

DODGE COUNTY



REQUEST FOR PROPOSALS

P25 Radio System

Public Safety Radio Committee, Dodge County, WI

RFP NUMBER: #28 26-03

Issued Date: April 1, 2026

RFP Submittal Deadline

June 30, 2026

3:00 pm (CST)

Submit Sealed RFP's To:

Dodge County Clerk

Administration Building

127 E Oak St.

Juneau, WI 53039

(920) 386-3600

Office Hours: 8:00 am – 4:30 pm Monday through Friday

Table of Contents

- Section 1 - Terms and Conditions
- Section 2 - Existing Conditions and User Requirements
- Section 3 - System Configuration and Growth
- Section 4 - Implementation and Project Management
- Section 5 - System Equipment Requirements
- Section 6 - Coverage Criteria
- Section 7 - Dispatch Consoles
- Section 8 - Shelter, HVAC, Compound
- Section 9 - Generator
- Section 10 - Tower Requirements
- Section 11 - Site Work Requirements
- Section 12 - Infrastructure Warranty and Maintenance
- Section 13 - Radio Requirements
- Section 14 - Radio Pricing
- Section 15 - System Pricing
- Section 16 - Additional Requirements
- Appendix A - Current Infrastructure
- Appendix B - Existing Channel Structure
- Appendix C - Tower Candidate Site List
- Appendix D - Critical Building List
- Appendix E - FCC Licenses
- Appendix F - Definitions
- Appendix G - Fire Department List
- Appendix H - Subscriber Radio List
- Appendix I - Pricing Considerations Worksheet
- Appendix J - RFP Standard Language
- Appendix K - Watertown System Information

1 **Section 1 - Terms & Conditions**

1.1 **Purpose Statement**

1.1.1 Purpose: This Request for Proposal (RFP) encompasses a turnkey project to provide Dodge County, Wisconsin (further known throughout this document as 'the Customer') with a new 700/800 MHz P25 Phase 2 Simulcast Radio System capable of meeting current and future communication needs, reliably and functionally.

1.2 **Appendix J, Dodge County, WI RFP Standard Language**

1.2.1 RFP Standard language for Dodge County, WI is provided in Appendix J and will take precedence over the other language in Section 1 should any conflicts arise.

1.3 **Response Instructions**

1.3.1 This RFP is a complete document and must be returned intact with the Vendor proposal provided in a point-by-point fashion. All responses and attachments should be placed into the Vendor proposal immediately behind the area in which the information was requested, i.e., a point-by-point response.

1.3.2 The RFP Authorization Form (See Attachments) must be completed and submitted with the Vendor's response.

1.3.3 If supplementary materials are attached, each inserted page must be labeled in the bottom margin with the number of the RFP section behind which it is being placed. If more than one page is inserted behind a particular RFP section, then each must be labeled with the appropriate section number plus a letter designator, e.g. 1.1a, 1.1b, 1.1c, etc.

1.3.4 When submitting responses to RFPs, corporate entities are required to comply with State law regarding authorized signatures. A letter of proposal submittal is required. If an official with the proposing Vendor other than the president executes the letter of transmittal such signature must be accompanied by a certificate or a copy of a resolution adopted by the corporation setting forth the authority of that individual to execute a contract.

1.3.5 The Vendor shall provide a point-by-point and narrative response that must be met as described below. The Vendors shall clearly delineate in its point-by-point response its position with respect to the stated requirement, meaning the statement of any of the following:

1.3.5.1 Comply and Exceeds - meaning that the item has been read and that the Vendor agrees and accepts the requirement(s) as stated; the Vendor also wishes to be scored higher for exceeding the requirement. Not all items allow this response; All responses marked Exceeds will be validated prior to awarding extra points.

1.3.5.2 Comply with Clarification – meaning that the Vendor fully accepts the requirement and is in addition providing an explanation of how it intends to adhere to the requirement(s); All responses will be validated to determine if the clarification is within the intent of the RFP or graded down to an Exception.

