



# **P25 Radio Request for Proposal Kitsap 911**

## **Technical Specifications**

**October 5, 2022**

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## SECTION 1

# Introduction and Overview

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## 1.1 Basic Project Description

- 1.1.1 Kitsap 911 (Buyer) is requesting Proposals for a complete 700/800 MHz APCO Project 25 (P25) system to include the following:
- (1) Radio system infrastructure including all radio equipment, controllers, interconnecting network equipment but not the actual transport facilities, microwave antennas, waveguides, and associated equipment.
  - (2) Optional P25 standards-based Inter-System Interfaces to the Pierce County Motorola P25 Combined Communications Network and the Washington State Patrol Motorola P25 system.
  - (3) Upgrade or replace existing Zetron AcomNovus radio dispatch console system equipment interconnected to the trunked radio system and conventional resources as required at the primary center at the Kitsap 911 facility.
  - (4) Mobile, portable, control station user equipment
  - (5) Radio system network alarm management and reporting system
  - (6) Technical support training
  - (7) Development of user training (Teaching the user training is not the responsibility of the Proposer)
  - (8) Existing system decommissioning and disposal
  - (9) Ongoing equipment updates to keep the system at current manufactured status
  - (10) Development of a detailed transition plan for conversion from the existing system to the new system
  - (11) Radio system infrastructure implementation project management, engineering, and full radio system installation services
  - (12) Ancillary systems such as microwave and fiber transport, DC power, and radio site construction will be furnished by the Owner as will overall system project management
- 1.1.2 The Buyer anticipates the Successful Proposer will provide a complete RF and console system solution.
- 1.1.3 Proposals will be evaluated as indicated in the Instructions to Proposers.
- 1.1.4 The Successful Proposer will provide a complete radio system solution.

## 1.2 Document Overview

1.2.1 This Document has the following sections:

- (1) Section 1 Introduction and Overview – This section provides a general overview of the proposed system scope of the project.
- (2) Section 2 – Existing System Description – This section describes the existing system, users, sites, and other systems currently in use.
- (3) Section 3 Common Technical Requirements – This section defines the broadly applicable technical requirements that apply to all aspects of the technical systems and equipment.
- (4) Section 4 Radio System Specifications and Requirements – This section defines the requirements for the P25 radio system, interconnecting router networks, and network management systems.
- (5) Section 5 Transport System Interface Requirements – This section defines the interface requirements for any site interconnection systems including microwave, telephone T1 connections, or other interconnection technologies as required.
- (6) Section 6 Site Improvement and Upgrade Requirements – This section defines the requirements for any site improvements required by the Proposers.
- (7) Section 7 DC Power Interface Requirements – This section defines the requirements for -48 VDC power systems interface. The -48 VDC system will be supplied by the Buyer. The Proposer shall interface to this DC power supply.
- (8) Section 8 Training Requirements – This section defines the end user, management, and technical training requirements.
- (9) Section 9 Data Network Requirements – This section defines the requirements for any data networks supplied as part of this Project including system data interfaces. The Buyer will supply the transport data network. The Proposer shall interface to that network.
- (10) Section 10 Logging Recorder Interface Requirements – This section defines the requirements for the logging recorder system interface.
- (11) Section 11 Console System Requirements – This section defines the requirements for the upgrade and optional replacement console system installed as part of the radio system implementation.
- (12) Section 12 User Radio Requirements – This section defines the requirements for the mobiles, portables, and control stations supplied under this procurement.
- (13) Section 13 Cybersecurity Requirements – This section defines the general requirements for electronic security for the radio systems and associated systems, as well as the Supplier’s product life cycle security program, intrusion detection,

- physical security, security of wireless technologies, documentation, and encryption key management.
- (14) Section 14 Implementation Requirements – This section defines the requirements for implementation including but not limited to items such as transition planning, factory staging, field storage, etc.
  - (15) Section 15 Quality and Workmanship Requirements – This section defines the requirements for quality and workmanship.
  - (16) Section 16 Acceptance Testing Requirements – This section defines the acceptance testing of the entire system as well as coverage testing.
  - (17) Section 17 Documentation Requirements – This section defines the documentation required to be produced and delivered for this project.
  - (18) Section 18 Warranty and Maintenance Requirements – This section defines the warranty and maintenance requirements for system support.
  - (19) Section 19 Project Closeout Requirements – This section describes the project closeout process and requirements.
  - (20) Appendices:
    - Appendix A: Abbreviations
    - Appendix B: Service Area Maps and Comprehensive Plan Maps
    - Appendix C: Candidate Sites
    - Appendix D: *Statement of Project 25 (P25) User Needs (P25 SPUN) Compliance Matrix*
    - Appendix E: Proposal Requirements Compliance Matrix

## **1.3 Information about Kitsap County**

- 1.3.1 Kitsap County is in Washington state on the Kitsap Peninsula, Bainbridge Island, and uninhabited Blake Island. The Kitsap Peninsula contains all of Kitsap County except Bainbridge Island and Blake Island, as well as the northeastern part of Mason County and the northwestern part of Pierce County. Kitsap County covers a total area of 566 square miles consisting of 395 square miles of land and 171 square miles of water. Thirty percent of the total area of Kitsap County is water. Kitsap county includes lands of the Suquamish and Port Gamble S’Klallam tribes. The highest point in the county is Gold Mountain, a Kitsap 911 radio and microwave site.

Kitsap County has a population of 275,611 (2020 census). Bremerton is the largest city and Port Orchard, across Sinclair Inlet south of Bremerton, is the county seat. The largest employer in the county is the United States Navy with installations at the Puget Sound Naval Shipyard, Naval Base Kitsap, and the Naval Undersea Warfare Center Keyport.

Kitsap County has ground transportation connections to the north via the Hood Canal Bridge, to the south from Mason and Pierce Counties primarily served by the Tacoma Narrows Bridge from Point Fosdick to Tacoma, and by Washington State Ferries running from Bremerton to downtown Seattle, from Kingston to Edmonds, and from Southworth to West Seattle via Vashon Island.

## 1.4 Information about Kitsap 911

1.4.1 Kitsap 911 Public Authority (“Kitsap 911”), formerly known as Cencom, is a Primary Public Safety Answering Point (PSAP) and serves a population of approximately 275,000 and covering an area of 566 square miles. In 2021, Kitsap 911 handled 179,330 9-1-1 calls and a total call volume of 305,403 calls as shown in Figure 1-1.

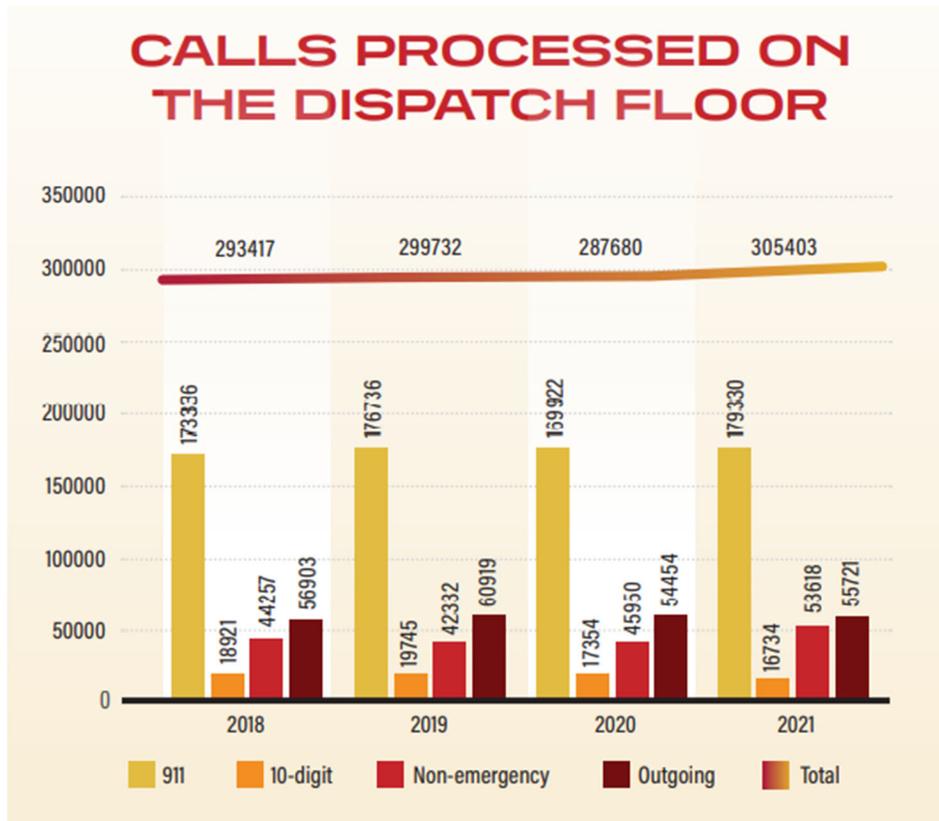


Figure 1-1: Kitsap 911 Call Distribution

1.4.2 Kitsap 911 provides dispatching services for the following agencies (shown in alphabetical order):

#### Member Agencies

- Bainbridge Island Fire Department
- Bainbridge Island Police Department
- Bremerton Fire Department
- Bremerton Police Department
- Central Kitsap Fire and Rescue
- Kitsap County Animal Control
- Kitsap County Coroner's Office
- Kitsap County Sheriff's Office and Jail
- North Kitsap Fire and Rescue
- Port Gamble Natural Resources
- Port Gamble Police Department
- Port Orchard Police Department
- Poulsbo Fire Department
- Poulsbo Police Department
- South Kitsap Fire and Rescue
- Suquamish Police Department

#### Non-Member Agencies

- Kitsap County Department of Community Development
- Kitsap County Department of Emergency Management
- Kitsap County Fire Marshal's Office
- Kitsap County Juvenile and Family Court Services
- Olympic Ambulance Service

## **1.5 Military Installations and the Regional Dispatch Center (RDC)**

1.5.1 Kitsap County includes four primary military installations and three other installations:

(1) Primary Military Installations:

- NBK Bangor
- NBK Keyport (Keyport NUWES-Naval Undersea Weapons Explosives Station)
- NBK Bremerton (Puget Sound Naval Shipyard)
- Manchester Fuel Depot

(2) Other Military Installations:

- The Landings (formerly Jackson Park Naval Reserve)
  - Camp Wesley Harris Naval Reserve
  - Camp McKean
- 1.5.2 Any call regarding police, fire, and/or medical incidents on military installations will be transferred to RDC except on NBK Manchester. Kitsap member agencies do provide mutual aid responses on the military installations when requested.

## **1.6 Kitsap County Fire Districts Map**

- 1.6.1 Figure 1-1 provides a map of the Kitsap County Fire Districts



# 1.7 Kitsap County Law Enforcement Regions Map

1.7.1 Figure 1-2 provides a map of the Kitsap County Law Enforcement Regions.

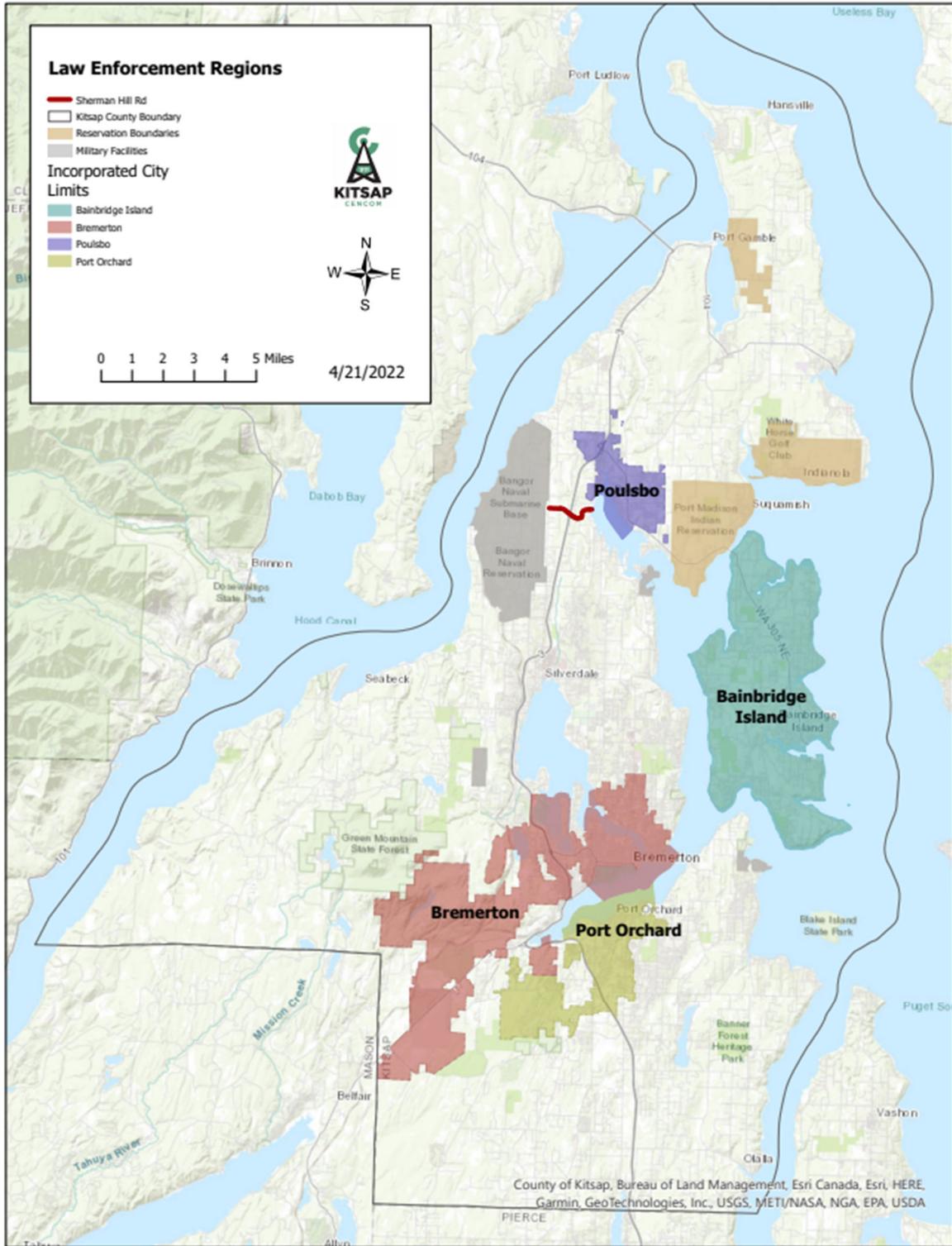


Figure 1-2: Kitsap County Law Enforcement Regions

SECTION 2

# Existing System Description

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## 2.1 Existing System Description

- 2.1.1 The Existing System Description is provided in the Request for Proposal Exhibit C, separate document, titled the *Existing System Description*.

## SECTION 3

# Common Technical Requirements

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This section describes technical requirements of all equipment supplied as part of this system.

### 3.1 Equipment to be Furnished Complete

- 3.1.1 Unless specifically excepted by the terms of these specifications, any parts or accessories ordinarily furnished or required to make a complete operating unit or system must be furnished by the Seller whether directly mentioned or not mentioned in the specifications.
- 3.1.2 The equipment must be complete, installed, and ready for operation at the Buyer's dispatch center location(s), central controller location (s), at any of the remote sites, in identified vehicles, and agency stations as required.

### 3.2 Component Ratings

- 3.2.1 Every component part of the equipment must be operated within the manufacturer's continuous commercial duty rating under any combination of operating conditions specified.

### 3.3 Overload Protection

- 3.3.1 Adequate fuses and/or circuit breakers must be included to protect the equipment from internal and external faults. In the event these fusing devices are employed in circuits exhibiting switching surges, a suitable time delay element must be incorporated in the fuse device to preclude false operation and yet protect the equipment from a sustained overload.

### 3.4 Electrostatic Protection

- 3.4.1 None of the equipment provided by Seller may be affected by an electrostatic discharge of 15,000 V from a 125 pF capacitor with a 500 ohm series resistor. This discharge simulates the typical electrostatic discharge from the human body. This discharge may be applied to any exterior surface of the common control unit, cabling, radio sets, and any associated items.

### 3.5 Electromagnetic Susceptibility

- 3.5.1 The radio components and dispatch equipment of the radio system may be operated in an equipment room with up to 110-watt VHF (140-174 and 219-225 MHz), UHF (380-512 MHz), 700/800 MHz, and 896-941 MHz transmitters and microwave transmitters with up to 2-watt output power. The system must not adversely impact or be impacted by any of these other radio systems.

## **3.6 Existing Equipment Interfaces**

- 3.6.1 The Buyer and Seller must coordinate all interconnections to all Buyer-supplied equipment in excess of being supplied under this bid. Actual interconnections to working systems will be done by the Seller.

## **3.7 Equipment Placement**

- 3.7.1 All equipment must be arranged and installed so its intended function will not be impaired because of weather, temperature, adjacent equipment, or any other factors. Sufficient installation space and clearance must be provided so service and maintenance can be readily performed. The relative arrangement of operating equipment must be consistent with good human engineering practices resulting in maximum operator efficiency. Plans showing the placement of all equipment must be submitted to the Buyer's Project Manager for approval a minimum of 30 days prior to actual placement since Buyer's installation requirements and standards must be preserved. The Seller will ensure room for placement of all equipment purchased under this bid.

## **3.8 Equipment Mounting**

- 3.8.1 Seller must install equipment in open frame 19-inch EIA racks. Cabinets may also be proposed. Most sites have existing typical 7-foot racks; however, the 911 Carver (Dispatch Center), Gold Mountain and View Park sites have open 9-foot racks. Seller must describe its plans for racks at all sites (i.e., ship equipment in racks and replace racks at the site or ship equipment in racks and transfer equipment to existing racks) especially 911 Carver, Gold Mountain and View Park sites with 9-foot racks. Installations must be carefully planned and organized to provide easy maintenance access and best space utilization. All cabinets and racks must include space for wire management between them.
- 3.8.2 If equipment requires separate cabinets, the cabinets must include standard EIA 19-inch rack mounting facilities for mounting the equipment. All sections of the cabinet must be constructed to prevent warping, twisting, or sagging of any component or assembly. The cabinet must be supplied with removable front and rear doors and adequate ventilation to provide cooling for the contained equipment.
- 3.8.3 Access doors must be equipped with locks to prevent access to the equipment by unauthorized personnel. All front and back cabinet doors must be easily removed for equipment maintenance. These doors or panels must have dimensions to permit free, unobstructed access to all equipment mounted in the cabinet. The cabinet must be manufactured of durable, quality materials. All materials prone to rust and/or corrosion must be finished and painted. Swing out or slide out chassis/circuit card assemblies must be provided to facilitate assembly and maintenance. Wiring and cabling must be formed with sufficient slack to allow unrestricted chassis movement. Intra-rack cable management must support the auto-retraction or otherwise automatic stowage of any cables connected to equipment mounted on slide-out rack rails. All hinges, slides, rollers, fasteners, etc. must be of high-quality construction to provide for long life and endure Public Safety use.

- 3.8.4 All parts requiring periodic servicing or maintenance must be easily accessible and must not require the removal of other parts or exposure to voltages above 60 VDC or VAC in order to gain this access. All cables, wiring, mating connectors, and plugs required for the complete system must be provided by the Seller. The following color code must be used unless Seller receives prior written approval from the Buyer:

White – telephone cables

Red – Alarm cables

Blue – Ethernet cables

Yellow – Cat 6 patch cords

Green – Radio system Ethernet data cables

- 3.8.5 Wiring and cabling both within the equipment and in the external interconnections must be neatly formed and dressed. Cable ties or lacing cord must be used to dress all cables in place.

### **3.9 Equipment Surge Protection**

- 3.9.1 All communications equipment must be furnished with power line and control line transient and surge protection devices. As a minimum, each surge protector must be a silicon avalanche trigger type device.
- 3.9.2 The type of device proposed must be specified by Seller on the equipment drawings furnished and approved by the Buyer's Project Manager before installation.

### **3.10 Power Supplies**

- 3.10.1 Dual power supplies operating redundantly must be supplied if it is a standard equipment option. Each power supply must be capable of supplying the entire load.
- 3.10.2 Power supplies must incorporate an electronic "crowbar" circuit to protect external equipment from excessive voltage in the event of a malfunction. A short-circuit protection current-limiting circuit must also be incorporated to protect the supply from accidental shorts or excessive current drains. The power supplies must have capacities to support the growth of the system within the system tier level.
- 3.10.3 If required to maintain any system or console programming, including any operator selectable programming, the power supplies must supply any battery supply required to maintain programming memory. The battery supply must maintain power to the memory for a minimum of 30 minutes.
- 3.10.4 Power supplies must not be operated at more than 75 percent of their rated load.
- 3.10.5 If multiple units are powered by a single power supply, each unit must be separately fused. A short at one unit must not cause the power supply fuse or circuit breaker to open resulting in the loss of power to all the other units.

- 3.10.6 The Buyer will supply uninterruptible power system (UPS) outlets and circuits if required for the system. Seller is not to include their own UPS systems or equipment to avoid series UPS system connections.

### **3.11 Non-LAN Cables**

- 3.11.1 All general-purpose interconnecting cables, except power, LAN, and equipment ground, used in the system must consist of standard telephone company type 25-pair cable with tinned-copper conductors, telephone standard color-coded insulation, with vinyl jackets, terminated with an Amphenol 50 terminal male connector on one end and a female connector on the other end. The number of installed cables must meet the system requirements plus specified future growth requirements.
- 3.11.2 Special purpose cables designed as part of the Seller's system are exempted from the requirement of 3.12.1.
- 3.11.3 LAN cables are specified in Section 9 Data Networks.

### **3.12 Connector Blocks**

- 3.12.1 All cabling in the system for non-LAN connections must run below the computer flooring, in overhead cable tray or in Buyer supplied cableway and terminate in Seller-supplied Leviton 40066-MR, or equal, 25-pair connector blocks having and standoff bracket and a prewired Amphenol female connector mating with the specified cable connector for general non-patch cable type interconnects. These “66 blocks” must be located on the plywood backboard mounted on the wall of the equipment room. The exact locations of the connector blocks must be identified on drawings and coordinated with the Buyer.
- 3.12.2 Should any conductor require a different gauge of wire than specified by the “66 block” manufacturer, or require shielding, the conductor must be supplied in addition to and terminate in the same locations with appropriate connectors at each end.
- 3.12.3 The number of blocks supplied must be the number required to accommodate all the circuits and functions, including the future growth requirements. At least one block must be supplied for each functional group of interconnections as listed. The blocks must be laid out in a logical manner to minimize the length of the interconnecting jumpers. Connections must be by jumpers as required from these blocks to the appropriate termination blocks. Blocks must not contain direct originating and terminating connections on the same block.
- 3.12.4 No series connecting (daisy chaining) of cabling must be used. All blocks and connectors used on the blocks must be identified with a marked identification strip.
- 3.12.5 The blocks may be mounted directly to the wall-mounted plywood backboard provided they are mounted in an orderly manner with jumper rings or cable distribution posts attached to the backboard. Sufficient rings or posts must be installed and located to accept the vertical jumpers from between the blocks to

facilitate jumper runs in either direction, and allow the jumpers to drop directly to their terminating positions. Rings or posts must also be installed located across the top to provide horizontal jumper runs positioned to allow the jumpers to access the vertical runs in either direction.

- 3.12.6 Patch panels may be used to transition from a single 8P8C (RJ45-type) cable and connector to a cross connect block or multi-conductor cable supporting multiple connections.

## SECTION 4

# Radio System Specifications and Requirements

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## 4.1 Introduction

- 4.1.1 This section defines the requirements for the fixed radio system infrastructure. Other elements required to make the system a complete functional radio system are defined in other sections. However, Seller is required to supply all the equipment components and services required to implement a complete system even if not specified in detail in these specifications.

## 4.2 System Description

- 4.2.1 The Buyer wants to install a new P25 trunked radio system operating in 700/800 MHz radio bands to replace some of the existing VHF radio systems. A very detailed description of the existing system is found in a separate document called the *Existing System Description*.
- 4.2.2 The new P25 trunked radio system must:
- (1) Operate in the 700/800 MHz radio bands depending on the radio channels available to Kitsap 911
  - (2) Meet the requirements of the Region 43 700 MHz Planning Committee to obtain coordination for 700 Public Safety designated channels. If 800 MHz NPSPAC channels are required to meet the RF channel capacity needs, the trunked system must also meet the requirements of the Region 43 800 MHz Planning Committee
  - (3) Work with existing infrastructure including new microwave system, dispatch console system, logging recorder, alarm system, and Kitsap 911 enterprise network. If the new P25 trunked radio system will not work with the existing infrastructure, the Proposer must clearly state the reasons the systems are incompatible and provide the replacement infrastructure costs as an option

## 4.3 Frequency Requirements

- 4.3.1 Seller must analyze 700/800 MHz frequencies for use with their system and provide this information to the Buyer. The Buyer will be responsible for all FCC licensing, frequency coordination, Region 43 Regional Planning Committee (RPC) approvals, and all associated costs, although Seller may propose to provide licensing services as an option. Seller must perform sufficient frequency research to determine if there is a high probability of being able to obtain all frequency resources required by their proposed system design. Seller is responsible to develop, gain approval from Buyer's Project Manager, and implement a plan to transition from the existing system to the proposed replacement system.

4.3.2 Seller must assume three standalone repeater sites will be required by the Region 43 RPC to obtain the frequency coordination letter needed by the FCC to license the 700 MHz channels. In Section 6.3 of the Region 43 700 MHz Plan <https://www.wsdot.wa.gov/partners/region43/pdf/43700MHzPlan.pdf> the committee provides requirements for Infrastructure to Support Interoperability Channels.

Required Interoperability Channels based on total licensed bandwidth are provided in the table below. See National Interoperability Field Operations Guide (NIFOG) for details on interoperability channels.

<b>Bandwidth Licensed</b>	<b>Required Number of Interoperability Channels</b>
0 to 50 kHz	None
62.5 to 100 kHz	1 Call Channel
112.5 to 175 kHz	1 Call Channel 1 Law Enforcement Channel 1 Fire/EMS Channel
> 175 kHz	1 Call Channel 1 Law Enforcement Channel 1 Fire Channel 1 EMS Channel

Each standalone repeater must operate in P25 conventional mode. The exact location of the repeaters will be determined in discussions with the 700 MHz RPC as a part of the Kitsap 911 frequency application, but Proposer shall assume Gold Mountain as the location in the proposal.

The Proposer shall assume the following 700 MHz Interop Channels:

- 7CALL50 (769.24375 MHz / Ch. 39-40)
- 7TAC74 (774.60625 MHz / Ch. 897-898)
- 7FIRE64 (769.99375 MHz / Ch. 159-160)

## 4.4 System Technical Requirements

4.4.1 The radio system must be an ANSI TIA-102 APCO Project 25 (P25) Phase 2 Time Division Multiple Access (TDMA) trunked radio system.

4.4.2 The system may employ simulcast or multicast technologies subject to the limitations of frequency availability. However, system designs should minimize site switching and the problems associated with multicast systems and radio traffic distribution.

4.4.3 Kitsap 911 does not have a traditional radio traffic study providing statistics on call attempts, busies, average call durations, busy hour, etc., but the PSAP did perform a radio congestion study in 2018. The final report from the study is found in Appendix B of the *Existing System Description*.

4.4.4 The Proposer must provide responses to all listed requirements in appendices A through D of the *Statement of Project 25 (P25) User Needs* document (P25 SPUN) dated August 2020, as follows:

- (1) The list of SPUN user needs requirements is provided in the RFP Technical Sections Appendix D.
- (2) Proposers must list all the requirements in appendices of the latest P25 SPUN document in their response and must identify the following:
  - Complies and Compatible – meets the requirements and provides demonstrated compatibility with other vendors’ equipment.
  - Proprietary – meets the requirements but does not provide demonstrated compatibility with other vendors’ equipment.
  - Not Compliant – equipment currently does not meet this requirement. If future compliance is planned, Proposer may make a comment and define the release level or date for planned compliance.)
- (3) Proposers must identify the costs associated with the implementation of any optional features not supplied as part of the basic bid. These costs must be inclusive of all costs (i.e., infrastructure and user radio costs) associated with the implementation of the feature and must be clearly identified in the Proposer's response. Any option in the SPUN not identified in the Proposer's response as an additional cost must be provided in the overall system proposed.

- 4.4.5 The system must comply with all the applicable ANSI TIA-102 series specifications for the basic system and options purchased available at the time the system is delivered on site. Proposers must certify their systems are compliant and the system will remain in compliance as future software releases and enhancements are released.
- 4.4.6 The system should have certified compliance across other vendor’s platforms as documented in the US Department of Commerce Public Safety Research Program, Project 25 Compliance Assessment Program (CAP). Proposers must identify any areas their product does not pass the tests outlined by the CAP or has not been tested.
- 4.4.7 The system must have a management system allowing the Buyer to make changes to the system, perform system administrative functions, monitor alarms, add equipment, delete equipment, etc. This system must provide for remote access so these functions can be done from other fixed locations as well as mobile locations. Proposers must describe in detail in their response how the system management functions work, what system management functions are provided, and how they support additional fixed and mobile management access.

## **4.5 Talkgroup Capability**

- 4.5.1 The system must be provided with the capability to initially support 200 user talkgroups not including any talkgroups required by the system or consoles for their operation.

- 4.5.2 The system must be capable of supporting a total of 500 user talkgroups not including any talkgroups required by the system or consoles for operation without adding hardware or software exclusive of software licensing.
- 4.5.3 Proposers must provide the cost of adding talkgroups to the system beyond the numbers specified in 4.5.1 and 4.5.2 including hardware, software, and installation after system award at the same discount rates applied to the other options priced.
- 4.5.4 The system must support a minimum of eight talkgroup priorities. Each talkgroup must be able to have its priority set independent of any other talkgroup.

## **4.6 Subscriber Capability**

- 4.6.1 The system must be provided with the capability to initially support 4,000 user unit identification numbers (IDs) not including any IDs required by the system or consoles for their operation.
- 4.6.2 The system must be capable of supporting a total of 8,000 user IDs not including any IDs required by the system or consoles for operation without adding hardware or software, exclusive of software licensing.
- 4.6.3 Proposers must provide the cost of adding subscribers to the system beyond the numbers specified in 4.5.1 and 4.5.2 including hardware, software, and installation after system award at the same discount rates applied to the other options priced.

## **4.7 Encryption**

- 4.7.1 The system must come supplied with the necessary hardware and software to support P25 standard AES encryption on all RF channels throughout the system.

## **4.8 Automatic Station Identification**

- 4.8.1 The system must be equipped to identify the system with a solid state automatic International Morse Code identification system and must operate in the following manner:
  - (1) Trunked Mode: The unit must operate in the semiautomatic mode transmitting the ID at intervals as defined in FCC rules for trunking operations. The unit must not interfere with the channel in use.
  - (2) Conventional Mode: The unit must operate in the semiautomatic mode transmitting the ID only when the repeat interval timer has elapsed, and the channel is not in use. The unit must not interfere with the channel in use.
- 4.8.2 The unit must have variable words per minute (WPM) up to 20, interval timing, and output levels. Units must be set initially for 20 WPM and 30-minute timing intervals. The unit must have a test mode and variable audio output level.

## 4.9 Equipment

- 4.9.1 Equipment supplied under this procurement must be compliant with all FCC rules and specifications in effect at the time of manufacturer.
- 4.9.2 The fixed equipment must operate over a room ambient temperature range of 0 to +40 degrees C with an ambient relative humidity of 5 to 95 percent.
- 4.9.3 The following equipment must be powered by nominally -48 VDC (range from -42.0 to -59.5 VDC):
- (1) All remote site equipment RF equipment including RF base stations, power amplifiers, receiver multicouplers, combiners, and any other equipment necessary for the remote site RF equipment to remain operational.
  - (2) All remote site data and ancillary equipment including data switches, routers, controllers, fault and alarm, and any other equipment required to keep the remote site operational during an AC power failure.
  - (3) All references in this specification refer to nominal -48 VDC refer to the DC power defined in this section and the DC power supply specification section.
- 4.9.4 All remote site equipment must be installed in EIA standard 19-inch “relay” racks. All racks must be 7 feet tall except 911 Carver, Gold Mountain, and View Park locations. 911 Carver, Gold Mountain, and View Park require 9 feet tall racks. All racks must be equipped with wire management spaces installed between the racks except unless approved by the Buyer. The final rack height for each site must be determined during the detailed design phase of the project. The relay racks must have the following:
- (1) Anodized or similar finish to resist corrosion
  - (2) Drilled and tapped holes on front and back of each rack support rail
  - (3) Vertical cable management must be 3.65 inches wide minimum and a minimum of 6 inches deep with cable access on both sides to allow cables to be routed between racks
  - (4) Horizontal cable management located on the racks as required to neatly dress and manage any intra-rack horizontal cables
- 4.9.5 Equipment may be mounted in 84-inch high 4-post racks (108-inch racks may be required for equipment at 911 Carver, Gold Mountain, or View Park) with integral cable management if the RF equipment is supplied as one assembly in a single rack or cabinet. The rack or cabinet width must not exceed 24 inches unless non-conforming rack sizes are clearly identified in the Proposal.

## 4.10 Interoperability

- 4.10.1 The system must interoperate with any other Project 25 trunked and conventional radio system for any standard Project 25 features including air interface, options, and intersystem operations.
- 4.10.2 The system must be capable of providing Project 25 Standard InterRF SubSystem Interface (ISSI) for interconnection to other Project 25 compliant trunked systems. Proposers must clearly identify by individual functions, the functions of the trunked system supporting the Project 25 Standard ISSI interface and not supporting the standard. ISSI interfaces for a connection to the Pierce County Motorola P25 system known as the Combined Communications Network (CCN) by Pierce County must be provided as an option.
- 4.10.3 The system must be capable of providing a Project 25 standard Console SubSystem Interface (CSSI) for connection to non-system supplier consoles. Kitsap 911 currently operates a Zetron ACOM console system for radio dispatch and a Zetron MAX system for call taking. Proposers must clearly identify by individual functions what functions of the trunked system supporting the CSSI Project 25 Standard interface and not supporting the standard.
- 4.10.4 VHF Conventional Interoperability: The system must support existing VHF interoperability through programming VHF conventional channels into the radios and 4-wire connections to the dispatch console system. Kitsap 911 plans to continue operations of some VHF channels including TAC 7 after the transition to the P25 system.
- 4.10.5 UHF Conventional Interoperability: The system must support UHF interoperability by adding UHF conventional capabilities for communicating with Mason, Jefferson, and Clallam County law enforcement as well as MedCom channels to some law enforcement and fire radios. A control station must be added to transmit and receive on a Mason County UHF law channel.
- 4.10.6 700/800 MHz P25 Phase 2: The system must support 700/800 MHz P25 by adding Pierce County fire and law talkgroups into the fire and law radios and, optionally, using an ISSI connection between systems.
- 4.10.7 700/800 MHz Conventional: The system must support 700/800 MHz Conventional interoperability by adding the Kitsap County Public Works channel into fire and law radios.
- 4.10.8 700/800 MHz DMR Tier 3: The system must support 700/800 MHz DMR Tier 3 interoperability by adding a Kitsap Transit control station and connecting it to the dispatch console system.

## 4.11 Reliability

### 4.11.1 Reliability/Redundancy/Backup

- (1) A minimum of two failures occurring with overlapping times must be necessary to cause the loss of any communications system features and functions.

### 4.11.2 Failure Mode One

- (1) Due to operational requirements and system loading, a failure causing the system to revert to conventional (non-trunking) operation would degrade the system to an unacceptable level. For this reason, the system must continue to trunk in the event the primary system control fails. Either a fault tolerant system continuing to trunk in the event of a primary system controller failure or redundant system controllers is required.
- (2) If the primary system control fails, these functions must automatically switch to any other distributed processor or a backup system controller for trunking control. If the trunking is controlled by distributed processors, they must be located at one or more of the radio communications sites.
- (3) During this mode of operation, the system must continue to provide all features and functions specified in this Document.
- (4) The complete system or any portion of the system must not be off the air for longer than 10 seconds during system changeover.

### 4.11.3 Failure Mode Two

- (1) In the event, the primary or backup system controls or distributed processors fail to the point trunking can no longer take place, the trunking system must revert to a preplanned non-trunked mode. In this preplanned mode of operation, a signaling message will be continuously sent to the system mobiles, portables, and control stations indicating the system is in a failure mode. The signaling must ensure the mobiles and portables will not go into the failure mode when out of RF coverage range.
- (2) All radio users must be made aware the system is in the failure mode of operation by a unique automatic audible alerting tone at predetermined intervals.
- (3) Preprogrammed RF channels will be programmed into the radios for the failure mode of operation.
- (4) The system must not be off the air for more than 10 seconds during the failure mode adjustment.

- 4.11.4 While the system is operating in the failed mode, the remote voting receiver and voting system must continue to function as a standard remote receiver voting system.

- (1) For conventional channels, if a voting comparator/selector should fail, then the associated repeater station must revert to an in-cabinet repeater operation. Operation in any simulcast mode must automatically cease for this channel.
- (2) For trunked channels, if a voting comparator/selector should fail, the associated receiver must be taken offline along with the associated transmitter unless the system is operating in simulcast mode, then the transmitter may continue to operate.
- (3) For trunked channels, if the entire receiver voting comparator/selector fails for a particular channel, then the channel must be taken off-line.

## **4.12 Other Reliability Requirements**

- 4.12.1 The system must allocate a minimum of two trunked repeater channels to perform as the control channel. When a new control channel is assigned, mobile/portable radio units must automatically search for and acquire the new control channel. The control channel must automatically sequence among all channels assigned this function. In the event the control channel fails, the failure must be detected, and one of the remaining signaling channels must be automatically assigned.
- 4.12.2 To assure all eligible channels in the system share equal time in the control channel mode, each channel must be automatically selected in sequence by the system controller until all channels have been selected. The process must then automatically begin with the first channel.
- 4.12.3 A monitoring device must be provided at each RF site to monitor control/signaling activity, and forward and reflected transmitter power of each transmitter at the site. Transmitters experiencing reflected power outside of their safe operating range must be shut down to avoid transmitter damage. A high reflected power condition must not cause transmitter damage. This monitoring device must be connected to the fault and alarm reporting system.

