microwave backhaul system shall utilize MPLS technology.
- C. All microwave links within a ring shall be configured for loop protection.
- D. All components shall have been fully tested in the field, having a proven service history of over 3 years in public safety radio systems.
- E. Manufacturers that supply components for the system must have a proven and known supply chain to serve the County for the lifecycle of the network.
- F. Software and firmware updates must be thoroughly regression tested prior to release and implementation. Software updates must include release information identifying the changes made, either to repair a problem or enhancements made.

#### **3.2 System Performance Requirements**

- A. Microwave links shall be designed for a minimum two-way end-to-end annual availability of 99.999% at a bit error rate (BER) of  $10^{-6}$ , at a minimum capacity of 150 Mbps.
- B. The microwave backhaul system shall support the P25 radio system's specifications for throughput, frame loss, latency, and jitter.





### **3.3 Microwave Backhaul Equipment**

#### **3.3.1 Microwave Radios**

##### **3.3.1.1 General**

- A. All microwave radios shall:
1. Be 19" rack mountable.
  2. Be type accepted for licensing under Part 101 of the FCC Rules and Regulations.
  3. Utilize all-indoor architecture.
  4. Support built-in error detection and correction.
  5. Be equipped for Adaptive Coding and Modulation (ACM) with a range of modulations from QPSK to 256QAM or higher, to allow the radios to automatically adjust the modulation during path fading to prevent total loss of communications. Switching between modulation rates shall be error-free for all traffic.
  6. Be equipped for -48 VDC operation and have redundant power supply cards.
  7. Have a minimum mean time between failure (MTBF) of 20 years.
  8. Provide sufficient transmit output power to meet the requirements of each link and comply with frequency coordination limitations and applicable FCC rules.

##### **3.3.1.2 All-Indoor Radios**

- A. All-Indoor radios shall:
1. Support operation in the 6 and/or 11 GHz bands.
  2. Support channel bandwidths up to 60 MHz.
  3. Operate to specification from 23°F to +131°F, and 5% to 95% humidity (non-condensing).
  4. Have an RF transmitter switch.
  5. Have a transmit monitor port for in-service maintenance.
  6. Provide built-in waveguide expansion ports to allow multiple RF signals to operate on a common waveguide/antenna.







7. Include a calibrated transmit monitor port on the antenna coupler unit (ACU) for power and spectrum measurement purposes.
8. Include front-panel test points for received signal strength indication (RSSI) measurement.

### **3.3.2 Microwave Radio Antennas**

A. Microwave radio antennas shall:

1. Be compatible with the radio frequency bands used and conform to applicable FCC requirements.
2. Be solid, parabolic, Category A antennas with radomes in accordance with FCC Part 101.115. Shielded antennas shall be used as required by frequency coordination.
3. Be of size and type to meet the specified path availability requirements.
4. Antennas shall be selected to perform in and endure the anticipated environmental conditions, as per TIA-222, current version.
5. Shall be equipped with two azimuth/stabilization rods for 8-foot diameter antennas or larger and one for 6-foot diameter antennas, tying the antenna rim to the tower steel (not tower cross members). Azimuth/stabilization rods are not required for 4-foot diameter and smaller antennas.

B. Microwave antenna systems shall utilize:

1. Mounting hardware designed specifically for the size and type of antenna mount structure, and the type of antenna used. Make and model numbers for all antenna mount hardware shall be provided to County for approval prior to beginning installation.
2. Pressurized elliptical waveguide for from the antenna to all indoor mount radios. Connectors shall be standard, premium type, and compatible with the antenna.
3. Solid corrugated copper outer conductor coaxial cable for split and all-outdoor mount radio configurations.

C. The Selected Vendor shall furnish a dehydrator/pressurization system at sites with full-indoor microwave radios that is:





1. Capable of maintaining at least 5 pounds per square inch gauge (psig) positive pressure of conditioned air in the elliptical waveguide. Individual pressure gauges with valves on a distribution manifold shall be provided for each transmission line.
2. Manually adjustable without the need for software or removable media.
3. Equipped with a run alarm and high and low-pressure alarms.





## 4. Network Management

### 4.1 Network Management System (NMS)

- A. The Selected Vendor shall use a single NMS for all equipment (i.e. P25, microwave backhaul and IP networking).
- B. The NMS shall monitor real time and ensure proper equipment configuration, operation, and integration of existing systems.
- C. The NMS shall monitor and allow remote configuration changes to the following subsystems at a minimum:
  - 1. P25 system control equipment
  - 2. Simulcast and voting equipment
  - 3. RF Site equipment
  - 4. Dispatch console subsystem
  - 5. Logging recorder
  - 6. Backhaul system (i.e. microwave radios, MPLS routers and IP routers and switches)
  - 7. Conventional radio system(s)
  - 8. Site alarms (environmental)
  - 9. Any other proposed subsystem
- D. The NMS shall display system status and alarm conditions.
- E. The NMS shall provide secure (VPN with two-factor authentication security), remote access to the system to check the operational status and view alarms through the network.
- F. The NMS shall support Simple Network Management Protocol (SNMP) allowing interfaces with higher-level network management systems.
- G. The NMS shall provide Simple Mail Transfer Protocol (SMTP) and Short Message Service (SMS) support to allow for email and text notification of system issues and alarms.





- H. The NMS shall:
  - 1. Monitor the health of all networked devices
  - 2. Remotely interrogate equipment and troubleshoot to board level failures
  - 3. Configure components remotely
  - 4. Routinely backup remote equipment configuration
  - 5. Remotely restore equipment configuration
  - 6. Push updates to remote equipment
  - 7. Manage encryption capabilities
  - 8. Generate real-time system statistical reports including failure, usage and performance reports
  - 9. Provide paging function based on multiple levels of fault configurations
- I. The NMS shall include storage to support no less than 6-months retention of all system data and reporting, without the need for removable or external archiving equipment.

## ***4.2 Network Management Terminal (NMT)***

- A. The Selected Vendor shall furnish one NMT's for the P25, microwave backhaul and IP network equipment. The NMT shall be located at the County dispatch center.
- B. The NMT shall include:
  - 1. Computer
  - 2. Display
  - 3. Keyboard, mouse, interfaces
  - 4. Networking equipment
- C. The NMT shall provide administrative and user profiles that set permissions for each set of user credentials.
- D. The NMT shall support 2 administrative profiles and 5 user profiles.





### **4.3 Site Alarms/Environmental Alarms**

- A. The Selected Vendor shall furnish all hardware and software to monitor, at a minimum, 20 conditions/points at each site (system control, simulcast/voting, dispatch, microwave backhaul and RF sites). At a minimum, the following alarms shall be monitored:
1. Door open/close
  2. Temperature high/low
  3. Power failure (AC and DC)
  4. UPS failure, low battery and bypass
  5. Generator run and trouble
  6. Generator low fuel level
  7. Tower lights
  8. Smoke alarm
- B. The proposal shall assume existing sites to be reused in the system design will contain a punch block where existing environmental alarms shall be available.





## 5. Civil Development

### 5.1 Existing Site Improvements

- A. The Selected Vendor shall be responsible for site improvements based on deficiencies discovered through the site surveys.
- B. Refer to Appendix A for location information on existing sites.
- C. The Selected Vendor shall verify that all sites selected for use have sufficient space available for antenna and ancillary equipment to be mounted on the tower/structure. If the Selected Vendor chooses a location on the tower/structure that is not available, the guarantee of coverage shall not change even though an alternative design may be required.
- D. The Selected Vendor shall perform structural analyses on all existing sites selected for their design. If no current drawings are available, the Selected Vendor shall provide all tower mapping services required for the structural analysis.
  - 1. Structural analysis shall be performed on existing towers according to the ANSI/TIA-222 standard, latest version applicable at time of structural analysis.
  - 2. Structural analysis shall include existing and proposed equipment; however, it is the County's intent that the Selected Vendor remove unused system equipment once cutover and acceptance of the new system is completed.
  - 3. Structural analysis reports shall be provided to the County upon completion of study or studies.
  - 4. In the event a tower fails the structural analysis, the Selected Vendor shall be responsible for providing a tower modification design detailing the modifications required to provide a passing structural analysis.
- E. The Selected Vendor shall identify and propose any additional work necessary to make existing County-owned and non-County-owned sites and infrastructure usable in the new dispatch, LMR and microwave backhaul systems.
- F. The Selected Vendor shall be responsible for updating all existing sites that are part of the new dispatch, LMR and microwave backhaul systems to be compliant





with their selected grounding and lightning protection standards. The Selected Vendor shall be accountable for updating all deficient site conditions.

- G. The Selected Vendor shall be responsible for completing any documents required by local, state and federal departments including, but not limited to permitting documents and State Historic Preservation Office (SHPO) forms.
- H. The Selected Vendor shall be responsible for any issues related to site selection and will be responsible for resolving any issues related to site permitting or zoning.
- I. Code Compliance:
  - 1. Installation of all electrical equipment, power distribution, lighting assemblies and associated wiring shall comply with the most recent edition of the National Electric Code (NEC) and Occupational Safety and Health Administration (OSHA) regulations.
  - 2. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).
  - 3. The Selected Vendor shall comply with all applicable local codes as well as industry best practices and guidelines stipulated in Section 1. 1. 1, Standards and Guidelines.
- J. The Selected Vendor shall assume total responsibility for maintaining liability insurance covering the following items:
  - 1. Project design
  - 2. Implementation
  - 3. Licensing
  - 4. Shipping
  - 5. Receiving
  - 6. All site work required
  - 7. Any items required for the Selected Vendor or any required subcontractors
- K. The Selected Vendor shall coordinate with utility companies for all utility related items, such as electrical service hookups and disconnects.





## **5.2 Power Systems**

### **5.2.1 DC Power Requirements**

- A. The proposal shall include new DC power systems for all RF sites.
- B. The DC power system shall be designed to meet the specific load requirements for all system equipment at each site and include enough capacity for an additional future load of 25%.
- C. The DC power system shall provide the following alarms to the NMS alarm system:
  - 1. Rectifier failure
  - 2. AC power failure
  - 3. Low current
  - 4. Battery low voltage
  - 5. DC breaker
- D. The DC power system shall perform as specified herein when housed with or adjacent to other radio transmitters operating in accordance with FCC regulations.
- E. All load current shall pass through a single main distribution breaker prior to sub-panel breaker/fuses and individual load breaker/fuses. An individual assigned breaker/fuse shall be employed for each specific communication device powered.
- F. The power supply/charger shall meet the following requirements:
  - 1. Input Voltage: single phase, 120 VAC +/- 10%
  - 2. Frequency: 60 Hz +/- 5%
  - 3. Output Voltage Range: -42 to -56 VDC (positive ground)
  - 4. Float Voltage: 50.9 - 54.0 VDC
  - 5. Equalize Voltage: 54.2 - 57.6 VDC
  - 6. DC Output Voltage Regulation: +/- 1/2% from no load to full load
  - 7. Output Current: As calculated to support load requirements







- a. Minimum 12 amps
  - b. Full recharge of batteries shall be accomplished within eight hours
8. Output noise shall not degrade the performance of LMR and microwave radio equipment in the vicinity of the power supply/charger
  9. AC to DC conversion efficiency shall not be less than 75%
  10. Shall include equalize circuitry and controls for periodic manual equalization of batteries as needed
  11. Shall be 19-inch rack mountable
  12. Shall be equipped with an input power AC circuit breaker, output power DC circuit breaker, DC current meter and DC voltage meter
  13. Shall be initially configured for independent operation, however, shall be capable of operating in parallel with another power supply/charger in the future, without damage to either unit
  14. Shall provide separate adjustable voltages for floating and equalizing of the batteries, with the voltages initially adjusted to accommodate the batteries provided
  15. Shall include short circuit current protection and high voltage shutdown circuitry
  16. Each alarm shall include a Form "C" contact for connection to an external alarm, and the alarm status shall be displayed on the front panel of the power supply/charger
- G. The 48-volt batteries shall:
1. Be designed for float connection in support of continuous steady current loads with battery discharge only during loss of charger/power-supply output
  2. Be sized to support full load operation during an AC power failure for a minimum of 2 hours
  3. Include support trays for installation inside the communication cabinets
  4. Include all cell interconnect bus pieces and hardware
  5. Be sealed, lead acid batteries requiring no maintenance
  6. Have a minimum service life of 10 years, defined as the time in which the battery capacity drops below 80% of the original capacity





H. Other DC Power System Components:

1. Load distribution/disconnect panels shall:
  - a. Include individual 100A circuit breakers for protecting and/or disconnecting each charger/battery bank from the load
  - b. Include a front panel LED display indicating whether a breaker has been tripped
  - c. Include a Form "C" relay for connection to an external alarm panel. The relay shall be activated if any breaker trips or is shut off
  - d. Be 19-inch rack mountable
2. Circuit breaker panels shall:
  - a. Include circuit breakers, appropriately sized for disconnecting the individual loads
  - b. Be 19-inch rack mountable
  - c. Include a minimum of five spare circuit breakers, with a minimum current rating equal to the circuit breaker for the installed load
3. The negative and positive bus bars shall:
  - a. Be 19-inch rack mountable
  - b. Be equipped with standoffs that will electrically isolate it from the mounting rack inside the cabinet
  - c. Be solid copper, sized to handle the required current capacity

15.DC power cables shall be of appropriate size to handle the load current requirements, as specified

### **5.2.2 Uninterruptible Power Supply Requirements**

- A. The proposal shall include a new Uninterruptible Power Supply (UPS) for the dispatch site equipment and any System Control equipment not capable of DC operation.