1.3.5.3 Exception – meaning that the Vendor understands the Customer's item but cannot accept or undertake the Customer's requirement(s). Proposal responses that take

exception to a stated RFP requirement risk being graded down in the evaluation process. Vendors are encouraged to request clarification of RFP items that are unclear during the period provided within the Customer's open procurement cycle.

1.4 **Contact Information**

1.4.1 Primary Contact: All contact and inquiry concerning this RFP shall be directed to the Customer as follows:

Contact: Trista Steinbach, Dodge County Purchasing Address: 127 East Oak Street, Juneau, Wisconsin 53039 Email: tsteinbach@co.dodge.wi.us

Phone: (920) 386-4224

1.4.2 Additional Customer Contact: All contact and inquiry concerning this RFP shall be copied to additional persons/departments as follows:

Contact: Jeff McNally, Senior Consultant, TUSA Consulting Services II, LLC Address: N/A Email: jeff.mcnally@tusaconsulting.com Phone: (913) 620-6077

1.5 **Definitions**

1.5.1 Definitions as used herein:

1.5.1.1 Consultant: TUSA Consulting Services II, LLC. (TUSA)

1.5.1.2 Vendor: The Vendor to whom a Contract is awarded.

1.5.1.3 Subcontractor: The Vendor's Contractors/Subcontractors

1.5.1.4 Owner/ Customer: Dodge County, Wisconsin

1.5.1.5 Proposal, RFP Response, Submittal: Correspondence or material furnished by Responders in response to this specification.

1.5.1.6 Radio Equipment/Subscribers: Contractor furnished P25 Land Mobile Radio portables, mobiles, and control stations, and related equipment engineered, integrated, furnished and installed as part of this RFP Response.

1.5.1.7 State: Wisconsin

1.5.1.8 Vendor: Any organization, company, or supplier responding to this RFP

1.6 **Proposal Timeline and Mandatory Meetings**

1.6.1 Mandatory Pre-Proposal Conference: This RFP constitutes the full scope of the information request. A mandatory RFP pre-proposal conference will be conducted after the release of this RFP. The time and place of the pre-proposal conference will be at:

Administration Auditorium Room, 1st floor, 127 E Oak Street, Juneau, Wisconsin 53039

Pre-Proposal Conference Location: **Administration Auditorium Room, 1st floor, 127 E Oak Street, Juneau, Wisconsin 53039**

Pre-Proposal Conference Date and Time: **May 5, 2026 @ 9:00 AM CST**

1.6.2 Mandatory Site Visits: Vendor site visits shall be made available immediately following the Mandatory Pre- Proposal Conference and continue on the following day, as needed.

1.6.3 RFP Questions: Dodge County assumes no responsibility or liability for any error or omission in any part of this RFP or resulting design. Prior to the deadline for questions, a Vendor shall notify Dodge County of any error, omission, inconsistency or other factor which requires clarification that is discovered while reviewing the documents or preparing a proposal. Such notification shall be made in writing to Dodge County's Purchasing Office.

All questions resulting in further clarification or modification to this (RFP) document will be handled by written addenda. Questions shall be directed to the Purchasing Division via email to tsteinbach@co.dodge.wi.us. Questions must be asked at least five (5) business days prior to the proposal due date. Questions received after this time may not be answered. Any changes as a result of issues raised will be made by written addenda and posted on the Dodge County website and Demandstar. It is the Vendor's responsibility to check the website for addenda prior to submitting your proposal. Oral and other interpretations or clarifications will be without legal effect.