## **4.13 Coverage**

- 4.13.1 Proposer must provide radio coverage predictions in various services areas as described below:
  - (1) The bounded area on the map in Figure B-1 Mobile and Portable Coverage map is the service area for mobile radios on the P25 radio system. The Mobile Service Area map also shows the existing sites. Proposer must provide predicted coverage of the proposed radio system for mobile radios in the County.
  - (2) The bounded area on the Figure B-1 map is also the service area for portable radios on the P25 system. Proposer must provide predicted coverage of the proposed radio system for portable radios in the County. In addition, the proposer must provide the predicted residential in-building coverage service areas for portable radios on the proposed P25 radio system assuming a bi-directional building loss of 6 dB.

- (3) The dark red bounded areas on the Figure B-2 map with detailed maps in Figures B-3, B4, and B5 are the commercial/industrial in-building service area for portable radios on the P25 radio system. The proposer shall provide predicted coverage for these commercial/industrial areas assuming a bi-directional building loss of 26 dB in these areas. In addition, the proposer must provide the predicted commercial/industrial coverage service areas for portable radios in the County on the proposed P25 radio system assuming a bi-directional building loss of 26 dB.
- (4) The blue bounded areas on the Figure B-2 map with detailed maps in Figures B-6 and B-7 are the heavy industrial in-building service areas for portable radios on the P25 radio system. The proposer shall provide predicted coverage for these heavy industrial areas assuming a bi-directional building loss of 36 dB in these areas.

The coverage boundaries must be considered the boundaries for the Bounded Area Percent Coverage (BAPC).

A Shapefile dataset for the polygons is available for download from the Kitsap 911 RFP website.

- 4.13.2 The system must be designed to provide BAPC of 95 percent within the Mobile Service Area (Map B-1) boundary and the Portable Service Area (Map B-1) boundary. The system must also be designed to provide BAPC of 95 percent with the red Commercial/Industrial areas and the dark blue Heavy Industrial areas (Map B-2), and the Commercial and Heavy. In addition to the 95 percent BAPC covered area reliability, the must deliver a Delivered Audio Quality (DAQ) of 3.4 (equivalent to a BER of 2.0 percent)<sup>1</sup> or better (speech understandable without repetition but with some noise or distortion present), as shown below.

Delivered Audio Quality (DAQ)	Faded 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.

<sup>1</sup> For purposes of this specification, coverage testing shall be done using a 2.0 percent Bit Error Ratio (BER). The Buyer may elect to also perform Delivered Audio Quality tests for additional information and performance data.

- 4.13.3 Coverage design, implementation, and testing for the system must adhere to the latest revision of Telecommunications Industry Association (TIA) Telecommunications System Bulletin 88 (TSB-88).
- 4.13.4 Coverage in Failure Mode One or Two must be equal to coverage in normal operating mode.
- 4.13.5 Seller's design must employ measures necessary to minimize the effects of RF interference with all users at existing facilities.
- 4.13.6 Proposers must provide computer-generated propagation plots clearly illustrating the predicted talk-in and talk-out coverage areas of their proposed systems for all areas showing 95 percent reliability. Plots must be provided for both mobile and worn portable coverage.
- 4.13.7 Mobile coverage must be for a 15-watt mobile using a unity gain antenna mounted on the roof of a vehicle with 15-feet of the type of coaxial cable recommended by the Proposer for mobile installations.
- 4.13.8 Portable coverage must be for a 3-watt portable radio mounted with a unity gain radio-unit-mounted antenna and the use of a remote-speaker mic assuming the user does not remove the radio when transmitting.
- 4.13.9 If portable plots assume worn-on-the-hip assumption, Proposer must explain and potentially adjust portable plots relative to the typical carry positions for Law Enforcement and Fire Fighters as shown in the photographs below:



Photo of Typical Carry Location of Law Enforcement Radio

Figure 6.5. Firefighter on the left with proper wearing of radio in pocket. Note minimal radio speaker microphone cord exposure. Firefighter on the right demonstrates use of the shoulder harness and leather case.



USFA FEMA Voice Radio Communications Guide for Fire Service

[https://www.usfa.fema.gov/downloads/pdf/publications/voice\\_radio\\_communications\\_guide\\_for\\_the\\_fire\\_service.pdf](https://www.usfa.fema.gov/downloads/pdf/publications/voice_radio_communications_guide_for_the_fire_service.pdf)

- 4.13.10 Coverage plots must be provided showing the coverage from the proposed sites. Simulcast cell coverage plots must account for both signal strength and simulcast overlap delay distortion in defining acceptable coverage. The plots must also include the area within the BAPC as described above. Proposer must include:
- (1) Composite coverage of system for mobiles and portables - talk-in and talk-out
  - (2) Simulcast cell coverage for mobiles and portables - talk-in and talk-out.
- 4.13.11 Although not required in the proposal, proposer must provide these additional coverage plots during the design phase of the project:
- (1) Single site coverage for mobiles and portables - talk-in and talk-out
  - (2) Most Likely Server plots of each physical site for portables and mobiles - A Most Likely Server plot for a simulcast cell as a single site does not meet this requirement. The Most Likely Server plots will be used to determine simulcast overlap areas for extra scrutiny and assist with directional antenna aiming for BDA (Bi-Directional Amplifier) and DAS (Distributed Antenna Systems) systems – talk-in and talk-out.
- 4.13.12 Both single-site, simulcast cell, and as applicable, composite-site coverage plots must be provided showing the total coverage from the proposed site or sites.
- 4.13.13 For designs using existing sites, Table 4-1 contains the existing antenna information to be used in the proposed design.

Table 4-1: Existing Antenna Information

Site	CC	BCH	CB	CH	E30	GM	HR	KCC	KG	LH	MO	NH	OH	SP	SU	TL	VP
Tx Antenna Elevation (Ft)	140		140		95	210	140			160	140	110	140	140	340	140	250
TX Standoff Length (Ft)	5		5		5	10	5			5	5	5	5	5	5	5	5
RX Antenna Elevation (Ft)	180	105	213	35	160	255	180	210	160	180	180	150	180	220	280	180	300
RX Standoff Length (Ft)	5		5		5	10	5		5	5	5	5	5	5	5	5	5
Additional Length for bridge and inside building	60		30		30	30	30		30	60	25	30	40	30	40	40	30
Horizontal Ice Bridge Length (+/- 5ft.)	20		25		20	10	10		10	0	10	10	10	10	10	10	10

Note 1: Antenna information is based on existing antennas for VHF channel LE 1

- 4.13.14 A description of the method used to calculate the coverage must be included in the proposal. All criteria and assumptions must be clearly stated on each map. In addition, the propagation model used, and methodology must be explained.
- 4.13.15 The following information must be clearly defined for each map and each site:
  - (1) Base/repeater site location, including latitude and longitude using NAD83
  - (2) Base/repeater RF transmitter output power (per channel)
  - (3) Base/repeater RF power at the input of the antenna (per channel)
  - (4) Base/repeater antenna model, gain, directivity, and azimuth and mechanical downtilt as applicable
  - (5) Base/repeater transmit effective radiated power (ERP) (per channel)
  - (6) Base/repeater receiver sensitivity
  - (7) Base/repeater transmit and receive antenna height(s) above ground
  - (8) Base/repeater antenna height(s) above average terrain (HAAT)
  - (9) Base/repeater site elevation above mean sea level (AMSL)
  - (10) Subscriber antenna type
  - (11) Subscriber RF transmitter output power
  - (12) Assumed fixed-site RF noise floor or degradation
  - (13) Assumed mobile and portable RF noise floor or degradation

## 4.14 Candidate Sites

4.14.1 Appendix C contains information on candidate sites serving areas of Kitsap County to assist Proposers with their proposed designs. The candidate sites include a City of

Bremerton tower, St. Michael Medical Center in Silverdale, and sites offered by tower leasing companies.

## **4.15 Simulcast System Requirement**

4.15.1 Where simulcast operation is proposed, the Proposer must provide full technical details about all aspects of the proposed simulcast equipment including but not limited to:

(1) Methods used to maintain required frequency stability and specifications for frequency stability.

(2) Methods used to maintain proper audio phasing and time of arrival requirements.

4.15.2 Buyer will supply the site interconnection transport facilities consisting of ISO Layer 2 connections using microwave, fiber, telco circuits or other transport facilities. If proposer requires quality of service, other traffic prioritization, or other traffic shaping (i.e., MPLS services, or ISO Layer 3 routing services, the Proposer must supply the required system (s).

4.15.3 Proposer must detail the bandwidth required to implement the trunking system. The Seller must supply any networking equipment required to connect the sites to the Buyer supplied transport network. Proposer must detail their limits on transport performance to maintain simulcast phasing in all configurations of transport operation.

4.15.4 Precision Frequency Source

(1) A precision frequency source must be provided at each simulcast transmitter site to control all frequency synthesizers in the repeater stations in order to stabilize all transmitter frequencies.

(2) The precision frequency source must be the same or like the "atomic" type frequency standard such as rubidium. Any other source offered by Seller must be fully equivalent to this technique and must be technically justified as an adequate source to meet the simulcast system requirements of frequency stability throughout the system.

4.15.5 Phase Delay Equalization

(1) Phase delay equalization must be provided to minimize simulcast overlap distortion. Equalization equipment must be provided for each transmit channel and will have sufficient delay adjustment to provide "over" and "under" adjustment of at least 25 percent or as required by the overlap distance requirements, whichever is greater. The equipment configuration must support adjustments in the simulcast delay or "launch time" adjustments from the controller location or other defined single location without making a trip to the remote site.

(2) The simulcast timing/phase delay equipment must automatically compensate for changes in the network routing. This compensation must allow for an infinite number

of network configurations. Proposer must specify the maximum Buyer network/transport time delay they can accommodate with their equipment.

## **4.16 Receiver Voting Systems**

- 4.16.1 Receiver voting systems must be employed as part of any area wide-trunked and/or simulcast radio system. The voting equipment must be capable of continuous duty operation. Each of the 700/800 MHz trunked radio simulcast channels must be supplied with a complete and independently functioning receiver voting system. Proposer must supply detailed information on the voting system including primary and secondary voters for each simulcast channel and working of the voting system for the initial voting and ongoing voting for each transmission.
- 4.16.2 The equipment supplied must be capable of the following operational criteria when an on-channel, properly coded signal appears in the system.
- (1) The remote receiver voting system must be designed and interconnected to constantly select the highest quality digital signal being received and automatically rejecting the weak and noisier (e.g., higher bit error rate) signals. The process must be continuously selective and provide for automatic switchover without interruption of speech or data. The best quality digital audio signals during a transmission as changes of condition or location occur must be selected. The voting comparator must monitor the integrity of the incoming receive data circuits and reject any lines not meeting the required bit error rate.
  - (2) The system must be essentially “fail safe,” so any receiver or data transport circuit failure will not cause the rest of the system to malfunction or result in an interruption of communications.
  - (3) Controls must be provided allowing for individual selection and disabling of each receiver input.

## **4.17 Trunked Site Receiver Multicoupler System**

- 4.17.1 Sites with multiple receivers must have a receiver multicoupling system. At each site, one receive antenna must be used as much as practical for all receivers at the site. If more than one antenna is required, on any site, for all 700/800 MHz receive operations, a detailed explanation of the proposed configuration along with complete justification must be included in the Proposal. The receiver multicoupling system must not be included in the transmitter combiner system.
- 4.17.2 The multicoupling system must be expandable to at least 15 channels and employ a high third order intercept above +40 dBm to limit the generation of intermodulation products. Noise figure must not exceed 5.0 dB. Any port not used in the system must be terminated in a 50-ohm load.
- 4.17.3 The multicoupling system must be powered by a nominal industry standard -48 VDC power connection. The -48 VDC system will be supplied by the Buyer. The

multicoupling system may be integrated with the tower mounted preamplifier control unit if the combination meets the requirements of both this section and the tower mounted preamplifier section.

## **4.18 Tower-Top Amplifiers**

- 4.18.1 Tower-top amplifiers (TTA) must be used in all cases where the receive antenna coaxial cable run exceeds 50 feet, or Proposer must provide a technical justification in their Proposal explaining the lack of a tower-top amplifier.
- 4.18.2 Each amplifier must be protected against lightning. The amplifier must be powered by nominal -48 VDC supplied by the Buyer. DC power for the amplifier must be supplied through the transmission line. A relay within the tower-mounted unit must automatically switch the preamplifier in or out of the circuit upon loss of power so the RF receive signal is routed through the TTA with a minimum of loss.
- 4.18.3 All tower-top amplifiers must employ a means of indicating a properly or improperly operating amplifier on a panel in the radio equipment building. All preamplifiers must automatically switch to a backup amplifier should the primary amplifier fail. Failure of an amplifier or switching of an amplifier to the backup amplifier must activate an alarm on the local alarm panel and the remote system indication.
- 4.18.4 The tower-top unit must operate in an ambient temperature range of from -40°C to +70°C with up to 99 percent relative humidity and up to 125 MPH winds. RF connectors must be 7/16" DIN or 4.3-10 type. A preselector filtering system must be installed for each amplifier system. The insertion loss of the filter must be no greater than 1.5 dB. The attenuation at +/- 5 MHz from the center of the pass band must be a minimum of 60 dB or as required by the final frequencies used in the system design. Seller must optimize the bandwidth of the filter for performance over the narrowest range of receive frequencies as opposed to using a wideband filter.
- 4.18.5 The tower mounted assembly must have a noise figure of 4.0 dB or better with a third-order intercept point greater than +40 dBm and the tower mounted system including the transmission line losses to the multi-coupler must have a minimum reserve gain of 12 dB.

## **4.19 Antennas and Transmission Lines**

- 4.19.1 All transmission antenna system components must be rated as low PIM (passive intermodulation) by the manufacturer. Type "N" connectors must not be used. If type "N" connectors are part of the proposed design, the Proposer must justify the use and the Buyer's Project Manager must approve prior to installation.
- 4.19.2 The 700/800 MHz base/repeater antennas furnished as part of the system must be designed to produce uniform signal strength on the ground from the antenna site to the horizon. Heavy null fill is required to assure close in coverage. Polarization must be vertical.

- 4.19.3 Separate transmit and receive antennas must be provided at trunked repeater sites. In all cases, antennas must be chosen to provide the best balance for system transmission and reception. Proposer must state the number of antennas required for the proposed system configuration.
- 4.19.4 All proposed antennas must meet the following minimum specifications:
- (1) Antenna gain: As required.
  - (2) Radiation Pattern: As required.
  - (3) Down Tilt Angle: As required.
  - (4) Rated Power Input: 500 watts minimum or more as required by the system design.
  - (5) Wind Rating: 120 MPH minimum.
  - (6) VSWR: 1.5 to 1 maximum.
  - (7) Antenna Termination: 7/16 -DIN connectors must be used. Nickel or chrome plated connectors shall not be used due to oxidation issues.
  - (8) Cable Termination: 7/16 DIN or 4.3-10 connectors (cable to jumper or equipment) connector must be used. Nickel or chrome plated connectors shall not be used due to oxidation issues.
  - (9) Operating Frequency: As designated.
  - (10) Bandwidth: 5 MHz minimum.
- 4.19.5 The antenna must be supplied with mounting brackets, mast, and all other suitable mounting hardware for top or side mounting on a mast or tower. All brackets, mast, clamps, and hardware must be of a suitable galvanized steel material to minimize corrosion and rust. Proposer must state in their Proposal the material to be used. The Buyer will supply the specific tower mounting structure and tower mounts as required by the antenna locations indicated in the Proposal. Seller must supply the hardware to mount to the Buyer-supplied tower mounts.
- 4.19.6 Transmission line losses must be kept at a minimum at each site. Depending on the line length required at each location, the following represents the types of transmission line preferred:
- (1) Transmission Line – Transmit and Receive: CommScope AVA or LDF series, 1/2", 7/8", 1-1/4", 1-5/8", or 2-1/4" jacketed foam dielectric, Helix or equivalent.
  - (2) Impedance: 50 ohms.
  - (3) Outer Conductor: Solid copper.

- (4) Grounding Kit: Kits must be furnished and installed to bond the transmission line at both the top and bottom of towers and at the bottom of non-tower (buildings) sites and at intervals not to exceed 75 feet along the transmission line between the top and bottom. Kits must be furnished and installed at all building entry points.
- (5) Hoisting Grip: The grips must be used at maximum 100-foot intervals for raising the transmission line on the structure.
- (6) Cable Clamps: Microflect/Valmont system of boots and cushions or equivalent must be used to attach the transmission line to the antenna support structure at intervals not to exceed the manufacturer's published recommendations.
- (7) Connectors: High-quality connectors required for each transmission line must be designed for use at 700/800 MHz and must be used at all installations. Nickel or chrome plated connectors must not be used.
- (8) Lightning Protection: Appropriate PolyPhaser, or approved equivalent, type entrance devices and lightning protectors must be provided at all locations. The lightning arrestors must be configured with Male and Female connectors to allow the removal of a failed lightning arrestor and direct reconnection of the coax cables without the use of a barrel connector.
- (9) Connectors for the equipment end of the transmission line must be field installed.
- (10) For price comparison purposes, all transmission line runs must be calculated for a length of 200 feet for each site, and costs must be proposed on this basis. The exact length of line for each site must be determined and supplied by Seller incidental to the Contract Price.
- (11) Equipment in-building interconnecting cables may be 1/4" or 1/2" Superflex coaxial cable to interconnect transmitter, combiner, receiver multicoupler, and antenna system transmission lines. However, all equipment in-building interconnecting cables must be either solid jacketed or double-shielded.

## **4.20 Computer Aided Dispatch Interface (CADI)**

- 4.20.1 The radio system must have an interface to the Kitsap 911 Hexagon Computer Aided Dispatch System (CAD) allowing information to be sent between the radio system and the CAD system if supported by the CAD system.
- 4.20.2 The CADI connection must be by industry standard TCP/IP connection using an industry standard Ethernet CAT6 interface. The interface must be to the CAD Ethernet LAN and any interface isolation must be provided by the radio system network interface.
- 4.20.3 Proposer must supply a list of all the interface commands and data available across the interface.

4.20.4 The system must support and be optionally supplied with the required hardware and software to provide the following functions as a minimum:

- (1) Push-to-talk ID: This function outputs the time, talkgroup ID, alias, unit ID of each Push-to-talk by any mobile, portable, control station, or console in the system in real time.
- (2) Talkgroup affiliation: This function outputs the time, talkgroup ID, and unit of each time a any mobile, portable, control station, or console in the system changes their talkgroup affiliation in real time.
- (3) Radio Check: This is a two-way function with the CAD system generating a “Radio Check” request to the system for a specific radio unit ID and the operational status of the radio as well as the time and affiliated talkgroup is returned to the CAD system.
- (4) Emergency Alert: This function outputs the time, talkgroup ID, alias, GPS location, and unit ID of each Emergency Alert button press by any mobile, portable, control station, or console in the system in real time.
- (5) Call Alert: This function allows a CAD operator to signal a “call alert” function to any mobile, portable, or control station in the system by unit ID. Activation of this function will send a Call Alert command to the specific unit ID and will return an acknowledging the Call Alert was or was not received by the unit.

4.20.5 The cost of the software and the hardware to implement this function must be included as an option to the system pricing. This cost includes any licensing fees required by the CAD vendor for the CAD vendor to develop an interface if a suitable one does not already exist.

## **4.21 Over-the-Air System Monitoring System**

4.21.1 Proposer must provide an over-the-air system monitoring system allowing the Buyer and Buyer’s maintenance personal to monitor the system “over-the-air”. This requirement must be done by monitoring the control channel of the system and recording and analyzing the control channel data. This system must provide the following:

- (1) Real time channel activity display showing the status of each channel, and if transmitting:
  - The talkgroup associated with the channel
  - The PTT ID of the unit currently transmitting
  - Call type of the unit currently transmitting (e.g., Emergency Call, Private Call, Talkgroup Call, etc.)
  - Any alarm conditions associated with the channel

- The length of time the actively transmitting unit has been transmitting in real time
- The length of time the channel has been keyed during this transmission
- Color coded display of the status for transmitting or idle

Channels must be organized on the display in a contiguous manner allowing all of the channels in the system to be seen on one screen.

- (2) All time stamps must be recorded for the Pacific time zone. Time stamps using Greenwich Mean Time or any other time zone are not acceptable.
- (3) Logging of all control channel data in its native format. The data must be automatically converted to “archive” files on a regular basis and shall break up the files into 24-hour blocks on a Buyer-defined hour. The Buyer must not be required to manually archive data to avoid losing it at any time.
- (4) Analysis of the control channel data to determine the following with the ability to generate and print reports for data on either a 15-minute or 1-hour interval on a regular basis showing:
  - Percent activity of each channel
  - Numbers of talkgroup calls
  - Average duration of the calls
  - Number of busies/blocked calls
  - Average duration of the busy/blocked calls
  - Longest duration of the busy/blocked calls
  - Average number of repeaters busy
  - Peak number of repeaters
  - Number of call alerts
  - Number of emergency alerts/calls
  - Number of private calls
  - Average duration of private calls
  - Number of data calls
  - Average duration of data calls

Reports must be able to be run for each day, each week, and each month based on the archived control channel data. It must also be possible to automatically generate daily, weekly, and monthly reports in any combination of the reports listed above.

- 4.21.2 One system must be supplied for each trunked RF site providing functions as an individual site. One simulcast subsystem is considered on RF site for the purposes of this system.
- 4.21.3 One system supplied must be portable with the software operating on a standard Microsoft Windows 10 or higher operating system on a laptop for portable use.
- 4.21.4 The RF modem/receiver for the monitoring system must be powered either by the laptop USB connection, +12 VDC, or 120 VAC, and have must the same receiver performance specifications as a mid-tier mobile radio or better.
- 4.21.5 The system software must be capable of being installed on multiple laptops or desktops without additional cost. Any licensing must be determined by the quantity of RF modem/receivers, not the copies of software. The use any copy of the software with any RF modem/receiver without restriction other than the software will need to be a version compatible with the RF modem/receiver being used. As an alternative, Proposer may propose using standard RF receivers and a hardware or software key for movement from device to device without restriction. The goal of this section is to be able to install multiple copies of the software in service or monitoring locations and then activate them using a single hardware key or by the RF modem itself based on the needs of the service personnel.

## **4.22 Over the Air Rekeying (OTAR)**

- 4.22.1 Proposer must fully describe the operation of their P25 Encryption Over the Air Rekeying using narrowband radio channels and cellular broadband services including:
  - (1) The radio user experience during OTAR and the radio options to change the user experience (narrowband and broadband)
  - (2) The approximate shortest time it takes to perform the rekeying operation for an individual mobile or portable radio (narrowband and broadband)
  - (3) The number of radio channels used during the rekeying operation (narrowband)
  - (4) The best-case number of rekeyed radios per hour per single rekeying channel (narrowband and broadband)
  - (5) Description of the rekeying operations and requirements of the system and user radio such as: must be turned on, must be in receive mode, etc. (narrowband and broadband)
  - (6) Description of any limitations placed on the user device or infrastructure during rekeying (narrowband and broadband)

- (7) Infrastructure requirements (narrowband and broadband)
- (8) Ability to program radios from a different manufacturer than those of the Seller's (narrowband and broadband)

4.22.2 This function shall be bid as an option.

## **4.23 Over the Air Programming (OTAP)**

4.23.1 Proposer must fully describe the operation of their Over the Air Programming including:

- (1) The radio user experience during OTAP and the radio options to change the user experience (narrowband and broadband)
- (2) The approximate shortest time it takes to perform the reprogramming operation for an individual mobile or portable radio (narrowband and broadband)
- (3) The number of radio channels used during the reprogramming operation (narrowband)
- (4) The best-case number of reprogrammed radios per hour per single reprogramming channel (narrowband and broadband)
- (5) Description of the reprogramming operations and requirements of the system and user radio such as: must be turned on, must be in receive mode, etc. (narrowband and broadband)
- (6) Description of any limitations placed on the user device or infrastructure during reprogramming (narrowband and broadband)
- (7) Infrastructure requirements
- (8) Ability to program radios from a different manufacturer than those of the Seller's (narrowband and broadband)

4.23.2 This function must be available as an option.

4.23.3 Proposer must provide a detailed discussion of the effectiveness and method to reprogram all user radios connected to the proposed P25 system when significantly changing the radio programming such as transitioning from conventional VHF operation to 700/800 MHz trunking operation. The discussion should include examples of customers having successfully used the proposed method for large scale reprogramming.

## **4.24 Broadband (Cellular Provided) Radio Services**

4.24.1 The Buyer wants to benefit from the increased coverage, over the air programming, over the air rekeying, location updates, and other broadband enabled services provided by cellular carriers.

- 4.24.2 Buyer requires a detailed explanation of the integration of the Proposer’s system with broadband systems. This explanation must be inclusive of all currently offered and supported methods of connectivity and any related connectivity services offered by the Proposer. Standard P25 interfaces and proprietary interfaces must be identified. Seller is encouraged to highlight their preferred method(s) for connectivity and offer any supporting material for their preference.
- 4.24.3 Proposer must identify the infrastructure, radio, and console system components needed to enable broadband services in the proposed network.
- 4.24.4 The capital and operating costs for broadband services must be identified and available as an option. The breakdown must include all costs per user device (one-time and recurring) and system costs (one-time and recurring) including interconnecting equipment and service subscriptions. If multiple broadband services are available in the proposed P25 system, each service must be identified with the associated capital and operating costs. Bundled services are allowed and encouraged, but for the purpose of the cost projections, the ongoing cost of each service/subscription must be detailed separately.
- 4.24.5 The Proposer must explain the user experience when the radio switches services between P25 Phase 2 trunking, analog conventional operation, and LTE services for push-to-talk calls such as:
- (1) Voice Services (i.e., group call, emergency call, priority call, preemptive call, scanning trunking system talkgroups, scanning conventional channels, simultaneously scanning trunking talkgroups and conventional channels)
  - (2) Data Services (i.e., radio ID, emergency alert, radio check, radio inhibit)
  - (3) Security Services (i.e., encryption, over the air rekeying)
  - (4) Other services (i.e., over the air reprogramming, radio management)
- 4.24.6 Proposer must provide information on the implementation of the broadband push-to-talk services.
- 4.24.7 Proposer must provide information on the design and implementation of the broadband push-to-talk services including the architecture of the broadband services within the LTE carrier network, external cloud-based services, the proposed P25 network, and any other elements of the service to assist with risk assessment of resilience and security concerns.
- 4.24.8 Proposer must also describe the services provisioned on the LTE carrier network such as mission critical push-to-talk (MCPTT), Mission Critical Data (MCData), Mission Critical Video (MCVideo), all IP data services, and any other related services with their priority.
- 4.24.9 Proposer must identify the prioritization of their applications within the broadband network.
- 4.24.10 Proposer must discuss interoperability scenarios:

- (1) Interoperability between Kitsap P25 users on the Kitsap P25 core and broadband users served by one broadband carrier network (users on Kitsap P25 and users on broad band carrier network)
- (2) Interoperability between Kitsap P25 users on the Kitsap P25 core and broadband users on broadband carrier networks provided by different carrier networks (users on Kitsap P25 core and users on two different broadband carrier networks)
- (3) Interoperability between Kitsap P25 core and other public safety agencies (i.e., Pierce County and Tacoma P25 users) on different broadband networks.

## **4.25 Wi-Fi Services**

- 4.25.1 The Buyer anticipates limited use of Wi-Fi, a collection of wireless local area networking technologies without handoff capabilities, for mission critical radio services in buildings. Wi-Fi is also expected for network management especially local access to network elements including Ethernet switches, routers, and user radios.
- 4.25.2 Proposer must describe the use of Wi-Fi in its proposal and the costs associated enabling Wi-Fi capabilities in user radios, switches, routers, user radios, and other network elements.
- 4.25.3 Proposer must identify the applicable IEEE standard (e.g., 802.11n, 802.11ac, 802.11ax) or the equivalent Wi-Fi Alliance name (e.g., Wi-Fi 4, Wi-Fi 5, Wi-Fi 6) for each device type and the applicable radio band (e.g., 2.4GHz, 5.8 GHz, 6GHz).

## **4.26 Radio Initiated Audio Test Call**

- 4.26.1 Proposer must provide a mechanism to perform an end-to-end radio call through the talk-in network elements to the radio system core and through the talk-out elements from the radio system core to the radio initiating the call to check the performance of the radio system. The call must not involve any actions by any other person other than the caller.
- 4.26.2 The radio user will originate a PTT call to its own radio ID, a specific radio ID, a talkgroup designated for the sole purpose of the end-to-end call test, or other mechanism. After call setup, the radio user will talk to the system and the system will playback the audio it received from the user.

## SECTION 5

# Transport System Requirements

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## 5.1 General

- 5.1.1 Buyer is responsible for supplying all site interconnections and transport using its microwave system and fiber links. Buyer will provide redundant transport links to each site. For any new radio sites required in the new P25 radio system, Buyer will supply back haul to the new site by modifying its microwave system or other back haul method after review of the proposed back haul solution with the Seller.
- 5.1.2 Buyer has a fully executed contract to replace its microwave system to support both native TDM (T1) traffic and native IP packet traffic to its existing radio sites.
- 5.1.3 The demarcation point between the Buyer's microwave network is the Ethernet ports on the microwave network. In other words, the Seller is responsible for all data cabling and equipment up to the port on the Buyer's equipment.
- 5.1.4 Seller provided networking equipment must provide redundant connectivity.
- 5.1.5 If Seller proposes a network based on MPLS for providing required quality of service, redundancy, and other capabilities for the radio system, the Buyer prefers a Nokia MPLS solution based on: 1) Kitsap 911 owns a Nokia SAR-8 for the path between Hansville Road and Cultus Bay, 2) Pierce County operates a Nokia MPLS system between Gold Mountain and the Purdy site, and 3) the overwhelming prevalence of Nokia MPLS networks in Public Safety, especially in Washington state. Other MPLS implementations may be proposed and will be considered.

## 5.2 Backhaul Requirements

- 5.2.1 The Proposal must include information related to the following:
  - (1) Minimum required and recommended backhaul bandwidth for connection between each remote site and the system controller(s).
  - (2) Minimum required and recommended transport bandwidth for connection between the primary dispatch facility and the system controller(s).
  - (3) Minimum required and recommended transport bandwidth for connection between the geographically diverse locations of system cores
  - (4) Details of all physical interfaces and requirements for the proposed new system equipment for future use should additional transport methods become available
  - (5) Any other transport requirements necessary for making a fully operable system

5.2.2 Seller must provide transport network compatible with the recently installed microwave system.

### **5.3 Data Networking Equipment**

5.3.1 Seller must supply their Ethernet data switches, routers, firewalls, and other equipment required for their system with a minimum of 25% of the used switch ports at each site for expansion for interconnection to Buyer supplied backhaul transport network. These unused switch ports must be provided in addition to:

- (1) Any unused ports required to comply with the supplied growth and expansion requirements specified
- (2) Ports assigned for local craft connections.
- (3) Ports assigned for port mirroring or Ethernet throughput testing.

5.3.2 If the system design requires the use of SFPs, a spare SFP must be installed in each device in at least one of the expansion capacity ports.

5.3.3 The Buyer prefers the data equipment to be powered by a nominal -48 VDC power source as described elsewhere in this specification. If the data equipment is powered by 120 VAC, the Seller must provide inverters or Uninterruptible Power Supplies with sufficient capacity to support the run time requirements of the Public Safety system.

5.3.4 The data equipment switch must allow for remote management, local access, and allow port mirroring as needed for troubleshooting purposes.

5.3.5 The data equipment must be rack mounted and properly grounded to a rack ground following Motorola R56 grounding guidelines and industry best practices.

## SECTION 6

# Site Improvement and Upgrade Requirements

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## 6.1 General

- 6.1.1 Except as described elsewhere in the Proposal Documents, all necessary site improvements at the remote sites, dispatch center, system controller location, and any other fixed-equipment locations will be performed by Buyer. This scope includes but is not limited to any improvements, modifications, or additions to the grounding systems, AC power systems, heating, equipment shelters, towers, ventilation, and air conditioning (HVAC) systems
- 6.1.2 Securing of Seller supplied equipment to meet seismic requirements is the responsibility of the Seller.
- 6.1.3 Space and power are not limitations at most of the Kitsap 911 sites. Depending on the Seller's space requirements, very few sites may need to have existing equipment relocated to a nearby rack or the existing may need to be slid to a temporary location near its original location. Relocation of the equipment is the responsibility of the Seller working with Kitsap 911. Under all circumstances, Seller must ensure operation of the existing equipment, regardless of its installed location, is not interrupted without prior approval of the Buyer.
- 6.1.4 Seller is encouraged to minimize the floor and rack space required at each location.
- 6.1.5 Seller must specify the following for each location of proposed fixed infrastructure equipment so the Buyer can determine the effects on the proposed equipment on the site requirements:
- (1) Equipment space requirements, including:
    - Number of rack spaces required
    - Rack dimensions, including, width, depth, and height, with all equipment installed
    - Any interior non-rack space required
  - (2) Equipment heat and power loads including:
    - Number of AC circuits required and what current and voltage ratings
    - Number of DC circuits required and what current and voltage ratings

## (3) Antenna requirements, including:

- Number and types of antennas required, including all transmit, receive, GPS, and any other necessary antennas
- Necessary installation space for each antenna
- Mechanical/wind loads for each antenna
- Antenna mounting requirements

## (4) Any additional requirements or preparations necessary for equipment or antenna installation

- 6.1.6 Buyer will develop applications, apply for, attend public hearings, provide responses to questions, for all permits, FAA clearance and review, tribal notifications, and any other environmental, tower, antenna, land use, historical, or related permits and/or approvals required for this project. Buyer will pay the actual permit application fee directly.
- 6.1.7 Seller must provide a normal length of calendar time for obtaining permits and site construction in their project schedule.

**6.2 Seismic**

- 6.2.1 Seller supplied equipment systems and seismic bracing must be capable of withstanding the effects of earthquake motions as defined in seismic design parameters of the adopted edition of the Revised Code of Washington (state) Chapter 70.86.

**6.3 Shelter and Equipment Grounding**

- 6.3.1 A grounding system using a “single-point” grounding concept is provided by the Buyer at each existing location. Seller must make all connections to the existing grounding system for all equipment provided by the Seller following established industry best practices.
- 6.3.2 For new locations, Seller must provide a grounding system and make all necessary grounding connections.
- 6.3.3 Existing locations have Transtector PEEP style cable entrance panels with sufficient capacity for additional RF cables; however, some entrance panels are at capacity and cables may need to share ports. Parts for the cable entrance panels are still available for Transtector.
- 6.3.4 Seller is responsible for cable entry panels, surge protectors, grounding hardware, and any other associated hardware for any new sites.
- 6.3.5 An internal perimeter ground bus is provided at existing site using #2 green-jacketed copper-stranded wire or ¼-inch copper bus bar.

- 6.3.6 For new sites, the Seller must install the interior ground bus following industry practices, manufacturer approved methods, or following the direction of the Buyer's Project Manager.
- 6.3.7 The Seller must install grounding conductors along the cable tray or other suitable support medium. One end of the conductor must be bonded to the rack, equipment support apparatus, or other metal equipment. The other end of the conductor must be bonded to the ground bus or internal perimeter ground bus conductor. All grounding conductors must be bonded to the ground bus conductor using suitable, approved methods.
- 6.3.8 The equipment grounding conductor must be a #6 AWG, or larger, green-jacketed, stranded-copper conductor. Braided conductor must not be used.
- 6.3.9 Grounding and bonding conductors must be installed in a direct path with bends no less than an 8-inch radius. Bends with an included angle of less than 90 degrees are not allowed. All grounding conductors must be cut to proper length to ensure the conductors do not create an electrical choke or unintended path for lightning strikes.

## 6.4 Materials

- 6.4.1 As applicable, materials must conform to the following specifications.
- (1) Structural-Steel Shapes: ASTM A 36/A 36M or ASTM A 529/A 529M
  - (2) Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi minimum yield strength
  - (3) Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 coating designation; mill phosphatized
  - (4) Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M and the following requirements:
    - Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality
    - Color: To be specified by Buyer from manufacturer's samples
  - (5) Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers
    - Finish: Hot-dip zinc coating, ASTM A 153, Class C
  - (6) High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers

- Finish: Hot-dip zinc coating, ASTM A 153, Class C
- (7) Anchor Rods, Bolts, Nuts, and Washers: As follows:
- Unheaded Bolts: ASTM A 687, high strength
  - Headed Bolts: ASTM A 490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts
  - Washers: ASTM A 36/A 36M
- (8) Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, capability to provide a sound foundation for field-applied topcoats despite prolonged exposure, and as follows:
- Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer; complying with performance requirements of FS TT-P-664
- (9) Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755/A755M and the following requirements:
- Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality

## 6.5 Antenna Mounts

- 6.5.1 Tower attached antenna mounts must be furnished and installed by the Seller. Buyer and Seller must agree on antenna mounting hardware, elevation, azimuth, and other technical parameters prior to installation.
- 6.5.2 Sellers must supply all antenna mounting hardware required to fasten or install the antenna.

## 6.6 Transmission Line Supports

- 6.6.1 Transmission line supports must be furnished and installed by the Seller as needed.
- 6.6.2 Transmission lines must be installed and supported following cable manufacturer instructions, not to exceed more than 42 inches between supports.
- 6.6.3 The transmission lines must be routed to an in-ground cable trench or an overhead ice-bridge depending on the site conditions.

## SECTION 7

# DC Power Interface Requirements

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## 7.1 General

- 7.1.1 For existing and sites, Buyer will provide all necessary -48 VDC power, including rectifiers, chargers, batteries, and primary circuit breakers, at all remote sites, dispatch centers, system controller location, and any other fixed-equipment locations as necessary.
- 7.1.2 For all new sites, Seller will furnish and install all necessary -48 VDC power, including rectifiers, chargers, batteries, and primary circuit breakers, cables, conduit, and connectors as necessary.
- 7.1.3 Industry standard power at the top of the DC power rack as defined by:
  - (1) Voltage range: -43.0 VDC to -56.4 VDC (-48 VDC nominal)
  - (2) Ripple and Noise: 30 millivolts
  - (3) Low voltage cut off at -42 VDC and reconnect when power is reapplied to the charger at -49 VDC.
- 7.1.4 DC power circuits must use a black colored wire for ground connections regardless of polarity.
- 7.1.5 DC power circuits must use red for – 48 VDC. If other voltages are used such as +12 VDC, the equipment supplied by Seller must use a different color than red or the wires must be marked continuously as to their voltage.
- 7.1.6 Installation of DC power circuits must comply with the National Electrical Code. NEC Article 336 requires TC or TC-ER rated cables in cable trays. Alternatively, DC conductors in cable trays may be run in Electrical Non-metallic Tube (ENT) commonly called smurf tube.
- 7.1.7 Unless otherwise approved by Buyer, Seller must furnish and install an appropriately sized circuit breaker panel at the top of each equipment rack, including appropriately sized circuit breakers, to allow each piece of equipment installed in each rack to be individually powered on and off.
- 7.1.8 Seller must furnish and install appropriately sized wiring between each rack's circuit breaker panel and the site's primary DC plant.
- 7.1.9 All RF-site equipment must operate on industry standard -48 VDC power. This requirement includes base stations, routers, switches, controllers, etc.