- B. Each dispatch operator position shall be provided with an individual UPS providing backup power for each position's electronic equipment (e.g. PC, monitor, etc.)
  
- C. The UPS shall be a single phase, online, double conversion, static type with the following features:
  - 1. Direct dedicated connection to main panel
  - 2. Surge suppression
  - 3. Input harmonics reduction
  - 4. Rectifier / charger
  - 5. Inverter
  - 6. Static bypass transfer switch
  - 7. Battery and battery disconnect device
  - 8. Internal maintenance bypass / isolation switch
  - 9. Output isolation transformer
  - 10. Remote UPS monitoring provisions
  - 11. Battery monitoring
  - 12. "Back room" UPS output shall be connected to a dedicated subpanel feeding quad 20A twist lock outlets to be installed on the overhead cable tray
  - 13. "Console position" UPS equipment shall contain enough outlets to provide power to positions' equipment without the need for power strips.
  - 14. Provide 2 hour runtime
  
- D. Operational Requirements:
  - 1. Automatic operation includes the following:
    - a. Normal Conditions - Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
    - b. Abnormal Supply Conditions - If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency





limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.

- c. If normal power fails, energy supplied by the battery through the inverter shall continue to supply regulated power to the load without switching or disturbance.
- d. When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
- e. If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.
- f. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal AC supply circuit without disturbance or interruption.
- g. If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal AC supply circuit for fault clearing.
- h. When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
- i. If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

16. Manual operation includes the following:

- a. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal AC supply circuit without disturbance or interruption.
- b. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.





17.Controls and Indications:

- a. Basic system controls shall be accessible on a common control panel on the front of the UPS enclosure.

E. Performance Requirements:

1. Input:

- a. Single phase, three-wire
- b. Voltage: 120/240V Nominal
- c. Frequency: 50/60 Hz +/- 3 Hz

2.Output:

- a. Voltage: 120/240V
- b. Frequency: 60 Hz, +/- 3 Hz
- c. Maximum Voltage Distortion: 5% at full load
- d. Two-hour battery operation

### ***5.3 Equipment Shelter (if required)***

#### ***5.3.1 General***

- A. If required, the Selected Vendor shall supply a new equipment shelter for existing sites.
- B. The Selected Vendor shall supply a new equipment shelter for all new sites.
- C. The Selected Vendor shall supply a new equipment shelter for existing sites, based space limitations and/or deficiencies discovered through the site surveys.
- D. The Selected Vendor may recommend re-use of existing shelters based on the site survey findings. The County shall approve re-use of any existing shelter.
- E. Should a new equipment shelter be required at any site in the Selected Vendor's design, it shall comply with the requirements of this section.





### **5.3.2 Shelter Size**

- A. The minimum exterior shelter dimensions shall be 12' x 16'. Minimum interior height shall be 9', unless waived by the County.
- B. Shelter dimensions shall accommodate legacy and new equipment with enough room to expand the usable rack footprint by 40%.

### **5.3.3 Shelter Design and Construction Requirements**

- A. Where possible, the shelter shall be a prefabricated, preassembled concrete shelter.
  - 1. If any site will not accommodate a prefabricated shelter, the County will consider site assembly and other shelter types.
  - 2. The Selected Vendor is responsible for all costs, permits and approvals required to transport the shelter to the site and for assembling and constructing the shelter at the site.
- B. In addition to all applicable codes and standards, the Selected Vendor shall design the shelter to meet or exceed the following structure requirements:
  - 1. 200 pounds per square foot distributed floor loading while on foundation
  - 2. 125 pounds per square foot distributed floor loading while lifting
  - 3. 200 pounds per square foot minimum roof load and a concentrated load of at least 500 pounds per square foot
  - 4. Minimum wind requirements as specified in the Levy County zone in TIA 222 Standard current revision
  - 5. Seismic Design Category [D]
  - 6. Vents and entryways shall be constructed to deter vandalism
  - 7. Vents and entryways shall be constructed to prevent entry of rodents
  - 8. Waterproof

### **5.3.4 Exterior Finish**

The exterior finish of the shelter shall be exposed aggregate.





### **5.3.5 Bullet Resistance**

Shelter walls shall be capable of stopping 30.06 rifle fires per UL 752 requirements.

### **5.3.6 Fire Rating**

Shelter walls must provide a two-hour fire rating.

### **5.3.7 Insulation and Interior Finish**

- A. Walls and ceiling must be insulated to a minimum value of R-11.
- B. Interior walls and ceiling must be sheathed with ½ inch white Nu-Poly® or similar board.
- C. Shelter walls must be reinforced as required to support wall mounted equipment.
- D. Floor will be covered with light colored industrial grade vinyl tile floor covering.

### **5.3.8 Exterior Door**

- A. The shelter shall be equipped with a 42 inch by 84 inch door.
- B. The door shall have a bullet resistance rating that complies with levels 1-4 of UL 752 ballistic standards.
- C. Door, frame and frame components shall be painted or otherwise treated to be rust-proof.
- D. Each door shall as a minimum be equipped with the following hardware and accessories:
  - 1. A continuous stainless-steel hinge the entire length of the door
  - 2. Neoprene weather strip
  - 3. High security locking cylinder latch set
  - 4. Mortised dead bolt
  - 5. Anti-pick plate on strike of door to restrict access to the latch and deadbolt
  - 6. Hydraulic closer





7. An exterior mounted canopy to protect the door entry shall be designed to support a load of 100 pounds per square foot

### **5.3.9 Power Distribution**

Power distribution shall include the following:

- A. One MOV/SAD only lightning arrestor, Type 1.
- B. One MOV lightning arrestor, Type 2.
- C. One (60 Amp) enclosed circuit breaker for safety disconnect of TVSS unit.
- D. One (200 Amp), 10,000 AIC, 120/240 VAC, single phase, 60 Hz, 30 space main breaker, snap-in utility power distribution panel, in a NEMA 1 surface mount enclosure.
- E. Circuit breakers for all communications system equipment and customer loads as specified.
- F. One (200 Amp), 240 VAC, fused, double pole, single throw safety switch.
- G. One (200 Amp), 240 VAC, non-fused, double pole, double throw manual transfer switch.
- H. One (200 Amp), four-pin, reversed service exterior power receptacle.
- I. Six 20 Amp specification grade duplex receptacles.
- J. One 20 Amp specification grade exterior ground fault duplex receptacle.
- K. Ten 20 Amp ceiling or cable tray mounted NEMA twist-lock receptacles with matching plugs.
- L. All wiring shall be installed in surface mounted conduit or NEMA wire ways and be in full compliance with ANSI/NFPA-70 - The National Electric Code, latest version.







### **5.3.10 Lighting**

- A. Equipment shelter lighting shall be energy efficient and generate low heat levels. Acceptable lighting shall be long lasting energy efficient technologies, such as light emitting diodes (LED) or fluorescent.
- B. Equipment shelter lighting shall comply with the U.S. defense standard MIL-STD-461E or most current version for low radio frequency interference (RFI) lighting fixtures.
- C. There shall be sufficient interior lighting to provide a level of 540 Lux (50-foot candles at 1 meter (39.4 inches) above the equipment shelter floor. Refer to TIA-569-B or most current version standard for additional information.
- D. Placement of equipment shelter lighting shall assure illumination in front of and behind tall equipment racks (within aisle ways; not directly above equipment racks).
- E. Light fixtures shall employ earthquake bracing.
- F. Interior lighting control switches shall be located near the non-hinged side of the entrance door to the equipment shelter. One switch shall control a single lighting fixture and the second switch shall control the remaining lighting fixtures. Refer to NFPA, NEC 70-2011 (or latest edition) Article 410 - Luminaries, Lamp Holders, and Lamps for additional information.
- G. Interior emergency backup lighting units shall be installed and activate immediately upon failure of all AC power. The emergency backup lighting shall also be equipped with an illuminated "Exit" sign mounted above the exit door of the equipment shelter indicating exit locations in the equipment shelter during emergency evacuation.
- H. Exterior lighting shall illuminate points-of-exit and entry into the site compound and the equipment shelter and be located to the side of the entrance way and above door level.
- I. Each equipment shelter shall have light-emitting diode (LED) exterior lighting fixtures with cutoff housings that limit the beam top to 35° below horizontal, and protection from falling ice.





- J. Each shelter shall have a combination photoelectric/motion switch that provides for automatic illumination at sunrise or when motion is detected, and extinguishment of the exterior equipment shelter lights at twilight.
- K. Each exterior light equipped with a combination photoelectric/motion switch shall also have a photoelectric /motion bypass switch installed at the same location as the interior lighting control switches.

### **5.3.11 HVAC**

- A. HVAC shall be redundant wall mount air conditioning units, with low ambient and compressor anti-cycle controls, integral 5 kW resistance heat strips and washable dust filters.
- B. Selected Vendor will ensure HVAC is sized correctly with equipment heat loads and include the following features:
  - 1. Redundant lead/lag controls allowing approximately equal operating time on each air conditioning unit
  - 2. Active dehumidification controls that modulate heat and air conditioning operation to control high humidity conditions
  - 3. One 650 cfm at 0" of H<sub>2</sub>O static pressure exhaust fan system, including motorized intake and exhaust louvers, thermostat, fiberglass hoods, permanent expanded metal dust filter and exhaust insect screen

### **5.3.12 Site Alarms**

- A. Any change in the state of site equipment shall induce an alarmed state.
- B. Equipment monitored shall include, but not be limited to the following:
  - 1. Surge arrestors
  - 2. Transfer switch (normal or bypass state)
  - 3. Power fail
  - 4. HVAC
  - 5. Smoke detector
  - 6. Intrusion detection





7. High temperature
8. Low temperature
9. High humidity
10. UPS/DC Power Plant fail
11. UPS state (normal or bypass)
12. Generator (including, e.g., generator run, low fuel, high temp, and fail)
13. Generator not in auto
14. Low fuel level
15. Tower lighting alarms
16. To reduce false alarms, all alarm contacts shall be normally closed when no alarm is present.

#### **5.3.13 Grounding**

- A. The Selected Vendor shall follow industry standard best practices for the grounding and bonding of the building, electrical service, tower, cable trays, transmission line entrance portal, and all equipment and other structures, that the County will pre-approve. The Selected Vendor shall provide the standards documents to the County and include these documents in all site documentation.
- B. The required impedance of the ground system is 5-Ohms or less.