Questions are due no later than: **5/12/2026 @ 3:00PM CST**

Responses will be return no later than: **5/19/2026 @ 3:00PM CST**

1.6.4 RFP Response Due: All responses are due no later than: **June 30, 2026 @ 3:00PM CST**

1.7 **Proposal Response Submission and Evaluation**

1.7.1 Proposer shall submit "2" bound originals of the proposal excluding the Financial Proposal. Along with the proposal, include one flash drive containing two files as follows:

- File Named "PROPOSAL" to include the proposal excluding pricing details.
- File Named "PRICING" to include Attachment G – Financial Proposal. The Financial Proposal should only be submitted on the flash drive and not in the actual proposal.

All RFP responses including the point-by-point response and associated attachments are due to the Dodge County Clerk's Office, 127 E Oak St. per the due date. Prospective vendors can submit proposals via hand delivery or by mail via DHL, FedEx, UPS, USPS as outlined below. Hand Delivered or mailed proposals must include the following items:

- Be clearly marked with "**RFP # 28-26-03 & P25 Radio System - Dodge County, WI**" on the outside of a sealed envelope or box in the lower left-hand corner.
- Along with the proposal, include one flash drive containing 2 files as follows: One file named "PROPOSAL" to include the proposal excluding pricing details. One file named "PRICING" to include Attachment G – Financial Proposal.

Late proposals will not be accepted.

1.7.2 Evaluation Criteria: Technical and Pricing Proposals shall be evaluated separately using a weighted point system whereby out of a maximum 100 point Overall Project Score, 70 points shall be allocated to Technical Proposal evaluation scores, and 30 point being allocated to the Pricing Proposal. Technical Proposals will first be evaluated for overall responsiveness and completeness to the RFP. Proposals that are determined responsive and complete will be evaluated by the Customer and Consultant.

Technical Proposals will be graded in the following areas, listed in relative order of importance, with respect to the requirements as outlined in this RFP:

1. Experience and Qualifications of Vendor - 10
2. Technical Approach - 50
3. Timeline - 10
4. Price/Cost/Fees - 30

1.7.3 Score Results: The scored results of this Technical Evaluation will be multiplied by 0.70, thereby yielding a weighted technical project-total score. The results of this portion of the Evaluation shall be submitted to the Customer. At the direction of the Customer as to the suitability and acceptability of the Technical Evaluation Results, the Consultant will next open and evaluate proposed costs for each responsive Technical Proposal. The relative cost differences between responsive Cost Proposals shall be compared and evaluated. Each of the Pricing Proposals received from responsive Vendors shall have their individual cost evaluation raw scores multiplied by 0.30 and those portion results added together with the Technical Evaluation score, thus yielding an Overall Project Score for each Vendor's response. That Vendor response receiving the highest Overall Project Score shall be recommended by the Consultant as being the most responsive, best proposal. In the case of a tied Overall Project Score, the Consultant shall recommend that Vendor response having the highest Technical Proposal evaluation score.

1.7.4 Total Costs Evaluation: The Customer reserves the right to evaluate the total project price based on initial cost and life cycle analyses. Any deviations by Vendors from the pricing requirements herein shall be pre-approved by the Customer in advance of submittal, or they will be construed as being non-conforming, and the submittal may not be given further consideration.

1.8 **Contracts**

1.8.1 This RFP and the Vendor's proposal will be an integral part of the Contract. Any and all statements made in the proposal will automatically become part of the final Contract for equipment and services. Omission in the Vendor's proposal of any equipment, services, or provisions herein prescribed shall not be construed so as to relieve the Contractor of any responsibility or obligation necessary to the complete and satisfactory installation of any and all systems, equipment, and services specified. The price and any optional prices quoted must include all equipment, service, features, materials, labor, etc. necessary to make all the features, services, and equipment, which are included, fully functional. The Vendor agrees that the cost of additional equipment, materials, or

labor necessary to meet these requirements, which was not otherwise calculated in the Vendor's proposal, shall be solely at the Contractor's expense. If there are specific items that are purposefully excluded in the Vendor's indicated price, those must be defined by the Vendor's proposal. If, however, those Vendor-excluded items are what the Customer and its Consultant consider to be normal and customary for a project of this type, any proposal excluding such items will be graded as not meeting minimum requirements for the appropriate RFP category(s) impacted by that exclusion. Each Vendor proposal must be signed by a duly authorized officer who is empowered to contractually bind the Vendor. The Customer shall enter into contract negotiations with the apparent responsive and best Vendor. Should the Customer be unable to negotiate a Contract with the apparent responsive and best Vendor, the Customer may exercise the right to enter into Contract negotiations with the apparent responsive Vendor having the next-highest evaluation score.