- 7.1.10 Seller must furnish and install any necessary DC-to-DC converters required to support voltages other than -48 VDC. If any such converters are used, circuit breakers must also be used on the output to control each piece of equipment powers by the converter(s).
- 7.1.11 To ensure adequate -48 VDC power is made available by the Buyer, Seller must specify the current load for each piece of equipment proposed to be installed at each site, plus the total -48 VDC current load for all proposed equipment at each site.
- 7.1.12 Proposer must detail the DC power plant design requirements in their Proposal including design calculations and assumptions, operating parameters, and system technical information to fully describe the DC power equipment and system requirements.

## **7.2 Power Distribution**

- 7.2.1 Any 12 VDC distribution planned for load rack locations must have its own load power distribution panel.
- 7.2.2 DC Power Distribution in the load racks must be provided as required by the system design. DC distribution must be designed to reduce the amount of equipment losing power when a circuit breaker is turned off. At the very minimum, equipment should be connected so the loss of a single power circuit does not affect the redundancy of the equipment design.
- 7.2.3 The distribution panels must incorporate circuit breakers providing a connection to each circuit breaker to indicate when it has tripped because of an overload condition and an alarm relay providing a Form C dry contact closure when any of the circuit breakers are tripped.
- 7.2.4 All wiring to the loads must be done by Seller. All wiring must comply with the NEC wiring methods.
- 7.2.5 Any equipment (load) rack with a circuit breaker distribution installed as part of this work must have its own power and ground buses of suitable size for the equipment loads and be electrically isolated from the rack itself.

## **7.3 DC-to-DC Converter Specifications**

- 7.3.1 Any 48V DC to 12V DC converter supplied must supply its rated output voltage  $\pm 2\%$  at the load with an input range of -41 to -60 VDC.
- 7.3.2 The output noise must not exceed 10mV RMS (10 kHz to 10 MHz), 150 mV peak to peak (10 kHz to 100 MHz), and 26 dBmC measured at the DC output terminals for all ranges of load values.
- 7.3.3 The converters must have Form C alarm contacts to indicate a converter failure.
- 7.3.4 The voltage regulation from no load to full load must be 1 percent or better.

- 7.3.5 The converters must have the following indicators as a minimum: Input DC, Output DC, Failure.
- 7.3.6 The converters must be equipped with the following meters: DC output voltage, DC output current. The meters must have an accuracy of 2 percent or greater
- 7.3.7 The converters must automatically restart when the cause of the shutdown has been removed.
- 7.3.8 Converters must operate at full output capability over a temperature range of -20°C to 50°C, relative humidity 5 percent to 95 percent.
- 7.3.9 The converters must have an adjustable over-voltage protection limiting the maximum output voltage to no more than the rated voltage +10 percent.
- 7.3.10 The converters are all planned for installation at load racks. Seller must furnish and install all equipment and hardware required to mount the specified equipment in 19-inch racks.

## **7.4 Inverters**

- 7.4.1 Any inverters must provide filtered 120V AC output with an AC ripple component of less than 0.03 volts RMS (30 millivolts). Random electrical noise levels must be 32 dBrc or less measured at the output terminals for all load currents.
- 7.4.2 The input voltage range must be -42 to -60 VDC minimum.
- 7.4.3 The output waveform must be sinusoidal with a THD <2 percent for linear loads and <3 percent for non-linear loads from 0 to 100 percent load.
- 7.4.4 All inverters must be capable of supplying 120 VAC at 1 kW load continuously at +25°C temperature.
- 7.4.5 The inverter AC grounding and neutral connection must be installed in compliance with the NEC. The inverter must be defined as a separately derived system for code requirements.

## SECTION 8

# Training Requirements

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### 8.1 General

- 8.1.1 Seller must provide a recommended list of training for the Kitsap 911 radio system. A catalog of available training and a budgeted line item for training is not sufficient to meet this requirement.
- 8.1.2 Seller must train personnel selected by Buyer in the operation and maintenance of all the equipment supplied under this contract. The training must be for Buyer's training, technical, management, and end user personnel. All training must take place at the Kitsap 911 training/meeting room. This training must occur as close to cutover as possible.
- 8.1.3 Seller must assist with the development of training content for "Train the Trainer" delivery for end-user of radio users and end-user training in the operation of all of the user console equipment supplied. This training must include:
- (1) Training aids to be used by the trainers to train Buyer's staff and line personnel. Seller must grant Buyer permission to copy and use any training aids received for training users of the console system.
  - (2) Vendor activities to support the development of "End User" training on mobile and portable user radios. Training develop is expected to be slightly different between law enforcement users and fire users.
  - (3) The radio system and console system training must consist of "End User" and "System Manager" training. The "End User" and "System Manager" training classes must be separate and onsite. The "End User" training must also be used to train Buyer's trainers. Training must include all proposed systems.
  - (4) Manuals or operating guides must be provided for each student in the "System Manager" training sessions.
  - (5) Seller must provide overall system management training. These classes must be given Monday-Friday 0800-1700 hours at a location in Bremerton, Washington.
  - (6) Seller must provide training for any optional features provided with the system. These classes must be held in Bremerton, Washington.
- 8.1.4 Seller may be required to provide additional hours of training after contract award.
- 8.1.5 Seller must coordinate any training schedule with Buyer 45 days prior to starting any training. Concurrently the Seller must provide concise and comprehensive collection of training materials for Buyer's approval.

- 8.1.6 Seller must supply to Buyer for its approval a sample of all training materials 15 days prior to the start of any training classes.
- 8.1.7 Seller must provide class schedules, syllabi, and costs for basic system technical training. The purpose of this training is to allow Buyer's technical personnel to perform Tier 1 maintenance on all the equipment provided. Maintenance activities include troubleshooting and repair to the major assembly and Field Replaceable Unit (FRU) level. This training must include as a minimum the following:
- (1) Detailed explanation of system design.
  - (2) Detailed explanation of communication network structure.
  - (3) Detailed instructions on modifying and/or adding new sites, users, base stations, channels, MPLS routers, etc.
  - (4) Detailed instructions on modifying and/or adding system parameters,
  - (5) Detailed explanation of Intersystem Interfaces.
  - (6) Detailed explanations of operational, backup, recovery, and restart procedures.
  - (7) Fleetmapping and radio programming.
  - (8) Diagnostics.
  - (9) Detailed instructions on repair to the FRU level.
  - (10) Detailed instructions on software and hardware updates.
  - (11) Other topics as required to maintain the system.
- 8.1.8 Proposer must define training for the system software and functions. This training must not be a quick functional overview but must include the following topics:
- (1) Operating System basics.
  - (2) Detailed explanations and instructions on adding or modifying functions.
  - (3) Detailed explanations and instructions for performing diagnostics as well as addressing performance issues such as slow database query times or slow operator position data response times.
- 8.1.9 Proposer must provide cost and class information for factory training of technical personnel on a per-student basis as outlined in the pricing tables. The cost for recommended technician and management factory-based training for two Buyer's personnel, not including travel expenses, must be provided in the base cost of the system. The specific recommended classes must be listed in the Proposal. In addition, these classes must be bid as an option for additional personnel or additional training desired.

8.1.10 Seller must provide materials and training to train mobile and portable radio end users. This training must include training on each mobile and portable model supplied to Kitsap 911 with “Train the-Trainer” classroom training and end user training materials and resources for the Buyer’s trainers to use and provide to the end users. This training must be included in the base bid.

## SECTION 9

# Data Network Requirements

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This section defines the data network standards and requirements.

## 9.1 General

- 9.1.1 Proposer must specify, in the network design, the system requirements for backhaul bandwidth, as indicated in the Transport section of this specification.
- 9.1.2 The following guidelines are provided for personnel involved in the installation of equipment including, but not limited to, network cabling, devices, and systems. Any variation in these guidelines require the approval of the Buyer's Project Manager.
- (1) Seller must provide all personnel to perform the installation, configuration, programming and testing of equipment and systems at Buyer's locations or elsewhere as required. Buyer's technical staff may assist with network usage, interface, and other issues concerning Buyer's existing networks.
  - (2) Network device programming and configuration must be done by, or under the direct supervision of, a manufacturer-certified technician holding endorsements in the specific equipment.

## 9.2 Standards

- 9.2.1 All Buyer installation, implementation, and other standards apply to the Data Network System in addition to the standards indicated in this section.
- 9.2.2 The following are referenced and considered by the Buyer to be standard practices:
- (1) TIA/EIA-568-B – Twisted pair cabling
  - (2) NFPA 1221 – Standard for Installation, Maintenance, and Use of Emergency Communications Systems
  - (3) NFPA 70 – National Electrical Code
  - (4) BICSI Telecommunications Distribution Methods Manual
- 9.2.3 Unless specified otherwise, all intra-rack, inter-rack, data cabling must use Category 6 or 6A cabling and jacks configured as TIA/EIA 568-B terminations.
- 9.2.4 All materials must be new, unused and delivered to the job site in original manufacturer or distributor cartons or packages. No previously installed material may be used at any time.
- 9.2.5 Only plenum rated cabling must be used in plenum spaces.

## 9.3 Design

- 9.3.1 Seller must provide a complete design, including logical and physical diagrams and textual explanations, for the systems' data networks, including:
- (1) Protocol and bandwidth required for each portion of the network, including intra-site and in-building, noting the ownership of each major segment on the diagram.
  - (2) Points of interconnect with Buyer's existing networks.
  - (3) All points of access into the system networks from outside the system subnetwork (i.e., Buyer's Enterprise networks, the public Internet).
  - (4) All network devices used by Seller's systems.
  - (5) Addressing scheme showing subnets, virtual LANs, encrypted zones, and other topological features of the overall network.
- 9.3.2 Buyer's Project Manager will review and approve the data network design prior to the ordering of equipment
- 9.3.3 Use of wireless access points directly connected to the system's networks is prohibited.

## 9.4 Racks

- 9.4.1 Seller must furnish all required equipment racks, cable management, grounding, power distribution, seismic bracing, and installation for Seller's equipment. Unless otherwise specified, all equipment racks must be Chatsworth #55053-503 (19" x 7') or approved equivalent with side trough cable management. The 911 Carver, Gold Mountain, and View Park locations require 9-foot racks or cabinets.
- 9.4.2 Seller must install all racks to meet local Seismic Code survivability requirements as defined in the seismic design parameters of the adopted edition of the Washington State Building Code and local requirements.
- 9.4.3 Different cable management configurations may be needed at each remote site due to local variations. Cable management option must be presented to Buyer's Project Manager for review and approval before equipment is ordered.
- 9.4.4 Seller must install and properly ground each rack, and each piece of equipment in each rack.
- 9.4.5 Seller must provide rack face and side elevations of each equipment rack as anticipated to be deployed, such drawings also clearly identifying the ground points and path for each piece of equipment.

## 9.5 Cable System Installation Practices

- 9.5.1 Equipment requiring specific DTE and/or DCE connections must be clearly marked at each part. Cabling between such equipment must be clearly and permanently labeled as to which end is DTE and which is DCE.
- 9.5.2 Backbone infrastructure (e.g., cabling between the Main Distribution Frame – MDF – and Intermediate Distribution Frames – IDFs) must be terminated at type 66 (with 25 pair female connector, hinged cover, and mounting bracket) style connector blocks arranged in patch panels at designated locations, using sheathing, connection blocks, and procedures detailed herein.
- 9.5.3 Interconnect cabling between and equipment must terminate on either 25-pin, Amphenol style connectors on the back of patch panels or may use insulation displacement punch down connections depending on the manufacturer.
- 9.5.4 All network connections between the IDF equipment and workstations must be terminated in modular jacks at both ends.
- 9.5.5 Cable tie devices must not be used at any time; only hook-and-loop (a.k.a. Velcro©) style straps are permitted. Straps used in the MDF and IDFs must be spaced no more than 3 feet apart for the entirety of the run.
- 9.5.6 All pull ropes and like devices used during installation must be replaced in all pathways for future use.
- 9.5.7 Seller must follow manufacturer’s specifications about cable length, bend radius, environmental restrictions and mounting.
- 9.5.8 Cable must not be pulled through L-bend devices without prior approval of Buyer's Project Manager.
- 9.5.9 Cable with any sign of kinks, bends, twists or other damage or deformity must be considered faulty and replaced with good quality cable.
- 9.5.10 Cabling must never be attached to power cables or devices, lighting systems, or be located in any pathway with power cabling.
- 9.5.11 Cable tray must not surpass more than 50 percent of its rated capacity.
- 9.5.12 Innerduct must not be filled to more than 50 percent of its rated capacity.
- 9.5.13 All fiber optic cabling must be contained in orange or yellow raceway/ENT to distinguish it from other cabling.
- 9.5.14 All cabling must be cut to fit, include a service loop where appropriate, and be labeled on both ends.
- 9.5.15 The following color codes must be used:

- Red – alarm cabling
- White – analog telephony station cabling and patch cables
- Blue – Ethernet generic data cables
- Yellow – Cat 6/6A patch cables
- Green – radio system Ethernet data cables

## **9.6 Patch Panels**

- 9.6.1 Patch panels must be 24 or 48 modular jack ports, wired to T568B, with wire management on the horizontal/workstation/inter-intra rack side. Patch panels must terminate the building cabling on Amphenol-style multi-pin cables from the 66-block style insulation displacement connection blocks serving as terminations of the MDF network cabling where non-data connections are made.
- 9.6.2 A 1U (minimum) horizontal cable management bracket must be installed immediately below each patch panel.
- 9.6.3 All ports on each patch panel must be labeled with a unique identifier describing rack number, patch panel number and port number.

## **9.7 Testing**

- 9.7.1 Seller must provide written proof that each segment of cable was tested and certified by a competent and certified third party to be compliant with ANSI/TIA/EIA568-B Category 6 or 6A specifications.
- 9.7.2 Seller must provide written proof of end to end, full network testing performed by a competent and certified third-party showing throughput and maximum bandwidth capacity.

## **9.8 Network Devices**

- 9.8.1 Seller must furnish and install all routers, switches, firewalls, and other devices required for a complete system for connection to Buyer's demarcation point. Buyer must supply a redundant Ethernet connection from each remote site to the common or master sites as required.
- 9.8.2 All network devices must be of commercial quality; designed for high traffic environments; and be made and supported by recognized industry leaders as determined by Buyer.
- 9.8.3 Commercial, off-the-shelf network devices, software, and technology are highly preferred. Proposer must clearly note any device, software or technology used in the network that is proprietary, custom, or not widely available.

- 9.8.4 All devices must be “managed” and integrated by the Seller into the Network Management system described elsewhere.
- 9.8.5 All managed devices must be accessible through secure access control only. The use of a username and password is the minimum satisfactory response to this requirement.
- 9.8.6 Use of hubs is prohibited without prior approval of Buyer's Project Manager.
- 9.8.7 Seller must furnish, install, and configure firewall software and/or appliance devices.
- 9.8.8 Inclusion of Intrusion Detection/Prevention Systems must be provided as required.

## SECTION 10

# Logging Recorder Interface Requirements

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This section identifies requirements and specifications for interfaces to voice logging systems.

## 10.1 General

- 10.1.1 Buyer will provide a logging recorder system capable of capturing, storing, reconstructing, and playing back audio and digital data from the proposed APCO Project 25 (P25) compliant radio system (and other Kitsap 911 sources such as existing legacy radio channels, the dispatch console system, and other Kitsap 911 system).
- 10.1.2 Buyer has a manufacturer discontinued logging recorder due for replacement as documented in the Existing System Description.
- 10.1.3 Seller must assume redundant logging recorders with geodiversity but be prepared to discuss a non-redundant implementation.
- 10.1.4 Seller must supply a list of supported logging recorders identifying the number of logging recorder installations in service for the proposed radio system. For example:
  - Recorder Manufacturer 1 – 100 installations in service for proposed P25 system
  - Recorder Manufacturer 2 – 10 installations in service for proposed P25 system
- 10.1.5 Seller must provide the technical requirements of the logging recorder and the P25 system for each supported logging recorder system. These technical requirements should address analog and SIP channel capacities, the mechanism for enable recording (i.e., Hook status, VOX, thresholds, gains, timers), encoding, and other settings necessary for integration of the P25 system to the recorder.
- 10.1.6 Seller must provide the P25 system costs (i.e., hardware, software, services, monthly recurring support costs) for each supported logging recorder system to assist Buyer in determining the total cost of the logging recorder solution.
- 10.1.7 Seller must discuss the plan for the integration and acceptance testing of the P25 radio system including the logging recorder interface(s) and logging recorder(s).

## SECTION 11

# Console System Requirements

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This section details requirements for configuring the existing Zetron ACOM console dispatch system to the new P25 radio system. As an option the Seller may also propose a new dispatch console system furnished and installed as part of this radio system procurement.

The console system requirements are organized into:

- (1) General Console System Information
- (2) Requirements for Interfacing with Radio Systems
- (3) Console Controller and Network/Infrastructure Requirements
- (4) Dispatch Console Requirements
- (5) Remote Desktop Requirements
- (6) Control Station Requirements
- (7) Console Installation Requirements
- (8) Required System Options

This specification details requirements for:

- An upgrade of capabilities to the existing of the console dispatch system and a replacement dispatch console system
- Optional replacement of the existing console dispatch system.

The upgrading or replacement of the console system must be installed and made operational with minimal console operator disruption.

Acceptance testing will be developed by Seller and will be dependent on the radio system interfaces and console system features, functions, and operation.

Note: For purposes of this specification the terms “channel” and “talk group” are interchangeable.

## 11.1 Existing System Description

- 11.1.1 A very detailed description of the existing Zetron console system is found in a separate document called the *Existing System Description*. The description includes information on console positions, screenshots, connection diagrams, and accessories.

## 11.2 Upgrade Capabilities of Existing Dispatch Console System and Optional Replacement

11.2.1 Proposer must provide a detailed description and detailed equipment, licensing, services, and recurring costs (operations, maintenance, support, etc.) to upgrade the existing Zetron ACOM Novus dispatch console system (or option to replace the dispatch console system) to interface to the new P25 radio system. The Proposer may also propose to replace the dispatch console system as an option. The upgrade and optional replacement proposal must use the following assumptions:

- (1) No change in the number of console positions at the 911 Carver (20 positions plus system management and station alerting positions. See Table 1-17 in the *Existing System Description*) and remote console positions (45 remote console kits with 20 concurrent licenses).
- (2) Proposer will identify the functions and locations of elements of the console system. Connectivity between elements must be included and specified as to preferred media, minimum bandwidth required, protocol, and any other defining characteristic the Proposer deems necessary for proper preparation of their Proposal.
- (3) Move the redundant console control system to a geodiverse location in Kitsap County. Kitsap 911 will provide network connections.
- (4) New P25 system will support encryption on some Law Agency talkgroups.

11.2.2 Proposer must discuss the two options for encryption, namely encryption in the radio core, and encryption in the console positions, with a comparison of all costs (in console system and radio system) and benefits.

11.2.3 The design, sizing, and all costs to add a geodiverse CSSI interface for the new P25 system must be provided. Costs must break out feature costs in the radio core, licensing costs for talkpaths/ talkgroups/ SIP sessions as applicable, and the services to the upgrade to the radio system and console system.

11.2.4 Proposer must provide a plan and the costs to include system acceptance of the upgraded console system and the integration of the upgraded console system to the new P25 radio system as a part of the factory acceptance testing of the new P25 radio system without operational risk to the production dispatch console. Proposer must provide the plan for this testing such as using a demonstration system, use of secure VPN links, temporary use of another console system, etc.

## 11.3 General Requirements for the Dispatch Console System

11.3.1 This section defines a set of general requirements for the proposed replacement console system. Proposer must make sure they understand the interfaces and their associated complexity. This Document outlines the requirements and provides information on the specific interfaces. In addition, information about the operation of the existing system is

included. Buyer desires a highly reliable and resilient console system. Maintaining service to the public during emergency conditions is a high priority goal and the console system must support this goal.

### 11.3.2 System Elements

- (1) Proposer will identify the functions and locations of elements of the console system. Connectivity between elements must be included and specified as to preferred media, minimum bandwidth required, protocol, and any other defining characteristic the Proposer deems necessary for proper preparation of their Proposal.
- (2) The Proposal must include, at minimum, these elements:
  - (a) The console system controller to be located at the 911 Carver location
  - (b) Redundant console system controller supporting geodiversity at a location in Kitsap County to be determined. Kitsap 911 will provide transport facilities between the two locations.
  - (c) Twenty console positions at the 911 Carver location
  - (d) Twenty remote console positions for dispatching radio calls from an Internet connected location
- (3) There are no requirements for door opening or other device-operating, “Aux IO” type connections on the radio console

### 11.3.3 Implementation Approach – Upgraded Zetron Acom System

- (1) The exact implementation process will be determined in part by the new radio system vendor and technology. However, Buyer’s general concept to implement the radio console system is as follows:
  - (e) Design, procure, and upgrade the existing Zetron Acom system to operate with the existing analog VHF/UHF system and the new P25 radio system.
  - (f) Test the Zetron console system during factory staging tests of the new P25 radio system. Proposer must clearly identify the details of a plan to perform integration tests of the upgraded Zetron console system with the existing system and the new P25 radio system. Buyer prefers to implement the upgraded Zetron console system during field implementation of the new P25 system, but integration testing of the upgraded console system with the new P25 system must be done before the P25 system is completed.
  - (g) Install console equipment at Kitsap 911 at a predetermined number of positions to verify proper operation and training.
  - (h) When the new console system is ready for full deployment, place remaining consoles in service.

#### 11.3.4 Implementation Approach – New Console System

- (1) The exact implementation process will be determined in part by the new radio system vendor and technology. However, Buyer’s general concept to implement the radio console system is as follows:
  - (i) Design, procure, and replace the dispatch console system to operate with the existing analog VHF/UHF system and the new P25 radio system.
  - (j) Test the new console system during factory staging tests of the new P25 radio system. Buyer prefers to implement the new console system prior to the field implementation of the new P25 system.
  - (k) Install console equipment at Kitsap 911 at a predetermined number of positions to verify proper operation and training.
  - (l) When the new console system is ready for full deployment, place remaining consoles in service.

### 11.4 Requirements for Interface with Radio Systems

11.4.1 As a minimum, the trunked radio console system interface must provide the following functions as specified by the APCO Project 25 standards for the trunked radio system.

- (1) Talkgroup Call.
- (2) Multiple Talkgroup Simultaneous Selection.
- (3) Calling unit PTT-ID display.
- (4) Display of the current radio site associated with the radio.
- (5) Emergency Alert showing the unit ID and site affiliated with the radio. An audible indication must also be provided. The dispatcher must have the ability to silence the audible indication but not the visual indication. The visual indication must not clear until it is cleared by the field unit initiating the call or by the dispatch supervisor. The indication must display on all console positions assigned to dispatch for the agency of the radio.
- (6) Console priority for the dispatcher transmit audio has priority over field unit audio.
- (7) Unit disable from the supervisor’s console. This feature will allow a supervisor to temporarily disable a field unit so it cannot transmit.
- (8) Talkgroup merge, allowing the dispatcher to merge several different talkgroups together into a single talkgroup.

- (9) Control and display of radio system function controls on the dispatch console screen as follows (at a minimum):
  - (a) Volume Control.
  - (b) Select and unselect.
  - (c) PTT.
  - (d) Call indication.
  - (e) PTT ANI.

#### 11.4.2 Interface Hardware Requirements

- (1) Seller must provide all hardware required to meet the functional requirements of the system. In addition to this equipment, the Vendor must provide:
  - (a) Notch filters to prevent the keying tones from being heard on the console speakers, recorders, and remote monitor speakers as applicable. A notch-type reject filter must also be incorporated in the system to prevent speech interference with the continuous keying tone. The filters must be sufficiently narrow so as not to affect the clarity and intelligibility of the audio signals.
  - (b) Each transmit channel must be equipped with a line transformer providing a balanced 600-ohm nominal impedance or by jumper or programming option a 10,000-ohm bridging impedance.

#### 11.4.3 Console Controller Design and Functional Requirements

- (1) The system must support all current functions, limited only by the functionality of the new radio system.
- (2) The system administrator must be able to limit the maximum and minimum settings for the volume control of each talk group/channel so a minimum and maximum adjusted volume can be set system wide, and system wide setting may not be alterable by system users.
- (3) The system administrator must be able to assign a text label of not less than 12 characters to each console in the system. The label is used for intercom, reporting, and identification purposes.
- (4) The system must be designed to be inherently redundant and resilient. The Proposer must provide detailed information regarding the system's redundancy and resiliency features.

(5) The interface to the controllers must be redundant as limited by the radio system controllers. The failure of one radio system controller must not cause a complete failure of the console system.

(6) Paging and Signaling

- (a) The console system must support DTMF signaling over the P25 trunked radio system so the consoles can signal using DTMF.
- (b) The console system must support all standard Quick Call and Quick Call II type 2-tone sequential signaling formats over conventional analog resources.
- (c) The system must support Plectron tone signaling over analog conventional resources by providing the ability to program audio frequency paging tones in the frequency range from 300 Hz to 3200 Hz each with an individually programmable tone frequency, duration, and inter-tone gap.
- (d) The system must support the ability to stack up to 10 pages for a single transmission.
- (e) The system must provide for automatic transmitter selection for paging on conventional channels where the paging site and frequency can be programmed as part of the paging tone configuration.
- (f) The system must log and time stamp all paging operations with the channel the paging occurred on, the console position initiating the page, and the transmitted tones/signaling.

(7) Maintenance Modes

- (a) The system must be configured so all controllers may be removed from service for maintenance activity except one to continue operating the console system.
- (b) The system hardware and software must be designed so hardware and software diagnostic programs may be run on one of the redundant controllers without affecting the other computer operating the console system.
- (c) Proposer must identify in their Proposal the various maintenance modes available and must identify any maintenance activity requiring taking multiple controllers out of service.
- (d) Maintenance modes must be accessible from both local and remote access.
- (e) The system must have the ability to block remote initiation of any maintenance mode with the potential to cause the system to fail.

(8) Diagnostics

- (a) The system must be equipped with diagnostic facilities continuously testing, monitoring, and verifying the proper operation of the system. When a fault is found, a visual display and an audible alarm will sound at the supervisor's console alerting the operator of a fault. The audible alarm must be disabled by actuating a function control on the display monitor.
- (b) A computer log output must be provided displaying in plain English the diagnostic fault output, type, date, and time of the fault. A function control must also be provided to interrogate the status of the system, initiate diagnostics, and provide a log entry or output.

#### 11.4.4 Controller Hardware Requirements

- (1) Proposer must supply detailed information regarding the following:
  - (a) Controller hardware (make, model, CPU, RAM, form factor, power requirements, number of drives, and heat load)
  - (b) Operating system
  - (c) Software applications
- (2) A local rack mounted keyboard, monitor screen, and KVM switch must be installed at each console server location for access to the associated servers. The KVM switch capacity for at least two spare ports remain for future use.
- (3) Displays for console server computers must be of the fold up, rack mountable type with integrated mouse and keyboard.
- (4) The equipment must be designed to permit the removal and replacement of the radio system interface circuit boards without turning off the power to the system.
- (5) The console controller system hardware must be redundant. Proposer must identify the controller hardware and the system response to individual controller hardware elements.

## 11.5 Dispatch Console Requirements

- 11.5.1 The intent of this section is to define the requirements for the console hardware and software related to the console system. This section defines requirements for both the new system and compatibility with the existing VHF radio system. Proposer is encouraged to verify the performance of their equipment to these requirements. Proposer must comply with the requirements set forth in this section and must identify in their Proposal how this is accomplished.

### 11.5.2 Delay and Acoustics

- (1) The console system is used in a close spaced environment with speakers and headsets. Audio delay between speakers with the same audio at different console positions results in an unacceptable audio environment in the dispatch center. As a result, Buyer considers minimizing audio delay between console positions located in the same operational area or room to be critical.
- (2) The console system must be considered VoIP Priority Level 5 (Interactive Media and Voice) for purposes of packet prioritization. The system must not introduce more than 99 msec of delay in the audio path to avoid distortion.
- (3) Proposer must identify in their Proposal the mechanisms to manage and control audio delay between consoles.

### 11.5.3 Dispatch Console Software Requirements

- (1) Seller must supply all software media, licenses, passwords, and access keys to all software required to operate the system.
- (2) Seller must load, configure and maintain all software provided, including the operating system, database management, and console operation software.
- (3) Upgrade, update and other patches for Seller-provided software must be applied only after Seller has certified the patch as helpful or benign to the console system's operation. Such certification must occur offline and must not affect currently running operations.
- (4) All costs associated with ongoing software refresh and maintenance must be clearly explained and presented as an optional maintenance plan.

### 11.5.4 Dispatch Console Equipment Requirements

- (1) This section defines console equipment requirements to support both the existing VHF radio system and the new radio system.
- (2) General Hardware Requirements
  - (a) Seller must propose, specify, procure and install all hardware necessary to complete the system.
  - (b) All hardware must be designed for heavy-duty, long-term use.
- (3) Computer Hardware
  - (a) All PC hardware must be commercial off the shelf products of established manufacturers.

- (b) Seller must indicate whether work area personal computers are certified to run Microsoft Windows software concurrently. All computers used in the system must have their hard drives deep-level formatted and operating systems re-installed from known good media before being deployed.
- (c) Seller must provide the typical layout of the console equipment for each console position, remote console position, the system, and the system administration equipment. Seller must include and install the required remote keyboard, mouse, and monitor interface devices (KVM) as needed. To remotely mount the keyboard, mouse, and monitors. If Seller needs remote access to the system during installation or operation, seller will provide detailed requirements and necessary hardware and software.
- (d) All console functions must be accessible to dispatchers on a single display.

#### (4) Keyboard/Mouse

- (a) Seller must provide one standard 101-key keyboard for each console position. Keyboard must be standard length and layout; the use of proprietary keyboards is not acceptable.
- (b) Seller must provide one standard mouse with each console position, the mouse to include two buttons and one scroll wheel.
- (c) The mouse is to be wired, not wireless, and must be a discrete unit (not integrated into the keyboard).
- (d) The mouse must be of closed construction, i.e., optical or laser operated as opposed to ball and roller operated.

#### (5) Headset Jacks

- (a) Proposer must include two appropriate, compatible 6-wire audio headset jack, J327 style jacks, for each console position. They must be supplied with long enough cables to be installed at any Buyer-selected location on the console furniture. The headsets will be furnished by the Buyer. Connection to the console must be on a plug-in basis to the headset jack that will automatically disconnect the microphone when plugged in.

#### (6) Microphone

- (a) A high-quality boom style, low-impedance supercardioid-pattern dynamic desk microphone with a flat, uniform frequency response, a minimum front-to-back ratio of 15 dB from 100 Hz to 7 kHz, and a transmit switch must be provided with each console as an option. The microphone must be of a hum-resistant design to permit normal operation in the close vicinity of the monitor displays and desktop fluorescent lamps. A microphone jack must be supplied to accept or remove the microphone as required.

- (b) Proposer must provide a list of all wired and wireless headsets tested and approved for operation with the console system.

(7) Foot Switches

- (a) Each console must have connections to accommodate a foot switch. The console must be capable of supporting two physically and electrically independent foot switches. The foot switches must key Buyer designated talk groups when operated. The foot switches must be heavy enough and equipped with a non-skid bottom surface, to prevent sliding when operated on a flat smooth surface such as a plastic carpet mat or a tile or linoleum floor.
- (b) Seller must furnish and install each foot switch assembly with at least 8 feet of cable to permit locating the assembly next to a dispatcher in a convenient location.

(8) Logging Recorder Interface

- (a) The audio from each console position must be recorded on the proposed logging recorders system using SIP and RTP protocols using the P25 AIS interface. In addition, each console position must be provided with a logging recorder interface providing the same audio as received and transmitted by the dispatcher's headset or desk microphone and select speaker when a headset is not used. This audio level must be set at a nominal -10 dBm for typical dispatcher audio.

(9) Conventional Control, 4-Wire Audio

- (a) Each transmit/receive channel module or equipment must be supplied with jumpers or programming for field selection to permit any conventional channel to operate with 4-wire audio and tone and E/M keying.
- (b) Each conventional channel must be equipped with a relay providing a dry set of form C contacts. The relay must operate whenever the transmitter on that channel is operated. The relay contacts must be capable of handling 0.1 ampere at up to 60 VDC.

(10) Speakers

- (a) Speakers must be supplied with each console as follows:

One speaker for the selected audio

Three speakers for the unselected audio

- (b) The selected and unselected audio speakers must be supplied as standalone enclosed desk-top external speakers.

- (c) The selected and unselected audio speakers must be separated spatially so the dispatcher can easily determine the speaker producing the audio.
- (d) The movable user selected audio speaker must be furnished and installed with a cord long enough to facilitate its relocation to any portion of the console work surface.
- (e) Speakers must be high-quality and sized to handle the maximum output of the audio amplifiers without adding any appreciable distortion and to reflect the proper load to the audio amplifiers output.

(11) Intercom

- (a) Proposer must describe any Intercom Function Control and indicator provided in the console system permitting the console operator to intercom to any console and/or to any conventional base station site connected to the system.

(12) Radio Console Telephone System Interface

- (a) The radio dispatch console system must be equipped with an integrated telephone interface providing each dispatcher the ability to automatically arbitrate between the radio audio and telephone audio.
- (b) The radio dispatch console system must integrate with the existing Zetron MAX CT call taking system and the Hexagon CAD system. For dispatch consoles located at Kitsap 911 and remote console kits, the integration between the Zetron Acom dispatch system and the Zetron MAX CT call taking system is described in the dispatch console section of the *Existing System Description*.
- (c) For Kitsap 911 consoles, the radio dispatchers must be able to monitor radio audio on the select and monitor speakers while talking on the phone. A fifth speaker connected to the Zetron MAX CT Media Dock is used for telephone ringing and Instant Recall Recording playback. The microphone is muted to the telephone system during radio PTT calls.
- (d) For remote consoles, the radio dispatchers must be able to connect to radio dispatch console system, the existing Zetron MAX CT telephone system and the Hexagon CAD system. The remote console kits are a single PC connecting to three virtual machines (Zetron Acom, Zetron MAX CT, and Hexagon Idispatch). Kitsap 911 provides a USB headset and a USB handset with each remote kit. Most operators prefer to use two headsets by adding a USB headset adapter to the standard Plantronics headset. One headset/handset USB port is set up for Zetron Acom (radio) audio and the other headset/handset port is setup for Zetron MAX (Call taking) audio. Recall Recorders
- (a) The console system must be equipped with integrated Instant Recall Recorder features to record the selected and unselected audio at each position.

- (b) The instant recall recorder function controls must be located on the display monitor for easy access.
- (c) Instant recall recorders with a minimum of 12 hours of storage time must be provided as part of this contract.
- (d) Instant recall recordings must associate with each user and must not be available to other users on the same or different consoles.

#### 11.5.5 User Interface Requirements for Console Operations

(1) This section defines the requirements for operation on the existing VHF radio system and the new trunked radio system. References to “channel” and “talkgroup” should be read as interchangeable and applicable to either system. The new system is to mimic the operation of the existing system as closely as possible, within the limits of the proposed new technology.

(2) Functional Requirements:

- (a) The system must present a graphical user interface to the operator.
- (b) The user must accomplish all radio control functions using one display; the user must not be required to interact with a screen other than the main display to perform radio control functions.
- (c) The system must accept input from a touch screen monitor, a keyboard, and a mouse together or separately.
- (d) The user must be able to accomplish all system interaction using only the touch screen, a mouse, or a keyboard separately.
- (e) The user must operate the Push-To-Talk (PTT) function via touch screen, keyboard, mouse/trackball, or foot switch separately.
- (f) The system must allow for use of external desk microphone for transmission.
- (g) User must be able to select one or more talk group for simultaneous transmissions.
- (h) User must be able to transmit on any talk group without explicitly selecting it as a separate action. This is often called “Instant transmit.”
- (i) User must be able to patch two or more talk groups together to allow traffic from each to be heard on all patched talk groups.
- (j) User must be able to monitor traffic on one or more unselected talk groups through an external speaker designated for the purpose.

- (k) The console system must display and allow control of all radio channels on the existing VHF/UHF radio system.
- (l) The system must be configurable to allow for operation on any radio channel in the existing VHF/UHF system.
- (m) The system must be capable of displaying an unlimited number of radio channels, talk groups, or mixture through the graphical interface.
- (n) The console system must allow for the operation of any radio channel from any position, operation of multiple channels from any position, and simultaneous operation of multiple channels – individually or as a group – from multiple positions as determined by the console position log-in permissions.
- (o) Operation of any radio channel from one console position must not prevent the same channel or talk group from being operated by one or more other console positions. Console operation must be independent of any operation at another console (operation/selection on one console must not affect operation/selection at another console).
- (p) Selected channels must be clearly indicated by visual means on the system display.
- (q) Channels with active traffic must be indicated visually on the system display during the entire time the traffic is active.
- (r) Currently transmitting channels by the dispatcher must be visually indicated on the dispatcher's console only. All other consoles must see the transmission as indication of active traffic
- (s) Muted channels (volume turned to zero) must be clearly visually indicated on the display.
- (t) Channels as part of a transmit group (i.e., “multi-selected”) must be highlighted or otherwise visually indicated to be part of the group.
- (u) The system must provide individual volume controls for each channel/talk group.
- (v) The system must display the time each transmission is received on the radio control screen, associating it with the radio identifier/alias making the transmission.
- (w) The system must display the radio identifier/alias of last 20 received transmissions on the radio control screen.
- (x) The system must present a visual and audible indication of incoming intercom communication requests, the visual indication showing the originating console name in plain English.