#### **5.3.14 Entry Ports**

Cable entry ports shall consist of one – twelve-port/waveguide entry panel with 4 inch sleeves and protective blank covers.

#### **5.3.15 Cable Ladder**

The Selected Vendor shall supply and install up to 40 feet of 18-inch-wide cable ladder/tray.

#### **5.3.16 Telco Board**

The Selected Vendor shall supply one 4-foot x 6-foot x ¾ inch Telco board(s).





### **5.3.17 Accessories**

The Selected Vendor shall provide the following accessories:

- A. Two portable 10 pound “clean agent” fire extinguisher
- B. One hand held emergency eye wash station
- C. One first aid kit
- D. One service manual
- E. One smoke detector

### **5.3.18 Drawings**

The Selected Vendor shall:

- A. Provide three sets of shelter drawings with each shelter.
- B. Supply typical foundation drawings based on Presumptive Soil Parameters specified in the TIA -222 Standard current revision.
- C. Validate all foundation design parameters and assumptions for the specific site prior to construction.
- D. Supply support calculations for recommended building tie down locations.

### **5.3.19 Generator Plug**

- A. The shelter shall include a wall penetration for exterior weatherproof generator plug, to accommodate the use of a mobile generator.
- B. The location of the penetration and the type of exterior generator plug that is to be installed in the penetration will be coordinated with the County prior to manufacture of the shelter.





## **5.4 Site Generator**

### **5.4.1 General**

- A. If required, the Selected Vendor shall supply a new site generator for new and/or existing sites.
- B. The Selected Vendor shall supply a new site generator for existing sites based on deficiencies discovered through their site surveys.
- C. The Selected Vendor shall supply and install new generators that comply with the Outdoor-Use Units specifications in UL 2200, latest edition.
- D. The Selected Vendor may recommend reuse of existing generators based on the site survey findings. The County shall approve reuse of any existing site generators.

### **5.4.2 Power and Electric Requirements**

Generator specifications include the following:

- A. Fuel: Liquid Propane (natural gas or diesel may be provided as an option)
- B. Output: 35 kW (minimum, and sized for the proposed system)
- C. Phase: Single
- D. Voltage: 120/240 VAC
- E. Frequency: 60 Hz

### **5.4.3 Enclosure**

The generator enclosure shall be outdoor weather protective and securely attached to a foundation designed to the generator manufacturer's specifications.

### **5.4.4 Muffler Type**

The generator muffler shall be of residential critical grade including flexible exhaust section.





### **5.4.5 Control Panel**

- A. The generator control panel shall be either analog or digital and capable of displaying the following:
  - 1. Oil Pressure
  - 2. Coolant temperature
  - 3. Fuel level (where applicable)
  - 4. DC battery voltage
  - 5. Run time hours
  - 6. Alarm Status
  
- B. The generator shall be capable of providing, at a minimum, the following alarm status information:
  - 1. High or low AC voltage
  - 2. High or low battery voltage
  - 3. High or low frequency
  - 4. Low or pre-low oil pressure
  - 5. Low water level
  - 6. Low water temperature
  - 7. High and pre-high engine temperature
  - 8. High, low and critical low fuel levels (where applicable)
  - 9. Over crank
  - 10. Over speed
  - 11. Unit not in "Automatic Mode"

### **5.4.6 Miscellaneous**

- A. Generator will be supplied with block heater, 10 Amp battery charger, and meet NFPA99 and 110 requirements.
  
- B. Fuel tanks shall be sized to accommodate for a 7-day run time with a minimum size of 500 gallons.





- C. The Selected Vendor shall be responsible for generator installation, test, and first fill of all fuel tanks.
- D. Fuel tanks shall be equipped with monitoring device capable of triggering an alarm contact upon low fuel. Low full threshold shall be programmable.
- E. Fuel tanks shall be securely attached to a poured concrete foundation.

#### **5.4.7 Automatic Transfer Switch (ATS)**

- A. The Selected Vendor shall install the ATS in the shelter prior to shelter shipment.
- B. ATS shall include a programmable exerciser capable of automatic starting and shutdown of generator on a weekly basis.
- C. ATS shall have a 200 Amp rating and enclosed in NEMA 1 enclosure.

### **5.5 Self-Supporting Tower**

#### **5.5.1 General**

- A. The Selected Vendor shall leverage existing tower structures to the greatest extent possible.
- B. If required, the Selected Vendor shall supply a new self-supporting tower for new and/or existing sites.
- C. The Selected Vendor may recommend reuse of existing towers based on the site survey findings and structural analysis results. The County shall approve reuse of any existing tower structure.
- D. Should a new tower structure be required at any site in the Selected Vendor's design, it shall comply with the requirements of this section.

#### **5.5.2 Design Criteria**

- A. The design shall be based on the minimum wind and ice requirements as specified for Class III structures in TIA -222 Standard current revision.
- B. Each tower and foundation shall be designed for all equipment, appurtenances, ancillary equipment, antenna loading and include 25% future capacity.





- C. The tower shall be manufactured as a self-supporting lattice or a monopole design.
- D. All structural steel and hardware shall be galvanized after fabrication in accordance with the appropriate standards.
  - 1. All tower materials shall be hot dip galvanized after fabrication; with a minimum zinc coating of 2 oz. per sq. ft.
  - 2. Bolts shall be hot dip galvanized according to American Society for Testing and Materials (ASTM) A-325 or the latest version of this standard.
- E. The make, model, serial number, and height of the tower shall be clearly labeled at the base of the tower. Labeling shall be weatherproof and durable such as a stamped metal plate or equivalent.

### **5.5.3 Waveguide Support**

- A. There shall be a ladder type support system associated with the tower to mount the transmission cables.
- B. In the case of a monopole, transmission lines will be routed internally. This support shall comply with tower and cable manufacturer's installation specifications.
- C. The support system shall accommodate cable or waveguide mounting hardware at the proper intervals.
- D. The support shall be equipped with precision punched or drilled holes to allow installation of snap-in type or bolt-in hangers.
- E. The support system shall be sized for 25% growth beyond initial system implementation.
- F. The support materials will be of similar construction as other tower materials to appear integral to the structure.
- G. The support shall be designed to meet rigidity specifications similar to the tower.







#### **5.5.4 Waveguide Bridge**

The tower shall be equipped with a waveguide bridge with support posts spaced at intervals compliant to the wind loading specifications, but not more than 10 feet distant.

- A. There shall be posts placed on both lateral sides of the bridge to fully support the load.
- B. The bridge shall be designed to support all initial antenna transmission lines plus 25% growth capacity.
- C. The structure shall comply with the tower wind and ice requirements as specified in TIA -222 Standard current revision.
- D. The Selected Vendor shall furnish and install the waveguide bridge between the tower and equipment shelter.
- E. The following criteria shall govern the design of the waveguide bridge:
  - 1. Structurally sturdy to support live and dead loads
  - 2. Free standing (i.e., not attached to the shelter or tower)
  - 3. Minimum width of 2 feet in width
  - 4. Length/height as required by the site specifics
  - 5. Bridge/ice shield material shall be fabricated from galvanized bar grating or approved equivalent
  - 6. All components of the waveguide bridge shall be hot-dipped galvanized after fabrication
  - 7. Posts shall have galvanized caps
  - 8. Posts shall be set in concrete foundations.
  - 9. Each post shall be separately grounded to the site ground system with 1/0 AWG stranded bare copper conductor
  - 10. Waveguide bridge shall be adjustable in height to allow interface with shelter waveguide entry ports
  - 11. Waveguide Bridge shall be effectively grounded to the external ground bar





### **5.5.5 Climbing Equipment**

- A. The tower shall be equipped with an approved climbing ladder and safety device.
  - 1. The ladder may be integrated into the structural components of the tower.
- B. There shall be a climbing safety system compliant to original manufacturer's specifications.
- C. The equipment shall comply with TIA-222 current revision.
- D. The Selected Vendor shall provide two approved climbing harnesses.

### **5.5.6 Lighting System & Control (Option)**

- A. A lighting system is not required by the FAA for towers under 200 feet. However, due to the proximity of sites to the airport the FAA may require the installation of a lighting system. Therefore, a lighting system shall be proposed as an OPTION.
- B. The Selected Vendor shall furnish and install an obstruction lighting system approved by the FAA and compliant with applicable standards as an OPTION.
- C. The OPTIONAL lighting system shall include:
  - 1. Controller
  - 2. Lamps
  - 3. Lightning protection
  - 4. Mounting hardware
  - 5. Service cabling and conduit
  - 6. Conduit drain-breather system
  - 7. Wiring
  - 8. Other material required for a complete installation
- D. The lighting system shall be controlled by a 120-volt AC, single-phase solid-state control unit and power supply.
- E. The control unit shall be installed within a NEMA 3R metal cabinet or a NEMA 4X cabinet. The control unit shall be mounted inside the equipment shelter.





- F. The lights shall be automatically controlled by means of a photoelectric unit. The control unit shall be designed with relays for:
  - 1. ON-OFF status of lights
  - 2. Control unit failure
  - 3. Light failure
- G. The lighting system shall automatically revert to back-up power source upon loss of primary power. The lighting system shall automatically reset upon power restoration of primary power.
- H. The controller shall include a test switch allowing simulation of daytime and nighttime modes.
- I. All tower lighting wiring shall be contained within rigid galvanized conduit, junction boxes, and lighting equipment housings.
- J. Vertical conduit runs shall be adjacent to the tower waveguide supports.
- K. All levels of lighting shall be clearly visible from any direction of approach to the tower.
- L. The photoelectric unit shall be installed in a moisture-proof protective metal or high impact plastic housing.
- M. The photoelectric unit shall be installed on the building in an inconspicuous location and adjusted to attain an unobstructed view of the NNE sky.
- N. The photocell shall be mounted such that it is not affected by artificial light.
- O. Photocell wiring shall be installed entirely within rigid galvanized conduit.
- P. Ice shields shall be installed for all lighting system fixtures except for the top most light.
- Q. The controller case shall be grounded to the equipment shelter building ground with #4 AWG or larger copper wire.





## 6. System Implementation, Test and Acceptance

### 6.1 Project Management

- A. The Selected Vendor shall attend project and construction meetings as deemed necessary by the County prior to and during installation. Additional meetings may be scheduled at the discretion of the County.
- B. If any changes in the overall timeline occur, the Selected Vendor shall update the project schedule for discussion during these project meetings.
- C. The Selected Vendor shall provide written minutes of all meetings no later than five business days after the meeting.

#### 6.1.1 Project Staffing

The Selected Vendor shall provide the appropriate project staff based on workload and the level of effort required throughout the implementation/installation process.

- A. The staff identified in the Selected Vendor's proposal shall serve the duration of the project unless the Selected Vendor proposes an alternative plan to the County for consideration and gains approval. The County reserves the right to accept or reject any proposed staffing changes.
- B. The Selected Vendor's project manager shall be:
  - 1. The primary point of contact for the County.
  - 2. Fully responsible for supervising and coordinating the installation and deployment of the communications system.;
  - 3. Responsible for:
    - a. Development and acceptance of the project management plan
    - b. Managing the execution of the project against that plan
    - c. Overseeing the day-to-day project activities, deliverables, and milestone completion
    - d. Coordinating, and facilitating weekly status meetings.
- C. The Selected Vendor's project engineer shall:





1. Have the primary responsibility for managing the system design and ensuring system installation in accordance with the approved system design. Any deviation from the proposed system design shall be subject to project change control procedures and will not be undertaken until approved by the County.
2. Ensure the accurate development of block diagrams, system-level diagrams, and rack diagrams.
3. Supervise the development and execution of:
  - a. Acceptance Test Plan (ATP)
  - b. Coverage Acceptance Test Plan (CATP)
4. Guide the project team through the processes and procedures necessary to prove that the system performs as specified in the contract. The County shall approve all test plans prior to execution.

### **6.1.2 Scheduling**

The Selected Vendor shall develop and maintain a project schedule including tasks, milestones, start and end dates, task predecessors, and task owners based on an approved WBS.