1.9 **Right of Refusal**

1.9.1 The Customer reserves the right to reject any and all RFP Responses received. Acceptance of any Response will not place the Customer under any obligation to purchase any equipment, system or services. The Customer reserves the right to reject any or all bids and to waive any or all irregularities, mistakes, omissions or informalities relative thereto. The date and time for the submittals of questions and for the submittal of bids as set forth in this RFP shall be deemed mandatory. The failure to meet all submittal dates as set forth shall constitute a defect in the submission, which shall be grounds for rejection as non-responsive. The failure to meet any submittal dates shall not be considered a waivable irregularity, omission, or informality.

1.10 **Remedies**

1.10.1 Remedies shall be part of any Contract awarded and negotiated with the Successful Vendor. The scope of these remedies will become part of a negotiated contract and shall minimally include a graduated set of monetary penalties for unexcused late or delayed performance by the Contractor. The project schedule's indicated completion date shall be the basis for assessment of completion remedies. Remedies shall be applied as follows:

- 1.10.1.1 Unexcused project completion delays of between 1 day and 30 days beyond the Contract's indicated completion date shall be assessed a penalty of \$1,000 per day.
- 1.10.1.2 Unexcused completion delays that extend from Day 31 through Day 70 beyond the Contract's indicated completion date shall be assessed a penalty of \$1,500 per day.
- 1.10.1.3 Unexcused completion delays beyond 70 days shall be assessed a remedy of \$2,000 per day.
- 1.10.1.4 Any unexcused project completion delay that exceeds 180 days from the Contract's indicated completion date shall trigger an automatic default of the Contract.

- 1.10.1.5 If the Contractor is unable to cure the reason for its completion failure within 45 additional days, the Contract will self-cancel and the Owner will initiate action against the Contractor's performance bond unless some acceptable accommodation is reached by the Contractor with the Owner. During the 45-day default period, remedies will be assessed at the rate of \$3,000 per day. Remedies shall also apply to warranty repair service.
- 1.10.2 The RFP and its subsequent contract with the Successful Vendor will include a mandatory warranty period where repair services performed in the field will be necessary. This RFP contains response time periods within which the Contractor is required to provide services and materials. A failure to perform on the part of the Contractor to meet its contracted response time requirements shall result in a financial penalty of the scope and amount indicated by this RFP or as modified during contract negotiations.
- 1.11 **Bid, Performance, and Payment Bonds**
- 1.11.1 A Bid Bond in the amount of five percent (5%) of the indicated cost shall be provided by the Vendor at the time of submittal. The Bid Bond will be returned immediately to all unsuccessful Vendors and at the conclusion of successful contract negotiations with the best and most advantageous Vendor.
- 1.11.2 A Performance Bond in the amount of one hundred percent (100%) of the Contract Price shall be provided by the Contractor in the event a contract is subsequently awarded through either a sole-source or competitive procurement process. The Performance Bond shall be exercised by the Customer for failure of the Contractor to perform according to the terms of the Contract, i.e., an uncured default condition that results in Contract Cancellation. The Performance Bond shall be in place prior to a notice to proceed. The cost of the Performance Bond shall be the responsibility of the Contractor.
- 1.11.3 A Payment Bond in the amount of one hundred percent (100%) of the Contract price would likewise be required. The Payment Bond must be from a surety company authorized to do business in the State with a rating of A- or better in the most current edition of the A.M. Best Insurance Report. The cost of the Payment Bond shall be the responsibility of the Contractor.
- 1.12 **Purchase Payment Schedule**
- 1.12.1 The following payment schedule shall apply: 20% at Contract execution. 20% at delivery of and inventory by the Customer or their designee of radio equipment and accessories to the Customer's designated location(s). 10% at successful completion of radio acceptance testing. 20% upon issuance of the portable radio equipment including completion of applicable training. 20% upon installation of the mobile radio and control station equipment including completion of applicable training. 10% upon Final Acceptance.