### (3) Control Display

(a) The control displays in all consoles must contain the following function controls as a minimum:

- i. A selected audio speaker.
- ii. Three unselected audio speakers.
- iii. Individually adjustable speakers.
- iv. An audio level indicator on the display.
- v. A digital 24-hour electronic clock always displayed on the screen (synchronized to all other consoles and network time).
- vi. A simul-select function control.
- vii. An intercom function control for communicating to the site of the control stations and other consoles.
- viii. An alert-tone function control.
- ix. An alert-warble tone function control.
- x. An alert-pulsed tone function control.
- xi. Repetitive channel marker tone with adjustable audio levels.
- xii. An all-mute function and timer, adjustable to at least 90 seconds. This function must mute all unselected audio at the associated console position.
- xiii. A coded squelch disable monitor function control.
- xiv. A patch-transmit function control.
- xv. A transmit function control to key selected transmitters.
- xvi. Individual channel volume controls.
- xvii. Function controls and indications to perform the specified functions.

### (4) Transmit/Receiver (T/R) Control Functions

(a) Each channel must be equipped with the following control functions as a minimum:

- i. Call Indicator. This function must illuminate a colored indicator flashing approximately two pulses per second when receiver audio is present on

the console selected channel or a steady indicator when the console channel is in the unselected mode.

- ii. **Select Function Control.** Depressing this Function Control must allow the channel to be selected individually or with any or all other radio channels for simultaneous transmission. It must also route the selected channel's receive audio to the selected speaker. To release the simultaneous function, only the select Function Control of the desired channel need be momentarily activated causing all other channels to revert to the unselected mode. Selecting a channel, resets all other channels unless the multiselect-switch-function is simultaneously selected.
- iii. **Channel Busy Indicator.** This function must illuminate a colored indicator whenever another console is transmitting on the channel. A busy indication on a console must inhibit the console from transmitting on the busy channel but provide audio monitoring of the transmission.
- iv. **Select Indicator.** This function must illuminate a colored indicator when the channel is in the selected mode.
- v. **Instant Transmit Function Control.** This function must provide immediate access to and instant transmitting on any channel without first placing the channel in a selected mode or unselecting other channels. This function must be a single keystroke operation and not override supervisory control.
- vi. **Transmitter Indicator.** This function must be a red panel indicator when the transmit Function Control is activated or when transmission is made on the channel in the Select mode.
- vii. **Patch Function Control.** This function control must allow the channel's receive audio to be retransmitted (cross-patched) into another radio channel.
- viii. **Patch Indicator.** This function must illuminate a colored indicator when the patch function has been activated.
- ix. **Take-Over Function Control.** This function must be on the supervisory console only. It must allow the operator to transmit on a given channel even though the busy circuits are activated. It must prevent parallel-connected channels from accessing the station transmitter. The operator overridden by this function must be alerted of the takeover and will automatically be able to monitor the supervisory console's transmissions.
- x. **Take-Over Indicator.** This function must illuminate a colored indicator at the module and all parallel console channels when the takeover function has been activated.

- xi. Volume Controls. This function must allow adjustment of the audio level of any individual channel. Individual channels must have a limit to the minimum level that can be set. This action is in addition to the volume control associated with each speaker.
- xii. Main/Standby Select Control for conventional base stations. This control allows for the selection of a different base station should the main base station fail. This control must be accomplished by providing either a mechanism to switch the incoming wire-line audio connection between the two base stations or by providing a second 4-wire audio connection for the standby transmitter.

#### (5) Indicators

- (a) Incandescent lamps must not be used as indicators. All indicators must be displayed on the console monitor or LED displays. Function controls, legends, and illuminated indicators must be color-coordinated to minimize operator confusion, simplify operation, and reduce operator fatigue.

#### (6) Identification Strips

- (a) Control functions associated with each channel must be identified with the channel name or other Buyer-designated identification, e.g., BIPD, KCSO, NKFR, POPD, SKFR, etc.
- (b) The minimum size of the channel name must match the size of the main display of portable radios e.g., 14 characters.
- (c) The channel name identifier must appear across the top of the various operational modules. These identifiers must be easily reprogrammed in the field.
- (d) The illuminated indicators must be identified by function, e.g., select, busy, etc.
- (e) Mechanical switches must be identified either by engraving the fronts of the switches, or employing legible removable keycaps, or other semi-permanent method (except attaching stickers to key-tops) or a combination. LED monitor function control modules must be clearly marked with alphanumeric displays.

#### (7) Digital Clock

- (a) A 24-hour synchronized electronic digital clock displaying hours, minutes, and seconds must be provided in each console within the monitor display displayed in a prominent location. All console clocks must be synchronized to a common time base.
- (b) A time reference source linked to NIST, or Buyer-supplied network time or similar time standard must be provided that connects to the console system. This source must be the same time base used by the radio system.

(8) Programming

- (a) The equipment must be field programmable by Buyer dispatch technical staff.
- (b) The capability to program function tones, console displays, labels, etc. must be built into the application software and must not require any additional software or hardware.

(9) Phone Patch

- (a) A phone patch feature must be provided allowing patching a phone line from the telephone system to any transmit/receive channel. Operation must be initiated by depressing the phone patch switch located on the appropriate select module. A phone patch disable Function Control must also be provided so the operator can interrupt a patch if necessary. Both sides of the patch must be capable of being monitored. When in patch mode, patch operation must not interfere with any other function of the console. One patch path must be supplied with one additional quoted as an option.

(10) Miscellaneous Controls

- (a) Reserved

## **11.6 Remote Console Requirements**

11.6.1 Proposer must propose a “remote console” solution capable of operating on a laptop computer and operable from anywhere access to the Buyer’s network can be obtained.

11.6.2 Proposer must fully describe the laptop solution’s operation, hardware, software, and network requirements.

11.6.3 Proposed remote console solution must be a single console for radio dispatch, call taking from the existing Zetron MAX CT console system, and the existing Lexagon CAD system with two headsets, four external speakers, and a footswitch.

## **11.7 Dispatch Backup Radios**

11.7.1 Seller must plan on the Buyer using portable radios in the dispatch center as backup to access the radio system.

## **11.8 Console Installation Requirements**

11.8.1 This section defines the requirements for installation and implementation of the radio control console systems. In their Proposal, Proposer must include a general implementation plan and identify risks associated with the implementation process.

(1) Installation Requirements

- (a) Buyer's communication system is continuously in use. The existing communication system will need to remain operational during the cutover to the new system.
- (b) Seller must closely coordinate the installation of the equipment with the Buyer's Project Manager. A migration plan which details cutover milestones must be included in the Proposal.
- (c) Seller must stage, configure, and test all console equipment prior to final installation.

## (2) Removal of Existing Equipment

- (a) Any existing equipment replaced by the new equipment will be removed by Seller's staff resources. Seller must coordinate closely with the Buyer's Project Manager regarding work effort and scheduling required. It is extremely critical the installation and removal of the equipment does not result in loss of operation or communications.

## (3) Dispatch Console Equipment

- (a) The console equipment must be installed in the areas as identified. This requirement includes as required the console electronics, computers, display monitors, and any ancillary equipment required. The location and layout of all equipment must be approved by the Buyer's Project Manager prior to installation.
- (b) The console common equipment electronics must be installed in the equipment room at the Kitsap 911 unless otherwise approved by Buyer's Project Manager.
- (c) All audio connections at the dispatch and control locations must be made via interconnection terminals (Siemens type 66, BIX blocks or equal) for ease of maintenance. Computer connections must be by standard "RJ45" type LAN connections. This requirement does not apply to speaker, microphone, PTT Footswitch, or other equipment-to-equipment interconnections at the console positions.
- (d) The analog radio control cabling must be shielded with a minimum of 60 dB shielding. Seller must ensure that the radio control signaling audio signals do not interfere with nor receive interference from other cables in the conduit or from the base stations.

## 11.9 Required Console Options

11.9.1 The following options must be priced as separate items in the Proposal Form. The prices for these options are to be quoted in single-unit quantities. Buyer may, at their option, order any of the following features without any requirement to order any other option.

- (1) Details including cost, operation and requirements for an additional laptop computer based “remote console” solution as described above.
- (2) The cost and description of key replacement parts, modules, assemblies, power supplies, special remove tools, cables and other necessary item to return a failed console function(s) to full operation. These costs and descriptions are to be provided after system award.
- (3) The cost and description of the System Management Report capabilities must be provided in the bid response. An example of a System Management Report must be included with this proposal. The report statistics must include, but not be limited to, each radio channel's activity or talkgroup for the trunking interface, i.e., event counter, hourly/daily and average event time totals. Statistics must be broken down into hourly and daily totals, plus show average times per each receive and transmit event. These reports must be able to be triggered automatically for specific intervals such as daily at midnight, weekly, and monthly and must be available in a nonproprietary electronic format.
- (4) The cost to add one complete operator position including hardware and software.
- (5) The cost of a geodiverse, redundant console system connected to Kitsap 911 via fiber.

## SECTION 12

# User Radio Requirements

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## 12.1 General

- 12.1.1 User equipment includes all non-fixed user equipment, including mobile radios, portable radios, control stations, and related accessories.
- 12.1.2 Proposer must include their offering for user equipment for use on the new trunked radio system. Proposer is encouraged to minimize user equipment options, such as a single multiband mid-tier fire portable for all fire users and a single multiband mid-tier law portable for law users. Similarly, reduced mobile radio offerings to split mount, dash mount, and dual head split mount configurations are preferred for fire apparatus and law vehicles.
- 12.1.3 Proposer must provide pricing for individual user radios and accessories as well as any available quantity discounts as shown in the pricing sheets in Exhibit K and associated detail sheets
- 12.1.4 Proposer must provide a listing of user radios from other manufacturers demonstrated to operate on the proposed system. Any limitations in function or changes in the configuration of the proposed system must be described. Proposer must also describe management of the third-party radios including OTAP (over the air programming) and OTAR (over the air rekeying).
- 12.1.5 Proposer must submit cut sheets and detailed specifications for all user equipment offered. This information must include dimensions, weight, channel capacity, alphanumeric display capability, standard transmitter and receiver RF specifications, intrinsically safe options, MIL-STDs, etc.
- 12.1.6 Proposer must provide pricing for programming software and any required programming materials (e.g., cables, connectors, dongles, etc.) for each user radio proposed.

## 12.2 Technical

- 12.2.1 All user equipment proposed must be highly reliable and intended for mission critical operations.
- 12.2.2 All radios proposed with the system must be proposed at the technical parameters required for the correct operation of the proposed infrastructure.
- 12.2.3 At a minimum, all user radios proposed, without modification or upgrade, must meet the following capabilities:

- (1) Operation (transmitting and receiving) on all channels in the VHF and 700/800 MHz bands and programmable in the step size required to maximize the use of the frequency band and as required by the FCC.
- (2) APCO Project 25 Phase 2 (TDMA) Common Air Interface operation, including compliance with the latest P25 suite of standards and the latest version of TIA-102.
- (3) All P25 Standard Service Set features.
- (4) Digital P25 Phase 2 (TDMA) trunked operation.
- (5) Digital P25 and analog conventional operation.
- (6) Automatic site-switching for trunked multicast sites.
- (7) Signaling, including:
  - CTCSS encoding and decoding.
  - DCS encoding and decoding.
  - Ability to pass DTMF audio sent from radio console system for fire station alerting interface.
- (8) Direct (simplex/talk-around/radio-to-radio) operation without reliance on the fixed network.
- (9) Emergency call, operational in both trunked and conventional modes.
- (10) Unit ID, providing a unique digital identifier for each unit transmitting to the system every time the user radio transmits.
- (11) Private call, allowing any two specifically authorized units to set up a temporary communications path through the trunked system. The private call cannot be selected by another user or dispatch.
- (12) Call Alert, allowing any specifically authorized units, including dispatch, to send a command to a particular unit or groups of units providing a programmable visual, aural, or both indications for a received Call Alert. Optionally, a relay contact closure must be provided to allow the operation of vehicle horns, lights, or other alerting devices external to the radio.
- (13) Multiple channel/talkgroup scanning for conventional channels, trunked talkgroups, and mixed scan lists of conventional channels and trunked talkgroups.
- (14) Provide an indication of abnormal trunked radio system operating mode.
- (15) Selective radio inhibit and uninhibit.

- (16) Time-out timer to prevent inadvertent keying of the transmitter for extended periods of time, configurable from 60 to at least 300 seconds.
  - (17) FCC OET Equipment Authorization certification (“type accepted”).
  - (18) Fully solid-state, and frequency synthesized for transmitter and receiver frequency control.
- 12.2.4 Any multi-band user radios must, at a minimum, be capable of operating on all FCC CFR47 Part 90, licensable channels in the 136-174 MHz (VHF) and 700/800 MHz radio bands.
- 12.2.5 All user radios must be software programmable.
- 12.2.6 All user radios must be delivered fully programmed for operation on the proposed trunked system and all other channels as specified by Buyer.
- 12.2.7 All user radios must be delivered properly aligned, meeting all technical performance specifications. Each user radio will be tested using an approved test script for receive sensitivity transmit output power, and frequency alignment. Any radios found not to be properly aligned for all technical and operational performance specifications must be removed from service and realigned or replaced at Proposer's expense, including any Buyer staff time and expense costs.
- 12.2.8 Full P25 AES encryption capability is required as an option on at least some radio models. Any encryption offered shall be ANSI EIA Standards compliant. Proprietary solutions will not be accepted. Over-the-air rekeying must also be provided as an option as described below:
- (1) Proposer must describe their “Over the air rekeying (OTAR),” allowing all radio units equipped with encryption to reprogram the encryption key over the RF standard voice radio channel. The response must describe how the function works, the limitations of OTAR, and typical rate of rekeying in radios per hour for most customers.
- 12.2.9 The ability to reprogram the radio unit’s basic programming or “Over the air reprogramming (OTAP)” is a Buyer desired feature. Proposer must describe how this function works, the limitations of OTAP, and typical rate of programming in radios per hour for most customers.
- 12.2.10 Proposer must provide a radio management system as an option to administer and control radio configurations and OTAP.
- 12.2.11 The radio management system must be installed and configured to support the management of early radios prior to the installation of the radio core to avoid multiple touches of the early radio to register them in the radio management system. Once the new radio system is awarded, agencies will begin requesting early deployment of mobile radios for installation in replacement vehicles and apparatuses. Early deployment of portables is also anticipated. Proposer’s radio management system must be operational

very early in the project to capture the early deployment radios before they are issued or installed.

## **12.3 Mobile Radios and Control Stations**

12.3.1 At a minimum, all mobile radios (and/or associated control heads, as appropriate) proposed must support the following features:

- (1) Full compliance with P25 operation and standards
- (2) Backlit alphanumeric display, readable in sunlight or darkness; dimmable based on ambient light to reduce the internal vehicular light for night driving showing a minimum of 14 characters
- (3) Front-mounted power/volume knob
- (4) Front-mounted channel/talkgroup selector
- (5) Emergency button, protected from inadvertent activation
- (6) Transmit indicator
- (7) System “busy” indicator
- (8) Capable of supporting an external speaker

12.3.2 Mobile radios must be configured for operation from standard 12 VDC, negative ground.

12.3.3 Control station radios must be configured for operation from 120 VAC/60 Hz, or optionally 12 VDC.

12.3.4 Mobile and control station radios must be operable across an ambient temperature range of -30 to +60 degrees C.

12.3.5 Transmitter power for the mobile radios proposed must not exceed the power necessary to provide reliable operation throughout the specified coverage area.

12.3.6 All mobile radios must be supplied with a connectorized, detachable palm-type microphone, detachable external speaker, interconnecting cables, power cables, fusing, mounting hardware, coaxial cable, antenna mounts, and antenna to provide a complete installation. If additional antennas are proposed such as antennas for GPS/GNSS, Wi-Fi, or LTE, the antennas must be provided with all necessary cables, connectors, mounts, and multiplexers as needed.

12.3.7 Seller must provide Pulse Larsen NMO150/450/750 impact resistant, roof mount triband antennas (VHF/UHF/700/800 MHz). Roof mount antennas with a tall base equivalent to Motorola AN000131A01 are prone to damage from car washes and tree branches and are not acceptable.

12.3.8 Seller must provide NMO type mobile antenna mounts from the same manufacturer as the roof mount antennas unless the antenna manufacturer does not make NMO mounts. Seller should assume 10% of the vehicles will require a thick roof NMO antenna mount.

12.3.9 Seller must provide a triband covert antenna for vehicles requiring them. The covert antenna must support VHF, 700/800 MHz bands as well as GPS/GNSS, LTE, or Wi-Fi depending on the capabilities of the proposed mobile radios.

12.3.10 Mobile radio must be capable of the following minimum configurations:

- (1) Remote mount with various lengths of control cables
- (2) Remote mount with dual control heads and various lengths of cables
- (3) Dash mount with integral control heads
- (4) Handheld control heads for covert mobile radio installations
- (5) Remote mount for motorcycle installations
- (6) All control heads except the handheld control head must be identical in appearance, function, and operation for all three configurations

12.3.11 The fire agencies in Kitsap County use apparatus intercom systems with wired and wireless headsets. Proposer must verify their mobile equipment is compatible with headset manufacturers by Sigtronics, Firecom, Setcom, and David Clark. If, during implementation, the supplied equipment is determined to be incompatible with the existing intercom units, Seller must supply new mobile equipment or must replace the existing intercom units at Seller's expense.

12.3.12 All control station radios must be supplied with a desk microphone (or palm microphone if desired), speaker, interconnecting cables, AC power supply with power cables, fusing, coaxial cable, and antennas to provide a complete installation.

12.3.13 All control station antenna systems must support VHF and 700/800 MHz operations with "control station" antennas other than mobile triband antennas with radial ground plane kits.

12.3.14 Control stations must be capable of the following minimum configurations:

- (1) Dash mount radio in a desktop kit with integral speaker, desk microphone (or palm microphone if desired), AC power supply and power cables, fusing, coaxial cabling, and antenna systems supporting VHF and 700/800 radio bands control antennas
- (2) Remote mount with control head with external speaker, desk microphone (or palm microphone if desired), AC power supply with power cables, fusing, coaxial cabling, and antenna systems supporting VHF and 700/800 radio bands control antennas with dual control heads and various lengths of cables

- (3) Control station radio (dash mount or remote mount) supporting radio operation from a single deskset or multiple desksets (up to four desksets) in remote location from the radio using Ethernet cabling

## **12.4 Portable Radios**

12.4.1 At a minimum, all portable radios proposed must support the following features:

- (1) Full compliance with P25 operation and standards
- (2) Backlit alphanumeric display with a minimum of eight characters (on applicable models), readable in sunlight or darkness with a minimum of 14 characters on the main display and 8 characters on the top display
- (3) Side-mounted push-to-talk (PTT) button
- (4) Top-mounted power/volume knob
- (5) Top-mounted rotary channel/talkgroup selector
- (6) Emergency button, protected from inadvertent activation
- (7) Transmit indicator
- (8) System “busy” indicator
- (9) Minimum 500 mW audio output power from built-in speaker
- (10) Capable of supporting an external speaker-microphone (wired and wireless)
- (11) Constructed of a high impact-resistant material and sealed to protect internal circuitry against foreign particles, dust, moisture, and splashed water

12.4.2 One or more models of the portable radios must comply with NFPA 1802 for hazard zone operation.

12.4.3 Transmitter power for the portable radios proposed must be a minimum of 3 Watts.

12.4.4 Batteries must provide an operational use of at least ten hours, based on a duty cycle of 5 percent transmit, 10 percent receive, and 85 percent standby

12.4.5 All portable radios must be provided with a spare battery.

12.4.6 For operational efficiency, all batteries including spare batteries fitting any model of portable must be the same physical size and capacity i.e., 3400mAH.

12.4.7 Proposer must provide portable radio battery chargers, not all portable radios will need desktop chargers. Batteries and chargers shall be capable of recharging a fully discharged battery to 90 percent of full charge in one hour or less.

- 12.4.8 All portable radios shall be supplied with a whip antenna supporting tri band operation and receipt of GPS location signals.
- 12.4.9 For Law Agency radios, Proposer must provide a wired remote speaker microphone supporting a 3.5mm jack for earbuds and a wireless remote speaker microphone.
- 12.4.10 Proposer must have as available options for all portable radio accessories, including the following at a minimum:
- (1) Data/programming cables
  - (2) Remote speaker-microphones (without attached antenna) with 3.5 mm jack and wireless remote speaker microphones
  - (3) Motorcycle helmet and headset interconnections
  - (4) SWAT team ear and throat microphones and similar accessories
  - (5) Headsets
  - (6) Antennas
  - (7) Belt clips
  - (8) Carrying cases
  - (9) High-capacity batteries for longer than 8 hours of operation
  - (10) Chargers, including single-battery, multiple-battery, and vehicular
  - (11) Portable battery analyzer/reconditioner units.

# Cybersecurity Requirements

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## Introduction

Cybersecurity threats, whether malicious or unintentional, pose a serious and ongoing challenge for public safety communications and network systems. Public Safety entities, worldwide have experienced and are experiencing an increasing number of cyber-attacks. High reliability of radio and interconnecting transport systems is essential for communications between PSAP's, secondary dispatch centers and first responders. A cyberattack on these systems can have significant impacts on this reliability, thus, interfere with the public safety mission of protecting life, maintaining order and safeguarding property.

A variety of steps need to be taken throughout the life cycle of public safety communications systems to protect them from cyber threats. This specification calls for cybersecurity requirements included within the design phase of system and component development. Being a focus at the onset of development will further ensure cybersecurity is implemented throughout the testing, manufacturing, delivery, installation, and support phases of the product life cycle, thereby reducing overall cybersecurity risks.

This specification is grouped in the following topic areas:

General Cybersecurity requirements:

- Information Security and Data Sensitivity
- Software and Services
- Access Control
- Account Management
- Session Management
- Authentication/Password Policy and Management
- Logging and Auditing
- Communication Restrictions
- Malware Detection and Protection
- Reliability and Adherence to Standards
- System Information Security

Supplier's product life cycle security program:

- Secure Development Practices
- Documentation and Tracking of Vulnerabilities
- Problem Reporting
- Patch Management and Updates

- Supplier Personnel Management
- Secure Hardware and Software Delivery

Intrusion Detection:

- Host Intrusion Detection
- Network Intrusion Detection

Physical Security:

- Access to System Components
- Perimeter Access
- Communications Inside Perimeter

Wireless Technologies

Cryptographic Technology:

- Documentation
- Key Management

References

## **13.1 Information Security and Data Sensitivity**

### **Baseline Specification:**

- 13.1.1 All data in transit, accessed, or stored across the system(s) environment will be encrypted and handled as restricted data.
- 13.1.2 The nature of restricted data is its use, dissemination, and access are limited to specific agencies, individuals, and situations.
- 13.1.3 Where existing data repositories employed by the system Owner(s) users already have established levels of mandated sensitivity and protection, those levels will be used at a minimum.
- 13.1.4 Retention of any data will be in accordance with Owner record retention policy as specified by the respective data owner. Upon expiration of the retention period, data will be destroyed or otherwise disposed per agency policy.
- 13.1.5 Data in the system will not be releasable to any external parties without written permission from Owner and compliance with applicable law.

## 13.2 Software and Services

Unused and unnecessary software and services in any system containing system administration computers, servers or components left enabled can pose potential entry points for exploits, especially if they are not monitored. These services can range from system diagnostics to messaging applications. Various attacks have been crafted to exploit these vulnerabilities, leading to the compromise. These vulnerabilities can be addressed by the "principle of least functionality," stating programs or processes must only be able to access the information and computational resources needed for them to perform their intended function.

### Baseline Specification:

13.2.1 The Seller must remove all software components not required for the operation and/or maintenance of the procured product. If removal is not technically feasible, then the Seller must disable software not required for the operation and/or maintenance of the procured product. This removal must not impede the primary function of the procured product. If not required software cannot be removed or disabled, the Seller must document a specific explanation and provide risk mitigating recommendations and/or specific technical justification. The Seller must provide documentation on what is removed and/or disabled. The software to be removed and/or disabled must include, but not be limited to:

- Games.
- Device drivers for product components not procured/delivered.
- Messaging services (e.g., email, instant messenger, peer-to-peer file sharing).
- Source code.
- Software compilers in user workstations and servers.
- Software compilers for programming languages not used in the procured product.
- Unused networking and communications protocols.
- Unused administrative utilities, diagnostics, network management, and system management functions.
- Backups of files, databases, and programs used only during system development.
- All unused data and configuration files.

13.2.2 The Seller must provide documentation of software/firmware supporting the procured product, including scripts and/or macros, run time configuration files and interpreters, databases and tables, and all other included software (identifying versions, revisions, and/or patch levels, as delivered). The listing must include all ports and authorized services required for normal operation, emergency operation, or troubleshooting.

- 13.2.3 The Seller must remove and/or disable, through software, physical disconnection, or engineered barriers, all services and/or ports in the procured product not required for normal operation, emergency operations, or troubleshooting. This removal and/or disabling must include communication ports and physical input/output ports (e.g., USB docking ports, CD/DVD drives, video ports, and serial ports). The Seller must provide documentation of disabled ports, connectors, and interfaces.
- 13.2.4 The Seller must configure the procured product to allow the Buyer the ability to re-enable ports and/or services if they are disabled by software.
- 13.2.5 The Seller must disclose the existence of all known methods for bypassing computer authentication in the procured product, often referred to as backdoors, and provide written documentation stating all backdoors created by the Seller have been permanently deleted from the system.
- 13.2.6 The Seller must provide summary documentation of the procured product's security features and security-focused instructions on product maintenance, support, and reconfiguration of default settings.

### **13.3 Access Control**

Systems without appropriate access control methods in place can allow adversaries to gain unauthorized or undetected access. Access control is the process of restricting access to certain systems, information, functions, tools, locations, components, or resources. Access control limits individual users and processes by implementing the "principle of least privilege" so every process, program, or user must only access authorized and necessary information and resources for operation. This restriction reduces the number of potential entry points for an attack. Access control is designed to enforce security policies and streamline security management processes by grouping users based on their role within the organization, rather than separately evaluating each individual identity.

#### **Baseline Specification:**

- 13.3.1 The Seller must configure each component of the procured product to operate using the principle of least privilege. This includes operating system permissions, file access, user accounts, application-to-application communications, and any other privileged configurable services.
- 13.3.2 The Seller must provide user accounts with configurable access and permissions associated with one or more organizationally defined user role(s), where roles are used.
- 13.3.3 The Seller must provide a system administration mechanism for changing user(s)' role (e.g., group) associations.
- 13.3.4 The Seller must configure the procured product so a session or inter-process communication initiated from a less privileged application, access must be limited and enforced at the more critical side.

- 13.3.5 The Seller must provide a method for protecting against unauthorized privilege escalation.
- 13.3.6 The Seller must document options for defining access and security permissions, user accounts, and applications with associated roles. The Seller must configure these options, as specified by the Buyer.
- 13.3.7 The Seller must recommend methods for the Buyer to prevent unauthorized changes to the Basic Input/Output System (BIOS) and other firmware. If it is not technically feasible to protect the BIOS to reduce the risk of unauthorized changes, the Seller must document this case and provide mitigation recommendations.
- 13.3.8 The Seller must verify and provide documentation for the procured product, attesting unauthorized logging devices are not installed (e.g., key loggers, cameras, and microphones), as specified by the Buyer.
- 13.3.9 The Seller must deliver a product enabling the ability for the Buyer to configure its components to limit access to and from specific locations (e.g., security zones, business networks, and demilitarized zones [DMZs]) on the network with attached components, where appropriate, and provide documentation of the product's configuration as delivered.

## **13.4 Account Management**

Some radio and interconnecting transport systems are configured with publicly available default accounts and passwords. In some cases, these accounts can be used to gain unauthorized system access or to escalate privileges.

### **Baseline Specification:**

- 13.4.1 The Seller must document all active accounts (including, but not limited to, generic and/or default) necessary for proper operation of the procured product.
- 13.4.2 The Seller must change default account settings to Buyer-specific settings (e.g., length, complexity, history, and configurations) or support the Buyer in these changes. The Seller must not publish changed account information. The Seller must provide new account information to the Buyer via a protected mechanism.
- 13.4.3 Prior to delivery of the procured product to the Buyer, the Seller must remove or disable any unnecessary accounts for normal or maintenance operations of the procured product.
- 13.4.4 As specified by the Buyer, accounts for emergency operations must be placed in a highly secure configuration and documentation on their configuration must be provided to the Buyer.

## 13.5 Session Management

Weak or insecure system session operating practices can result in vulnerabilities in radio and interconnecting transport systems. Examples of insecure practices include permitting use of clear text passwords, passwords lacking requisite complexity, multiple concurrent session logins, remembered account information between logins, and auto-filling fields during logins. Once an account is compromised, system administrators have no way of knowing with certainty whether the account is being used by an unauthorized party.

### Baseline Specification:

- 13.5.1 The Seller must not permit user credentials to be transmitted or shared in clear text. The Seller must not store user credentials in clear text unless the Seller and Buyer agree to the practice for the procured product given the protection offered by other security controls. The Seller must only allow access protocols encrypting or securely transmitting login credentials (e.g., tunneling through Secure Shell Terminal Emulation [SSH], Transport Layer Security [TLS]).
- 13.5.2 The Seller must provide an appropriate level of protection (e.g., encryption and digital signing) for the session, as specified by the Buyer, commensurate with the technology platform, communications characteristics, and response time constraints.
- 13.5.3 Unless specifically requested by the Buyer, the Seller must not allow multiple concurrent logins using the same authentication credentials, allow applications to retain login information between sessions, provide any auto-fill functionality during login, or allow anonymous logins.
- 13.5.4 The Seller must provide account-based and group-based configurable session-based logout and timeout settings (e.g., alarms and human-machine interfaces).

## 13.6 Authentication/Password Policy and Management

The need for constant availability of radio and interconnecting transport systems often results in weak password policies, providing easy entry points into such systems. This easy access may be caused by users selecting poor or easily guessed passwords easily used by attackers to gain access within minutes.

### Baseline Specification:

- 13.6.1 The Seller must document the levels, methods, and capabilities for authentication and authorization. The Seller must deliver a product adhering to standard authentication protocols.
- 13.6.2 For System Administration computers and servers, the Seller must provide a configurable account password management system allowing for, but is not limited to, the following:
  - Changes to passwords (including default passwords).

- Selection of password length.
- Frequency of change.
- Setting of required password complexity.
- Number of login attempts prior to lockout.
- Inactive session logout.
- Screen lock by application.
- Comparison to a library of forbidden strings.
- Derivative use of the username.
- Denial of repeated or recycled use of the same password.

13.6.3 The Seller must protect passwords, including not storing passwords in clear text and not hardcoding passwords into software or scripts.

13.6.4 The Seller must provide a centralized and local account management capability.

13.6.5 If needed for ongoing support and maintenance, the Seller’s solutions involving interactive remote access/control must adhere to (i.e., be compatible with) the Buyer’s implementation of multifactor authentication (e.g., two-factor or token).

**Baseline Specification for Secure Single Sign-On:**

13.6.6 The Seller must ensure account access for single sign-on is equivalent to enforcement as a result of direct login.

13.6.7 The Seller must use a secure method of authentication (e.g., strong two-factor authentication) to allow single sign-on to a suite of applications.

13.6.8 The Seller must protect key files and access control lists used by the single-sign-on system from non-administrative user read, write, and delete access. The single-sign-on system must resolve each individual user’s credentials, roles, and authorizations to each application.

13.6.9 The Seller must provide documentation on configuring a single-sign-on system, as well as documentation showing equivalent results in running validation tests against the direct login and the single sign-on.

**13.7 Logging and Auditing**

Recording specific system activity in the form of logging generates an audit trail. Failure to perform logging makes it difficult to monitor activity, identify potential cyber-attacks in time to

take protective actions, perform diagnostics, and carry out forensic activities in the event of a successful cyber-attack. Without easy access to information on system activity, post-event investigations may not yield conclusive results and the risk of similar events occurring in the future would remain high.

### **Baseline Specification:**

13.7.1 The Seller must provide logging capabilities or the ability to support the Buyer's existing logging system. Logging capabilities provided by the Seller must be configurable by the Buyer and support the Buyer's security auditing requirements. As specified by the Buyer, the procured product must cover the following events, at a minimum (as appropriate to their function):

- Information requests and server responses.
- Successful and unsuccessful authentication and access attempts.
- Account changes.
- Privileged use.
- Application start-up and shutdown.
- Application failures.
- Major application configuration changes.

13.7.2 The Seller must provide standard time synchronization in the procured product (e.g., Global Positioning System [GPS], Network Time Protocol [NTP], and IEEE 1508-2008). If the Seller is not providing standard time synchronization and is providing an authoritative time source, the procured product must be configured to synchronize to the authoritative time source.

13.7.3 The Seller must time stamp audit trails and log files, as specified by the Buyer.

13.7.4 If required by the Buyer, the Seller must provide confidentiality and integrity security protection of log files.

13.7.5 The Seller must implement an approach for collecting and storing (e.g., transfer or log forwarding) security log files.

13.7.6 The Seller must recommend log management and Security Information and Event Management (SIEM) integration methods (e.g., syslog).

13.7.7 The Seller must provide a list of all log management capabilities of the procured product capabilities of generating and the format of those logs. This list must identify the logs are enabled by default.

## 13.8 Communication Restrictions

Poorly designed network architectures lacking a defense-in-depth approach to security may be vulnerable to cyber exploitation. Security can be enhanced by partitioning networks into multiple segments and placing technical security controls (e.g., firewalls, unidirectional communication devices, or virtual private network [VPN] concentrators) between the network segments. Hardware, software, and firmware restricting communications are important tools in establishing an appropriate cybersecurity defensive architecture. The network architecture is how a network is designed and segmented into logical, smaller functional subnets (i.e., network security zones) for the purpose of communication.

### **Baseline Specification for Large-Scale Networked Radio and Interconnecting Transport Systems:**

- 13.8.1 The Seller must recommend guidance on the design and configuration of network security zones within the procured product.
- 13.8.2 The Seller must provide information on all communications (e.g., protocols) required between network security zones, whether inbound or outbound, and identify each network component of the procured product initiating communication.
- 13.8.3 The Seller must provide a method to restrict communication traffic between different network security zones. The Seller must provide documentation on any method or equipment used to restrict communication traffic.
- 13.8.4 The Seller must verify and document disconnection points established between the network security zones and provide the methods to isolate the zones to continue limited operations.
- 13.8.5 The Seller must provide a means to document network traffic is monitored, filtered, and alarmed (e.g., alarms for unexpected traffic through network security zones) and provide filtering and monitoring rules.
- 13.8.6 If firewalls are provided by the Seller, the Seller must provide documentation on the firewalls and their firewall rule sets for normal and emergency operations. If the Buyer has the responsibility of procuring its own firewalls, the Seller must recommend appropriate firewall rule sets or rule set guidance for normal and emergency operations. The basis of the firewall rule sets must be "deny all," with exceptions explicitly identified by the Seller.
- 13.8.7 The Seller must provide the Buyer with access, including administrative as needed, to network components of the procured product, including firewalls.
- 13.8.8 The Seller must document all remote access entry pathways and ensure they can be enabled or disabled by the Buyer as needed.
- 13.8.9 The Seller must verify the procured product allows use of unique routable network address spaces (i.e., address spaces other than 192.168.0.0/16, 172.16.0.0/12, and

10.0.0.0/8 must be supported) work within the Buyer's network. If this requirement cannot be met, the Seller must offer an alternative approach, with mitigating security measures, acceptable to the Buyer.

#### **Baseline Specification for Products Using Communication Tunneling (e.g., using a VPN):**

13.8.10 The Seller must provide or use an existing security-isolated environment outside the control network (e.g., using a demilitarized zone [DMZ] or an equivalent or a superior form of security isolation) for the communications tunneling server to reside in.

13.8.11 The Seller must use different authentication credentials from those used for in-network communications when establishing control network access using communication tunneling.

13.8.12 The Seller must configure the communication tunneling components of the procured product (e.g., connectors, filters, and concentrators) to provide end-to-end protection (e.g., end-to-end encryption) of the data in transit. This protection must address confidentiality and/or integrity, as specified by the Buyer.

#### **Baseline Specification for System Networks or Networking Components:**

13.8.13 The Seller must provide a method for managing the network components of the procured product and changing configurations, including hardware and software configurations (e.g., addressing schemes).

13.8.14 The Seller must verify and provide documentation the network configuration management interface is secured.

13.8.15 The Seller must provide Access Control Lists (ACLs) for monitoring network components (e.g., port mirroring and network tap) of the procured product.

### **13.9 Malware Detection and Protection**

Malicious code (e.g., malware) comes in many shapes and forms. Most often it is spread by humans via USB devices, email, or websites (by clicking) in the form of Trojans and viruses. Malicious code can enter systems through removable media. It can also be self-propagating in the form of worms. As radio and interconnecting transport systems migrate onto Internet Protocol (IP)-based platforms, they become more susceptible to malware infections and require cyber protections against them.

#### **Baseline Specification for Systems and Components with Malware Protection Capabilities:**

13.9.1 The Seller must provide, or specify how to implement, the capability to automatically scan any removable media introduced to the product being acquired.

13.9.2 The Seller must implement **at least one** of the following:

- Provide a host-based malware detection capability. The Seller must quarantine (instead of automatically deleting) suspected infected files. The Seller must provide an updating scheme for malware signatures. The Seller must test and confirm compatibility of malware detection application patches and upgrades.
- If the Seller is not providing the host-based malware detection capability, the seller must suggest malware detection products to be used and provide guidance on malware detection and configuration settings will work with Seller products.
- If the Seller is not providing a host-based malware detection capability, nor suggesting malware detection products, and if specified by the Buyer, the Seller must provide an application whitelisting solution. The solution must be tested, validated, and document only permit approved applications may run.

13.9.3 The Seller must validate cybersecurity services running on the procured product (e.g., virus checking and malware detection) do not conflict with other such services running on the procured product.

## **13.10 Reliability and Adherence to Standards**

Adherence to security standards is one step in protecting radio and interconnecting transport systems and components from compromise. These standards should be considered when procuring radio and interconnecting transport systems and components in order to improve security implementation, including the protection of sensitive information.

### **Baseline Specification:**

13.10.1 The Seller must protect the confidentiality and integrity of the Buyer's sensitive information.

13.10.2 The Seller must verify the addition of security features does not adversely affect connectivity, latency, bandwidth, response time, and throughput specified.

13.10.3 The Seller must use an implementation complying with the current applicable interoperability and security standards, as specified by the Buyer (e.g., NIST 800 series, ISA/IEC 62443, IEEE 1613, IEEE 1588, and NERC CIP).

13.10.4 Upon the Buyer's request, the Seller must return or document the secure disposal of the Buyer's data and Buyer-owned hardware no longer needed by the Seller (e.g., NIST Special Publication [SP] 800-80).