- A. The schedule shall represent tasks associated with completing work on all items identified in the WBS.
- B. The Selected Vendor shall update the project schedule with actual dates as tasks are completed.
- C. The Selected Vendor shall present all schedule updates to the County during the weekly status meetings.
- D. The schedule shall address the following at a minimum:
  1. Site surveys
  2. Detailed design review
  3. Site preparation
  4. Equipment order and manufacturing
  5. Factory acceptance test
  6. Equipment delivery





7. System installation
8. System configuration
9. System optimization
10. Acceptance testing
11. Coverage testing
12. User training
13. System cutover
14. System documentation development and delivery
15. System and equipment warranty

### **6.1.3 Project Meetings**

- A. The Selected Vendor shall schedule a project kickoff meeting prior to the beginning of the project.
- B. The Selected Vendor shall schedule weekly project status meetings following contract award and the initial kickoff meeting.
- C. Weekly status meetings shall continue throughout the duration of the project until the County issues final system acceptance.
- D. The Selected Vendor shall be responsible for facilitating the weekly status meetings.
- E. The Selected Vendor shall prepare and distribute meeting agendas and minutes to the County via e-mail on a weekly basis at least 24-hours prior to each scheduled meeting.
- F. Meeting agenda items shall include, as a minimum, the following items:
  1. Schedule review
  2. Status of deliverables
  3. Risk items and planned responses
  4. Proposed changes
  5. Plans for the next period
  6. Action item assignments





7. Punch list review

#### **6.1.4 QA/QC Plan**

- A. The Selected Vendor shall submit the QA/QC plan for review during preliminary design as described in this section.
- B. The QA/QC plan shall address all stages of the project, including, but not limited to:
  1. Procurement
  2. System design
  3. Installation
  4. Implementation
  5. Testing
  6. Cutover
- C. The QA/QC plan shall:
  1. Describe the plans and procedures that ensure compliance of the proposed system design with the RFP requirements.
  2. Be included in the project management plan developed by the Selected Vendor's project manager.
  3. Be an integral part of the project.
  4. Include the County personnel as part of the review and approval process for all deliverables and submittals.
  5. Address the following project tasks at a minimum:
    - a. Design analysis and verification
    - b. RF coverage analysis and verification
    - c. Design changes and document control
    - d. Material ordering, shipping, receiving, and storage
    - e. Site preparation (if required)
    - f. Field installation and inspection
    - g. Equipment inventory and tracking





- h. System testing and validation
- i. Software regression testing
- j. Deficiency reporting and correction
- k. Implementation and cutover
- l. Training and certification

### **6.1.5 Project Punch List**

- A. The Selected Vendor shall establish and maintain a punch list, as mutually agreed to with the County. The punch list shall be maintained in real time.
- B. The punch list shall address all open issues including those related to sites, facilities, equipment, and acceptance tests.
- C. The Selected Vendor shall distribute the punch list to the County weekly via e-mail.
- D. The punch list shall include the following at a minimum:
  - 1. Sequential punch list item number
  - 2. Date identified
  - 3. Item description
  - 4. The party responsible for resolution
  - 5. Expected resolution date
  - 6. Resolution date
  - 7. Details about how each punch list item was resolved and tested
  - 8. Notes about the item
- E. If the Selected Vendor receives written permission from the County to transfer the responsibility of an item to another person or group, the Selected Vendor shall add a new entry to the punch list and appropriately note the original entry.
- F. The Selected Vendor shall be responsible for reviewing each punch list item and advising the County of any changes.







- G. The Selected Vendor shall update the status of punch list items during each weekly status meeting.

## ***6.2 Frequency Coordination and Licensing***

- A. The County will provide all current licensing information to the Selected Vendor following contract award.
- B. The County anticipates a transition to 700 MHz for the proposed system.
- C. The Selected Vendor shall:
  - 1. Provide all FCC and frequency coordination modifications and applicable forms to the County for review and approval following approval of the preliminary design.
  - 2. Complete all engineering tasks required for channel search/identification, coordination and licensing of all new LMR and microwave channels and the modification of existing licenses, which are required for the new system, including the completion of all forms and submission of license applications to the FCC.
  - 3. Track all applications and filings with the selected frequency coordinator and/or the FCC.
  - 4. Respond to any questions by the selected frequency coordinator and/or the FCC regarding all applications and filings.
  - 5. Correct and resubmit any applications or filings by the selected frequency coordinator and/or the FCC for the modification of licenses or re-licensing of existing channels at no additional cost.
  - 6. Complete Federal Aviation Administration (FAA) forms as necessary.
  - 7. Complete all required FCC construction deadline notifications.
  - 8. Ensure compliance with the FCC's Maximum Permissible Exposure (MPE) requirements.
  - 9. Provide copies of each license to the County.





### **6.2.1 Intermodulation Interference**

- A. The Selected Vendor shall analyze all transmitters at each site for intermodulation interference, considering transmitting equipment from all tenants located at the sites as identified in FCC license information.
- B. If the Selected Vendor identifies an intermodulation problem prior to, during, or following implementation, the Selected Vendor shall resolve the issue without degrading system coverage or performance for a period of up to 12 months after System Acceptance and at no cost to the County.
- C. Transmitters at each site shall meet FCC Maximum Permissible Exposure (MPE) standards (per latest revision of FCC Office of Engineering and Technology (OET) Bulletin 65).
- D. The Selected Vendor shall mitigate causal and occupational exposure at locations that exceed MPE standards.
  - 1. Fencing, signage, and/or other techniques shall be approved in advance by the County.

### **6.3 Site Surveys**

- A. The Selected Vendor shall participate in a mandatory site survey with the County to confirm actual equipment location within each space prior to the start of the system installation.
- B. During the mandatory site survey, the Selected Vendor shall determine and document any changes needed to the detailed design installation drawings. All detailed design drawings and documents requiring changes shall be revised prior to installation.
- C. The Selected Vendor shall visit all sites to:
  - 1. Assess site, safety, and access conditions
  - 2. Verify work to be completed, including location of equipment and installation requirements
  - 3. Assess the condition of existing radio shelters, radio towers, power systems, standby power systems, cable and waveguide routing, earthquake bracing, site grounding and lightning protection systems, and all other installation





- practices, to assure that they adhere to industry standard(s) listed in Section 1.3.C.
4. Identify existing County equipment that can be reused on the new system
- D. The Selected Vendor shall produce a Site Survey report for each site, including, at a minimum:
1. Cover page with site name, date of survey, survey team member(s), and general site description
  2. Accurate site coordinates (latitude/longitude) using Datum WGS84, preferably near the tower or antenna structure of interest
  3. Photographs (submitted in .jpeg format using the naming convention "site name photo description date.jpg") of:
    - a. Overall site, showing location of radio tower(s) and equipment shelter(s)
    - b. The radio tower(s)
    - c. Antennas to be used for this project or location for new antennas
    - d. Radio shelter exterior
    - e. Inside of equipment shelter, including front and rear of existing radio equipment to be removed
    - f. Coaxial cable and waveguide routes
    - g. Rack location and position(s) where new equipment will be installed
    - h. DC panel indicating breakers to be used
    - i. Dehydrator unit and distribution manifold
    - j. Feedline entry (inside and outside of shelter)
    - k. Grounding and lightning protection systems
  2. Potential obstructions at or near the site that could impede radio paths and/or radio coverage, including type, and approximate azimuth and height
  3. A list of existing equipment that can be reused for the new system
  4. A list of issues encountered or identified and proposed solution(s) for each deficiency
  5. A statement of the work to be completed for system implementation and the method to complete the work





6. Recommended site upgrades, including, but not limited to equipment shelter, radio tower, antenna, waveguide, AC or DC power system, backup generator(s), UPS system(s), site access and physical site security
  7. Accurate drawings of the shelter/equipment room in MS-Visio native format
  8. Tower mapping with complete inventory of tower appurtenances, including antenna type, manufacturer, model number, height, weight, tower leg, azimuth, and transmission line type and size
- E. The Selected Vendor shall produce a Grounding Assessment report for each site, based on the standard(s) selected in Section 1.3.C. The report shall include at a minimum:
1. Cover page with site name, date of survey, survey team member(s), general site description, and selected standard(s) name and revision
  2. Accurate site coordinates (latitude/longitude) using Datum WGS84, preferably near the tower or antenna structure of interest
  3. Photographs (submitted in .jpeg format using the naming convention "site name photo description date.jpg") of:
    - a. AC utility service grounding
    - b. Site ground ring (tower and shelter)
    - c. Ground rod test well(s)
    - d. Tower grounding (each leg)
    - e. Tower ground bar(s)
    - f. Tower guy wires
    - g. Transmission line grounding kits
    - h. Ice bridge grounding (all sections and legs)
    - i. Exterior ground bar(s)
    - j. Exterior RF entry port grounding
    - k. Interior RF entry port grounding
    - l. Interior halo grounding
    - m. Interior master ground bar(s)
    - n. Secondary ground bar(s)





- o. RF surge suppressor grounding
  - p. Equipment rack grounding
  - q. Cable ladders and trays
  - r. DC power systems
  - s. AC surge suppressors
  - t. Generator grounding
  - u. Fuel tank grounding
  - v. Fence(s) and gate(s)
  - w. Other nearby metal objects
- 4. Clamp-on meter measurements (in ohms) for each component assessed per the selected standard(s)
  - 5. A list of existing grounding equipment that can be reused for the new system
  - 6. A list of issues encountered or identified and proposed solution(s) for each deficiency
  - 7. A statement of the work to be completed for system implementation and the method to complete the work
  - 8. List of site upgrades, including recommended or optional requirements specified in the selected standard(s) for compliance with industry best practices

### **6.4 Microwave Path Design**

- A. The Selected Vendor shall conduct physical path surveys to identify type, location and height of potential path obstructions for verifying path clearance and performing path calculations.
- B. The Selected Vendor shall perform an independent analysis of all radio paths to ensure that all radio paths will meet the path availability requirements.

### **6.5 Detailed Design**

The Selected Vendor shall submit the Detailed Design package within 60 days after contract award, which shall include the following:

- A. Any updates to previously submitted design information





- B. A detailed description of the new LMR and microwave backhaul systems, including the function of all equipment and how they interact to meet the requirements of this RFP.
- C. System block diagrams
- D. Radio channel/frequency plan(s)
- E. Radio coverage maps
- F. Bandwidth requirements and calculations
- G. IP addressing scheme and plan
- H. Microwave path analysis results:
  - 1. Path profiles
  - 2. Path calculations, showing capacity, RSL, fade margin and availability
  - 3. Recommended antenna mount location and height
- I. Microwave backhaul architecture diagram showing the physical relationship and connectivity between the sites, and the frequency band of each link.
- J. Migration/Cutover plan:
  - 1. A preliminary cutover plan describing how the radio system will be phased over into a fully operational system.
  - 2. The Selected Vendor shall successfully complete all tests and training prior to the actual cutover of systems.
  - 3. The Selected Vendor shall provide the necessary labor to cutover from existing systems to the proposed system.
  - 4. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.
  - 5. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.