1.13 **Proposal Pricing Summary Sheets**

1.13.1 Vendors shall provide detailed price breakdown submittals for all equipment, features, accessories, civil work, materials, project management, and installation/engineering services. It is not acceptable to lump category costs. Vendors must provide sufficient detail in their pricing proposals whereby it is possible to identify equipment types and services groupings. The format of the price submittal shall follow that as indicated by RFP Appendix I, Price Sheets Spreadsheets. Pricing Considerations and Future Discounts. The Contractor will be responsible for packing all equipment and any freight charges. The Vendor agrees that all prices quoted in the RFP Response are valid for no less than 12 months from the Contract execution date or Final Acceptance Date if it is past 12 months from Contract execution. Future price discounts are valid for the time periods indicated in RFP Appendix I, Pricing Considerations and Future Discounts.

1.13.2 Vendors may offer a trade-in credit for all decommissioned equipment. The Customer reserves the right to choose to keep any portion or all of the decommissioned equipment if they do not take advantage of any trade-in credits.

1.14 **Non-Collusion Affidavit**

1.14.1 Vendors must complete and submit the Non-Collusion Affidavit form. Attach an executed original in the Original-Marked proposal submittal and a copy of this executed form in all subsequent proposal copies, as required.

1.15 **Conflict of Interest**

1.15.1 In the interest of ensuring that efforts of the Contractor do not conflict with the interests of the Customer, and in recognition of the Contractor's professional responsibility to the Customer, the Contractor agrees to decline any offer of employment if its independent professional work on behalf of the Customer is likely to be adversely affected by the acceptance of such employment. The initial determination of such a possibility rests with the Contractor. It is incumbent upon the Contractor to notify the Customer and provide full disclosure of the possible effects of such employment on the Contractor's independent, professional work on behalf of the Customer. Final decision on any disputed offers of other employment for the Contractor shall rest with the Customer

1.16 **Brokerage Fee**

1.16.1 The Contractor warrants that he has not employed any person to solicit or secure this Contract upon an agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Customer the right to terminate the Contract, or, at the discretion of the Customer, to deduct from the Contract price or consideration, the amount of such commission, percentage, brokerage, or contingent fee. This warranty shall not apply to commissions payable by contractors upon contracts or established commercial or selling agencies maintained by the Contractor for the purpose of securing business. No elected official or employee of the Customer shall be permitted to share any part of this Contract or any benefit that may arise wherefrom, and any contract made by the Customer in which such individual(s) shall be personally

interested shall be void, and no payments shall be made thereon by the Customer or any officers thereof.

1.17

Cone of Silence

1.17.1

A Cone of Silence will be in effect for this RFP beginning with the RFP release date and will terminate upon issuance of Notice of Award. A violation of the "Cone of Silence" renders any award voidable at the sole discretion of the Customer's chief administrative officer and may subject the potential Respondent/Vendor or representative to debarment. A prospective Vendor must not have any communication with any of the elected officials, nor candidates for elected office, nor any employees from the Customer's Government, which includes the all public safety personnel, or any members of the Evaluation Committee , either individually or collectively, concerning this project. Contractor/Respondent or representative who intend to submit a proposal for this project are hereby placed on formal notice that they are not to contact the Customer's personnel for such purposes as holding meetings of introduction, meals, or meetings relating to the selection process outside of those specifically scheduled by the Customer. Any such activities may cause immediate disqualification for this project. All requests for interpretations or clarifications must be in writing, addressed to the contact person as listed in this RFP. All such interpretations and supplemental instructions will be in the form of a written addendum which, if issued, will be posted on the Customer's website on the date indicated in this RFP. Such written addenda will be binding on the Respondent and will become a part of the RFP Document(s).