## **13.11 System Information Security**

13.11.1 The Contractor must maintain physical and electronic information security of site access gate/door codes, Internet VPN access codes, system drawings, RF infrastructure configuration files, telephone numbers, IP addresses and other sub-systems electronic files stored on laptops, smart phones and other electronic media utilizing AES 128-bit or greater cipher (encryption) in order to protect any sensitive electronic files.

- 13.11.2 The Seller custom encryption key must contain at least a 16-character count including multiple uppercase, lowercase, digits and symbol characters.
- 13.11.3 The Seller must use file or whole drive encryption utilizing AES 128-bit or greater cipher in order to protect any electronic files in the event of a lost or stolen laptop or computer bag containing a hard drive, solid state drive, USB stick or other electronic media.
- 13.11.4 The Seller must certify their password control software utilizes salting and hashing security measures for storing electronic passwords.
- 13.11.5 The Seller must certify disposal of electronic media (hard drive, solid state drive, USB stick or other) must be erased or deleted (data erasure) with data-erasing software using pseudorandom data and physically destroying the media device to avoid retrieval by local dumpster diving or e-waste disposal third parties.
- 13.11.6 The Seller must certify any printed or CD-ROM materials will be discarded must be shredded utilizing a cross-cut shredder to avoid retrieval by local dumpster diving.
- 13.11.7 The Seller must certify employees have been trained on social engineering manipulation security risks of divulging system data, combination codes, passwords or other verbal information over the phone or by email.

## **The Seller's Life Cycle Security Program**

The Seller's life cycle security program is an important consideration in the procurement process. Vulnerabilities frequently result from architecture, design, weaknesses, and vulnerabilities in hardware, software, and firmware coding, as well as in bundled third-party products. Many security vulnerabilities are the direct result of writing software with inadequate attention to secure coding practices reducing the risk of successful deliberate and persistent malicious attacks. Life cycle security programs provide a structured way for developing robust products with fewer weaknesses and vulnerabilities or finding and remediating them before software and systems are delivered and installed in the Buyer's environment. Seller post-production support is critical for maintaining secure software and systems, including remediating newly discovered vulnerabilities and ensuring spare parts can be replaced with genuine parts. The hardware, software, or firmware must be delivered as it was ordered and shipped—without being tampered with or otherwise modified. After a product has been removed from service, the disposal of the product provides opportunities for the compromise of information and configurations deemed sensitive by the Buyer or Seller.

### **13.12 Secure Development Practices**

Secure product development practices are a set of processes integrated into the system development life cycle (SDLC) reducing the security risks of the overall product. These practices help to develop more robust hardware, software, and firmware with fewer weaknesses and vulnerabilities, as well as identify and remediate weaknesses and vulnerabilities before

implementation. Secure development practices ensure security is integrated into all phases of the SDLC and is considered a key component of system development.

### **Baseline Specification:**

- 13.12.1 The Seller must provide summary documentation of its secure product development life cycle including the standards, practices (including continuous improvement), and development environment (including the use of secure coding practices) used to create or modify Seller-provided system hardware, software, and firmware. If applicable, the Seller must document how the most critical application security weaknesses (including OWASP Top 10 or SANS Top 25 Most Dangerous Software Errors) are addressed in the Seller's SDLC.
- 13.12.2 As specified by the Buyer, the Seller must identify the country (or countries) of origin of the procured product and its components (including hardware, software, and firmware). The Seller must identify the countries where the development, manufacturing, maintenance, and service for the product are provided. The Seller must notify the Buyer of changes in the list of countries where product maintenance or other services are provided in support of the procured product. This notification must occur within 90 calendar days prior to initiating a change in the list of countries.
- 13.12.3 The Seller must provide a Quality Assurance program and validate the software and firmware of the procured product have undergone Quality Control testing to identify and correct potential cybersecurity weaknesses and vulnerabilities. This testing must include fuzz testing, static testing, dynamic testing, and penetration testing. The Seller must use positive and appropriate negative tests to verify the procured product operates in accordance with requirements and without extra functionality, as well as monitor for unexpected or undesirable behavior during these tests. This testing may be done by the Seller or an independent entity. The Seller must provide summary documentation of the results of the testing including unresolved vulnerabilities and recommended mitigation measures.
- 13.12.4 The Seller must provide summary documentation of its coding reviews, including defect lists and plans to correct identified vulnerabilities.
- 13.12.5 The Seller must communicate security-related technical issues with a single technical point of contact (e.g., a company support email address or a company support phone number), as specified by the Buyer. The Seller must communicate with the Buyer within 30 calendar days. This communication is not intended for non-technical contract-related issues.
- 13.12.6 The Seller must provide documentation of all input validation testing including, but not limited to, measures for prevention of command injection, Structured Query Language (SQL) injection, directory traversal, Remote File Include, Cross-Site Scripting (XSS), and buffer overflow.
- 13.12.7 The Seller must only store backup copies of system data to off-site (cloud) data storage utilizing end-to-end Perfect Forward Secrecy (PFS) Transport Layer Security (TLS)

based communications encryption protocol and 128-bit or greater AES cipher encryption for the stored data. The cloud storage data must be protected utilizing AES 128-bit or greater cipher encryption. The encryption must use the Sellers custom encryption key verses the use of the cloud providers stored server encryption key held in escrow by this third party.

13.12.8 The Seller must provide a contingency plan for sustaining the security of the procured product in the event the Seller leaves the business (e.g., security-related procedures and products placed in escrow).

13.12.9 The Buyer must have the right to request documentation of the Seller's implemented cybersecurity program, including recent assessment results or conduct periodic, as needed on-site security assessments at the Seller's facilities. These on-site security assessments may be conducted by an independent third party, at the discretion of the Buyer. The scope of the on-site assessments will be established between the parties prior to scheduling the on-site security assessments.

### **13.13 Documentation and Tracking of Vulnerabilities**

When security vulnerabilities are discovered in hardware, software, and firmware, the timely application of corrective actions and/or mitigation steps can reduce the likelihood adversaries will be able to exploit these vulnerabilities in radio and interconnecting transport systems. Some of these vulnerabilities may be publicly disclosed before the Seller can develop remedies; others may be kept from disclosure until remedies are available.

Security breaches may also affect the cybersecurity of the procured product. Such breaches may involve a compromise of security involving the Seller's organization, or any organization involved in the product's supply chain. Security breaches may result in the loss of sensitive product design.

Information, information on the Buyer's use and configuration of the product, a compromise of access control information for the deployed products (e.g., compromise of access control information the Seller uses to perform maintenance on a deployed product), or other security-sensitive information. If the Buyer is informed of a security breach in a timely manner, it may be able to apply mitigating measures to maintain adequate levels of security.

#### **Baseline Specification:**

13.13.1 Upon request of the Buyer, and prior to the delivery of the procured product, the Seller must provide summary documentation of publicly disclosed vulnerabilities in the procured product and the status of the Seller's disposition of those publicly disclosed vulnerabilities.

13.13.2 The Seller must provide, within 10 business days after product delivery, summary documentation of uncorrected security vulnerabilities in the procured product. This documentation includes summary documentation on vulnerabilities have **not** been publicly disclosed or have only been identified **after** the delivery of the product. The summary documentation must include a description of each vulnerability and its potential

impact, root cause, and recommended compensating security controls, mitigations, and/or procedural workarounds.

13.13.3 After contract award, the Seller must provide summary documentation within 10 business days of any identified security breaches involving the procured product or its supply chain. Initial and follow-up documentation must include a description of the breach, its potential security impact, its root cause, and recommended corrective actions involving the procured product.

## 13.14 Problem Reporting

It is difficult to build perfectly secure products and sometimes unknown vulnerabilities exist in the core logic and configuration of radio and interconnecting transport systems and components. When vulnerabilities in hardware, software, or firmware configurations are discovered, a process is needed to allow users to report them. A vulnerability mitigation process allows for the tracking of progress to develop workarounds, patches, and fixes. Timely notification of vulnerabilities is essential to create defenses for zero-day exploits.

### Baseline Specification:

13.14.1 The Seller must provide a secure process for users to submit problem reports and remediation requests. This process must include tracking history and corrective action status reporting.

13.14.2 Upon the Buyer submitting a problem report to the Seller, the Seller must review the report, develop an initial action plan within 10 business days, and provide status reports of the problem resolution to the Buyer within 30 calendar days with monthly updates until the problem is resolved.

13.14.3 The Seller must provide the Buyer with its responsible disclosure and threat reporting policies and procedures (e.g., Computer Emergency Response Teams [CERTs]), which must address public disclosure protections implemented by the Seller.

## 13.15 Patch Management and Updates

The discovery of product weaknesses and vulnerabilities is an ongoing process for Sellers. To remediate discovered weaknesses and vulnerabilities, responsible system and product Sellers regularly release updates, patches, service packages, or other fixes to their products—including third-party hardware, software, and firmware. Testing and validation of the patches and upgrades are necessary prior to performing the updates on a production system.

### Baseline Specification:

13.15.1 The Seller must provide documentation of its patch management program and update process (including third-party hardware, software, and firmware). This documentation must include resources and technical capabilities to sustain this program and process. This includes the Seller's method or recommendation for how the integrity of the patch is

validated by the Buyer. This documentation must also include the Seller's approach and capability to remediate newly reported zero-day vulnerabilities.

13.15.2 The Seller must verify and provide documentation procured products (including third-party hardware, software, firmware, and services) have appropriate updates and patches installed prior to delivery to the Buyer, or within 30 calendar days after delivery.

13.15.3 For the duration of the purchase contract or support agreement, the Seller must provide appropriate software and firmware updates to remediate newly discovered vulnerabilities or weaknesses within 30 calendar days. Updates to remediate critical vulnerabilities must be provided within a shorter period than other updates, within 10 business days. If updates cannot be made available by the Seller within these time periods, the Buyer and Seller must mutually agree to the Seller proposed reasonable timeframe to provide mitigations and/or workarounds.

13.15.4 When third-party hardware, software, and firmware is provided by the Seller to the Buyer, the Seller must provide appropriate hardware, software, and firmware updates to remediate newly discovered vulnerabilities or weaknesses within 30 business days. Updates to remediate critical vulnerabilities must be provided within a shorter period than other updates, within 10 business days. If these third-party updates cannot be made available by the Seller within these time periods, the Seller must provide mitigations and/or workarounds within a mutually agreeable time period.

## **13.16 Seller Personnel Management**

Seller personnel who have access to a Buyer's procured product, or have sensitive information about the system, need to protect this information from adversaries. Without Seller personnel management processes, sensitive information and access to assets could be compromised when changes to a Seller's staff occur.

### **Baseline Specification for Radio and Interconnecting Transport Systems:**

13.16.1 The Seller must provide summary documentation to attest to its workforce receiving position-appropriate cybersecurity training and awareness. This includes specialized training for those involved in the design, development, manufacture, testing, shipping, installation, operation, and maintenance of products procured by the Buyer, as part of the Seller's cybersecurity program.

13.16.2 The Seller must perform security background checks on its employees (including contract personnel) working directly on or involved in the development of a Buyer's system or procured product. The background check methodology must be mutually agreed upon by the Buyer and Seller.

13.16.3 The Seller must ensure policies and procedures are followed to prohibit the unauthorized disclosure of knowledge, information, architectures, or configuration relevant to the Buyer's system.

13.16.4 The Seller must share information with the Buyer to support the timely update of authentication credentials and access control to reflect staffing changes.

### **13.17 Secure Hardware and Software Delivery**

Radio and interconnecting transport systems use information and communication technology (ICT). The modern ICT supply chain is complex and extended, and it provides numerous opportunities for subversion, including malicious code insertion, counterfeit insertion, and tampering. Specifically, ICT, including radio and interconnecting transport systems, requires protection during delivery, both physical (when components are transported) and logical (when software, including patches, is downloaded). If radio and interconnecting transport systems and their components are not protected during delivery, the resulting production systems may fail prematurely or exhibit unintended functionality, which can compromise system availability, reliability, and integrity.

#### **Baseline Specification:**

13.17.1 The Seller must establish, document, and implement risk management practices for ICT supply chain delivery of hardware, software, and firmware. The Seller must provide documentation on its:

- Chain-of-custody practices.
- Inventory management program (including the location and protection of spare parts).
- Information protection practices.
- Integrity management program for components provided by sub-Sellers.
- Instructions on how to request replacement parts.
- Maintenance commitment to ensure, for a specified time into the future, spare parts must be made available by the Seller.

13.17.2 The Seller must specify how digital delivery for procured products (e.g., software and data) will be validated and monitored to ensure the digital delivery remains as specified. If the Buyer deems encryption is warranted, the Seller must apply encryption to protect procured products throughout the delivery process.

13.17.3 The Seller must use trusted channels to ship critical system hardware.

13.17.4 The Seller must demonstrate a capability for detecting unauthorized access throughout the delivery process.

13.17.5 The Seller must demonstrate chain-of-custody documentation for critical delivery system hardware and require tamper-evident packaging for the delivery of this hardware.

## Intrusion Detection

Intrusion detection is used to detect attempts to compromise the confidentiality, integrity, or availability of radio and interconnecting transport systems. An intrusion detection system (IDS) is a component, or specialized software residing on a component, monitoring network or system activities for malicious activities or policy violations and logs or reports potential issues. Intrusion detection on radio and interconnecting transport systems can involve the use of host-based or network-based IDSs.

### 13.18 Host Intrusion Detection

A host-based intrusion detection system (HIDS) is one of the last layers of protection for the systems on a network. A HIDS is used to monitor and analyze the communication traffic within a system component or the entire system. It can also be used to assess communication traffic at the component's network interfaces. The HIDS monitors and reports the configuration of the host system and application activity. A HIDS may perform such functions as log analysis, event correlation, integrity checking, policy enforcement, rootkit detection, performance monitoring, and base-lining to detect variations in system configuration.

#### **Baseline Specification for the Procured Product with a HIDS:**

- 13.18.1 The Seller must provide either a configured HIDS or the information needed for the Buyer to configure the HIDS.
- 13.18.2 The Seller must implement or recommend a configuration for the HIDS adhering to requirements for the Buyer's operating system functions or business objectives.
- 13.18.3 The Seller must apply the auditing and logging provisions outlined in Section 13.7 of this specification to the HIDS.

### 13.19 Network Intrusion Detection

A network intrusion detection system (NIDS) is used to identify and analyze communication traffic on a computer network and to identify unauthorized or malicious activity. NIDSs can be either knowledge-based or behavior-based. Due to the nature of monitoring, a NIDS generates voluminous logs. If these logs are not properly configured during initial setup, they may become unmanageable, and therefore not useful. Performing the initial configuration of the NIDS is a minor effort compared to the degree of effort required for ongoing log reviews and tuning. Log consolidation, review, and notification software tools should be used to help automate the review of NIDS data.

#### **Baseline Specification for the Procured Product with a NIDS:**

- 13.19.1 The Seller must recommend a placement(s) of the NIDS sensors to provide appropriate monitoring for the system network.

- 13.19.2 The Seller must provide traffic profiles with expected communication paths, network traffic, and expected utilization boundaries for behavior-based (also called anomaly based) NIDS.
- 13.19.3 The Seller must provide initial and routinely updated signatures for knowledge-based (also called signature-based) NIDS.
- 13.19.4 The Seller must provide either a configured NIDS or the information needed for the Buyer to configure the NIDS in adherence to the Buyer's functional requirements.
- 13.19.5 The Seller must provide a NIDS architecture working with the system communication method.

## Physical Security

Physical security is an important element in cyber defense for radio and interconnecting transport systems. Physical security is used to deter, delay, detect, and deny physical access by unauthorized individuals, including those who may wish to physically access system components in order to compromise the confidentiality, integrity, or availability of the systems or their data.

### 13.20 Physical Access to System Components

Physical security is a key aspect of protecting radio and interconnecting transport systems from manipulation, sabotage, or theft. The innermost level of physical security involves deterring and delaying an adversary from gaining access to the system or its components once inside the facility.

#### **Baseline Specification for the Acquisition of New Radio and Interconnecting Transport Systems, When the Buyer Does Not Have Existing Physical Security Enclosures and Wishes to Include Them:**

- 13.20.1 The Seller must provide lockable or locking enclosures or rooms for radio and interconnecting transport systems and system components (e.g., servers, clients, and networking hardware) and for the systems used to manage and control physical access (e.g., servers, lock controllers, and alarm control panels).
- 13.20.2 The Seller must provide a method for tamper detection on lockable or locking enclosures. If a physical security and monitoring system is used, tamper detection must be compatible.
- 13.20.3 The Seller must change locks, locking codes, keycards, and any other keyed entrances or provide the Buyer with the tools and instructions for making these changes.
- 13.20.4 The Seller must work with the Buyer to verify physical security features do not hamper system operations.

13.20.5 The Seller must reprogram codes (e.g., remove default codes) on provided locks and locking devices so the codes/passwords are unique to the Buyer and do not repeat codes used in the past.

13.20.6 As specified by the Buyer, the Seller must provide two-factor authentication for physical access control.

### **13.21 Perimeter Access**

Perimeter security is one of the first lines of defense for protecting a facility and its internal systems. A breach of this perimeter can lead to the compromise of radio and interconnecting transport systems. Perimeter security components restricting physical access to a facility, or a portion of a facility include fences, walls, entrance gates or doors, vehicle barriers, surveillance and alarm systems, and security guards.

Perimeter access restrictions are used to prevent unauthorized individuals from entering areas where radio and interconnecting transport systems and their communication pathways are located.

#### **Baseline Specification for the Acquisition of a Physical Perimeter Access System:**

13.21.1 The Seller must provide a physical security assessment as specified by the Buyer and relevant to the procurement defining the security perimeter physical access points and controls needed at each access point.

13.21.2 The Seller must coordinate with local authorities when installing and using remote alarm systems as defined and specified by the Buyer.

13.21.3 The Seller must verify and provide documentation stating monitoring and alarm of physical access can be separated from the control network (unless making this communication part of the control network is specifically requested by the Buyer).

#### **Baseline Specification When the Seller is Also Involved in the Operation of the Physical Perimeter Access System:**

13.21.4 The Seller must allow access within the perimeter only to those employees, contractors, or guests explicitly permitted in such access by both the Seller and Buyer.

13.21.5 The Seller must verify and provide documentation stating security personnel have completed background checks.

### **13.22 Communications Inside the Physical Security Perimeter**

Compromise of the communications within a security perimeter can jeopardize the security of radio and interconnecting transport systems. These communications need to be secured to limit access to radio and interconnecting transport systems and their data, which should flow to only authorized users. These communications may involve wired or wireless communications.

## **Baseline Specification for the Acquisition of Communications Internal to the Buyer's System:**

- 13.22.1 The Seller must verify and provide documentation stating physical communication channels are secured from physical intrusion.
- 13.22.2 The Seller must verify and provide documentation stating communication channels are as direct as possible (e.g., communication paths between devices in the same network security zone do not pass-through devices maintained at a lower security level or unnecessarily cross into zones of lower physical security).

## **Wireless Technologies**

Wireless technologies refer to any technology (e.g., Wi-Fi, Bluetooth, radio, microwave, infrared, and ZigBee) allowing analog and digital communication without the use of wires.

### **13.23 General Wireless Technology Provisions**

Many radio and interconnecting transport systems and networks use wireless technologies; therefore, it is important to establish and maintain effective and reliable wireless communications links. Unlike wired networks, access to wireless networks does not require physical access or the typical permissions associated with physical access. It is important to use sufficient security protections to mitigate the threat of the wireless network being used by individuals without the organization's knowledge or consent.

#### **Baseline Specification for Wireless Technology:**

- 13.23.1 The Seller must document specific protocols and other detailed information required for wireless devices to communicate with the control network, including other wireless equipment able to communicate with the Seller-supplied devices.
- 13.23.2 The Seller must document use, capabilities, and limits for the wireless devices.
- 13.23.3 The Seller must document the power and frequency requirements of the wireless devices (e.g., microwave devices meet the frequency requirements of Generic Requirements [GR]-63 Network Equipment Building System [NEBS] and GR-1089).
- 13.23.4 The Seller must document the range of the wireless devices and verify the range of communications is minimized to both meet the needs of the Buyer's proposed deployment and reduce the possibility of signal interception from outside the designated security perimeter.
- 13.23.5 The Seller must document the wireless technology and associated devices comply with standard operational and security requirements specified in applicable wireless standard(s) or specification(s) (e.g., applicable IEEE standards, such as 802.11).
- 13.23.6 The Seller must demonstrate—through providing summary test data—known attacks (e.g., those documented in the Common Attack Pattern Enumeration and Classification

[CAPEC] list, such as malformed packet injection, man-in-the middle attacks, or denial-of-service attacks) do not cause the receiving wireless devices to crash, hang, be compromised, or otherwise malfunction.

13.23.7 The Seller must document the configuration control options enabling various of the security level of the devices.

13.23.8 The Seller must allow and recommend alarm settings in accordance with the needs of the system.

## **Cryptographic System Management**

A cryptographic-based security system involves both cryptographic methods (e.g., primitives/ algorithms) and Cryptographic Key Management (methods of creating, distributing, maintaining, validating, and updating cryptographic keys). This specification addresses provided basic cryptographic system documentation and management capabilities.

### **13.24 Cryptographic System Documentation**

The strength of cryptographic systems varies widely. Having documentation of how the cryptographic features work and how they should be implemented and managed within a particular environment is critical to the long-term effectiveness of a system. It is important to establish a baseline set of documentation detailing which cryptographic primitives (e.g., algorithms) the Seller intends to implement in the proposed system, and how those primitives are to be implemented and managed throughout the product life cycle.

#### **Baseline Specification for Cryptographic System Documentation:**

13.24.1 The Seller must document how the cryptographic system protects the confidentiality, data integrity, authentication, and non-repudiation of devices and data flows in the underlying system as specified by the Buyer. This documentation must include, but not be limited to, the following:

- The cryptographic methods (hash functions, symmetric key algorithms, or asymmetric key algorithms) and primitives (e.g., Secure Hash Algorithm [SHA]-256, Advanced Encryption Standard [AES]-128, RSA, and Digital Signature Algorithm [DSA]-2048) implemented in the system, and how these methods are to be implemented.
- The preoperational and operational phases of key establishment, deployment, ongoing validation, and revocation.

### **13.25 Cryptographic Key and Method Establishment, Usage, and Update**

Cryptographic systems, once implemented, require the ability to update credentials in an efficient manner. Without these support capabilities, the effectiveness of the overall system will decrease over time. A process of credential updates requiring physically visiting each protected device in

a very large, distributed system is unlikely to maintain its effectiveness over time. This section provides requirements for the types of functions to enable a Buyer to effectively manage a large number of devices installed at unattended locations.

**Baseline Specification for Cryptographic System Establishment, Usage, and Updates:**

13.25.1 The Seller must only use "Approved" cryptographic methods as defined in the Federal Information Processing Standard (FIPS) Security Requirements for Cryptographic Modules (FIPS 140-2).

13.25.2 The Seller must provide an automated remote key-establishment (update) method protecting the confidentiality and integrity of the cryptographic keys.

13.25.3 The Seller must ensure:

- The system implementation includes the capability for configurable cryptoperiods (the life span of cryptographic key usage) in accordance with the Suggested Cryptoperiods for Key Types found in Table 1 of NIST 800-57 Part 1.
- The key update method supports remote re-keying of all devices within 180 calendar days as part of normal system operations.
- Emergency re-keying of all devices can be remotely performed within 30 calendar days.

13.25.4 The Seller must provide a method for updating cryptographic primitives or algorithms. (Note: Prior requirements have addressed updating cryptographic keys. This requirement addresses updates to or replacement of the cryptographic method.)

## 13.26 References:

FirstNet, Appendix C-10 NPSBN Cybersecurity

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Cybersecurity Procurement Language for Energy Delivery Systems

[http://energy.gov/sites/prod/files/2014/04/f15/CybersecProcurementLanguage-EnergyDeliverySystems\\_040714\\_fin.pdf](http://energy.gov/sites/prod/files/2014/04/f15/CybersecProcurementLanguage-EnergyDeliverySystems_040714_fin.pdf)

Exec. Order No. 13,636, "Improving Critical Infrastructure Cybersecurity." 78 Fed. Reg. 11739. February 19, 2013. [www.gpo.gov/fdsys/pkg/FR-2013-02-19/pdf/2013-03915.pdf](http://www.gpo.gov/fdsys/pkg/FR-2013-02-19/pdf/2013-03915.pdf).

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Internet Engineering Task Force (IETF). "Glossary." IETF. [www.ietf.org/glossary](http://www.ietf.org/glossary).

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National Institute of Standards and Technology (NIST). *Guidelines for Smart Grid Cybersecurity*. NIST Interagency Report (IR) 7628. Gaithersburg, MD: NIST, 2010.

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## SECTION 14

# Implementation Requirements

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This section defines the implementation requirements.

## 14.1 General

- 14.1.1 These standards and other standards are the requirements for the installation of the system(s) and equipment.
- 14.1.2 Seller must carefully coordinate all phases of the work with the Buyer's Project Manager.
- 14.1.3 The following requirements are provided for installation of equipment including, but not limited to, antennas and antenna systems, consoles, base/control/repeater equipment, data networking equipment, and other miscellaneous equipment and devices required or used. Any variation in these guidelines require the approval of Buyer's Project Manager.
- (1) Seller must furnish all personnel to perform the initial installation, placement and assembling at the Buyer's locations or elsewhere as required, of the individual equipment and the components into an operating system. This requirement includes the performance of any test to determine the satisfactory operating condition of the equipment before it is formally accepted by Buyer.
  - (2) Seller is responsible for the installation of all equipment furnished under this Contract. Seller must provide sufficient competent engineers and technicians to perform the installation, as well as a full-time, factory-trained, technically competent project manager to supervise all phases of the system installation. The project manager must be assigned to this project through the installation and all testing phases. Seller must also perform connections between Buyer provided equipment and Seller provided equipment (e.g., microwave equipment, routers, Ethernet switches, logging recorder, etc.) as may be required.

## 14.2 Equipment Installations

- 14.2.1 The equipment installations required by this specification include the following described items as well as all other attachments, hardware, software, and procedures as may be provided to ensure a completed installation in accordance with the standards of good engineering practices, all building codes and ordinances (including earthquake protection) in effect at the sites specified in this specification and requires the approval of Buyer's Project Manager.
- 14.2.2 The installation must follow the latest versions of Motorola R56, Harris AE/LZT 123 4618/1, or other recognized guidelines and standards. Proposer must identify in their response the installation standard for their installations.

- 14.2.3 All special tools, testing devices, extenders, and other equipment required to properly maintain the complete network, mobiles, portables, control stations, and any associated components must be supplied with the network in accordance with the maintenance and testing requirements. A list of all such devices, extenders, tools, or equipment must be enclosed with the Proposal.
- 14.2.4 Wiring of 120 and 240 VAC to the nearest distribution panel will be provided by Buyer as part of the project. A review of existing circuit drops, and available breaker positions must be conducted by Seller. All new circuit breakers in panels must be supplied by Buyer. Wiring from this distribution panel to any new equipment is the responsibility of the Seller. Proposer must identify in their proposal the number and type of AC circuits required.
- 14.2.5 Buyer will provide space for all console and control equipment. The Seller must install the equipment within this space and connect the units to commercial/ emergency power. Seller must cooperate with the Buyer to connect all Buyer-provided equipment to the Seller-provided equipment. All bonding and grounding connections to the existing bonding and grounding systems must be provided by the Seller.
- 14.2.6 All site work permits and licenses, as required to improve or develop any of the sites, must be provided by Buyer as part of their work. Seller will be required to obtain electrical and building permits as may be applicable to their work. Each Point of Destination will require separate permits from the agency having jurisdiction.
- 14.2.7 All site work, tower strengthening, earth work, site grading access improvements, equipment shelter construction, utility work and improvements, structural analysis, architectural work, and associated items will be provided by Buyer. Seller is required to provide all services associated with the implementation of the radio system except those specifically identified in these specifications as provided by Buyer.
- 14.2.8 Proposed prices must include all installation hardware, brackets, braces, fasteners of all kinds, wiring, conduit, ancillary devices, procedures, and services required to install and/or interface equipment and components to provide a complete operating system fulfilling the requirements of the specification.
- 14.2.9 Seller is required to adhere to FCC rules and all state and local government codes and ordinances in all matters pertaining to the work.
- 14.2.10 The proposed installation work must be authorized by Buyer's Project Manager prior to commencement of any particular phase of work at each Point of Destination. Seller must provide descriptions and layout drawings showing the proposed installations at each site at least 30 days prior to beginning any work. Buyer must receive written approval of Buyer's Project Manager prior to beginning work.
- 14.2.11 Access to all Points of Destination will require prior coordination with Buyer's Project Manager.

- 14.2.12 Fixed equipment and cable installations must be accomplished in accordance with earthquake protection practices. This requirement includes, but is not limited to, providing flexible entry cables, surge loops, special battery racks, and special equipment rack design and mounting practices.
- 14.2.13 Rack mounting may be accomplished by either of two methods—special floor only mounting or a combination of floor and top mounting. Proposer must recommend a particular method and provide an option for any other method. Buyer will select the preferred method prior to execution of the Agreement. All mounting arrangements must comply with the current edition of the Washington State Building Code and local building requirements.
- 14.2.14 It is Seller's responsibility to be aware of the facilities for delivering, storing, placing, handling, and disposing of materials. All aspects of the installation must be planned and executed in a professional manner as approved by Buyer's Project Manager. Seller must make provisions to have all trash properly disposed of daily.
- (1) Seller must supply all the necessary installation items required to make the equipment a complete operating system including Buyer-supplied equipment. This requirement must include, but is not limited to, clamps, wiring, cable, hardware, ty-wraps, anchors, etc.
- (2) Seller must make all the test, adjustments, level settings, etc. to the equipment required to control and operate the consoles, recorders, base stations, and associated equipment in a normal manner.
- 14.2.15 The Seller must provide any necessary cutouts in the computer floor sections as required. Buyer's Project Manager must approve the location of any cutouts required.

### **14.3 System Staging**

- 14.3.1 The system minus the antennas and antenna feed lines, but including the transmitter combiners, receiver multicouplers, and tower-top amplifiers must be assembled and tested. This testing may be done at the factory or other location chosen by the manufacturer not on Buyer's premises. This process is referred to as “System Staging” in this Document as defined below.
- 14.3.2 The equipment must be installed in the same racks and configuration as it will be installed at Points of Destination to the greatest degree practical. This includes:
- Same equipment mounting locations
  - Same adjacent rack mounting arrangement where racks are mounted adjacent to each other
  - All inter- and intra-rack cabling must be cut to the correct length for the installation at the Buyer's location. This requirement includes the factory attachment of all cable connectors

- All power connections both AC and DC
- Console positions may be set on a table or rack mounted to facilitate testing without installation in console furniture
- Any doors, access panels, equipment covers must be installed for the final Staging Acceptance Test
- Any exceptions to the staging layout, different from the final installation at Points of Destination must be clearly defined and identified in the staging documentation

## 14.4 Installation Plan

14.4.1 Seller must develop and submit a final installation plan to Buyer's Project Manager for approval at least 45 days prior to the start of installation. No equipment is to be installed until the plan has been approved by Buyer's Project Manager. The plan must detail location of equipment, cabling, mounting, hardware, and installation procedures. Diagrams must be used to indicate equipment locations.

14.4.2 The existing system including consoles, remote desktop units, mobiles and portables, etc. must remain operational during the system transition. At no time, can Buyer's users be without communications from one of the systems or the other. Seller must develop an installation plan identifying all the processes for effecting the transition between the old system and the new system including fall back plans and any common operation required.

14.4.3 Proposer must discuss the possibility of using City facilities for the mobile installation and programming work instead of Seller provided facilities. Buyer desires to keep the vehicle fleet as close to the place of use as possible to minimize downtime.

## 14.5 Equipment Recordkeeping

14.5.1 Prior to the installation of equipment, Seller must establish a record system for each unit or equipment to be furnished under this contract. The system must be computerized and must keep current the correlation between equipment serial numbers and model numbers. This system may be in a database or spreadsheet format. The system must allow Buyer's technical staff to keep the information up to date over the life of the system. As a minimum, the record must contain the following but not be limited to:

- (1) Type of equipment
- (2) Manufacturer
- (3) Model number
- (4) Serial number
- (5) Date of installation

- (6) Accessory operational checklist
  - (7) Maintenance list
  - (8) Parts replaced
  - (9) Name of technician who performed the work
- 14.5.2 Seller, prior to the installation of equipment, must establish a system maintenance log and a failure reporting system to assist in recordkeeping and management of the maintenance program. This system may be the same system as outlined in the previous paragraph but with the additional capacity to add maintenance and repair notes and information.
- 14.5.3 The record system, the failure reporting system and the system maintenance log must be subject to approval by Buyer's Project Manager. The record system and the system maintenance log must be maintained locally under Buyer's technical staff control.

## **14.6 Grounding**

- 14.6.1 All equipment must be grounded (bonded). Grounded Equipment must include, but not be limited to, all metal conduit, trays, racks, chassis, shelves, antennas, and transmission lines in accordance with these specifications.
- 14.6.2 The grounding system configuration for the equipment must be a single point grounding system installed by Seller. Seller must document any existing grounding systems and assure Buyer's Project Manager the existing grounding systems meet all manufacturer's specifications for the new equipment being installed. If deficiencies are noted, Seller must provide a written report detailing all deficiencies on a Point of Destination basis. Buyer will be responsible for correcting the deficiencies.
- 14.6.3 Seller must furnish and install all grounding and bonding conductors and make all necessary connections to the grounding system. The conductors must be a minimum size of 6 AWG stranded-copper wire unless a smaller wire size must be used to equipment size limitations. Any deviation from the 6 AWG grounding wire must be approved by Buyer's Project Manager. Bonding conductors must be used to bond the various pieces of equipment, conduit, trays, etc. together.
- 14.6.4 Ground conductors must be run as straight as possible with a minimum number of bends (no 90-degree bends permitted).
- 14.6.5 Seller must supply all the necessary installation items required to make the equipment a complete operating system including Buyer-supplied equipment. This requirement includes, but is not limited to, clamps, wiring, cable, hardware, ty-wraps, anchors, etc.
- 14.6.6 Seller must make all the test, adjustments, level settings, etc. to the equipment required to control and operate the consoles, recorders, base stations, and associated equipment in a normal manner.

- 14.6.7 Seller must provide any necessary cutouts in the computer floor sections as required. Buyer's Project Manager must approve the location of any cutouts required.

## **14.7 Failure to Meet Requirements of Specifications**

- 14.7.1 Should any of the inspections, tests, or operation of the equipment under service conditions show the system or equipment does not meet the requirements of the specifications, Buyer's Project Manager may reject the equipment and direct Seller to immediately furnish new equipment or parts as needed to bring it up to the requirements of the specifications.

## **14.8 Antennas and Mounts**

- 14.8.1 All communications antennas, regardless of specific installation location, must be erected plumb, level, and square unless specifically noted in the design (e.g., mechanical downtilt antennas). Seller must supply antenna mounts and all attachment hardware required to install Seller-supplied antennas. If fabrication is necessary, antenna mounting hardware must be hot dipped galvanized after fabrication. Antenna mounting hardware must be made of hot dipped galvanized or stainless-steel material. Heavy wall conduit (already galvanized) may be used when mounting antennas to buildings, wooden poles, or other non-tower structures. Exterior utilization of electrogalvanized or plated material for mounting of antennas is not permissible.
- 14.8.2 If the galvanizing on any antenna support is heavily scratched, saw cut, drilled, or destroyed in any manner, the damaged area must be repaired using cold galvanizing compound.
- 14.8.3 Antenna mounting hardware must provide a good bond between antenna and antenna mount.

## **14.9 Antenna Feed Line**

- 14.9.1 All antennas must have a jumper constructed of Commscope LDF4-50A or equal (not to exceed 50 inches) when using Commscope AVA5-50 or equal or larger as the primary length of feed line. If Commscope LDF4-50A or equal is used as the primary length of feed line, it must be connected directly to the antenna. A "drip loop" must be formed as this jumper or feed line is installed. The manufacturer recommended bending radius specifications must not be exceeded. No connectors must fall within, or be obscured by, any antenna support pipe or conduit run when making antenna feed line installations inside of support pipes or conduit runs.
- 14.9.2 At tower sites the following items must be employed:
- (1) Where feed line support systems have not been provided, cable ladder or angle mount clamps must be installed to support the feedline using waveguide cushions or similar mounting approach.

- (2) At locations where galvanized pipe or electrical conduit are used for mounting antennas, the external feed line runs may be secured by the utilization of stainless-steel wraplock or stainless-steel ties.
  - (3) At locations where wooden utility poles are used for mounting of antennas, the antenna feed line may be secured by using jiffy clips, one hole pipe straps or rigid conduit straps.
  - (4) No snap in hangers, ty-wraps of any sort, twisted wire, electrical tape, duct tape, string, rope, or any non-workmanlike approach must be used to support antenna feedlines.
- 14.9.3 When installing antenna feed line runs, the antenna feed line must not be attached to any individual antenna feed line run already installed. Attachment methods must encompass all antenna feed line runs and antenna feed line support at this point. Attachment intervals must follow requirements contained within this RFP or manufacturer recommendations.
- 14.9.4 The use of cable trays or messenger cable for antenna feed line support must be considered on an "as needed" basis. All antenna feed line runs must be secured to the messenger or cable tray by the utilization of stainless-steel wraplock or stainless-steel ties.
- 14.9.5 All antenna feed line runs inside buildings (where cable trays are provided) may be secured by utilization of black nylon cable ties. Where cable trays are not provided, the use of jiffy clips, one hole pipe straps, rigid conduit straps, Unistrut and Unistrut clamps, or black nylon cable ties are permitted to secure antenna feed line runs. Utilization of electrogalvanized or plated material inside of buildings is permitted.
- 14.9.6 All antenna feed lines must have cable identification tags denoting the corresponding antenna. Each antenna and transmission line must be identified with colored tape bands and brass tags supplied and installed by Seller as follows:
- (1) Red – Receive.
  - (2) Yellow – Transmit.
  - (3) Brass Tag – Antenna/feedline names chosen during design.
- 14.9.7 Number of bands denotes antenna number.
- 14.9.8 Place colored tape bands on antenna, near ends of each cable and jumper and on cables on both sides of building entrance panel and on both sides of cable on the inside of the building.
- 14.9.9 Color tape must be 3M 7 mil Scotch 35 Vinyl Electrical Color-Coding Tape (red and yellow).