6. The County reserves the right to approve and change the cutover plan as it relates to any or all system components.
  
- K. Coverage Acceptance Test Plan (CATP), complete with coverage overview, service area definitions and grid structures, talk-in and talk-out test procedures, County and Selected Vendor responsibilities, and sample pass/fail sheet
  
- L. Sample factory testing documentation for each piece of equipment
  
- M. System installation, optimization, operation, and maintenance manuals for all equipment
  
- N. Blank site installation, grounding remediation, and optimization documents to be completed during and after installation and provided with as-built documentation
  
- O. Tower structural analysis, based on TIA-222 latest revision, showing results of passing or failed tower and/or foundation with existing and proposed antenna(s)
  1. Structural analysis for failed tower and/or foundation shall detail the required or recommended modifications for tower and/or foundation remediation
  2. Sites without a completed structural analysis, tower mapping, and/or remediation pricing shall not be presented at Detailed Design Review
  
- P. Complete Detailed Design package for each site, consisting at a minimum the following content:
  1. Cover page with site name, site type (control, multicast, simulcast, etc.), simulcast cell name (if applicable), technology (Conventional, P25 Phase 1, P25 Phase 2, etc.), frequency band, number of channels, and other pertinent site data if applicable (region, site ID, etc.), Google Earth site photo, accurate site coordinates, elevation, County name, ownership (land, tower, shelter),
  2. Index page with sheet titles, drawing descriptions, drawing versions, and page numbers
  3. Block diagram(s) showing entire network and any region- or subsystem-specific diagram
  4. Mobile and Portable Talk-in and Talk-out coverage maps
  5. Site plan showing existing and/or proposed site compound, tower(s), and shelter(s), all to scale and orientation





6. Tower drawings (to scale and different elevations as needed) including tower type and height, number of legs, existing and proposed antenna and coaxial cable loading information, antenna center line heights, and any other equipment mounted on the tower
7. Transitional and final floor plan drawings, including room layouts with doorways, existing and proposed rack location(s), cable trays, RF entry port(s), power system(s), HVAC unit(s), generator room(s), all to scale with interior and exterior dimensions and measurements of rack(s) to room/shelter walls and/or other surrounding equipment
8. Equipment rack/cabinet elevation diagrams for radio/backhaul rack(s), combiner rack(s), and any DC power rack(s), with dimensions and rack unit locations
9. Equipment room/shelter power drawing(s) showing how new equipment connects to AC or DC power systems, as well as backup generator and UPS systems
10. Detailed electrical loading for AC and/or DC power systems (itemized by equipment types and quantities), as well as UPS and generator sizing and BTUs for HVAC for the entire site
11. Detailed antenna system drawings for proposed base station transmit and receive antennas, TTAs, GPS, and/or microwave dishes, complete with quantities, model numbers, and configuration/interconnection
12. RF entry port drawing(s) showing existing and/or proposed entry ports, labels for existing and proposed transmission lines (color-coded by size), and quantity and types of lightning protection devices for
13. Interior and exterior site grounding system drawings
14. Site-specific frequency and combiner plans
15. Network equipment interconnection drawings showing router and switch connections, with cables and port numbers labeled and color-coded
16. Site-specific IP addressing scheme, showing host names, host addresses, subnet mask, equipment use/description, and configuration-specific notes
17. Patching schedules and termination details for all cabling necessary for a complete record of the installation
18. Location of demarcation points for any items to be provided by the County
19. Site-specific bill of materials for all new equipment to be installed at the site







- 20. Site remediation summary (with pricing) based on results from Site Survey report, Grounding Assessment report, and Structural Analysis report
- Q. Draft Staging Acceptance Test Plan (SATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment.
- R. Draft Final Acceptance Test Plan (FATP) outlining a comprehensive series of tests that will demonstrate proof of performance after installation and optimization is complete.
- S. The Final FATP and Final SATP shall be submitted no later than 15 business days before the testing starts and shall be approved no later than five business days before the testing starts.
- T. Any other items as required or requested by the County prior to Detailed Design Review.
- U. All items required for detail design shall be submitted to the County 10 business days prior to the detailed design review meeting.
- V. A detailed design review meeting shall be conducted to allow the Selected Vendor to present the system detailed design for review and approval.
- W. The detailed design review shall be considered the last step prior to ordering and/or manufacturing of equipment. Upon approval of the detailed design by the County, the Selected Vendor may begin the ordering and manufacturing of system equipment. The County shall not be held liable for any equipment ordered or manufactured prior to approval of the detailed design.

## **6.6 Staging**

- A. Each individual assembly or equipment unit for the LMR and microwave backhaul systems shall undergo factory testing prior to shipment.
- B. The Selected Vendor shall submit standard factory test documentation, documenting the tests performed and indicating successful completion of testing to the County.
- C. System staging:





1. The Selected Vendor shall perform system staging and testing on the complete system at a location in the United States.
2. The intent of the staging tests is to demonstrate to the County that the system is ready for shipment and installation.
3. The Selected Vendor shall provide all necessary technical personnel, and test equipment to conduct staging tests.
4. All deviations, anomalies, and test failures shall be resolved at the Selected Vendor's expense.
5. The Selected Vendor shall use an approved staging acceptance test plan (SATP).
6. The Selected Vendor shall successfully perform all tests before the County witnesses the official SATP and provide a copy of the test results.
7. The Selected Vendor shall provide a detailed agenda for the SATP one week before the County is onsite to witness the testing.
8. The Selected Vendor and the County shall jointly execute and date the SATP following completion of all tests.
9. All tests in the SATP shall be marked as either pass or fail.
10. The Selected Vendor shall document all failed components.
11. The Selected Vendor shall correct and retest all failed components.
12. The Selected Vendor shall replace at its own expense failed components that are not repairable.
13. The decision to retest an individual failed SATP tests or the entire plan shall be at the County's discretion.
14. The Selected Vendor shall provide the County with the fully executed and complete SATP document.
15. There shall be no deemed acceptance of the SATP.

## ***6.7 Shipping and Warehousing***

- A. The Selected Vendor shall ship and warehouse all equipment and materials at its own expense. The County will not store equipment.





- B. The Selected Vendor shall be responsible for transporting LMR and backhaul equipment to and from the Selected Vendor's warehouse(s) and the County sites.
- C. The Selected Vendor maintains all liability and risk for all equipment until it has been installed at the site.

## **6.8 Tower Installation**

### **6.8.1 General**

- A. The Selected Vendor shall:
  - 1. Furnish all materials, labor, equipment, and mounting hardware to provide a complete functional tower installation.
  - 2. Perform all operations required for the installation.
  - 3. Be responsible for all concrete work and excavation.
- B. All concrete work shall comply with manufacturer's recommendations, including temperature, slump and air content.
- C. Two sets of fresh field concrete specimens shall be taken for each concrete pour.
  - 1. One set of field-cured concrete specimens shall be tested for weight.
  - 2. One set of specimens shall be tested for compressive strength with the tests to be taken at 7 days and at 28 days.
  - 3. The results of these tests will be presented to the County.
  - 4. The compressive strength test shall be the average of the two specimens from the same composite sample.
- D. Tower documentation shall include construction, installation, and maintenance drawings.
- E. All drawings shall be approved by a Florida registered Professional Engineer (PE).





### **6.8.2 Erection**

- A. The foundation shall be allowed to cure for at least 7 days before erecting the tower.
- B. Manufacturer recommended bolts shall be used for all connections in accordance with the installation documentation.
- C. Bolts should be of such lengths as to protrude beyond the nuts a minimum of 1/4 inch and a maximum of 1/2 inch.
- D. All bolts shall be equipped with self-locking nuts.
- E. Field reaming of coated metal components will be acceptable only upon determining there is no structural damage to the tower.
- F. Field remanufactured holes must be hot stick galvanized as specified and completely filled by the use of a larger diameter bolt.
- G. All bolts placed through slotted holes shall be equipped with flat washers.
- H. Mud, dirt, and other foreign matter shall be removed from the tower sections before erection. Special attention shall be given to cleaning the contact surfaces at joints before they are bolted together.
- I. When portions of the tower are ground assembled, such assembly shall be on rigid surfaces or blocking, which will provide support to prevent distortion of tower steel and damage to surface finish.
  - 1. All bolts shall be installed in all connections of ground assembled portions of the tower.
  - 2. Temporary bracing of tower members shall be used to avoid overstressing or distortion.
- J. The structure shall be erected plumb.
- K. The method of assembling and erecting shall be such that no member will be subjected to a load in excess of that for which it was designed.
- L. Extreme care shall be taken to establish and maintain the true geometric shape of the portion of the tower assembled.





1. All connections must lie flat where bolted together.
  2. No gaps between butt flanges or connections are acceptable after the bolts are tensioned.
- M. Slings or other equipment used for picking up members or portions of the tower shall be of such material or protected in such a way as to not damage the tower section, the finish, or distort or overstress the tower when lifts are made.
- N. Portions of the tower shall be raised in such a manner that no dragging on the ground or against other hard surfaces occurs.
- O. Damaged tower sections can be used if properly repaired.
1. If a damaged portion cannot be repaired to the satisfaction of the County, it shall be replaced.
  2. For any galvanized surfaces, damaged for any reason, zinc-based solder repair shall be used.
    - a. Solders in a rod form or a powder may be used.
    - b. Surfaces must be cleaned using a wire brush or a light grinding action.
    - c. Surface preparation shall extend into the surrounding undamaged galvanized coating.
    - d. The thickness of zinc solder repair shall be equivalent to the originally specified hot dip galvanizing process.
    - e. Repairs shall be performed in accordance with the solder manufacturer's instructions.
- P. Only wrenches of proper size, which will not deform the nuts, nor damage the surface finish, are to be used.
- Q. Standard ironworkers' 12-inch spud or 12-inch socket wrenches shall be used.
- R. Pipe extenders will not be permitted.
- S. During construction of the tower where required, the obstruction lighting fixtures shall be installed and operated at each required level as each such level is exceeded in height during construction.





### **6.8.3 Grounding**

- A. The tower and all appurtenances shall be installed in accordance with Motorola R56, Harris 4Z/LZT 123 4618/1 R3A or MIL-STD-188-124B.
- B. All equipment mounted on the tower shall be properly bonded/grounded to the tower.
- C. All antenna systems shall be effectively grounded and provide surge protection to all equipment.
- D. All antenna transmission lines shall be properly bonded/grounded to the tower.
  - 1. At a minimum, transmission lines shall be bonded/grounded at the antenna base, at the base of the tower, and at the exterior ground bar located at the entry to the building.
  - 2. Additionally, transmission lines shall be bonded/grounded to the tower or cable ladders at intervals recommended by the manufacturer.
  - 3. Antenna transmission line ground conductors shall be bonded to the tower in compliance with standards.
- E. The site installation should have less than 5 ohms resistance between any connected point on the ground bus and earth ground.
- F. The Selected Vendor shall test ground resistivity using the four-point method.
- G. The Selected Vendor shall supply a ground test report that fully describes the testing method used.

### **6.9 System Installation**

- A. Installation shall consist of a complete tested system to include placement of associated cabling, appropriate system layout, and terminal connections.
- B. The Selected Vendor shall provide associated power supplies and any other hardware, adapters, and/ or connections to deliver a complete operable system to the County.
- C. The Selected Vendor shall participate in a mandatory project site survey with the County to confirm actual equipment location within each space Prior to the start of the system installation.





- D. During the mandatory project site survey, the Selected Vendor shall determine and document any exact locations that differ from the detailed design installation drawings.
- E. All detailed design drawings and documents requiring changes shall be revised prior to installation.
- F. The Selected Vendor shall coordinate with others, as appropriate, to confirm that any preparatory work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, and electrical, is complete before final inspection.
- G. The Selected Vendor shall provide and pay for all materials necessary for the execution and completion of all work.
- H. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this RFP.
- I. All materials furnished and work completed shall be subject to inspection by the County.
- J. The Selected Vendor shall be responsible for preparing and submitting the necessary applications for site permissions/access to install system equipment at non-County owned sites.
- K. The Selected Vendor shall be responsible for any leases at non-County owned sites for temporary space needed during installation and cutover to the new system.
- L. The Selected Vendor is responsible at all space-limited sites (not just leased sites) for planning, coordinating, supplying temporary shelter or site-on-wheels, moving/installing of existing and new equipment, and decommissioning of old equipment.
- M. Qualified, trained personnel experienced with this type of work, shall perform all installations.
- N. Equipment installation will be compliant with all applicable standards for seismic bracing.