1.18

Non-Appropriation of Funds

1.18.1

In the event no funds or insufficient funds are appropriated and budgeted by the Customer or are otherwise unavailable for fulfilling the requirements of the Contract, the obligations of the Customer shall terminate on the last day of the fiscal period for which appropriations are received without penalty or expense to the Customer of any kind whatsoever. The Customer will immediately notify the Contractor or its assignee of such occurrence. In the event of such termination, the Customer agrees to peaceably surrender possession of the equipment to the Contractor or its assignee on the date of such termination. The Customer will not cancel if any funds are appropriated to it, or by it, for the acquisition, retention or operation of the equipment or other equipment performing similar functions for the current fiscal period in which the termination occurs. This shall include the next succeeding fiscal period thereafter and that it will not during the funding period give priority to other functionally similar equipment or services. Contractor shall covenant and agree to indemnify and hold the Customer harmless against any loss, damage liability, cost, penalty, or expense, including attorney's fees, which the Customer does not otherwise agree to in the Contract and which is incurred or arises due to a failure of the Customer to appropriate funds in the manner described herein for a continuation of the Contract or exercise of the option to purchase the equipment.

1.19 Contractor's Insurance and Warehousing

1.19.1 The Contractor shall be responsible for any and all loss of material connected with the construction due to unexplained disappearance, theft or misappropriation of any kind or nature. The foregoing provisions shall not operate to relieve the Contractor and any Subcontractors of responsibility for loss or damage to their own or rented property or property of their employees of whatever kind or nature, including but not limited to tools, equipment, forms, scaffolding and temporary structures including their contents. The Customer shall in no event be liable for any loss or damage to any of the aforementioned items or any other property of the Contractor and any Subcontractors, which is not included in the permanent construction. The Contractor and any Subcontractors hereby waive any right of recovery they may have against the Customer for damage or destruction of property of whatever kind or nature whether it is their own property or property of their employees. The Contractor acknowledges the title and risk of loss for the new system shall transfer to the Customer upon Final Acceptance. The Contractor shall procure and maintain for the duration of the Contract the following insurance policies as mandated by and with minimum limits set by the Customer's Procurement Policy with coverage for occurrences and claims that may arise from or in connection with the performance of the obligations hereunder by the Contractor, its agents, employees, representatives and subcontractors: 1. The contractor shall maintain in full force and effect throughout the contract term liability and property damage (casualty) policies. The policy of liability insurance shall cover all of the contractor's operations on the premises, including bodily injury and property damage; shall provide a per-occurrence limit of at least one million and aggregate of two million The policy shall name the Customer as an additional insured. The property damage policy shall cover the replacement value of the structures and equipment the contractor installs on site. 2. The contractor shall also maintain workers' compensation insurance as required by law, and employers' liability coverage of at least \$1,000,000. The Customer will consider proposals offering reasonable exceptions to the requirements stated above. All policies shall be issued by an insurer of substantial size and financial stability. The policies or certificates evidencing

1.19.2 The insurance policies required by the Contract shall contain, or be endorsed to contain, the following provisions:

The Customer, its officers, agents, servants and employees, shall be added as additional insured's, under the Comprehensive General Liability and Automobile Liability Coverages.

1. The Workers compensation insurance and Employer's liability coverages shall contain an express waiver of all rights of subrogation against the Customer, its officers, agents, servants, and employees, for losses arising from work performed by the Contractor for the Customer.

2. All insurance policies required by this Contract shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party. Coverage

cannot be reduced or in limits except after thirty (30) days prior written notice by certified mail to the Customer.