- 14.9.10 Place 1.5” diameter round blank brass tags (Brady Catalog #23211) near ends of each cable. Each brass tag must be customized to clearly identify each run of cable utilizing ¼” steel stamps for letter and number sets (Brady Catalog #23240 and #23241).
- 14.9.11 Continuous, ¼-inch-wide, Type 316stainless-steel strapping (Brady Catalog #42331) and stainless-steel banding heads (Brady Catalog #90910) utilizing a proper banding tool (Brady Catalog #42322) must be used to secure the brass tag at the connector ends of each run of cable.
- 14.9.12 All antenna feed line entryways into buildings must be sealed. All entryways must be filled to near capacity prior to starting a new opening. Microwave waveguide installations may dictate special consideration.
- 14.9.13 All antennas supported by wooden poles, electrical conduit, or pipe mounted to building sides or through the roof must use some type of grounding system. Where possible, this type of support should have an AWG #2 wire running to an adequate grounding system or grounding rod.
- 14.9.14 After ground strap installation, the work must be wrapped with overlapping layers of black outdoor electrical tape and protected with Scotchkote or equivalent outdoor coating to preclude corrosion. A minimum of three layers of the protection must be applied.

## SECTION 15

# Quality and Workmanship Requirements

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This section defines the quality and workmanship requirements for all phases of this project.

### 15.1 General

- 15.1.1 Seller must advise Buyer's Project Manager of any equipment failing during installation and testing or arrives damaged, the cause of the failure or damage, and the actions to remedy the problem. Failed equipment may not be repaired unless the entire module or assembly is replaced with a new unused spare assembly previously been factory tested and aligned.
- 15.1.2 All equipment must contain the latest current production hardware, firmware, and software at time of the start of system acceptance testing unless otherwise agreed to in writing by Buyer's Project Manager. Such agreement must include a list of all the equipment, firmware, and software not at current production levels, as well as the current version of the equipment, firmware, and software, plus an explanation as to why it was not upgraded to current release and a description of any difference between the installed version and the current production version.
- 15.1.3 All field service bulletins, software patches, and similar service and repair notices must be installed prior to the start of system acceptance testing. Buyer's Project Manager must be provided with all such field service notices, documents, patches, release notes, etc. applying to the system being installed prior to the start of acceptance.
- 15.1.4 All work done and material supplied by Seller must comply with defined industry standards such as:
- (1) R56 latest version
  - (2) Harris Standard known as AE/LZT 123 4618/1 latest revision
  - (3) EIA/TIA 568C – Commercial Building Telecommunications Wiring Standard
  - (4) EIA/TIA 569C – Commercial Building Standard for Telecommunications Pathways and Spaces
  - (5) EIA/TIA 607B – Commercial Building Grounding and Bonding Requirements for Telecommunications
  - (6) Institute of Electrical and Electronic Engineers (IEEE) Publication: 142-2007 Recommended Practice for Grounding of Industrial and Commercial Power Systems
  - (7) National Fire Protection Association (NFPA) Publication: 70, 2011 Edition National Electrical Code (NEC)

- (8) Underwriters Laboratories, Inc. (U.L.) Publication 83-2008 Thermoplastic Insulated Wires
  - (9) Underwriters Laboratories, Inc. (U.L.) Publication 467-2007 (R86) Grounding and Bonding
  - (10) Underwriters Laboratories, Inc. (U.L.) Publication UL 96A-2007 – Installation Requirements for Lightning Protection System
  - (11) Underwriters Laboratories, Inc. (U.L.) Publication UL 96-2005 – Lightning Protection Components
  - (12) Underwriters Laboratories, Inc. (U.L.) Publication UL 1581-2001 – Reference Standards for Electrical Wire, Cable and Flexible Cores
  - (13) Institute of Electrical and Electronic Engineers (IEEE) Publication: IEEE C62-1991 – Lightning Protection
  - (14) International Building Code
  - (15) International Fire Code
  - (16) Local codes as applicable
- 15.1.5 In the event of a conflict or different ways of accomplishing the same result, the more stringent code or specification requirement must be used. Seller must request additional clarification from Buyer's Project Manager. Failure to request clarification may result in Seller having to re-install equipment or rework an installation at Seller's own expense.
- 15.1.6 Upon completion of installation, all material must be free from defects, corrosion, scratches, or other such conditions as to present an other-than-new appearance. All the equipment and material must be of recent manufacture and design, new and unused.
- 15.1.7 All finished work must be straight, level, true and plumb where applicable, and installed exactly per the manufacturer's instructions, recommendations, and drawings. Only qualified mechanics skilled in this kind of work must be used. All workmanship must be first class in all respects. All mounting locations must be approved by Buyer's Project Manager before installation; failure to do this may result in the repair, removal, and re-installation of the equipment at Seller's expense.
- 15.1.8 Equipment racks must be securely anchored and electrically isolated from the floor.
- 15.1.9 Seller must restore any floor panels, ceiling tiles, raceway covers, power panel covers, junction box covers, equipment cabinet panels, and similar covers or protective devices removed during installation. Should Seller find missing covers, panels, etc. the missing items must be brought to the attention of the Buyer's Project Manager as soon as possible for remedy.

- 15.1.10 Seller must use only technicians trained in the installation of this equipment. Seller must identify and provide resume information including training history of any technician proposed to perform work on the system. Buyer's Project Manager must have the right to reject personnel from proposed project team for in Buyer's Project Manager's opinion lack of training or prior unsatisfactory performance.
- 15.1.11 All work must be performed, according to local conditions, in a manner best calculated to promote timeliness and accuracy, to secure safety of life, person, and property, to assure safe and continuous operation of Buyer's equipment and mission, and to reduce to a minimum any interference with the public and with other contractors in or about the property.
- 15.1.12 Seller must be responsible for any damages to Buyer's property which may occur during the installation of the equipment specified in this Contract due to negligence on Seller's part.
- 15.1.13 Seller must take all appropriate actions to ensure the work areas are kept clean and safe. All waste materials generated by Seller must be removed daily.
- 15.1.14 All wiring and cabling must be laced, clamped or supported by appropriate means. All wiring must be done in a neat and workmanlike manner. Wiring and cabling must use Buyer-provided cable tray, race way, conduit, or underfloor wiring systems where provided. Ty-wraps must not be used to support or bundle LAN cables rated at CAT 6 or higher. Hook and loop style (e.g., Velcro) straps and cable ties or similar method must be used for all LAN cables rated at CAT 6 or higher. Any method compressing or deforming the LAN cable must not be used.

## **15.2 AC Wiring**

- 15.2.1 Wiring practice, material and cabling must be in accordance with requirements of the National Electrical Code, OSHA, Underwriters Laboratories, and applicable local codes and standards. All wiring must be laced clamped or supported by appropriate means. All wiring must be done in a neat and workmanlike manner.
- 15.2.2 If installed by the Seller, AC wiring from the building circuit-breaker or fuse switch panels must be a minimum of 12 AWG.

## SECTION 16

# Acceptance Testing Requirements

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This Document defines the acceptance and performance testing requirements for the system and the individual components. The acceptance testing process includes the following:

- Factory Staging Acceptance Testing
- System Acceptance Testing
- Performance Acceptance Testing
- Interface Acceptance Testing
- Coverage Acceptance Testing

## 16.1 Assembly Staging Testing

16.1.1 The entire system must be assembled and tested at the equipment supplier's location as described in the Implementation section of this specification.

16.1.2 The complete system must pass the Staging Acceptance Test Plan (SATP) prior to final installation. The SATP must include the following as a minimum:

- Certification for each piece of equipment meeting its manufacturer's published specifications
- Test results showing receive sensitivity, transmitter power output, and modulation for each piece of base station equipment showing the test results matched to the serial number of the specific equipment
- Test results showing the testing of each alarm point provided for all alarms
- Test results for the receiver multicoupler and tower-top amplifier
- Test demonstration showing the basic capabilities of the system to make, and process calls at each site in the system.
- Test demonstration of all basic console functions to be able to place talkgroup calls, patch calls together, interface to conventional resources and any other interconnections defined in these specifications
- Test demonstration of the ability of the system to continue full system functionality during the sudden failure of any single processor or controller in the system where system redundancy is provided

- Test demonstration of the ability of the system to continue to provide trunking in cases where complete failure of the system controllers or failure of the controller to RF subsystem interconnection
- Test demonstration of the ability of the system to continue to provide communications when the trunking controller fails
- Test demonstration of the ability for backup systems to take over operation or provide service
- Verification of the ability to use the telephone interconnect system where applicable
- Inspection of equipment and installations including cable dressing, cable construction, grounding, equipment condition, etc
- Spot verification of the previous information provided in the test results discussed above for the RF performance, alarm performance, and any other items for which an actual demonstration is not provided on up to five pieces of equipment and or subsystems

## **16.2 System Acceptance Process**

### 16.2.1 The system acceptance process must:

- (1) Seller must submit a final performance test plan or test procedure (Acceptance Test Plan (ATP)) for Buyer's Project Manager's approval at least 30 days prior to the time of the tests. The test plan must set forth the test equipment to be used and the procedures to be followed for evaluating the system performance to ensure conformance with these specifications. This test plan must be agreed to by both parties.
- (2) Seller must advise Buyer's Project Manager the system is ready for the system acceptance process to start.
- (3) Seller must supply to the Buyer the acceptance documentation as outlined in the Performance Test Section below. Buyer's Project Manager will review and approve the documentation or request additional documentation or clarifications if the documentation is not satisfactory.
- (4) Buyer and Seller must mutually agree on a schedule for the site visits to inspect the quality of the work, verify the equipment has been installed, perform any spot checks or other tests outlined below performed in the field. Buyer's Project Manager will perform these tests with Seller's assistance to perform measurements. Buyer's Project Manager will then accept each site, generate a punch list of items to be fixed or completed, or reject the site.
- (5) Buyer and Seller will then perform the system operational tests as described below and in the ATP.

- (6) Seller with Buyer's Project Manager's supervision will then perform the Coverage Acceptance Test Plan (CATP) as described below. Seller must generate a report showing the area tested, the tested locations, the number of locations and the pass fail criteria. This information will be supplied to Buyer's Project Manager. Should the CATP not pass, Seller must verify system operation and re-run the tests. If on the second CATP, the system still does not pass, Buyer's Project Manager will stop the acceptance process and determine the course of action.
- (7) After a successful CATP, the general operational testing as described below and in the CATP will commence.
- (8) After successful general operational testing the system must run for 30 days without the following:
  - Any failure causing the complete loss of one or more channels or a site
  - Any central controller failures
  - Any voting system failure
  - Any console position failure resulting in the loss of one or more console positions
  - Any failure of the alarm reporting system resulting in the loss of alarms from more than one site
- (9) If any of the failures described above occur, Seller must replace the failed equipment and the 30-day acceptance period will start again. If 30-day acceptance period is restarted twice, the Seller and Buyer's Project Manager will stop the acceptance process and evaluate the next steps.

## **16.3 Performance Tests and Buyer's Acceptance**

16.3.1 Performance tests must include but are not limited to the following tests. All tests must be performed after the equipment has been fully installed in its final location:

- Certification for each piece of equipment meeting its manufacturer's published specifications
- Test results showing receive sensitivity, transmitter power output, and modulation for each piece of base station equipment showing the test results matched to the serial number of the specific equipment
- Test results showing the testing of each alarm point provided for all alarms
- Test results for the receiver multicoupler and tower-top amplifier
- Site effective receiver sensitivity test

- Antenna, feedline, and RF interconnection Passive InterModulation (PIM) levels. Systems must not exceed PIM levels of 140 dBc or approximately -107 dBm
- Test demonstration showing the basic capabilities of the system to make, and process calls at each site in the system
- Demonstration of the proper site switching process where multi-cast is used
- Demonstration of all of the primary functions associated with network management, call tracking, traffic management, and associated functions
- Test demonstration of all basic console functions to be able to place talkgroup calls, patch calls together, interface to conventional resources and any other interconnections defined in these specifications
- Test demonstration of the ability of the system to continue full system functionality during the sudden failure of any single processor or controller in the system where system redundancy is provided
- Test demonstration of the ability of the system to continue to provide trunking in cases where complete failure of the system controllers or failure of the controller to RF subsystem interconnection
- Test demonstration of the ability of the system to continue to provide communications when the trunking controller fails
- Test demonstration of the ability of the ISSI interface to function to the adjacent systems based on the final system design
- Test demonstration of the ability for backup systems to take over operation or provide service
- Verification of the ability to use the telephone interconnect system where applicable
- Inspection of equipment and installations including cable dressing, cable construction, grounding, equipment condition, etc
- Spot verification of previous information provided in the test results discussed above for the RF performance, alarm performance, and any other items for which an actual demonstration is not provided on up to five pieces of equipment and or subsystems
- Performance and specification verification of 25 percent of the mobiles and portables by Seller supplied automatic test equipment of mobiles, portables and control stations prior to installation. Should more than 5 percent of the 25 percent fail, Seller must retune 100 percent of the mobile, portable, control station equipment.

(1) Inspection of all installations, workmanship and material supplied

- (2) Audio levels
- (3) Hum and noise levels
- (4) Distortion
- (5) Proper operation of the interface to the radio networks
- (6) Proper operation of the remote desktop console positions
- (7) Proper operation of the interface to the existing VHF conventional radio systems
- (8) Conformance with these specifications

## **16.4 Interface to Other Equipment**

- 16.4.1 Testing must be conducted by Seller in accordance with the approved plan. All testing must be under the direction and supervision of and witnessed by designated representatives of Buyer's Project Manager. Seller must supply all the test equipment required for each test.
- 16.4.2 Seller must notify Buyer's Project Manager at least ten days in advance of the time he or she is ready to make the tests on the entire system.
- 16.4.3 The Buyer's Project Manager will accept the system when it has operated continuously for a 30-day period without a failure after the successful completion of the performance test. This period is in addition to the time of completion.
- 16.4.4 The acceptance of equipment or parts thereof will in no way relieve Seller of the responsibility for furnishing equipment which meets the requirements of these specifications.

## **16.5 Coverage Acceptance Testing**

- 16.5.1 Seller must guarantee coverage to meet or exceed the coverage indicated on Seller's computer-predicted coverage plots. The guaranteed mobile coverage must be based on a passing DAQ threshold of 3.4, or a corresponding bit-error rate (BER) of 2 percent, once all fixed radio equipment is installed and commissioned.
- 16.5.2 Coverage acceptance testing must adhere to the latest revision of TIA TSB-88 and must conclusively demonstrate the radio coverage is being achieved in accordance with the specifications required by this RFP. The number and size of test tiles must be determined in accordance with TIA TSB-88; however, the tile size must not exceed 1/2 square mile within the blue, red, and yellow bounded areas. Consistent with TSB88, a confidence level not less than 99 percent must be used.
- 16.5.3 Both talk-out and talk-in coverage performance tests must be performed. In lieu of performing talk-in tests, Vendor may provide a talk-out versus talk-in signal level analysis, including field verification, proving the system is talk-out limited or the talk-in

and talk-out ranges are balanced. Within the bounded “in-building” coverage areas, coverage testing must be done accounting for the effective bi-directional loss with agreement of the Seller and Buyer on the method.

- 16.5.4 All radio equipment used for coverage testing must be configured with the most current firmware and software available at the time of testing.
- 16.5.5 Coverage testing must be performed by Seller. At its discretion, Buyer's Project Manager may have a representative present for any or all testing.
- 16.5.6 All equipment necessary to perform the coverage testing, including radios, power supplies, vehicles, and any other ancillary equipment, must be provided by Seller.
- 16.5.7 Seller must verify and certify proper calibration of all equipment used during the coverage testing.
- 16.5.8 All coverage test data and relevant records must be provided to Buyer's Project Manager in both paper and electronic format readable with standard software (Word, Excel, Adobe Acrobat, or other Buyer-approved software).
- 16.5.9 Prior to performing coverage tests, Seller must submit proposed test grid maps to the Buyer's Project Manager for approval.
- 16.5.10 Seller must submit a detailed Coverage Acceptance Test Plan (CATP) for approval by Buyer's Project Manager.
- 16.5.11 Seller is responsible for the coverage guarantee provisions, including remedial actions to be undertaken by and at Seller's expense if the coverage as depicted in the proposal plots is not met. Remedies for coverage failure must address the entire problem area(s) and not be limited to correcting a portion of the failed area. Remedies may not degrade areas of coverage previously accepted. A retest of coverage must be conducted in any area (previously failed or not) potentially affected by the remedy in order to verify the composite coverage is maintained.
- 16.5.12 After completion of the coverage test, the Proposer shall provide the raw data collected in a file and an interactive map with the test results for each data point collection.

## SECTION 17

# Documentation Requirements

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### 17.1 General

- 17.1.1 Seller must deliver the following documentation in electronic format. Documentation must be delivered on removable media (CD, DVD, USB drive) and must be made available for download by Buyer's Project Manager at a secure, private File Transport Protocol (FTP) site for a period of 3 months following final acceptance of the system.
- 17.1.2 Portable Document Format© (PDF) is acceptable except as specifically noted. “Secured” PDF means a PDF document with password security. Documents noted as “Native” must be provided to Buyer's Project Manager in a format to be edited and maintained with current versions of Microsoft Word, Excel, Access, PowerPoint, or Visio. Document formats noted as “Native/...” must be provided in the most recent version of the designated format. All photographs must be provided in JPEG (.jpg) format. Hardcopy refers to paper documents.
- 17.1.3 All design documents in “Native” and PDF formats must be provided in black in white due to color blindness and the limitations of some printers and photocopiers especially devices supporting large paper formats, The use of color in Microsoft Word and Excel documents should be limited especially in Tables and Figures. Color PowerPoint presentations and color photos are encouraged. Color in these documents may be acceptable if the black and white versions clearly communicate the information provided by the use of colors.
- 17.1.4 Whole System
- (1) Document: System Detailed Design
- The System Detailed Design document includes a clear description of design goals and assumptions, propagation predictions and accompanying data, equipment lists, installation diagrams, interconnect diagrams, transport diagrams, annotated diagrams showing audio, RF, and signaling paths, electrical design including grounding and TVSS devices, list of channels/talkgroups, detailed list of required CTCSS/DTMF/other tone signaling, and other engineering detail sufficient to procure, install, configure, operate and maintain the subsystems comprising the vendor’s response to the project scope.
  - Format: PDF.
- (2) Document: System Access Information
- Seller must supply a complete list of all usernames, account names, passwords, reset instructions, and other information required to satisfy system security

requirements. These requirements explicitly require the Seller to supply all information for all levels of access.

- Seller must provide a signed statement attesting no hidden accounts, “backdoors,” or other points of unauthorized access exist in the systems. The statement must be dated and signed in ink by a responsible officer of Seller.
- Format: Secure PDF.

(3) Document: Programming Documentation

- Where provided by manufacturer, Seller must supply all programming, configuration, and troubleshooting documentation for all components to the Buyer. Seller must further supply to Buyer's Project Manager comprehensive written documentation of all programming and configuration settings implemented on all components of the system.
- Format: PDF and hardcopy.

(4) Document: Licenses and Registrations

- Seller must furnish all hardware, software, and firmware licenses and warranties for all components being provided. Seller must supply proof of registration in Buyer's name for all software, firmware, and hardware where such registration is required for installation, configuration, or other purpose. Seller must further provide a complete list of software, firmware and hardware not registered in Buyer's name, said list to include all information necessary for Buyer's Project Manager to complete registration (i.e., product identification codes, CD keys, serial numbers, etc.).
- Format: PDF and hardcopy.

(5) Document: Component Warranty Materials

- All certifications and documentation activating, relating to, and governing equipment warranties from component manufacturers, properly completed and authorized by Seller.
- Format: PDF and hardcopy.

### 17.1.5 Project Management

(1) Document: Work Breakdown Structure (WBS)

- Seller and Buyer's Project Manager must jointly produce a work breakdown structure identifying the elements of work required to fulfill the project's goals and objectives. The WBS must be at a level of detail deemed by Buyer's Project Manager to be sufficient for effective project management. Each entry in the

WBS must include, at a minimum, a unique identification number, the task name, the anticipated duration, and all dependencies. WBS in chart form is preferred.

- Format: Native.

(2) Document: Schedule

- Seller must furnish a project schedule for review, modification and acceptance by the Buyer's Project Manager. Schedule must show each set of tasks to be completed, expected duration, start and end time for each subsystem, and responsible person for each task at a level of detail determined by Buyer's Project Manager to be sufficient for project management.
- Format: Native/MS Project 2007.

(3) Document: Contact List

- Seller and Buyer's Project Manager must generate a common contact list identifying all key participants in the project including, at minimum, project owners; project executives/sponsors; Executive leadership responsible for the project for Seller and Buyer; project managers; engineering leads; technical leads; salespersons; sales manager; technicians; and supervisory personnel for Buyer, Seller, and all subcontractors. Contact information must include, at a minimum, each person's name, company, project role, email address, office telephone number, mobile/24-hour telephone number, mailing address.
- Format: Native and PDF.

(4) Document: Security/Background Information

- This project requires entry to one or more secure public safety facilities. Seller personnel, including subcontractors, must successfully complete a criminal background security check to be allowed access to these facilities. Seller must supply fully completed Background Check Authorization Forms as supplied by Buyer's Project Manager for each Seller or subcontractor employee who will be on premises. Said forms must be supplied no later than five working days prior to the expected date of facility access.
- Format: Hardcopy.

(5) Document: Risk Register

- Seller must provide an ongoing risk register plan to the Buyer's Project Manager. Buyer's Project Manager must participate in the register's creation and maintenance. Register must contain, at minimum, number, description, probability, impact, risk owner, triggering event or circumstance, and response for each risk identified.

- Format: PDF and hardcopy.

(6) Document: Communication Plan

- Seller and Buyer's Project Manager must jointly produce a communications plan identifying project and agency stakeholders, their level of information required, the frequency of needed communication, the method of communication, and the creator of each communication.
- Format: Native and PDF.

(7) Document: Site Readiness Plan

- Where applicable, vendor must provide reports on the readiness of each Point of Destination and facility to accept the provided systems in accordance with industry standards and codes. Site readiness reports must include the specific instances of standard or code shortfalls, including drawings, pictures, and text explanations, along with reference to the specific code, standard, or practice being applied. This document is intended to be used as the basis for Buyer improvements at the sites and must be prepared by Seller to best suit this use.
- Format: PDF and native.

(8) Document: System Implementation Plan

- Seller must furnish documentation detailing the overall plan for changes in the system. This plan must be focused on subsystem level activity and illustrate the sequencing, interface, and dependencies of each subsystem.
- Format: PDF and native.

(9) Document: Transition Plan for Each Subsystem

- Seller and Buyer's Project Manager must jointly create a transition plan for each subsystem. The transition plan identifies the specific steps and changes required to move Buyer from the existing system to the new/upgraded system, including all interim or temporary states through which the process must move before achieving end state. For example, if system users must temporarily move to a backup location while the primary location is being implemented, this condition must be noted in the transition plan.
- Format: PDF and hardcopy.

(10) Document: System Planning Documentation

- System Planning documentation includes the following, all of which are to be presented by Seller to Buyer's Project Manager for review, input, and approval prior to equipment ordering:

- ◇ Fleet configuration (“fleetmap”).
  - ◇ Channel/talkgroup/frequency plan.
  - ◇ Field radio replacement or reprogramming plan.
  - ◇ Radio programming development plan.
  - ◇ Logging recorder channel plan.
  - ◇ Transport design.
  - ◇ Network management design identifying type and number of devices, alarms, monitors and presentation program and other elements required by the system.
- Format: PDF and hardcopy.

(11) Document: Staging Acceptance Plan

- Seller must provide a comprehensive test plan for all system components and their interactions in a staged configuration to Buyer's Project Manager for review and approval. Seller must provide written (hardcopy) certification of the plan’s successful completion signed by Seller and Buyer's Project Manager.
- Format: Native and hardcopy.

(12) Document: System Acceptance Plan

- Following installation and configuration, Seller and Buyer's Project Manager must inspect and test the system prior to implementation. Seller must supply the initial System Acceptance Plan (SAP) to Buyer's Project Manager for review and approval prior to implementation. Seller and Buyer must complete the testing as identified in the SAP and both must sign the document as satisfactorily completed prior to implementation beginning.
- Format: Native and hardcopy.

(13) Document: Certificate of System Acceptance

- Seller must furnish a Certificate of System Acceptance to Buyer's Project Manager for review and signature. The Certificate must be signed by the Buyer's Project Manager upon successful completion of the project including any post installation system run time requirements.
- Format: Hardcopy.

### 17.1.6 Radio System

#### (1) Document: System Overview

- A written description of the system including components used, transport methods employed, installation locations, configuration parameters, features and functionality of the installed system.
- Format: PDF and native.

#### (2) Document: Component Operation, Installation and Maintenance Manuals

- Manufacturer supplied operation, installation and maintenance manuals for all radios, antennas, TVSS devices, combiners, multiplexers, power distribution units, inverters, timing sources, simulcast equipment, and other components of the radio system.
- Format: PDF.

#### (3) Document: As Built

- The set of drawings, equipment specification sheets, engineer's instructions and other documentation detailing how the systems addressed by the project scope were implemented. The make, model, serial number and installed location of each major component must be noted and supplied in Native format (MS Excel preferred). Where applicable, a complete inventory of circuit board/card used in each equipment chassis, along with their location in the chassis, must be provided in Native format (MS Excel preferred). As built documents must include photographs of components' completed installation. This information will be used by Buyer's Project Manager to maintain and operate the system and will form the basis for ongoing documentation throughout the lifetime of the system.
- Format: PDF and native.

### 17.1.7 Federal Communications Commission (FCC) Licenses

#### (1) All applications made on behalf of the Buyer.

- Format: PDF.

#### (2) All documentation received from the FCC or sent to the FCC on behalf of Buyer in regard to the licenses.

- Format: PDF.

#### (3) All licenses received from the applications made on behalf of Buyer.

- Format: PDF.

### 17.1.8 Antenna Systems

#### (1) Document: As Built

- Antenna system as built drawings must include manufacturer make, model, and serial number for each installed antenna along with the site location, antenna support structure (tower), location on the structure (leg/face, height and azimuth), connection media, and downtilt. Additional components such as tower top amplifiers, waveguide splitters, circulators and others must be noted with make, model, serial number, mounting location, and connection type. Photographs of the connection media's entry point into the equipment facility must be supplied and the proper connection media clearly identified. Photographs and identifying notations of antennas as mounted, grounding, inline TVSS, and cable paths must also be included.
- Format: Native.

### 17.1.9 Transport

#### (1) Document: Transport Design

- All network designs and engineering documentation including MPLS, WAN, and LAN systems. Documentation must include:
  - ◇ System diagrams for all data networks and interconnections
    - (i) *Radio Network with interconnections to other networks*
    - (ii) *Network Management Systems*
    - (iii) *MPLS Network*
  - ◇ IP Addressing (Multicast and Unicast) - IP Address, Subnet Mask, and Default Gateway
  - ◇ Port assignments for every data network device including unused ports indicating interface type (i.e., copper, SFP, etc.)
  - ◇ VLAN diagrams (simply adding VLAN number to IP addressing tables will not suffice to meet this requirement)
  - ◇ IP Multicast networks and protocols
  - ◇ MPLS Network Diagrams:
    - (i) *LSPs*
    - (ii) *Individual diagrams for each MPLS service instance (i.e., each epipe, VPLS, VPRN, IES, etc.*
- Format: Native.

(2) Document: As Built

- Where the Vendor furnishes transport elements, the Vendor must supply diagrams and explanatory text identifying each component and connection comprising the system transport (i.e., Ethernet, microwave, telco) as actually built. The characteristics of each connection (i.e., speed/bandwidth, protocol) must be identified for each link in the transport. Each component of the system transport must be identified by make, model, device type, and serial number along with its installation location.
- Format: PDF and Native.

(3) Document: Maintenance and Operation

- Seller must supply all manufacturer provided documentation regarding the maintenance and operation of each component of the transport systems being furnished by Seller.

#### 17.1.10 Network Management

(1) Document: System Design

- All final design and engineering documentation pertaining to the network management system must be supplied by Seller to Buyer's Project Manager for review and approval prior to implementation. The System Design must include diagrams, explanatory text, and other material detailing all network health, monitoring, configuration, routing, alert, alarm, and notification systems, devices and mechanisms used in the system. These systems include site alarms, environmental monitoring and report, equipment alarms, data network, database, server, backhaul, and other subsystems.

(2) Document: As Built

- Seller must supply drawings, specifications, diagrams, photographs, test data, and explanatory text identifying all network management elements described herein as they were built and configured. As built must include addressing schemes used, equipment makes, model, serial number and firmware/software revision as applicable.

(3) Document: Maintenance and Operation

- Manufacturer supplied operations and maintenance manuals must be supplied for each portion of the network management system and the related subsystems (i.e., alerting, environmental, site alarms, etc.).

### 17.1.11 Data Networks

#### (1) Document: Network Design

- All network design and engineering documentation including addressing scheme, protocols used, bandwidth requirements, interfaces to other networks and to components, component configuration (including port assignment, VLAN assignment, etc.). Design must identify owner of each portion of the data network being used.
- Format: PDF.

#### (2) Document: Component Operation, Installation and Maintenance Manuals

- Manufacturer supplied operation, installation and maintenance manuals for all parts of the data network hardware and software.
- Format: PDF.

#### (3) Document: As Built

- The set of drawings, equipment specification sheets, engineer's instructions and other documentation detailing how the systems addressed by the project scope were implemented. The make, model, serial number and installed location of each major component must be noted and supplied in Native format (MS Excel preferred). Where applicable, a complete inventory of circuit board/card used in each equipment chassis, along with their location in the chassis, must be provided in Native format (MS Excel preferred). As built documents must include photographs of components' completed installation. This information will be used by Buyer's technical staff to maintain and operate the system and will form the basis for ongoing documentation throughout the lifetime of the system.
- Format: PDF and Native.

### 17.1.12 Console

#### (1) Document: Component Operation, Installation and Maintenance Manuals

- Manufacturer supplied operation, installation and maintenance manuals for all parts of the console subsystem hardware and software. Console programming instruction and configuration documentation is explicitly required.
- Format: PDF.

#### (2) Document: As Built

- The set of drawings, equipment specification sheets, engineer's instructions and other documentation detailing how the systems addressed by the project scope

were actually implemented. The make, model, serial number and installed location of each major component must be noted and supplied in Native format (MS Excel preferred). Where applicable, a complete inventory of circuit board/card used in each equipment chassis, along with their location in the chassis, must be provided in Native format (MS Excel preferred). As built documents must include photographs of components' completed installation. This information will be used by Buyer's technical staff to maintain and operate the system and will form the basis for ongoing documentation throughout the lifetime of the system.

- Format: PDF and native.

(3) Document: Training Manuals and Aids

- Seller must supply complete training manuals and training aids for all operational aspects of the console system. Training documents must support operator and administrator training requirements.
- Format: PDF with permission to copy for internal use.

#### 17.1.13 Logging Recorder Interface

(1) Document: Detailed System Interface Design

- Seller must furnish a detailed system design to Buyer's Project Manager for review and approval prior to implementation. Detailed System Design must include, at a minimum: wiring diagrams and explanations identifying how and where the logging recorder will be interfaced to the relevant radio channels; explanations including diagrams and drawings describing the system's interface with consoles, headsets, channel assignments and names, including the source of each channel's audio and data.

(2) Document: Component Operation, Installation and Maintenance Manuals

- Manufacturer supplied operation, installation and maintenance manuals for all parts of the logging recorder interface. Full documentation of the functions, features, and operation of all software components must be included.
- Format: PDF.

(3) Document: Training Manuals and Aids

- Seller must supply complete training manuals and training aids for all operational aspects of the logging recorder system interface.

(4) Document: As Built

- The set of drawings, equipment specification sheets, engineer’s instructions and other documentation detailing how the systems addressed by the project scope were implemented. The make, model, serial number and installed location of each major component must be noted and supplied in Native format (MS Excel preferred). Where applicable, a complete inventory of circuit board/card used in each equipment chassis, along with their location in the chassis, must be provided in Native format (MS Excel preferred). As built documents must include photographs of components’ completed installation. This information will be used by Buyer's technical staff to maintain and operate the system and will form the basis for ongoing documentation throughout the lifetime of the system.
- Format: PDF and native.

17.1.14 Mobile and Portable Radio Equipment

(1) Document: Component Operation, Installation and Maintenance Manuals

- Manufacturer supplied operation, installation and maintenance manuals for all parts of the mobile and portable equipment. Full documentation of the functions, features, and operation of all software components (for example audio playback, event reconstruction, system administration, and so on) must be included.
- Format: PDF.

(2) Document: Training Manuals and Aids

- Seller must supply complete training manuals and training aids for all operational aspects of the mobile and portable radios. Training manuals must address field user training.

## SECTION 18

# Warranty and Maintenance Requirements

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This section describes the warranty and maintenance requirements for the Kitsap 911 P25 radio system.

### 18.1 Warranty/Maintenance

- 18.1.1 Seller must repair or replace without charge to Buyer, any equipment or part thereof, which fails in operation during normal use within 12 months after system acceptance. Repairs or replacement do not apply to failures caused by acts of God or extraordinary circumstances beyond the control of Seller.
- 18.1.2 Seller must perform all maintenance, servicing, removal and replacement of defective parts, and adjustments and measurements to maintain the equipment supplied under this contract to the manufacturer's specifications and requirements of the FCC for a period of 1 year from the date of Buyer's acceptance of the system. These actions must be at no additional cost to Buyer for those services requested for malfunctions reported during a normal working day. A normal working day is Monday through Friday, 0800 to 1700 hours, holidays excepted.
- 18.1.3 Seller must provide Buyer with written documentation after each service call describing the service performed, the cause of the outage or repair, and post repair testing, programming, or other actions taken to verify proper operation. If Buyer's spares were used in the repair, the item number or model number and serial number of the spare used, and the defective unit replaced must also be documented. Seller must return the defective unit to Buyer's specified location.
- 18.1.4 Seller must have a trained and competent technician to maintain the supplied equipment in a timely manner on 24-hour call at all times. Buyer must be given the phone numbers and addresses of the people to contact in an emergency. The designated technician on call must be located within a 60-minute normal driving range of Buyer's dispatch center.
- 18.1.5 When a malfunction is reported and service is requested, Seller's technician must be in route to the equipment location to effect emergency repairs within 30 minutes after Seller was notified by Buyer of request for service.
- 18.1.6 Seller must provide the names of the persons acting as the primary contact point for service, complaints, and general inquiries. Their names, addresses, and telephone numbers must be given to Buyer. Seller must supply the escalation process and personnel in the event the normal trouble alerting and service request process not work.

18.1.7 Buyer may at its discretion elect to have its technical staff on site during the warranty repair and maintenance actions. The onsite staffing will be to witness and possibly assist in the equipment repair or upgrade process as desired.

18.1.8 Seller must provide the after-warranty services for board and module level return and repair service for the following:

- Five-day turnaround from receipt of the defective unit to return shipment.
- Twenty-four-hour turnaround from receipt of the defective unit to return shipment.
- Advance Replacement if a replacement unit is sent for Buyer's use prior to removal of service of the defective unit and Buyer returns the replacement unit to the repair depot after receiving Buyer's repaired unit back.

18.1.9 All warranty and repair work must be done to restore the original operation of the system is restored to the more stringent of these specifications or the manufacturer's original specifications. All replacement parts must be of new manufacturer, appearance, and performance. Any replacement parts or modules with a shelf life must have the original shelf life starting from the time of receipt by Buyer as when the unit was manufactured.

18.1.10 Maintenance and Test Equipment

(1) Each Proposer must include with the Proposal a list of recommended spare parts deemed necessary by the manufacturer to minimize down time and test and maintenance equipment required to maintain the equipment to the card level. Each Proposer must also submit a required list of test equipment and fixtures to maintain the system to the component level if possible or as close to the component level as possible.

18.1.11 Proposer must provide quotes as an option for the following:

- Complete system maintenance on a normal 0800-1700, five days a week basis for quoted on an annual basis for a 5-year term. Provide after-hours' call out hourly rates as well.
- Complete system maintenance on a 24/7 basis but not including mobile and portable units quoted for on an annual basis for a 5-year term.
- Services and equipment to keep the hardware and software up to date for a period of 10 years. The exact services included must be detailed along with any additional required services not included in the cost. This requirement includes work required of Buyer as well.

## **18.2 Future Equipment and Parts Availability**

18.2.1 The manufacturer must certify in writing all parts, components, software, firmware, and major subassemblies used in this equipment will be available for at least 10 years after

award of contract. This requirement ensures additional equipment required in the future can be assembled and supplied and replacement parts, software, and firmware will be available to maintain the supplied equipment.

## SECTION 19

# Project Closeout Requirements

---

This section describes project closeout requirements applicable to the Project. Each of the following elements must be accepted by Buyer's Project Manager as complete before the project will be considered closed and final payments issued.

## 19.1 Objectives Met

19.1.1 Buyer's Project Manager will conduct a product completion review to verify all project work was completed. All project objectives, goals and deliverables must be met at the quality and quantity identified in the project plan, specifications, and contract. This determination must be made solely at the discretion of Buyer's Project Manager in accordance with the contract, specifications, and plan relevant to this Project.

19.1.2 Accomplishment of goals and objectives must be signified by Buyer's Project Manager's signature on a Final Acceptance document.

## 19.2 Contract Terms

19.2.1 Every contract requirement and term, including requirements contained change orders, contract amendments, and other formally incorporated documents must be fulfilled to the Buyer's Project Manager's satisfaction prior to the acceptance of the proposed system as complete.

## 19.3 Documentation

19.3.1 Each document described in Section 17 Documentation Requirements must be completed and accepted by Buyer.

## 19.4 Governmental Certifications

19.4.1 Where required, Seller must provide proof of compliance with federal, state and local requirements prior to project closure. These requirements may include, but are not limited to:

- (1) Compliance with prevailing wage, insurance, tax and other requirements.
- (2) Escrows for source code or other intellectual property as required by the Contract.
- (3) Proof of payment to suppliers, subcontractors, and others as required by law and/or contract.
- (4) Grant requirements, as applicable.

## **19.5 Transfer of Responsibility and Support**

19.5.1 The Project's resulting systems must be transferred from project teams to operations, maintenance, and warranty teams as appropriate. Seller must supply documentation of the transfer and conduct a training/orientation session regarding the Buyer contacts and process with ongoing support providers identified by the Seller.