1. Equipment placement in racks or cabinets shall be such that heavier items are lower in the racks while lighter items are higher in the racks to minimize the effect of centrifugal forces and swaying during an earthquake.
  2. Bracing of equipment is required during unattended periods of construction.
- O. The Selected Vendor shall not use equipment supplied as spares for installation of the proposed system.
- P. The Selected Vendor shall supply all spare equipment in new condition.
- Q. The Selected Vendor shall clean all equipment and devices and repair all damaged finishes.
- R. The Selected Vendor shall leave sites neat and broom swept upon completion of work each day.
- S. The Selected Vendor shall thoroughly clean all equipment shelter and building floors and remove all scuff marks and abrasions prior to acceptance.
- T. The Selected Vendor shall remove all trash weekly.
- U. Inspection:
1. The County shall conduct an inspection of the installations upon substantial completion.
  2. The County shall document any deficiencies on a single punch list and provide the punch list to the Selected Vendor for resolution.
  3. Final acceptance testing shall not commence until all punch list items are resolved.
- V. The Selected Vendor shall provide the County with all programming cables required for the programming or configuring of any provided piece of equipment.

## **6.10 Acceptance Testing**

### **6.10.1 General**

- A. Prior to testing, the Selected Vendor shall:







1. Verify and document that all equipment, hardware, and software are upgraded to the latest factory revision. Multiple revision levels among same equipment types are not acceptable.
  2. Provide two weeks written notice to the County that the system is ready.
  3. Submit a Test Plan for review and approval by the County.
- B. The Selected Vendor shall provide all test equipment and miscellaneous cables, adapters and parts required to perform all testing specified in this RFP. All test equipment shall be calibrated prior to testing.
- C. The Selected Vendor shall utilize quality instruments in proper condition for all tests. Calibration records for all instruments shall be available at the site during all testing.
- D. The Selected Vendor shall perform all tests in the presence of County or a County-approved representative.
- E. The Selected Vendor shall submit all test schedules to the County for approval.

#### **6.10.2 LMR Acceptance Testing**

- A. The Selected Vendor shall use the completed and approved FATP.
- B. The Selected Vendor shall successfully perform all FATP tests before the County witnesses the official FATP.
- C. The Selected Vendor and the County representatives shall jointly execute and date the FATP following completion of all tests.
- D. All tests in the FATP shall be marked as either pass or fail.
- E. The Selected Vendor shall provide all necessary technical personnel and test equipment to conduct FATP tests.
- F. All deviations, anomalies, and test failures shall be resolved at the Selected Vendor's expense.
- G. The Selected Vendor shall document, correct, and retest all failed components.
- H. The Selected Vendor shall replace at its own expense any failed component that is not repairable.





- I. Retest of individual failed FATP tests or the entire plan shall be at the County's discretion.
- J. The Selected Vendor shall provide the County with the fully executed and completed FATP document.
- K. There shall be no deemed acceptance of the FATP.

### **6.10.3 Microwave Backhaul Acceptance Testing**

#### **6.10.3.1 Antenna System Tests**

- A. The Selected Vendor shall conduct return loss (RL) testing on all microwave antenna systems. The antenna system includes the antenna, waveguide and connectors.
  - 1. The measured return loss of the antenna system shall be 21 dB or greater over the specified frequency range of the antenna. For RL testing the Selected Vendor shall:
    - 2. Perform RL tests after the antenna system has been installed, and prior to antenna alignment
    - 3. Include a copy of the RL trace in the Test Report
    - 4. If the RL of the antenna system is < 21 dB, perform a distance to fault (DTF) measurement to identify fault area(s)
    - 5. Make any repair or replacement required and repeat testing until a 21 dB RL is achieved over the specified frequency range of the antenna

#### **6.10.3.2 Microwave Radio Path Tests**

The Selected Vendor shall perform the following tests for each radio path.

- A. Transmitter
  - 1. Measure and record the microwave radio transmit power at the center frequency of each radio at each modulation rate and verify it is within the expected tolerance.
  - 2. Measure and record the output frequency of each radio transmitter and verify it is within the specified limits.





3. If either the transmit power or frequency are not within expected limits, investigate and correct the issue before beginning the tests described below.

B. Receive Signal Strength

1. For each radio link, measure the RSL under no-fade conditions and verify that it is within 2 dB of the expected value. If the RSL is not within 2 dB of the expected value, investigate and correct the issue before beginning the remaining tests described below.
2. Thermal Fade Margin (to confirm that the calculated fade margin matches actual performance)
3. Conduct this test after it has been verified that the expected RSL for normal link operation is present at both ends of the link.
4. Fade the receiver using an external continuously variable vane attenuator (0 to 60 dB) in series with the receiver.
5. Apply attenuation using the vane attenuator until the receiver reaches the  $10^{-6}$  and  $10^{-3}$  BER thresholds.
6. The fade margin is equal to the amount of attenuation that was required to reduce the received signal level to the  $10^{-6}$  and  $10^{-3}$  thresholds. Record both values. The fade margin shall be no less than 2 dB lower than the calculated value.
7. The Selected Vendor shall remedy the source of degradation if the fade margin does not meet this requirement.

C. Far-End Transmit Fade Test:

1. Fade the far end transmitter using a continuously variable vane attenuator and record the fade margin at the  $10^{-6}$  and  $10^{-3}$  BER thresholds. Note the difference between these fade margins and those achieved during the Thermal Fade Margin Test.
2. Results for Thermal Fade and the Far-End Transmit Fade that differ by 3 dB or more may indicate possible interference or presence of dribbling errors emanating from the far end transmitter. If transmit dribbling errors are suspected, reduce the transmit power of the Power Amplifier (or bypass the PA) and repeat Far-End Fade Test. If the difference is 3 dB or more, remedy the source of the degradation and retest.





### **6.10.3.3 Packet Internet Payload Performance**

- A. Long-term Ethernet Test - after successfully completing the Radio Path Tests, perform an RFC 2544 test, with the radio link at nominal RSL.
  - 1. Begin generating Ethernet traffic at 100 Mbps, increasing the data rate until the test set indicates dropped packets, then reduce data rate until no packets are dropped for 10 minutes.
  - 2. Continue generating Ethernet traffic across the radio path for a minimum of 12 hours and show that there was no packet loss.
  - 3. If there is packet loss, identify and resolve the issue, and then repeat the test until there is no packet loss.

### **6.10.3.4 MPLS Testing**

- A. Demonstrate operation of all features of the MPLS routers, testing equipment operation in accordance with the manufacturer's recommended test procedures.
  - 1. Demonstrate access and administration of MPLS router lookup tables.
  - 2. Demonstrate the proposed MPLS system will meet or exceed latency and jitter requirements specified in this RFP.
  - 3. Demonstrate the priority packets provisioned with a primary and alternative route do switch to the alternate route in 20 milliseconds or less when the primary route fails.
  - 4. Demonstrate packets with no provisioned route are successfully rerouted in 50 milliseconds or less when the microwave route is restricted or failed due to a microwave path fade.
  - 5. Route/system tests shall be performed to demonstrate the correct operation of all functions of the MPLS routers operating over the microwave radios and fiber optic route closures. The results from the route and systems tests shall be recorded and presented to the County for review and approval.

## **6.11 Coverage Testing**

- A. The Selected Vendor shall submit a Coverage Acceptance Test Plan (CATP) that will validate the coverage requirements defined in paragraph 1.2.4.
- B. CATP:





1. The CATP shall be consistent with the procedures and guidelines outlined in TSB-88 (current version).
  2. Coverage testing shall commence only after the radio system is fully optimized, tested and aligned.
  3. The County will observe and monitor the entire coverage testing process.
  4. Significant changes to the system will require retesting of coverage at the County discretion.
  5. The CATP shall be conducted between when trees are in full foliage
  6. The Selected Vendor shall perform the following types of coverage testing:
    - a. Automated talk-out and talk-in objective BER drive testing
    - b. In-Building talk-out and talk-in DAQ Testing for those buildings contained within Appendix B
- C. The BER test results shall be the determining factor for pass/fail of the P25 system coverage. Should the BER testing not pass using the criteria outlined, at the system-wide level, the system will not pass the acceptance testing.
- D. Test configurations:
1. Test configurations shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment (including the proper microphones) that will be used with the system. In addition, the proper subscriber antenna location (e.g., roof-mounted, hip-level, etc.) should be simulated during the testing, and the attenuator values required to simulate those locations shall be submitted to the County for their review and approval prior to testing.
  2. Automated objective drive testing:
    - a. The Selected Vendor shall test on-street BER and signal level, using a portable to be used on the system.
    - b. The Selected Vendor shall test at a statistically significant number of test locations throughout the [State/County/City] (and within the buildings). Methods for determining the minimum number of tiles are provided in TSB-88.





- c. The Selected Vendor shall test both talk-out and talk-in BER, and talk-out signal level, as applicable.
    - d. Testing will be conducted in FDMA mode, and operating in the simulcast mode, as applicable.
  - 3. Non-automated subjective DAQ testing:
    - a. The Selected Vendor shall perform in-building non-automated subjective DAQ coverage testing using portable radios typical of the system, in their proper configuration (e.g., shoulder-mounted antenna, Bluetooth speaker mic, etc.).
  - 4. In-Building DAQ Testing:
    - a. Small commercial building (single story, open floor plan). Five test locations, one in each corner and one in center.
    - b. Medium building (small school, light industrial, medical office). Twenty test locations uniformly distributed on the ground floor.
    - c. Large building (shopping malls, factories, buildings over 5 stories). Multiple test points uniformly distributed on the ground floor.
    - d. Appendix B contains a list of Critical Buildings where in-building DAQ testing shall be performed, and results provided
- E. For testing purposes, the County shall be divided into 1/4-mile square test tiles .25-mile x .25-mile.
  - 1. The Selected Vendor may subdivide test tiles if necessary.
- F. The Selected Vendor shall not count inaccessible test tiles as either a pass or fail in the statistical analysis.
- G. Should the coverage test fail, the [Selected Vendor] shall correct the cause of the failure and re-conduct the coverage test in its entirety.
- H. The Selected Vendor shall document round trip for each test tile.
- I. A failure in either direction will be noted as a failure for that test tile.
- J. The Selected Vendor shall provide a standardized test form for testing.





## **6.12 Training**

### **6.12.1 Training Programs**

The Selected Vendor shall develop and conduct training programs to allow the County personnel to become knowledgeable with the system, subsystems, and individual equipment.

- A. The Selected Vendor shall provide:
  - 1. Operation training
  - 2. System management training
  - 3. Training shall cover all features, operation, and special care associated with the equipment supplied.
  
- B. Operational training shall include the following categories:
  - 1. APCO P25 Fundamentals
  - 2. P25 Portable/Mobile Unit Operation
    - a. (4 sessions with up to 25 participants per session)
  - 3. P25 IP Console Operation
    - a. (2 sessions with up to 15 participants per session)
  - 4. P25 IP Console Administration
    - a. (1 session with up to 10 participants)
  
- C. The Selected Vendor shall provide system management training for technical staff responsible for managing the system.
  
- D. System management training shall include, but is not limited to:
  - 1. Planning and setting up the system and network
  - 2. Building and implementing system and network profiles and configurations
  - 3. Performing database management functions
  - 4. Monitoring and managing the system's performance
  - 5. Writing and printing system reports.





- E. The Selected Vendor shall:
  - 1. Conduct all training at a location where duplication of system operation will not impact daily operations.
  - 2. Coordinate with the County regarding number of attendees, schedule, and training location.
  - 3. Schedule classes as close to system cutover as possible.
  - 4. Train the County employees or designated individuals.
- F. For console and subscriber operator training, the Selected Vendor shall provide "train-the-trainer" courses to selected County personnel.

### **6.12.2 Training Materials**

- A. The Selected Vendor shall provide all instructional material, for all technical and operational training classes for the exact model and series of equipment delivered, including:
  - 1. Printed manuals
  - 2. Audio, video, interactive self-paced personal computer programs
  - 3. Complete equipment operating instructions
- B. All instructional material shall be subject to the approval of the County and shall become property of the County.
- C. Training materials shall be professionally produced and provided in binders.
  - 1. Loose leaf materials are not permitted.
  - 2. Paper shall be 8 ½ x 11" whenever possible.
  - 3. If larger paper is utilized it must be professionally incorporated into the document.
  - 4. Binders shall be color coded where it will provide an organizational benefit.
  - 5. Illustrations and photographs, where provided, shall be specific to the County installation.
  - 6. Color photos must be provided where detail or clarity is supported by use of color.







- 7. Black and white photocopying of color materials is unacceptable.
- D. The Selected Vendor shall provide fully editable (softcopy) versions of all training materials so that the County trainers can update the course materials.
- E. The Selected Vendor shall provide unit pricing for all media (e.g., CDs, DVDs, and Manuals) used for training.

## **6.13 System Cutover**

### **6.13.1 Cutover Plan**

- A. The Selected Vendor shall develop a Cutover Plan for review and approval by the County. The County reserves the right to approve and change the cutover plan as it relates to any or all system components. The Cutover Plan shall be logical and must consider every facet of the existing and new networks. Key objectives of the Cutover Plan are:
  - 1. Ensure that new systems are brought online with minimum interruption to all existing systems and communications.
  - 2. The Selected Vendor shall be responsible for planning and coordinating the implementation of all equipment, subsystems, and the overall system.
  - 3. The Selected Vendor shall:
    - a. Be responsible for any costs associated with their proposed cutover plan.
    - b. Program the users' existing and/or new radios
    - c. Identify the cutover of individual circuits
    - d. Identify temporary alternate routing of critical circuits
    - e. Include fallback, recovery, and contingency plans to mitigate the risk of circuit failure during cutover
    - f. Maintain reliable and stable communications
    - g. Ensure the timely deployment of a complete and functional network
    - h. Identify physical and technical constraints that must be considered for successful implementation planning such as site ownership, site access,





- shelter space, tower loading and availability and electrical load limitations
  - i. Ensure successful integration with all legacy systems, including a smooth transition from existing operations
  - 3. Clearly defined roles and responsibilities between the Selected Vendor and the County.
- B. The Cutover Plan shall demonstrate that it meets the following requirements:
- 1. Supports the operational requirements of each participating agency including.
  - 2. Ensures users and technical staff are prepared for the migration to the new network
  - 3. Mitigates risk
  - 4. Does not exceed maximum outage times
  - 5. Considers site access issues, such as sites that are inaccessible during winter months
- C. During detailed design, the Selected Vendor shall deliver a draft Cutover Plan describing how the existing radio systems will be migrated to the new system.
- D. The Cutover Plan shall:
- 1. Include the schedule and procedures associated with the transition of each operational user group.
  - 2. Specifically address how the existing users will begin using the new system with minimal operational impact.
  - 3. Provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.
- E. The County reserves the right to approve and change the Cutover Plan as it relates to any or all system components.

### **6.13.2 Cutover Execution**

- A. After successful completion of all tests and training, the Selected Vendor shall execute the system cutover according to the approved Cutover Plan.





- B. Any modifications to the plan shall be proposed to and approved by the County at least ten business days prior to execution.
- C. The Selected Vendor shall provide 5 business days advance notice for required outages of the existing system during the cutover. All planned outages require approval of the County.
- D. The Selected Vendor shall provide the necessary labor to cutover from existing systems to the new system.

### **6.13.3 30-Day Operational Verification Period**

- A. The Selected Vendor shall plan a 30- calendar-day operational burn-in period for (each region/phase), in addition to the entire system.
- B. The conditions of the test shall be determined during Final Design with plans including loading the system as fully as approved by the County.
- C. Technical staff from the County and Selected Vendor shall monitor the burn-in period.
- D. The Selected Vendor shall demonstrate the integrated operation, reliability, long-term stability, and maintainability of the system during this period.
- E. System must be fully loaded (all users must be fully migrated).
- F. A Critical failure of the system during this test will cause the 30-day burn-in period and warranty to reset and restart from the beginning after completion of the repair. A Critical Failure is defined as follows:
  - 1. Any failure which causes a loss of 15% or more in capacity or coverage in any cell
  - 2. Any failure which causes a loss of the primary system control
  - 3. Any failure which causes a loss of simulcast capability
  - 4. The concurrent failure of two or more repeaters
  - 5. Concurrent failure of two or more switches and/or routers
  - 6. Any system failure that causes the loss of two or more console positions
  - 7. Any failure that renders the logging recorder inoperable or caused the irretrievable loss of recorded audio





- 8. Failure of the receiver voting system
- G. A minor failure will cause the burn-in period to temporarily hold until the issue has been fully resolved to the County satisfaction.
- H. After resolution of the failure, and with County approval, the burn-in period will continue.
- I. Two or more repetitive minor failures of the same functionality with or without the same root cause shall be defined as a major failure.
- J. Two or more repetitive minor failures of the same piece of hardware with or without the same root cause shall be defined as a major failure.
- K. Two or more repetitive minor failures with the same root cause shall be defined as a major failure.
- L. Two or more similar minor failures without the determination of cause will temporarily hold the burn-in test until a cause is found and corrected, or the County is satisfied there is little likelihood of a systemic recurring issue.

#### ***6.14 Decommissioning, Removal, and Disposal of Legacy Equipment***

- A. The Selected Vendor shall remove existing equipment (e.g., transmitters, consoles, mobiles, cables, and antenna systems) not being reused in the new system or identified for future use by County.
  - 1. Equipment purchased by the Selected Vendor as Trade-In shall be removed and handled according to the terms of any applicable Trade-in agreement.
- B. The Selected Vendor shall maintain a detailed inventory of all equipment removed, listing the following at a minimum:
  - 1. The owning agency
  - 2. Model numbers
  - 3. Serial numbers
  - 4. Asset numbers
  - 5. Location removed from





6. Location within the warehouse
  7. Trade-in or disposition value
- C. The Selected Vendor, at its sole expense, shall warehouse, as necessary, removed equipment prior to disposal.
- D. The Selected Vendor, at its sole expense, shall transport all removed equipment to the County-specified disposal location.

### **6.15 As-Built Documentation**

- A. At the completion of each implementation phase, the Selected Vendor shall provide complete as-built documentation as outlined below:
1. Equipment provided
  2. Plan and elevation drawings of all equipment including antennas on towers
  3. Shelter floor plans
  4. Cabling and terminations
  5. Block and level diagrams
  6. Fleet mapping and programming
  7. Setup, configuration, and alignment information, to include commissioning, provisioning, test, and turn-up
  8. Successfully completed, signed, and dated Coverage and Final Acceptance Test Plans
- B. The Selected Vendor shall provide final documentation in printed form:
1. Six bound, hard copy, printed sets
    - a. Hand modified drawings are not acceptable.
    - b. Hard copies of all drawings shall be 11" x 17".
- C. The Selected Vendor shall provide final documentation on USB drive:
2. All drawings provided in MS-Visio native format
  3. All other documentation provided in MS-Word or MS-Excel native format





4. A copy of all drawings and documentation in Adobe Portable Document Format (PDF)

## **6.16 Final System Acceptance**

- A. The County shall deem the system ready for final acceptance following successful completion and approval of the following:
  1. Final Detailed Design
  2. Staging Acceptance Test
  3. All contracted installation completed
  4. Final inspection and punch list resolution
  5. As-built documentation
  6. Coverage Acceptance Test
  7. Final Acceptance Test
  8. Delivery of final documentation
  9. Successful completion of (30)-Day Burn-in test
  10. Training completed
- B. No conditional acceptances will be granted.





## 7. Warranty, Maintenance, and Support

- A. The Selected Vendor support includes the initial 3-year warranty, software and firmware upgrade support, and spare parts and equipment.
- B. Should the Selected Vendor be a system integrator, they will provide pricing and discounts per the final contract throughout the term of the final contract.

### 7.1 Warranty

- A. All equipment provided shall be new and covered by a full manufacturer's warranty for 3 years, commencing with County final acceptance of the system or mutually agreed project phase.
- B. System performance, installation, and all hardware, parts, software, and materials (including third-party equipment) shall be warranted for a period of 3 years.
- C. Warranty coverage shall include all related return and delivery fees.
- D. As an option, the Selected Vendor shall provide their top tier of 24 hours a day, 7 days a week, 365 days a year on-site support for annual increments (years 4-10) following expiration of warranty.
- E. The Selected Vendor shall provide a single toll-free telephone number staffed and available 24 hours a day, 7 days a week, 365 days a year, for service requests and warranty claims.
- F. During the warranty period, service and repair shall be performed 24 hours a day, 7 days a week, 365 days a year.
  - 1. There shall be no additional charges for work outside of normal Selected Vendor business hours.
- G. If Selected Vendor level support is required, the following repair response time and repair-completed time criteria shall be in effect:
  - 1. The Selected Vendor shall contact the County within 15 minutes of telephone notification for a Critical Service issue.
  - 2. The County defines Critical Service issue as any one or more of the following events that results in a loss of voice traffic on the system:





- a. Any failure which causes a loss of 15% or more in capacity or coverage in any cell
  - b. Any failure which causes a loss of simulcast capability
  - c. Any failure which causes a loss of the primary system control (assuming a primary/secondary architecture)
  - d. Any system failure that causes the loss of two or more console positions
  - e. Any failure that renders the logging recorder inoperable or causes a loss of recorded audio
  - f. The failure of two or more repeaters
  - g. Concurrent failure of two or more switches and/or routers
  - h. Failure of the receiver voting system
3. The Selected Vendor's qualified service representative and the County's representative shall attempt to resolve the Critical Service issue over the phone or via remote network management.
  4. If the Selected Vendor's qualified service representative and the County's representative cannot resolve the issue remotely or over the phone, then the County shall make the determination regarding the criticality of the service issue.
    - a. If determined to be critical the Selected Vendor shall dispatch a qualified service representative to the site experiencing the service issue.
  5. The Selected Vendor's qualified service representative shall be physically present at the site that requires service within 1 hour of County's decision to escalate the call to on-site service.
  6. On-site Selected Vendor's service representative shall make every effort to resolve the Critical Service issue within 4 hours from the time the critical service issue was reported.
- H. The Selected Vendor shall repair all equipment, hardware, and software throughout the implementation, cutover, and warranty periods.
- I. The following procedures shall be followed during the warranty period:
1. The Selected Vendor shall provide the County with written documentation indicating:







- a. The cause of the service outage
  - b. The resolution
  - c. All post-repair testing procedures to ensure proper operation
2. In the event the Selected Vendor uses County-owned spares to complete a repair, the documentation shall include the model and serial number of both the defective unit and the spare.
  3. Hardware:
    - a. For all equipment needing factory or depot repairs, the Selected Vendor shall maintain a comprehensive tracking system to track units to and from the factory/depot.
- J. Replacement parts shall be new or original repaired parts only.
- K. Fixed equipment mail-in board repair shall be completed within seven calendar days of receipt.
- L. Equipment must be returned to the County via second-day shipping, with tracking number provided to the County.
- M. Serialized units sent in for depot repair must not be exchanged unless specifically authorized by the County.
- N. The original unit must be repaired and returned unless specifically authorized by the County.
- O. Software and Firmware:
  1. The Selected Vendor shall warrant all software and firmware.
- P. During the installation, warranty, and extended warranty periods, the Selected Vendor shall provide, at no additional cost, commercially available upgrades of all software and firmware originally sold to the County.
- Q. The frequency and timing of installation of upgrades during this period shall be at the sole discretion of the County based on availability by the Selected Vendor.
- R. The Selected Vendor shall provide all back-up media and revised software manuals to the County at the time of any software revisions at no cost.





- S. The Selected Vendor shall update all devices to the same and latest release level prior to the conclusion of the warranty period at no additional cost to the County.
- T. The Selected Vendor shall update any hardware not supporting the then latest release level to the current hardware make and models supporting the latest release level.
- U. Recurring Failures and Manufacturer Defects:
  - 1. Any fixed equipment or fixed equipment module that fails twice during the acceptance test or twice during the first 12 months after System Acceptance shall be indicative of a recurring or systemic failure or defect that warrants further investigation by the Selected Vendor and County.
    - a. If the defect is deemed by the County to be systemic after the investigation is completed, the Selected Vendor shall then be responsible for replacing at no additional cost to the County all equipment and/or equipment modules related to the recurring or systemic failure, not only the specific equipment affected.
- V. The Selected Vendor, at no additional cost to the County, shall correct latent design defects or recurring problems relating to software, firmware, hardware, or overall system design, during the warranty period.
- W. During the warranty period, the Selected Vendor shall correct all system malfunctions due to software at no additional cost to the County.