## **19.6 Financial Review and Final Invoice**

19.6.1 Final invoice may be submitted following completion of a financial review and reconciliation of the Project conducted by Buyer's Project Manager with Seller.

## **19.7 Lessons Learned**

19.7.1 At Buyer's Project Manager's discretion, Seller may be required to participate in a Project review and the development of a "lessons learned" document as part of project closure activities.

## **19.8 Project Closure Certification**

Upon satisfactory completion of these requirements, Buyer's Project Manager and Seller must certify the Project as complete by signing a Project Closure document.

## APPENDIX A

# Acronyms and Abbreviations

---

AC	alternating current
ACL	access control list
AES	advanced encryption standard
AGC	automatic gain control
AH	amp hour
AHJ	Authority Having Jurisdiction
AMSL	above mean sea level
ANI	automatic number identification
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officers
ASR	antenna structure registration
ASTM	American Society for Testing and Materials
ATP	Acceptance Test Plan
AWG	American wire gauge
BAPC	bounded area percent coverage
BER	bit-error rate
BFD	Bremerton Fire Department
BPD	Bremerton Police Department
BICSI	Building Industry Consulting Services International
BIFD	Bainbridge Island Fire Department
BIOS	basic input output system
BIPD	Bainbridge Island Police Department
BIX	building industry cross-connect
BPWD	Bremerton Public Works Department
CAD	computer aided dispatch
CADI	computer aided dispatch interface
CAP	Compliance Assessment Program
CATP	Coverage Acceptance Test Plan
CCN	combined communications network

CD	compact disc
CH	channel
CH	chief
CIP	critical infrastructure protection
CKFR	Central Kitsap Fire and Rescue
CPU	central processing unit
CSSI	Console SubSystem Interface
CTCSS	continuous tone coded squelch system
DAQ	delivered audio quality
dB	decibel
dBc	decibels below the carrier
dBm	decibel relative to milliwatt
DBM	database management
dBmnc	decibel relative to noise in a circuit
DC	direct current
DCS	digital-coded system
DCE	data communications equipment
DEM	Department of Emergency Management
DIN	Deutsches Institut für Normung
DMZ	demilitarized zone
DTE	data terminal equipment
DTMF	dual tone multi-frequency
DUI	driving under influence
DVD	digital video disk
E/M	ear/mouth
EIA	Electronics Industry Association
EMS	emergency medical services
EMT	electrical metallic tubing
ENT	electrical non-metallic tubing
ERP	effective radiated power
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access

FIPS	federal information processing standards
FRU	field replaceable unit
FTP	File Transport Protocol
GNSS	global navigation satellite system
GPIO	general purpose input output
GPS	global positioning system
GHz	gigahertz
HAAT	height above average terrain
HEAR	hospital emergency ambulance radio
HIDS	host-based intrusion detection system
HQ	headquarters
HVAC	heating, ventilation, and air conditioning
HZ	hertz
IBC	International Building Code
ICOM	Island Communications
ICT	information and communication technology
ID	identification number
IDF	intermediate distribution frame
IDS	intrusion detection system
IES	Internet enhanced service
IEEE	Institute of Electrical and Electronic Engineers
IPBB	internal perimeter bonding bar
ISO	International Organization for Standardization
ISSI	InterRF SubSystem Interface
KAC	Kitsap Animal Control
KC	Kitsap County
KCSO	Kitsap County Sheriff's Office
KVM	keyboard, video (monitor), mouse
kW	kilowatts
LAN	local area network
LE	law enforcement
Lt	lieutenant
Li-ion	lithium ion

Li-poly	lithium polymer
LSP	label-switched path
LTE	long term evolution
LVL	low-voltage load disconnect
mA	milliamp
mAH	milliamp hour
MCP	mobile command post
MCT	mobile computer terminal
MDF	main distribution frame
MDT	mobile data terminal
MGB	master ground bus
MHSB	monitored hot standby
MHz	megahertz
MIB	management information base
Mm	millimeter
MPH	miles per hour
MPLS	multi-protocol label switching
MS	Microsoft
mV	millivolt
mW	milliwatt
NBK	Naval Base-Keyport
NEC	National Electrical Code
NERC	National Energy Regulatory Commission
NFPA	National Fire Protection Association
NIDS	network intrusion detection system
NIFOG	national interoperability field operations guide
NKFR	North Kitsap Fire and Rescue
NiMH	nickel metal-hydride
NIST	National Institute of Science and Technology
NMS	Network Management System
NPSPAC	National Public Safety Planning Advisory Committee
NRNWF	Navy Regional Northwest Fire
NTP	network time protocol

NUWES	Naval Undersea Weapons Explosive Station
OET	Office of Engineering and Technology
OSHA	Occupational Safety and Health Administration
OTAR	over the air rekeying
OTAP	over the air reprogramming
OWASP	open web application security project
P25	Project 25
PBB	primary bonding bus bar
PC	personal computer
PDF	Portable Document Format©
PFD	Poulsbo Fire Department
pF	picofarads
PFS	perfect forward security
PGNR	Port Gamble Natural Resource
PGPD	Port Gamble Police Department
PIM	passive intermodulation
PM	primary marker
POPD	Port Orchard Police Department
PPD	Poulsbo Police Department
PSAP	public safety answering point
PSNS	Puget Sound Naval Shipyard
PSTN	public-switched telephone network
PTT	push-to-talk
PTT ID	push-to-talk identification
RAD	repeater audio delay
RAM	random access memory
RCW	Revised Code of Washington
RDC	Regional Dispatch Center
RF	radio frequency
RFP	request for proposal
ROM	read only memory
RPC	regional planning committee
RSSI	receive signal strength indicator

RTU	remote telemetry unit
RTU	remote terminal unit
RU	rack unit
RX	receive
SANS	SysAdmin, Audit, Network and Security
SAP	System Acceptance Plan
SAR	service aggregation router
SATP	Staging Acceptance Test Plan
SDLC	software development lifecycle
SFP	small form-factor pluggable
Sgt	Sergeant
SIEM	security information and event management
SIF	system interface
SIP	Session Initiation Protocol
SKFR	South Kitsap Fire and Rescue
SNMP	Simple Network Monitoring Protocol
SPUN	Statement of P25 User Needs
SQL	structured query language
SPD	Suquamish Police Department
SRP	State Radio Project
STI	Survey Technologies Incorporated
SWAT	special weapons and tactics
SYSLOG	system events log
T/R	transmit/receiver
TAC	tactical
TBD	to be determined
TDM	time division multiplexing
TDMA	Time Division Multiple Access
TGB	tower ground bus bar
THD	total harmonic distortion
TIA	Telecommunications Industry Association
TLS	transport layer security
TRHI	telephone radio headset interface

TRIS	tri-regional interoperability system
TTA	tower top amplifier
TVSS	transient voltage surge suppression
TX	transmit
U	unit
UBC	Uniform Building Code
UHF	ultrahigh frequency
UL	Underwriters Laboratories, Inc.
USB	universal serial bus
UPS	uninterruptible power supply
V	volt
VAC	volt alternating current
VDC	volt direct current
VHF	very high frequency
VoIP	voice over internet protocol
VOX	voice operated switch
VPLS	virtual private line service
VPN	virtual private network
VPRN	virtual private router network
WAN	wide area network
WBS	work breakdown structure
WPM	words per minute
XSS	cross site scripting

# Coverage Maps

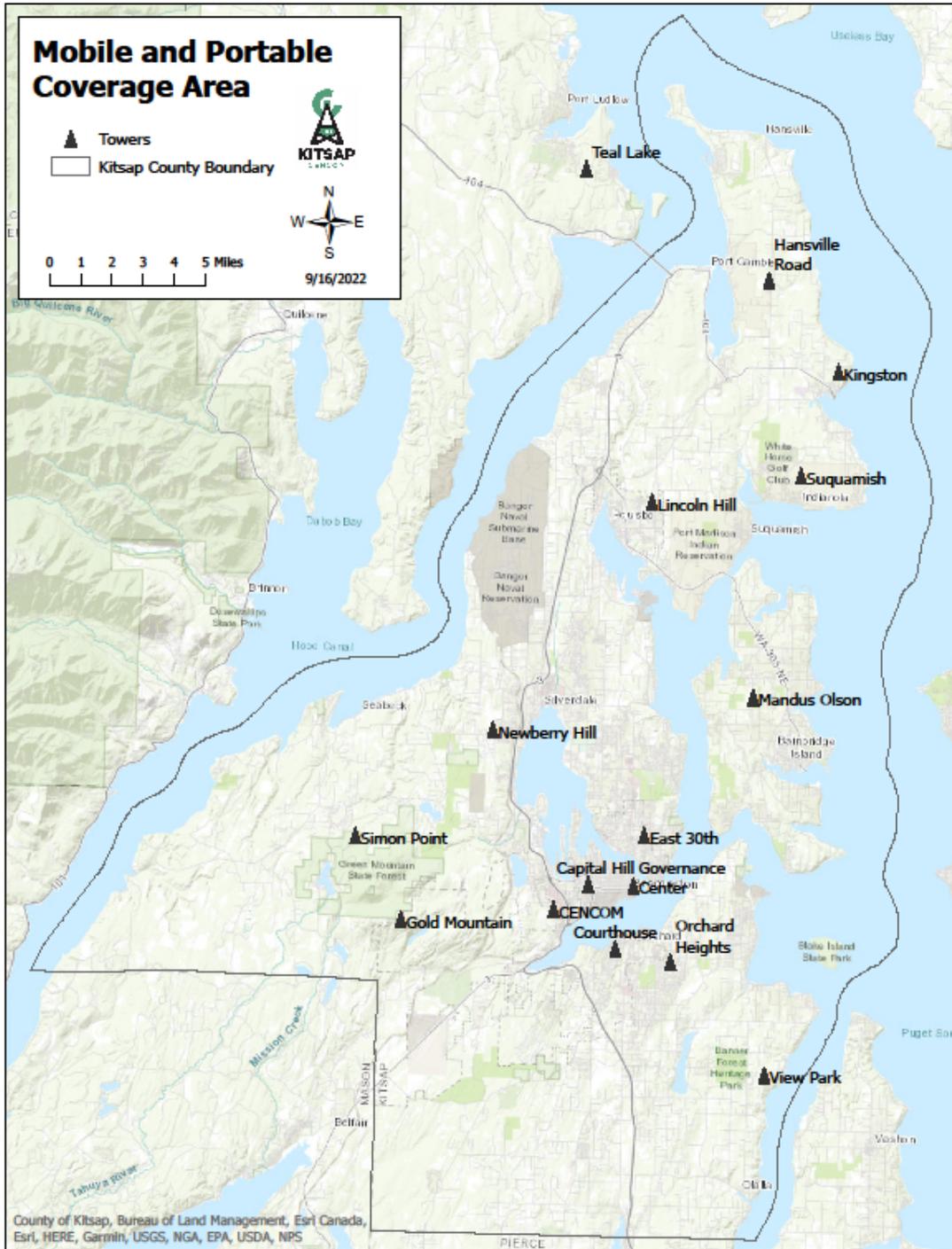


Figure B-1: Mobile and Portable Coverage Areas



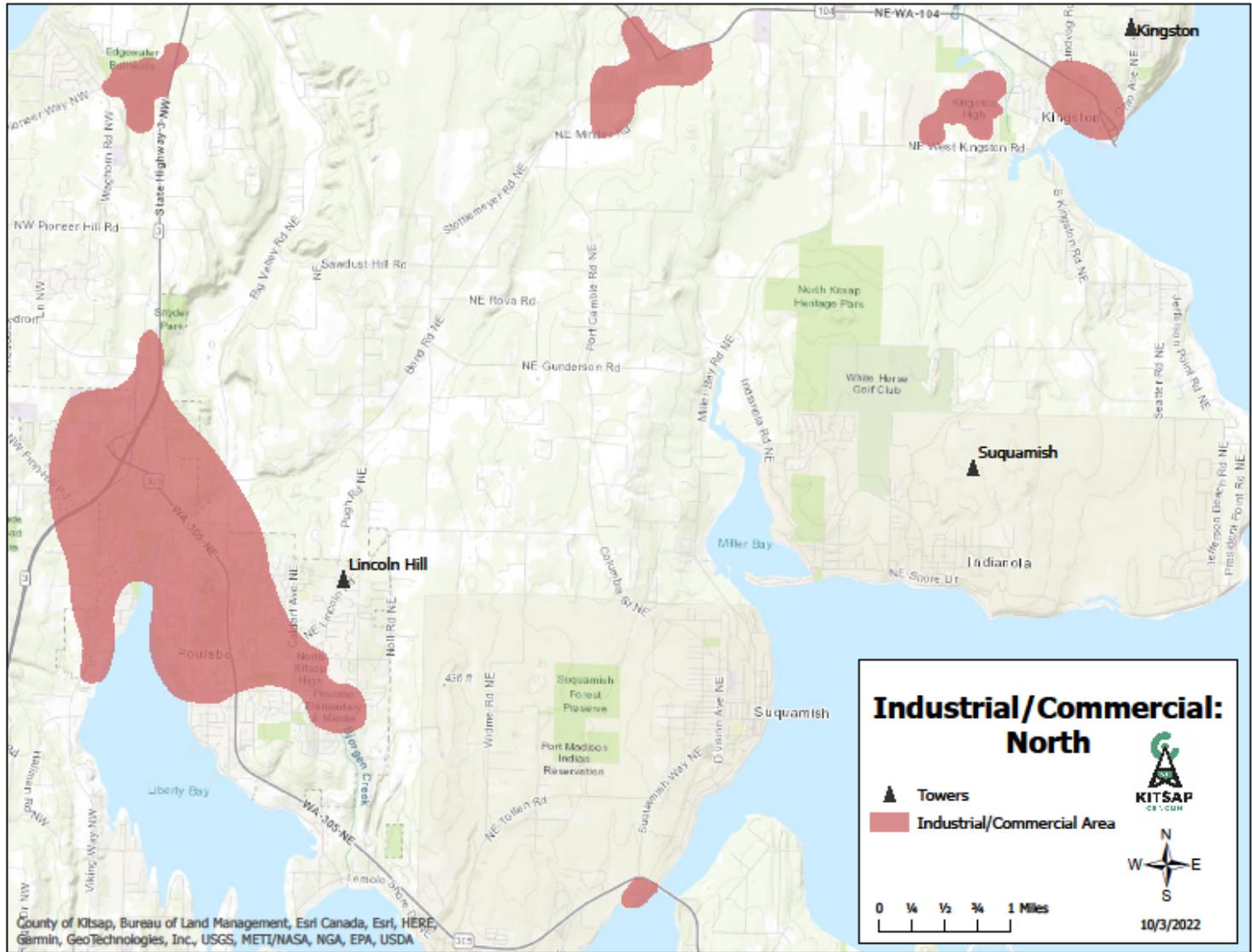


Figure B-3: Industrial/ Commercial Coverage Areas - North

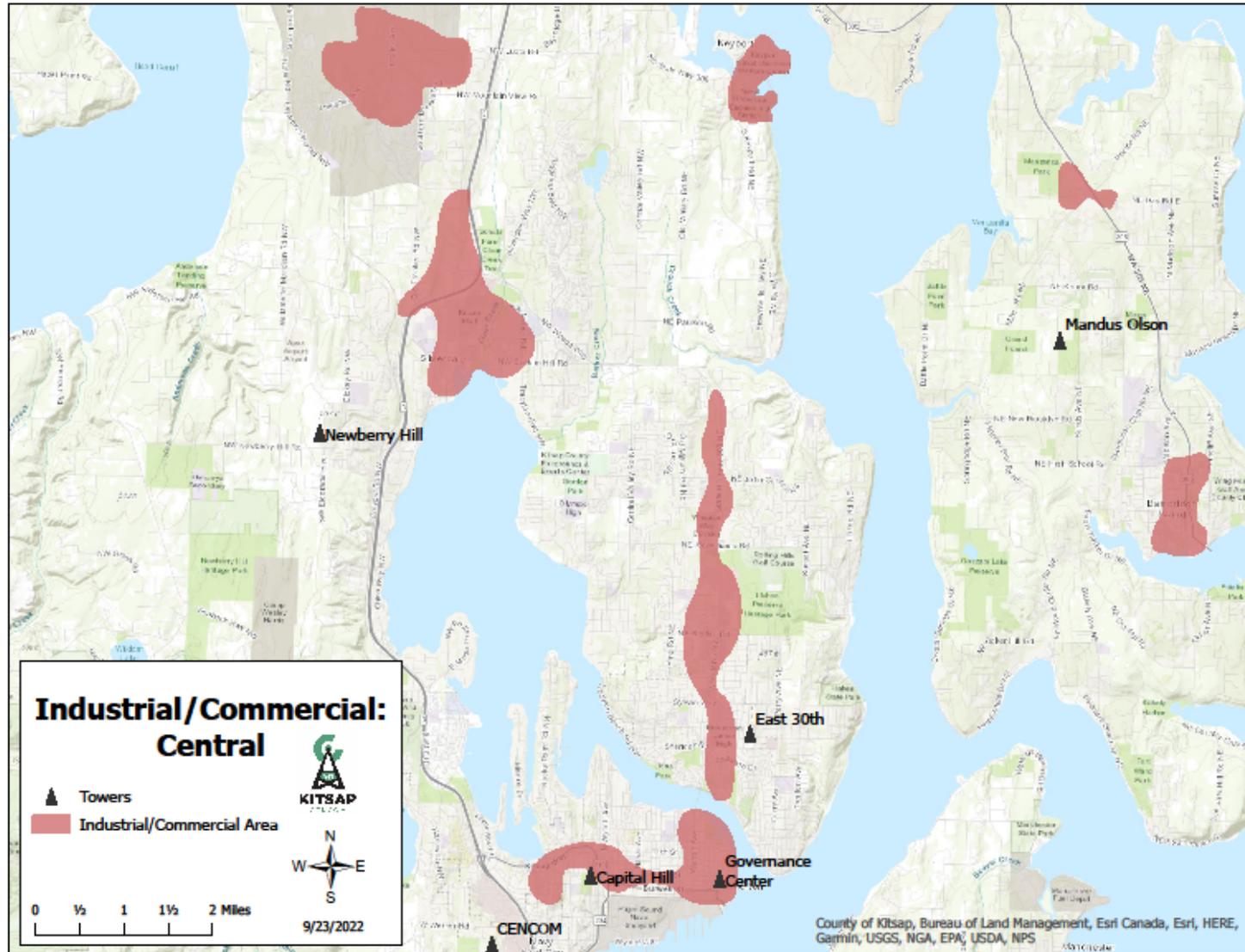


Figure B-4: Industrial/ Commercial Coverage Areas – Central

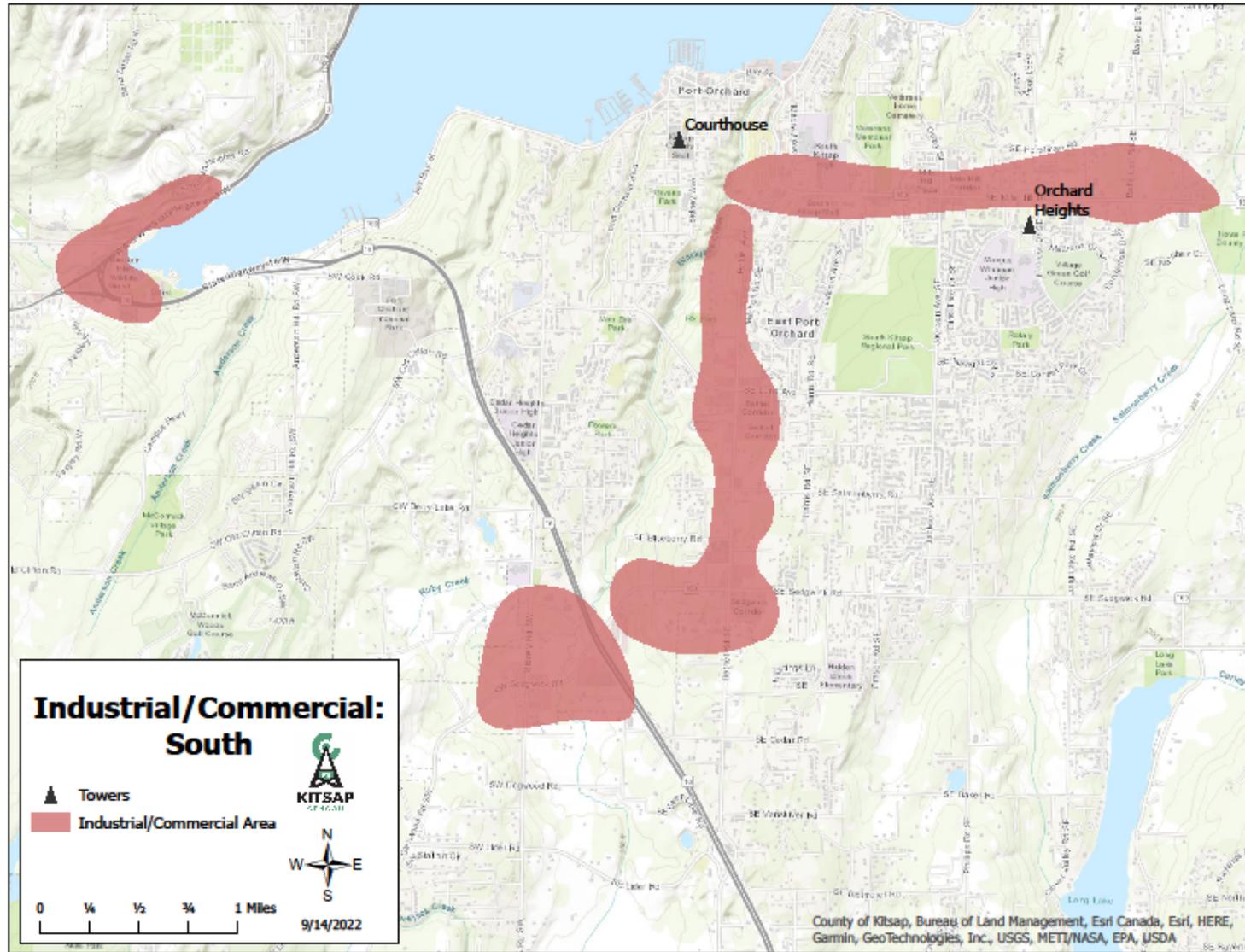


Figure B-5 Industrial/ Commercial Coverage Areas – South

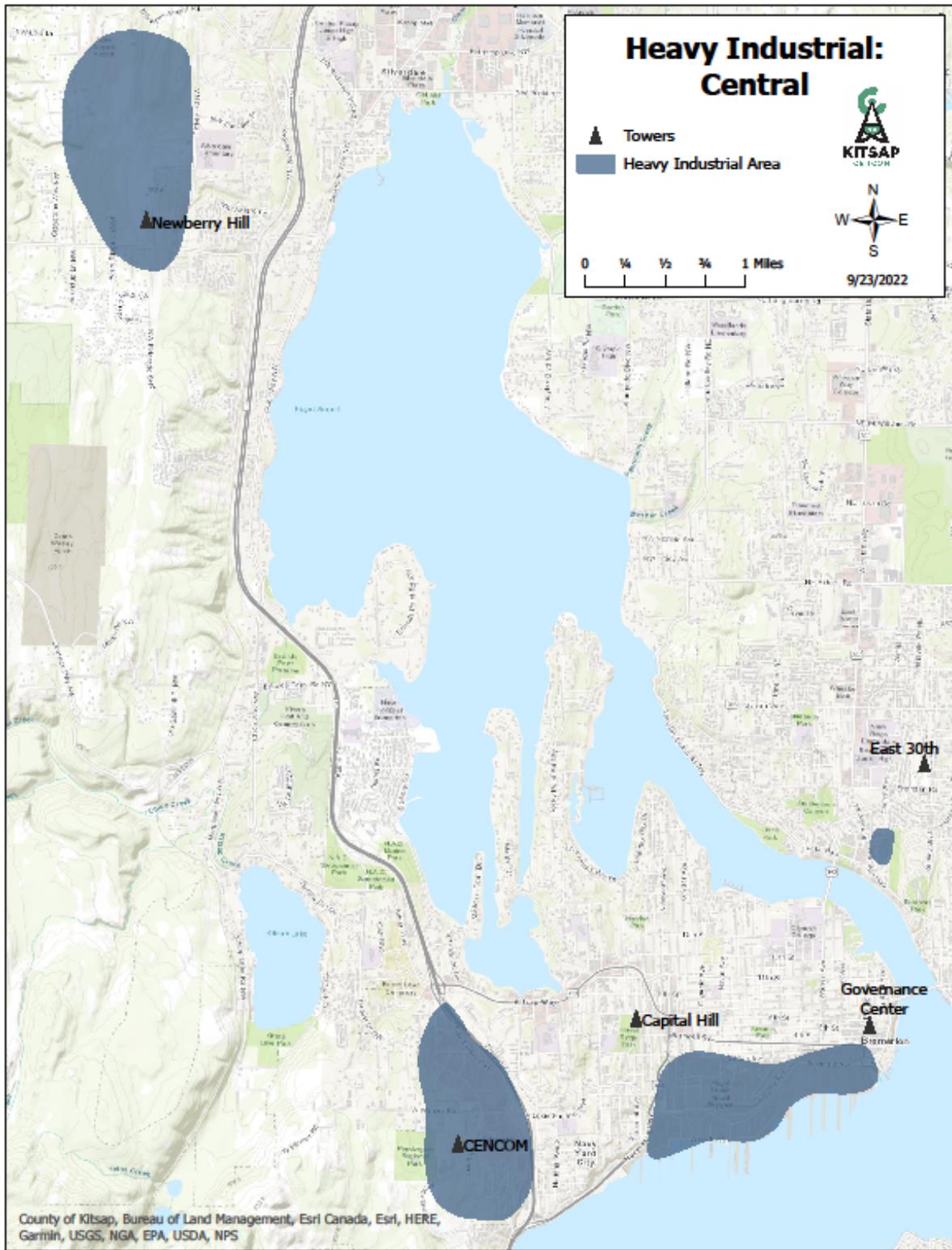


Figure B-6: Heavy Industrial Coverage Areas - Central

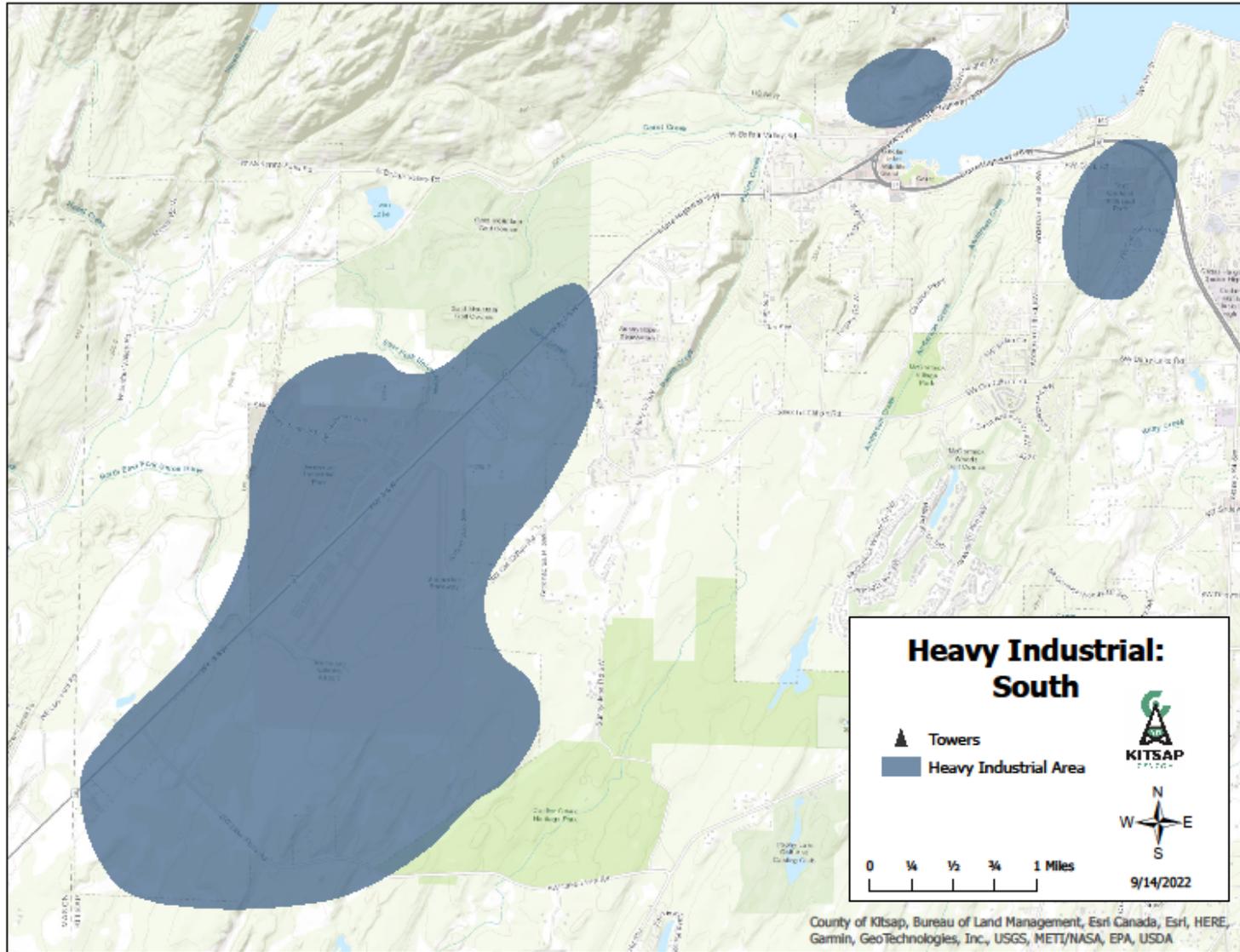


Figure B-7: Heavy Industrial Coverage Areas - South

# Candidate Sites

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Appendix C contains technical information on candidate sites identified by Kitsap 911 with potential to serve radio users in Kitsap County service area.

## Cheryl Street Bremerton

The City of Bremerton has an existing self-supporting tower with water tanks located on City of Bremerton property with a street address of 1925 NE Cheryl Street. Kitsap 911 has little information on the tower and has not contacted the City of Bremerton about the site.

Table C-1: Cheryl Street Bremerton

Candidate	Address	Coordinates	Approximate Height
Cheryl Street Bremerton	1925 NE Cheryl St., Bremerton, WA 98310	47-36-08.53, -122-37-02.84	~100 ft.

## Saint Michael Medical Center

Saint Michael Medical Center has an existing business relationship with Kitsap 911 and has been considered as a geodiverse location for redundant infrastructure, backup, and a possible radio site to improve coverage in Silverdale. The Medical Center leases space at Kitsap 911 as a backup facility with a high-speed fiber connection between the two locations. The roof top of the Medical Center could serve as a new Kitsap 911 tower site. Table C-1 contains technical information on the Medical Center.

Table C-2: Saint Michael Medical Center

Candidate	Address	Coordinates	Rooftop Elevation
St. Michael Medical Center	1800 NW Myhre Rd, Silverdale, WA 98383	47-39-22.44, -122-40-30.46	189 ft.

## Tower Company Candidate Sites

The candidate sites from tower companies are listed by the company names in alphabetical order.

## American Tower

Kitsap 911 has co-located on several American Tower sites in the existing system. American Tower provided the list of potential candidate sites shown in Figure C-1. For the technical information of each site contact Jeremiah Murphy, Inside Sales Representative, [Jeremiah.murphy@americantower.com](mailto:Jeremiah.murphy@americantower.com) (781) 926-6924.

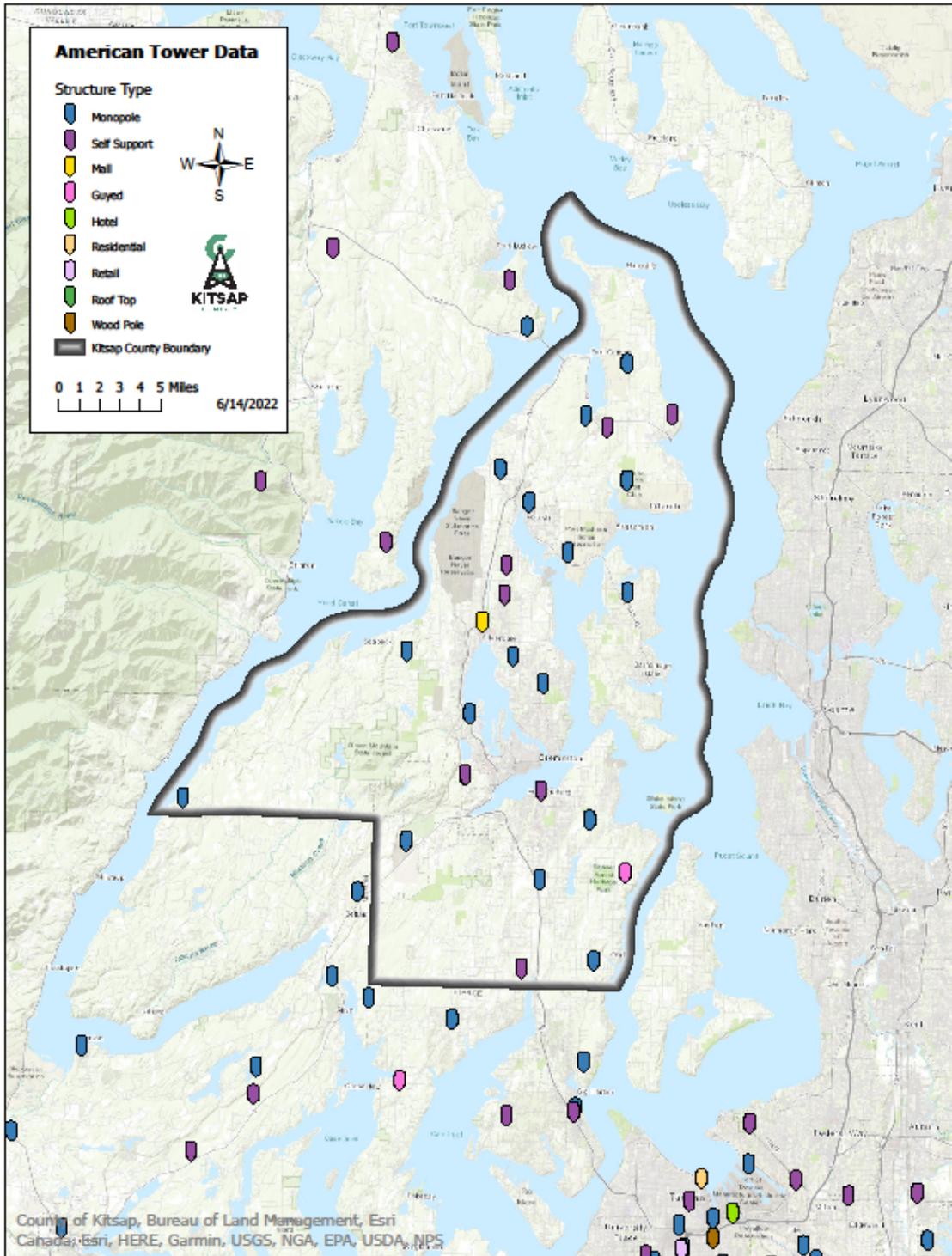


Figure C-1: American Tower Candidate Sites

## Crown Castle

Crown Castle provided the list of potential candidate sites shown in Figure C-2. For the technical information of each site contact Meredith Norris, Market Sales Manager, [meredith.norris@crowncastle.com](mailto:meredith.norris@crowncastle.com), (304)376-1724.

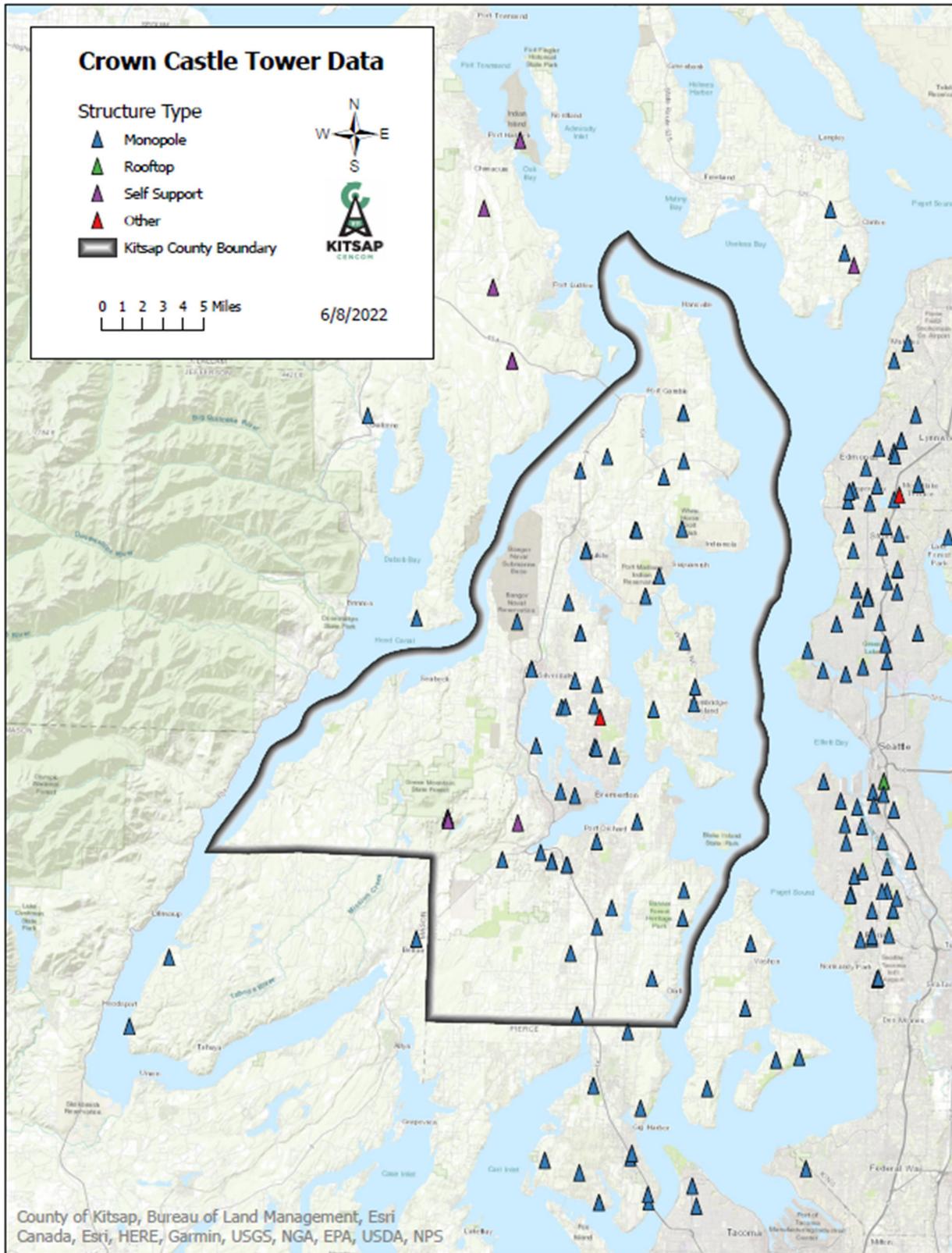


Figure C-2: Crown Castle Candidate Sites

## CTI Towers

CTI Towers manages one tower on Bainbridge Island for Comcast. The address, coordinates, tower type, and height are found in Table C-2. For the technical information contact Jason Peduto, Sales Manager, [jpeduto@ctitowers.com](mailto:jpeduto@ctitowers.com), (252) 573-8631

Table C-2: CTI Tower on Bainbridge Island

Candidate	Address	Coordinates	Tower Type and Height	ASR
CTI Towers, Bainbridge Island	7886 High School Road NE, Bainbridge Island, WA 98110	47-38-12.4, - 122-32-47.1	Guyed, 140 ft.	

## SBA Communications

SBA provided the list of potential candidate sites shown in Figure C-3. For the technical information of each site contact Joe Rozanc, Site Marketing Manager, [jrozanc@sbsite.com](mailto:jrozanc@sbsite.com), (702) 581-2663.

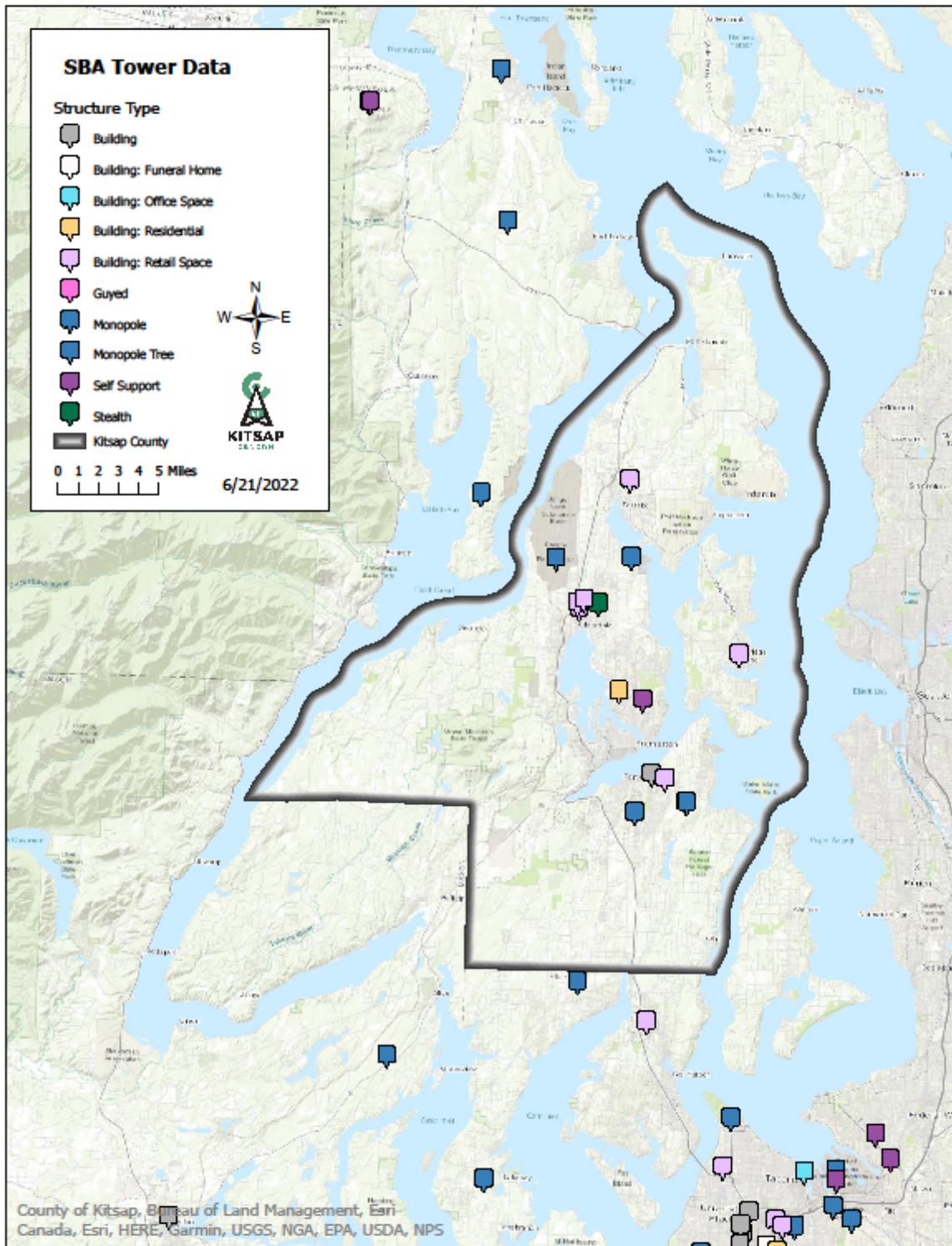


Figure C-3: SBA Candidate Sites

# Vertical Bridge

Vertical Bridge provided the list of potential candidate sites shown in Figure C-4. For the technical information of each site contact Tiffany McClurg, Regional Leasing Manager – West, [TMcClurg@verticalbridge.com](mailto:TMcClurg@verticalbridge.com), (206) 719-1639.

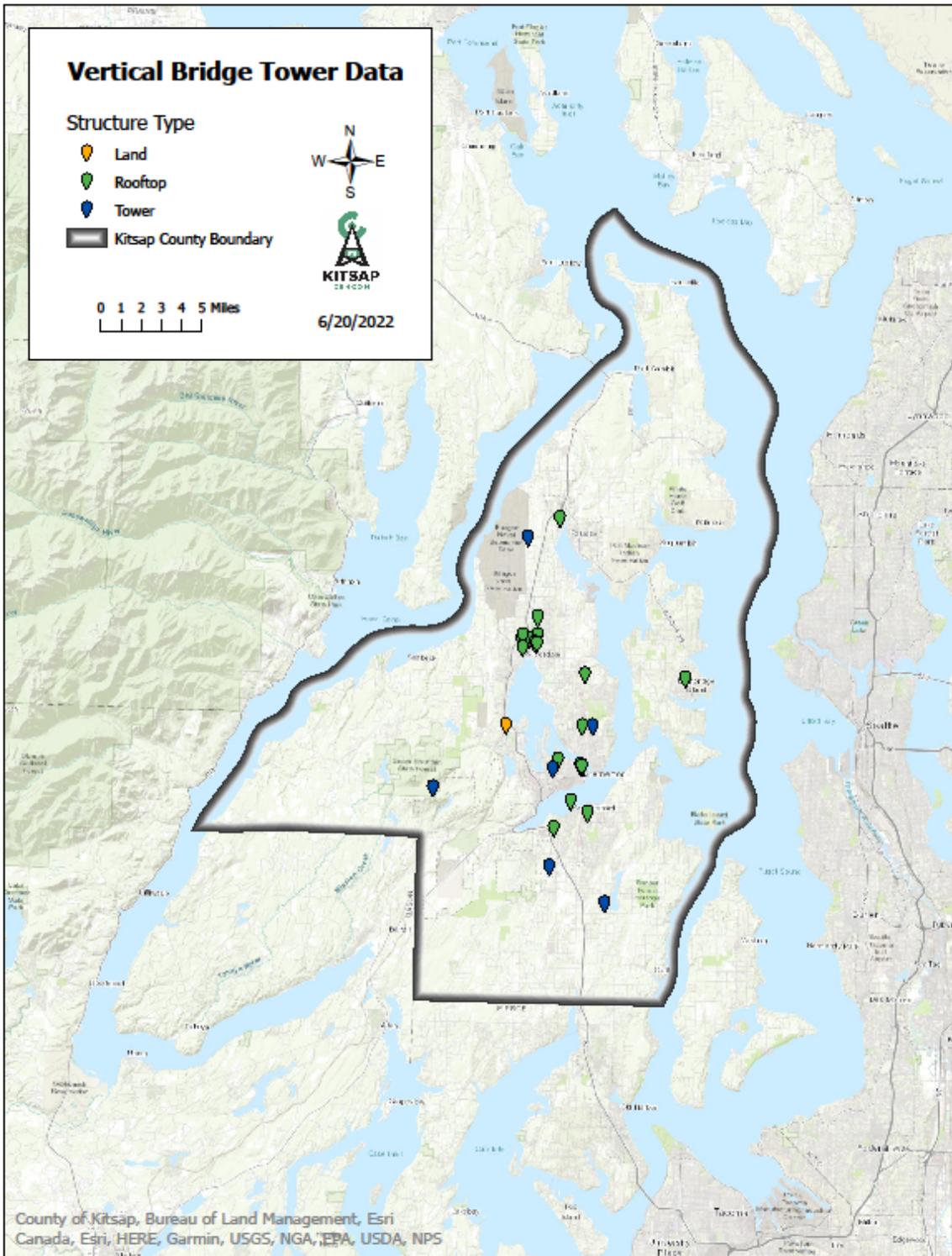


Figure C-4: Vertical Bridge Candidate Sites

## APPENDIX D

# Statement of Project 25 User Needs Compliance Matrix

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This compliance matrix for the P25 user needs is developed from the *Statement of Project 25 (P25) User Needs* document (P25 SPUN) dated August 2020 [https://www.cisa.gov/sites/default/files/publications/21\\_0609\\_p25\\_the-spun\\_508c.pdf](https://www.cisa.gov/sites/default/files/publications/21_0609_p25_the-spun_508c.pdf), and contains four tables:

- Table D-1: List of User Needs for P25 Features, Functions, and Services
- Table D-2: List of User Needs for P25 Infrastructure
- Table D-3: List of User Needs for P25 Consoles
- Table D-4: List of User Needs for P25 Subscriber Equipment

Proposers must provide the completed P25 Compliance Matrix tables listing the P25 user needs using the following:

- Trunking Phase 2 – add an “X” if the item is proposed using Trunking Phase 2
- P25 Standard – add an “X” if the item complies with the P25 standard
- Complies and Compatible – meets the requirements and provides demonstrated compatibility with other vendors’ equipment.
- Proprietary – meets the requirements but does not provide demonstrated compatibility with other vendors’ equipment.
- Not Compliant – equipment currently does not meet this requirement. If future compliance is planned, Proposer may clarify and define the release level or date for planned compliance.)
- Clarification – Text may be included to provide additional information on the user feature.

For more information on the descriptions of the features refer to the *Statement of Project 25 (P25) User Needs* document (P25 SPUN) dated August 2020.

Table D-1: List of User Needs for P25 Features, Functions, and Services

1.1 Voice Services

P25 Features, Functions, and Services	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Group Call						
Individual Call						
Announcement Group Call						
Broadcast Call						
Emergency Call						
System-Wide Group Call (System Call)						
Priority Call						
Preemptive Priority Call						
PSTN Interconnect Call						

1.2. Supplementary Data Services

P25 Features, Functions, and Services	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Transport of Talker ID						
Emergency Alarm (Emergency Alert)						
Emergency Alarm Cancel						
Group Emergency Cancel						

Call Alert						
Short Message						
Status Query						
Status Update						
Radio Unit Monitor						
Radio Check						
Radio Detach						
Radio De-Authorization						
Radio Inhibit						
Radio Un-inhibit						

1.3. Location Services

P25 Features, Functions, and Services	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Tier 1 Location Services						
Tier 2 Location Services						

1.4. Security Services

P25 Features, Functions, and Services	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Encrypted Call						
Authentication						
Over the Air Rekeying (OTAR)						
Encryption Key Update						
Link Layer Encryption						

1.5. Other Services

P25 Features, Functions, and Services	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Over the Air Programming						
Text Messaging						
Interconnection with non-P25 Systems						
Audible Signaling (Alert Tones)						
Subaudible Signaling (squelch control, tone control, Continuous Tone-Coded Squelch System [CTCSS]/Digital Carrier Squelch [DCS])						
Manual Roaming						
Automatic Roaming						
Individual Regrouping						
Group Regrouping						

Table D-2: List of User Needs for P25 Infrastructure

2.1. General System Needs

P25 Infrastructure	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Channel Width/Bandwidth Compliance						
Efficient Use of RF Resources						
FCC/NTIA Rules Satisfied						
FDMA Phase 1 Backwards Compatibility Analog Conventional						
TDMA Phase 2 Backwards Compatibility						
Adaptive to all Public Safety Bands						
Manufacturer Specific Features						
Multiple System Configurations Capability						
Orderly System Expansion						
Co-Channel Operation						
Out-of-Channel Emissions						
Duplex Time Slot Operation						
Dynamic Allocation of Channel Bandwidth for Data						

Standard Signaling and Communications Interfaces						
IP-Based Capabilities						
Throughput Delay						
Graceful Degradation (fallback/failover)						

### 2.2. Mobility Control Elements

P25 Infrastructure	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Call Processing Intelligence						
Secure Trunking Control Channel (Link Layer Encryption)						
Common Protocols and Coding Formats						
ID Structures						
Assignment of Unique IDs						

### 2.3. Common Air Interface

Common Air Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Features, Functions, and Services Support						
Phase 1 (FDMA) Common Air Interface						

Phase 2 (TDMA) Common Air Interface						
Common Channel Operation						

2.3.1. P25 Control Elements, Subscriber Management, and Call Processing Over the CAI

Common Air Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Maintained Site Location of Subscriber Units						
Mobility Tracking						
Registration and De-Registration						
Talkgroup Affiliation						
Location Registration						
Confirmed						
Unconfirmed						
Call Restriction						
Conventional Repeater Hangtime						
Operational Use of Conventional Talkgroups \$0000 and \$FFFF						
Surveillance Mode of Operations						
Busy Channel Lockout (Conventional Polite Mode)						

2.4. Inter-RF Subsystem Interface (ISSI)

2.4.1. General ISSI Needs

Inter-RF Subsystem Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Features, Functions, and Services Support						
P25 RFSS Connectivity						
P25 RFSS and ISSI Function and Equipment Upgrade Capability <sup>1</sup>						
Roaming						
Operational Modes						
Network Configurations						
Bearer Media for Interconnection						
Encryption Key Management						
Supported Services						
Control Element						
Traffic Element						

2.4.2. Subscriber Roaming Management (Unique to ISSI)

Inter-RF Subsystem Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
ISSI Roaming Management						
SU Identification						
SU Validation						
Resource Entitlement						

Granting Requested Resources						
Temporary Duplicate "Home Data File"						
Encryption Key Management						
Authorized Roamer Access in Emergency Mode						
ISSI Support for Polling of RFSS Capabilities						
In-Call Roaming						
Adjacent Site Information						

2.5. Fixed Station Interface

Fixed Station Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Features, Functions, and Services Support						
Transport of Clear Audio						
Transport of E&M Control Signaling						
Tone Remote Control (TRC)						
Intercom Capability						
Airlinks Supported (FM Operation)						
Airlinks Supported (P25 Digital (CAI) Operation)						

2.5.1. Conventional Digital Fixed Station Interface (CDFSI)

Conventional Digital Fixed Station Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
IP-Based Capabilities						
Transport of Encrypted Audio						
Transport of Caller-ID Information						
Transport of Talk-group Information						
Transport of NAC Code Information						
Transport of CTCSS/DCS Information						
Transport of Emergency Alarm						
Transport of Emergency Indications						
Transport of Received Voter Identification						
Advanced Control of the Fixed Station – Frequency of Operation						
Advanced Control of the Fixed Station – Repeating Voice						
Advanced Control of the Fixed Station – Receiver Squelch						
Intercom Audio						
Ethernet 100 Base-T						

Other CDFS Physical and Data Link Connectivity						
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## 2.6. Non-P25 Interfaces

### 2.6.1. Network Management Interface

Network Management Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Element Management						
Single Point of Entry						
Assign Limited Set of Database Fields						
Multiple Databases						
Vertical Partitioning						
Airlinks Supported (FM Operation)						
Airlinks Supported (P25 Digital (CAI) Operation)						

### 2.6.2. Telephone Interconnect Interface

Telephone Interconnect Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Full Duplex Telephone Interconnect						
Full Duplex Telephone Interconnect						
System Operator Control of PSTN Access						

### 2.6.3. Packet Data Host Network Interface

Packet Data Host Network Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Fixed Host Data Interface Protocols						
Fixed Host to Mobile Data Terminal (MDT) Communication						
Fixed Host to Fixed Host Communication						

Table D-3: List of User Needs for P25 Consoles

3.1. General Console Needs

P25 Consoles	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Console Patching						
Dynamic Regrouping						
Dispatcher Interrupt of Calls						
Dispatcher Audio Takeover						
Dispatcher Busy Call Takeover						
Call Termination by a Dispatcher						
Discreet Listening						
Radio Unit Monitoring (Remote Unit Monitoring)						
Dual-Tone Multifrequency (DTMF) Overdial						
Transport of CTCSS/DCS Information						
Transport of Emergency Alarm						
Transport of Emergency Indications						
Transport of Received Voter Identification						
Advanced Control of the Fixed Station – Frequency of Operation						

Advanced Control of the Fixed Station – Repeating Voice						
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### 3.2. Console Subsystem Interface

Console Subsystem Interface	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Features, Functions, and Services Support						
Packet Data						
Console Rekeying						
Telephone Patching						
Conventional/Trunking Patching						
Time Synchronization						
Voter Control and Status						
Conventional Channel Status and Control						
Received NAC Code						
Transmit NAC Code						
Mode of Received Call						
Conventional, Trunked, and Mixed Modes						
Detection and Reporting of Failure Conditions						
GPS/Automatic Vehicle Locator (AVL)						
Transport Layer						
Digital DTMF						

Table D-: List of User Needs for P25 Subscriber Equipment

4.1. Features, Functions, and Services Support

P25 Subscriber Equipment	Trunking Phase 2	P25 Standard	Complies and Compatible	Proprietary	Not Compliant	Clarification
Voice Services						
Supplementary Data Services						
Security Services						
Location Services						
Other Services						
Setup and Monitoring Functions						

4.2. Mobile/Portable Subscriber Unit General Requirements

P25 Subscriber Equipment	Trunking Phase 2	P25 Standard				
Analog Compliance						
Analog Support						
Electronic Serial Numbers (ESN)						
Military Specifications Methods						
Support Conventional and Trunked Modes						
Phase 2 Subscriber Equipment in a Trunked Phase 1 System						
Channel Width						
Efficient Use of RF Resources						

Channel Scan						
Connection to an External Audio and Push-to-Talk System						
Data Port for MDT, Portable Computer, or Other Peripheral Device						
Data Port to Peripherals						
Minimum Keypad Configuration						
Digitally Store Functional Characteristics						
Duplex Individual Calls						
DTMF Signaling						

#### 4.3. Vehicular Repeater (VR) Capability

P25 Subscriber Equipment	Trunking Phase 2	P25 Standard				
Full Duplex						
Direct Mode						
Unit to Unit Directed and Repeated						
In-Band Operation						
Manual or Auto Channel Selection						
Extended Range						
In-Vehicle or Stand-Alone						
Operational Control						
One-to-One Operation						
More Than One Operation						

Any Emergency In One-To-One Operation						
Vehicle Repeater Activation						
Single Control Capability						
Ease of Operation						
Full Control or Covert Installation						

#### 4.4. Mobile Data Peripheral Interface

Mobile Data Peripheral Interface	Trunking Phase 2	P25 Standard				
Mobile Data Interface Protocols						
MDT to MDT Communication						
MDT to Fixed Host Communication						
Minimum Data Speed						

# Proposal Requirements Compliance Matrix

Proposers must provide a completed compliance table listing all technical requirements of this RFP in their response (preferably by embedding responses in the requirements text) using the following:

- Fully Comply – no clarification required although additional information is allowed
- Partially Comply – clarification required
- Not Compliant – no clarification required although additional information is allowed
- Read and Understood (information only) – if a statement provides information and does not require compliance

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>Section 1 Introduction and Overview</b>					
<b>1.1 Basic Project Description</b>					
1.1.1					
1.1.2					
1.1.3					
1.1.4					
<b>1.2 Document Overview</b>					
1.2.1					
<b>1.3 Information about Kitsap County</b>					
1.3.1					
<b>1.4 Information about Kitsap 911</b>					
1.4.1					
1.4.2					
<b>1.5 Military Installations and the Regional Dispatch Center (RDC)</b>					
1.5.1					
<b>1.6 Kitsap County Fire Districts Map</b>					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
1.6.1					
<b>1.7 Kitsap County Law Enforcement Regions Map</b>					
1.7.1					
<b>Section 2 Existing System Description</b>					
<b>2.1 Existing System Description</b>					
2.1.1					
<b>Section 3 Common Technical Requirements</b>					
<b>3.1 Equipment to be Furnished Complete</b>					
3.1.1					
3.1.2					
<b>3.2 Component Ratings</b>					
3.2.1					
<b>3.3 Overload Protection</b>					
3.3.1					
<b>3.4 Electrostatic Protection</b>					
3.4.1					
<b>3.5 Electromagnetic Susceptibility</b>					
3.5.1					
<b>3.6 Existing Equipment Interfaces</b>					
3.6.1					
<b>3.7 Equipment Placement</b>					
3.7.1					
<b>3.8 Equipment Mounting</b>					
3.8.1					
3.8.2					
3.8.3					
3.8.4					
3.8.5					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>3.9 Equipment Surge Protection</b>					
3.9.1					
3.9.2					
<b>3.10 Power Supplies</b>					
3.10.1					
3.10.2					
3.10.3					
3.10.4					
3.10.5					
3.10.6					
<b>3.11 Non-LAN Cables</b>					
3.11.1					
3.11.2					
3.11.3					
<b>3.12 Connector Blocks</b>					
3.12.1					
3.12.2					
3.12.3					
3.12.4					
3.12.5					
3.12.6					
<b>Section 4 Radio System Specifications and Requirements</b>					
<b>4.1 Radio System Introduction</b>					
4.1.1					
<b>4.2 System Description</b>					
4.2.1					
4.2.2					
<b>4.3 Frequency Requirements</b>					
4.3.1					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
4.3.2					
<b>4.4 System Technical Requirements</b>					
4.4.1					
4.4.2					
4.4.3					
4.4.4					
4.4.5					
4.4.6					
4.4.7					
<b>4.5 Talkgroup Capacity</b>					
4.5.1					
4.5.2					
4.5.3					
4.5.4					
<b>4.6 Subscriber Capacity</b>					
4.6.1					
4.6.2					
4.6.3					
<b>4.7 Encryption</b>					
4.7.1					
<b>4.8 Automatic Station Identification</b>					
4.8.1					
4.8.2					
<b>4.9 Equipment</b>					
4.9.1					
4.9.2					
4.9.3					
4.9.4					
4.9.5					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>4.10 Interoperability</b>					
4.10.1					
4.10.2					
4.10.3					
4.10.4					
4.10.5					
4.10.6					
4.10.7					
4.10.8					
<b>4.11 Reliability</b>					
4.11.1					
4.11.2					
4.11.3					
4.11.4					
<b>4.12 Other Reliability Requirements</b>					
4.12.1					
4.12.2					
4.12.3					
<b>4.13 Coverage</b>					
4.13.1					
4.13.2					
4.13.3					
4.13.4					
4.13.5					
4.13.6					
4.13.7					
4.13.8					
4.13.9					
4.13.10					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
4.13.11					
4.13.12					
4.13.13					
4.13.14					
4.13.15	4.13.1	4.13.1	4.13.1	4.13.1	4.13.1
<b>4.14 Candidate Sites</b>					
4.14.1					
<b>4.15 Simulcast System Requirements</b>					
4.15.1					
4.15.2					
4.15.3					
4.15.4					
4.15.5					
<b>4.16 Receiver Voting Systems</b>					
4.16.1					
4.16.2					
<b>4.17 Trunked Site Receiver Multicoupler System</b>					
4.17.1					
4.17.2					
4.17.3					
<b>4.18 Tower Top Amplifiers</b>					
4.18.1					
4.18.2					
4.18.3					
4.18.4					
4.18.5					
<b>4.19 Antennas and Transmission Lines</b>					
4.19.1					
4.19.2					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
4.19.3					
4.19.4					
4.19.5					
4.19.6					
<b>4.20 Computer Aided Dispatch Interface (CADI)</b>					
4.20.1					
4.20.2					
4.20.3					
4.20.4					
4.20.5					
<b>4.21 Over-the-Air System Monitoring System</b>					
4.21.1					
4.21.2					
4.21.3					
4.21.4					
4.21.5					
<b>4.22 Over the Air Rekeying (OTAR)</b>					
4.22.1					
4.22.2					
<b>4.23 Over the Air Programming (OTAP)</b>					
4.23.1					
4.23.2					
4.23.3					
<b>4.24 Broadband (Cellular Provided) Radio Services</b>					
4.24.1					
4.24.2					
4.24.3					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
4.24.4					
4.24.5					
4.24.6					
4.24.7					
4.24.8					
4.24.9					
4.24.10					
<b>4.25 Wi-Fi Services</b>					
4.25.1					
4.25.2					
4.25.3					
<b>4.26 Radio Initiated Audio Test Call</b>					
4.26.1					
4.26.2					
<b>Section 5 Transport System Requirements</b>					
<b>5.1 General</b>					
5.1.1					
5.1.2					
5.1.3					
5.1.4					
5.1.5					
<b>5.2 Backhaul Requirements</b>					
5.2.1					
5.2.2					
<b>5.3 Data Networking Equipment</b>					
5.3.1					
5.3.2					
5.3.3					
5.3.4					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
5.3.5					
<b>Section 6 Site Improvement and Upgrade Requirements</b>					
<b>6.1 Introduction</b>					
6.1.1					
6.1.2					
6.1.3					
6.1.4					
6.1.5					
6.1.6					
6.1.7					
<b>6.2 Seismic</b>					
6.2.1					
<b>6.3 Shelter and Equipment Grounding</b>					
6.3.1					
6.3.2					
6.3.3					
6.3.4					
6.3.5					
6.3.6					
6.3.7					
6.3.8					
6.3.9					
<b>6.4 Materials</b>					
6.4.1					
<b>6.5 Antenna Mounts</b>					
6.5.1					
6.5.2					
<b>6.6 Transmission Line Supports</b>					
6.6.1					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
6.6.2					
6.6.3					
<b>Section 7 DC Power Interface Requirements</b>					
<b>7.1 General</b>					
7.1.1					
7.1.2					
7.1.3					
7.1.4					
7.1.5					
7.1.6					
7.1.7					
7.1.8					
7.1.9					
7.1.10					
7.1.11					
7.1.12					
<b>7.2 Power Distribution</b>					
7.2.1					
7.2.2					
7.2.3					
7.2.4					
7.2.5					
<b>7.3 DC-to-DC Converter Specifications</b>					
7.3.1					
7.3.2					
7.3.3					
7.3.4					
7.3.5					
7.3.6					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
7.3.7					
7.3.8					
7.3.9					
7.3.10					
<b>7.4 Inverters</b>					
7.4.1					
7.4.2					
7.4.3					
7.4.4					
7.4.5					
<b>Section 8 Training Requirements</b>					
<b>8.1 General</b>					
8.1.1					
8.1.2					
8.1.3					
8.1.4					
8.1.5					
8.1.6					
8.1.7					
8.1.8					
8.1.9					
8.1.10					
<b>Section 9 Data Network Requirements</b>					
<b>9.1 General</b>					
9.1.1					
9.1.2					
<b>9.2 Standards</b>					
9.2.1					
9.2.2					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
9.2.3					
9.2.4					
9.2.5					
<b>9.3 Design</b>					
9.3.1					
9.3.2					
9.3.3					
<b>9.4 Racks</b>					
9.4.1					
9.4.2					
9.4.3					
9.4.4					
9.4.5					
<b>9.5 Cable System Installation Practices</b>					
9.5.1					
9.5.2					
9.5.3					
9.5.4					
9.5.5					
9.5.6					
9.5.7					
9.5.8					
9.5.9					
9.5.10					
9.5.11					
9.5.12					
9.5.13					
9.5.14					
9.5.15					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>9.6 Patch Panels</b>					
9.6.1					
9.6.2					
9.6.3					
<b>9.7 Testing</b>					
9.7.1					
9.7.2					
<b>9.8 Network Devices</b>					
9.8.1					
9.8.2					
9.8.3					
9.8.4					
9.8.5					
9.8.6					
9.8.7					
9.8.8					
<b>Section 10 Logging Recorder Interface Requirements</b>					
<b>10.1 General</b>					
10.1.1					
10.1.2					
10.1.3					
10.1.4					
10.1.5					
10.1.6					
10.1.7					
<b>Section 11 Console System Requirements</b>					
<b>11.1 Existing System Description</b>					
<b>11.2 Upgrade Capabilities of Existing Dispatch Console System and Optional Replacement</b>					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
11.2.1					
11.2.2					
11.2.3					
11.2.4					
<b>11.3 General Requirements for the Dispatch Console System</b>					
11.3.1					
11.3.2					
11.3.3					
11.3.4					
<b>11.4 Requirements for Interface with Radio Systems</b>					
11.4.1					
11.4.2					
11.4.3					
11.4.4					
<b>11.5 Dispatch Console Requirements</b>					
11.5.1					
11.5.2					
11.5.3					
11.5.4					
11.5.5					
<b>11.6 Remote Console Requirements</b>					
11.6.1					
11.6.2					
11.6.3					
<b>11.7 Dispatch Backup Radios</b>					
11.7.1					
<b>11.8 Console Installation Requirements</b>					
11.8.1					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>11.9 Required Console Options</b>					
11.9.1					
<b>Section 12 User Radio Requirements</b>					
<b>12.1 General</b>					
12.1.1					
12.1.2					
12.1.3					
12.1.4					
12.1.5					
12.1.6					
<b>12.2 Technical</b>					
12.2.1					
12.2.2					
12.2.3					
12.2.4					
12.2.5					
12.2.6					
12.2.7					
12.2.8					
12.2.9					
12.2.10					
12.2.11					
<b>12.3 Mobile Radios and Control Stations</b>					
12.3.1					
12.3.2					
12.3.3					
12.3.4					
12.3.5					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
12.3.6					
12.3.7					
12.3.8					
12.3.9					
12.1.10					
12.1.11					
12.1.12					
12.1.13					
12.1.14					
<b>12.4 Portable Radios</b>					
12.4.1					
12.4.2					
12.4.3					
12.4.4					
12.4.5					
12.4.6					
12.4.7					
12.4.8					
12.4.9					
12.4.10					
<b>Section 13 Cybersecurity</b>					
<b>13.1 Information Security and Data Sensitivity</b>					
13.1.1					
13.1.2					
13.1.3					
13.1.4					
13.1.5					
<b>13.2 Software and Services</b>					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
13.2.1					
13.2.2					
13.2.3					
13.2.4					
13.2.5					
13.2.6					
<b>13.3. Access Control</b>					
13.3.1					
13.3.2					
13.3.3					
13.3.4					
13.3.5					
13.3.6					
13.3.7					
13.3.8					
13.3.9					
<b>13.4 Account Management</b>					
13.4.1					
13.4.2					
13.4.3					
13.4.4					
<b>13.5 Session Management</b>					
13.5.1					
13.5.2					
13.5.3					
13.5.4					
<b>13.6 Authentication/Password Policy and Management</b>					
13.6.1					
13.6.2					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
13.6.3					
13.6.4					
13.6.5					
13.6.6					
13.6.7					
13.6.8					
13.6.9					
<b>13.7 Logging and Auditing</b>					
13.7.1					
13.7.2					
13.7.3					
13.7.4					
13.7.5					
13.7.6					
13.7.7					
<b>13.8 Communication Restrictions</b>					
13.8.1					
13.8.2					
13.8.3					
13.8.4					
13.8.5					
13.8.6					
13.8.7					
13.8.8					
13.8.9					
13.8.10					
13.8.11					
13.8.12					
13.8.13					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
13.8.14					
13.8.15					
<b>13.9 Malware Detection and Protection</b>					
13.9.1					
13.9.2					
13.9.3					
<b>13.10 Reliability and Adherence to Standards</b>					
13.10.1					
13.10.2					
13.10.3					
13.10.4					
<b>13.11 System Information Security</b>					
13.11.1					
13.11.2					
13.11.3					
13.11.4					
13.11.5					
13.11.6					
13.11.7					
<b>13.12 Secure Development Practices</b>					
13.12.1					
13.12.2					
13.12.3					
13.12.4					
13.12.5					
13.12.6					
13.12.7					
13.12.8					
13.12.9					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>13.13 Documentation and Tracking of Vulnerabilities</b>					
13.13.1					
13.13.2					
13.13.3					
<b>13.14 Problem Reporting</b>					
13.14.1					
13.14.2					
13.14.3					
<b>13.15 Patch Management and Updates</b>					
13.15.1					
13.15.2					
13.15.3					
13.15.4					
<b>13.16 Seller Personnel Management</b>					
13.16.1					
13.16.2					
13.16.3					
13.16.4					
<b>13.17 Secure Hardware and Software Delivery</b>					
13.17.1					
13.17.2					
13.17.3					
13.17.4					
13.17.5					
<b>13.18 Host Intrusion Detection</b>					
13.18.1					
13.18.2					
13.18.3					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>13.19 Network Intrusion Detection</b>					
13.19.1					
13.19.2					
13.19.3					
13.19.4					
13.19.5					
<b>13.20 Physical Access to System Components</b>					
13.20.1					
13.20.2					
13.20.3					
13.20.4					
13.20.5					
13.20.6					
<b>13.21 Perimeter Access</b>					
13.21.1					
13.21.2					
13.21.3					
13.21.4					
13.21.5					
<b>13.22 Communications Inside the Physical Security Perimeter</b>					
13.22.1					
13.22.2					
<b>13.23 General Wireless Technology Provisions</b>					
13.23.1					
13.23.2					
13.23.3					
13.23.4					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
13.23.5					
13.23.6					
13.23.7					
13.23.8					
<b>13.24 Cryptographic System Documentation</b>					
13.24.1					
<b>13.25 Cryptographic Key and Method Establishment, Usage, and Update</b>					
13.25.1					
13.25.2					
13.25.3					
13.25.4					
<b>13.26 References</b>					
<b>Section 14 Implementation Requirements</b>					
<b>14.1 General</b>					
14.1.1					
14.1.2					
14.1.3					
<b>14.2 Equipment Installations</b>					
14.2.1					
14.2.2					
14.2.3					
14.2.4					
14.2.5					
14.2.6					
14.2.7					
14.2.8					
14.2.9					
14.2.10					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
14.2.11					
14.2.12					
14.2.13					
14.2.14					
14.2.15					
<b>14.3 System Staging</b>					
14.3.1					
14.3.2					
<b>14.4 Installation Plan</b>					
14.4.1					
14.4.2					
14.4.3					
<b>14.5 Equipment Recordkeeping</b>					
14.5.1					
14.5.2					
14.5.3					
<b>14.6 Grounding</b>					
14.6.1					
14.6.2					
14.6.3					
14.6.4					
14.6.5					
14.6.7					
<b>14.7 Failure to Meet Requirements of Specifications</b>					
14.7.1					
<b>14.8 Antennas and Mounts</b>					
14.8.1					
14.8.2					
14.8.3					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
<b>14.9 Antenna Feed Line</b>					
14.9.1					
14.9.2					
14.9.3					
14.9.4					
14.9.5					
14.9.6					
14.9.7					
14.9.8					
14.9.9					
14.9.10					
14.9.11					
14.9.12					
14.9.13					
14.9.14					
<b>Section 15 Quality and Workmanship Requirements</b>					
<b>15.1 General</b>					
15.1.1					
15.1.2					
15.1.3					
15.1.4					
15.1.5					
15.1.6					
15.1.7					
15.1.8					
15.1.9					
15.1.10					
15.1.11					
15.1.12					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
15.1.13					
15.1.14					
<b>15.2 AC Wiring</b>					
15.2.1					
15.2.2					
<b>Section 16 Acceptance Testing Requirements</b>					
<b>16.1 Assembly Staging Testing</b>					
16.1.1					
16.1.2					
<b>16.2 System Acceptance Process</b>					
16.2.1					
<b>16.3 Performance Tests and Buyer's Acceptance</b>					
16.3.1					
<b>16.4 Interface to Other Equipment</b>					
16.4.1					
16.4.2					
16.4.3					
16.4.4					
<b>16.5 Coverage Acceptance Testing</b>					
16.5.1					
16.5.2					
16.5.3					
16.5.4					
16.5.5					
16.5.6					
16.5.7					
16.5.8					
16.5.9					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
16.5.10					
16.5.11					
16.5.12					
<b>Section 17 Documentation Requirements</b>					
<b>17.1 General</b>					
17.1.1					
17.1.2					
17.1.3					
17.1.4					
17.1.5					
17.1.6					
17.1.7					
17.1.8					
17.1.9					
17.1.10					
17.1.11					
17.1.12					
17.1.13					
17.1.14					
<b>Section 18 Warranty and Maintenance Requirements</b>					
<b>18.1 Warranty/Maintenance</b>					
18.1.1					
18.1.2					
18.1.3					
18.1.4					
18.1.5					
18.1.6					
18.1.7					
18.1.8					

Reference	Fully Comply	Partially Comply	Not Compliant	Read & Understood	Clarification
18.1.9					
18.1.10					
18.1.11					
<b>18.2 Future Equipment and Parts Availability</b>					
18.2.1					
<b>Section 19 Project Closeout Requirements</b>					
<b>19.1 Objectives Met</b>					
19.1.1					
19.1.2					
<b>19.2 Contract Terms</b>					
19.2.1					
<b>19.3 Documentation</b>					
19.3.1					
<b>19.4 Governmental Certifications</b>					
19.4.1					
<b>19.5 Transfer of Responsibility and Support</b>					
19.5.1					
<b>19.6 Financial Review and Final Invoice</b>					
19.6.1					
<b>19.7 Lessons Learned</b>					
19.7.1					
<b>19.8 Project Closure Certification</b>					
19.8.1					