## ***7.2 Parts Availability***

- A. The Selected Vendor shall certify that replacement parts for all delivered equipment shall be available for a period of at least 10 years after the last date of production.
- B. In the event the Selected Vendor plans to discontinue manufacture of any product-line or stocking any part required for maintenance in the system, the Selected Vendor shall send written notice to the County 24 months prior to the date of discontinuance to allow for last-time buys and spares replenishment.





### **7.3 Spare Equipment**

- A. The Selected Vendor shall include recommended initial spare parts and equipment to be procured as part of the initial contract. The recommended spares shall contain those items required to repair and restore the system in the event of a system failure.
- B. The initial spare parts and equipment shall include, but is not limited to, the following:
  - 1. All Selected Vendor identified Field Replaceable Units (FRUs)
  - 2. All infrastructure components having no FRUs, but that can cause a critical failure
  - 3. Power supplies
- C. Initial spares for less critical items shall also be enumerated
- D. The spare parts and equipment shall include items that will rapidly and completely restore all critical system functionality with the least amount of effort (e.g., board replacement instead of troubleshooting to component level when a critical unit fails).
- E. The Selected Vendor shall determine the types and quantities of spares based on their proposed system size and design.
- F. The Selected Vendor shall define the primary equipment category each spare kit supports (e.g., transceiver board for a base radio or interface board for a router).

### **7.4 Lifecycle Support**

- A. System(s) shall not be accepted with components or equipment at the end of their respective lifecycles.
  - 1. Selected Vendor shall provide a roadmap for end of life dates on existing and/or proposed products.
- B. A product for which development and/or distribution will be discontinued within the next 5 years shall be considered "end of lifecycle" products.





- C. Any equipment that is discontinued within the first 5 years shall be replaced with the newer replacement model at the Selected Vendor's cost
- D. The County shall have the option to purchase post-warranty service for the system.
- E. The Selected Vendor shall:
  - 1. Provide spare parts and equipment at a discounted rate for the life of the contract.
  - 2. Provide technical support at a discounted rate for the life of the contract.
  - 3. Provide engineering services at a discounted rate for the life of the contract.
  - 4. Offer OPTIONAL service tier(s) for the system.
  - 5. Provide discounted software support and upgrades for the system.
  - 6. Offer extended warranty for all supplied equipment for up to an additional 7 years in 1-year increments.





## 8. Options

### ***8.1 Optional Smartphone/Broadband Device Integration***

- A. The smartphone/broadband device integration solution (SPBBI system) shall integrate voice and data communications between County P25 radio system users and County users with broadband devices and/or smartphone applications.
- B. The SPBBI system shall provide Push-to-Talk (PTT) communications operating over private and public Wi-Fi networks, 3G/4G carrier networks, and FirstNet's 4G LTE network.
- C. The SPBBI system must support both carrier integrated PTT over cellular (PTTtoC) operations and over the top PTTtoC operation on carrier networks as well as private and public Wi-Fi networks.
- D. The SPBBI system shall support management of the following features and functions:
  - 1. Quality of Service
  - 2. PTT Call Priority
  - 3. Preemption
- E. The SPBBI system server hardware shall be implemented using high-reliability internally redundant processor platforms.
  - 1. The SPBBI system may operate in a virtualized environment, providing the hardware providing that environment meets this requirement.
  - 2. As an OPTION, the SPBBI system may use separate redundant servers.
- F. The SPBBI system shall support reporting and display of location information for broadband and smartphone user devices.
- G. The SPBBI system shall provide an interface to an audio recording and retention (logging recorder) system, meeting the legal and operational requirements of County
- H. The SPBBI system shall employ compliant open standards for encryption and authentication, subject to applicable County policy.





- I. The SPBBI system shall include the necessary hardware, software, and licensing to provide TIA-102.BACA (P25 ISSI) network-level communications and the following P25 supplemental services:
  - 3. Group calls
  - 4. Individual calls
  - 5. Emergency calls
  - 6. Call alert
  - 7. Radio check
  - 8. Radio detach
  - 9. Radio inhibit/uninhibit
  - 10. Radio unit monitor
  - 11. Short message
  - 12. Status query
  
- J. The SPBBI system shall provide end-to-end, 256-bit AES encryption from P25 system users to smartphone and broadband devices as well as to P25 system dispatchers without transcoding.
  
- K. The SPBBI system shall have the following capacity and scaling features and functions:
  - 1. Minimum of 10 simultaneous P25 group calls
  - 2. Minimum of 10 concurrent end-to-end P25 talkgroups
  - 3. Minimum of 200 talkgroups
  
- L. The SPBBI system shall support Android™, Windows®, and iOS™ mobile platforms.
  
- M. The SPBBI system shall support Android™, Windows®, and iOS™ tablet and/or desktop platforms.
  
- N. The SPBBI system shall support managed group and PTT communications utilizing commercially available smartphones
  
- O. The SPBBI shall be equipped to support up to 500 units over private and public Wi-Fi networks, 3G/4G carrier networks, and FirstNet's 4G LTE network.





## **8.2 Optional Unit Location (GPS) Interface**

- A. The system shall include any gateway and server equipment required to enable unit locations services based upon GPS location transferred over the trunked system using the P25 Tier 2 GPS standard.
- B. The Proposal shall define the full feature set provided by the proposed/provided interface.
- C. A single terminal shall be provided in the dispatch center to track subscriber devices.
- D. The system shall support (1,000) active units reporting location once every 5 minutes.
- E. The system shall display location information for any subscriber devices initiating an emergency alarm.
- F. The system shall be fully compatible with applicable P25 GPS/Location standards.
- G. This interface shall provide access to all location data generated by the user units equipped and activated with GPS receivers.
- H. This interface shall allow the execution of commands related to the collection of location information:
  - 1. Requesting a location update
  - 2. Establishing location poll rates
  - 3. Adjusting location poll rates
  - 4. Selecting units for "fast-polling"
  - 5. Disabling location polling and updates





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## Appendix A - County Owned and Leased Sites

Table A.1 – County Owned and Leased Sites

Site Name	Latitude	Longitude	Tower Height (feet)	ASR#	Tower	Shelter	Generator
<b>Bronson (County owned)</b>	29° 27' 58.8" N	82° 38' 30.4" W	220	1204402	Reuse	New	Reuse
<b>Chiefland (Leased)</b>	29° 28' 18.7" N	82° 51' 41.4" W	480	1240180	Reuse	Reuse	Reuse
<b>Gulf Hammock (Leased)</b>	29° 17' 03.6" N	82° 39' 50.7" W	1,034	1018423	Reuse	New	New
<b>Williston (Leased)</b>	29° 22' 44.6" N	82° 25' 08.5" W	320	1300586	Reuse	Reuse	Reuse
<b>Inglis (Leased)</b>	29° 04' 14.2" N	82° 38' 46.8" W	350	1313409	Reuse	Reuse	Reuse
<b>Cedar Key (Leased)</b>	29° 10' 52.7" N	83° 01' 23.4" W	300	1311647	Reuse	Reuse	Reuse





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## Appendix B - Critical Buildings Requiring Coverage

Table B.1 - Critical Buildings Requiring Coverage

Name of Building	Street Address	Type of Structure
Bronson Elementary	400 Ishie Avenue, Bronson, FL 32621	School
Chiefland Elementary	1205 N.W. 4th Avenue, Chiefland, FL 32626	School
Joyce Bullock Elementary	130 S.W. 3rd Street, Williston, FL 32696	School
Williston Elementary	801 South Main Street, Williston, FL 32696	School
Cedar Key Combination (K-12)	950 Whiddon Ave. Cedar Key, FL 32625	School
Yankeetown Combination (K-8)	4500 Highway 40 West, Yankeetown, FL 34498	School
Bronson Middle & High School	351 Ishie Avenue, Bronson, FL 32621	School
Chiefland Middle & High School	808 North Main Street, Chiefland, FL 32626	School
Williston Middle & High School	350 S.W. 12th Avenue, Williston, FL 32696	School
Winn Dixie Chiefland	2202 N Young Blvd, Chiefland, FL 32626	Grocery Store
Walmart Super Center	2201 N Young Blvd, Chiefland, FL 32626	"Big Box" Store
Fanning Spring City Hall	17651 NW 90th CT, Fanning Springs FL 32693	Local Government/Municipal Bldg.
Chiefland City Hall	214 East Park Ave, Chiefland, FL 32621	Local Government/Municipal Bldg.
Chiefland Police	14 East Park Ave, Chiefland, FL 32626	Police Station/Municipal Bldg.
Bronson City Hall	550 Oak Street Bronson FL 32621	Local Government/Municipal Bldg.
Levy County Court House	355 South Court ST Bronson, FL	Local Government/County Bldg.
Levy BOCC	310 School ST Bronson, FL	Local Government/County Bldg.
LCISO and Jail	9150 NE 80th Ave Bronson	Law Enforcement/Detention County Bldg.
Levy EOC	7911 NE 90th Ave Bronson	Emergency Operations Center/County Bldg.





Name of Building	Street Address	Type of Structure
Levy County School Board	480 Marshburn Dr Bronson	School Department/County Bldg.
Winn Dixie Williston	727 West Noble Ave Williston	Grocery Store
Williston City Hall	50 NW Main ST Williston	Local Government/Municipal Bldg.
Williston Police	5 SW 1st Ave Williston	Police Station/Municipal Bldg.
Williston Airport FBO	1800 SW 19th Ave Williston	Airport Office
Monterey Boats	1579 SW 18th St Williston	Large Warehouse/Manufacturing Bldg.
Food Ranch	40 HWY 19 N Inglis	Grocery Store
Inglis City Hall	135 HWY 40 W Inglis	Local Government/Municipal Bldg.
Yankeetown City Hall	6241 Harmony Lane Yankeetown	Local Government/Municipal Bldg.
Cedar Key Police and City Hall	490 2 ST Cedar Key	Police Station/Municipal Bldg.
Levy DPS Complex	1251 NE CR 343 Bronson	Local Government/County Bldg.
Levy County Road Dept	620 North Hathaway Ave	Local Government/County Bldg.





## Appendix C - Levy County Fire Stations

**Table C.1 – List of Fire Stations Requiring Fire Station Alerting Solution**

Station	Street Address
Rescue Station #3 and Inglis Fire	141 Highway 40 West, Inglis, FL 34449
Fire Station #4	9990 SW 63rd Lane, lane, Cedar Key, FL 32625
Rescue Station #5	9991 SW County Road 347, Cedar Key, FL 32625
Fire Station #6	4591 NW County Road 347, Chiefland, FL 32626
Rescue Station #7	101 SW 2nd Street, Chiefland, FL 32626
Rescue Station #8	17651 NW 90th Court, Fanning Springs, FL 32693
Rescue Station #9	7851 NE90th Street, Bronson, FL 32621
Rescue Station #10	800 South Main Street, Williston, FL 32668
Fire Rescue Station #11	2830 SE County Road 121, Moriston, FL 32668
FD ST 77 (Fanning Fire)	17651 NW 90th Court, Fanning Springs, FL 32693
FD ST 71	2851 SE County Road 326, Gulf Hammock, FL32639
FD ST 70 (Bronson Fire)	660 E Hathaway Ave Bronson, FL
FD ST 72 (Williston Fire)	5 SW 1st Ave., Williston, FL
FD ST 75 (Cedar Key Fire)	489 1st ST Cedar Key, FL
Chiefland FS #12	16 NE 1 <sup>st</sup> Street Chiefland, FL 32626