Acceptability of Insurers. All insurance required by this Section shall be placed with insurers that are authorized to do business in the State of Wisconsin and have a rating of no less than A- in the most current edition of the A.M. Best Insurance Report. Insurers shall have a minimum financial size category of V2I according to A.M. Best.

1.19.3 Certificates of Insurance. The Contractor shall furnish to the Customer, Certificates of Insurance affecting coverage required by this Contract. The certificates are to be signed by a state licensed agent authorized by that insurer to bind coverage on its behalf and endorsements. The certificates and endorsements must be received and approved by the Customer prior to the Contract's effective date.

1.20 **Affirmative Action / Equal Opportunity Employer**

1.20.1 The Customer is an affirmative action/equal opportunity employer that selects contractors without consideration of race, religion, color, ethnic background, sex, age, or handicap. Minority-owned businesses are encouraged to submit bids. It is the policy of the Customer to award public building contracts without regard to race, religion, color, creed, national origin, sex, age, or handicapping condition.

1.21 **Indemnity**

1.21.1 Indemnity terms shall be negotiated and mutually agreed with the apparent winning Vendor as part of final Contract.

2 Section 2 - Existing Conditions and User Requirements

2.1.1 The intent of this RFP is to provide a 700/800 MHz P25 Phase 2 Simulcast Radio System which shall include multiple tower sites provided with equipment shelters, generators, and additional site hardware, including HVAC to support the Vendor's proposed infrastructure. New buildings must accommodate all proposed radio/microwave equipment, battery plants, DC power supplies, and ancillary equipment as necessary.

2.1.2 Vendors are required to propose a comprehensive set of equipment and services that satisfy this RFP's minimum requirements and are encouraged to describe specific areas within their proposal solutions that materially exceed these minimum objectives. The Vendor shall propose new infrastructure as necessary to satisfy the coverage requirements listed within this document.

2.1.3 The Site Work Requirements Section, provides for specific workmanship standards for communications facilities that must be met by the Vendor in the course of constructing the system. This RFP provides a baseline of technical requirements coupled with functional objectives that must be considered by responding Vendors. The RFP allows flexibility in the selection of sites and antenna placements by responding Vendors such that their response fully addresses the coverage reliability/audio quality requirements contained in Section 6 Coverage Criteria.

2.2 Current Usage Requirements

2.2.1 A comprehensive radio system study has been previously undertaken. A summarized detail of user needs, and expectations follows:

2.2.2 Improved Coverage

2.2.2.1 The greatest area of concern communicated during the various user interviews was the lack of coverage being provided to support operations. Mobile and portable radio coverage deficiencies are reported by the users to exist in multiple areas throughout Dodge County.

2.2.2.2 The Customer desires that the radio system coverage be improved to meet best practices in Public Safety. Vendors can find a complete list of the coverage requirements in the Coverage Criteria Section

2.2.3 Ease of Use / Ergonomics

2.2.3.1 Radio ergonomics are important to users, which is one reason why an electrically shortened antenna configuration for portable radio units has been defined in the Coverage Criteria Section .

2.3 Current Operable Aspects

2.3.1 System:

2.3.1.1 Multiple law, fire, and municipal agencies throughout Dodge County utilize the existing VHF Land Mobile Radio System for daily communication. This system utilizes 9 RF sites identified in Appendix A - Current Infrastructure.

- 2.3.2 **Dispatch:**
- 2.3.2.1 The dispatch center utilizes Motorola MCC 7500E consoles.
- 2.3.3 **Interoperability:**
- 2.3.3.1 The customer requires Interoperability with neighboring agencies, as well as the Wisconsin Interoperable System for Communications (WISCOM) and WISPN systems. This includes all counties that surround Dodge County.
- 2.3.4 **Radios:**
- 2.3.4.1 The radios used by end users include the following mobiles, portables, and control stations identified in Appendix H - Subscriber Radio List.
- 2.3.4.2 Radios are not maintained as part of a preventive maintenance program.
- 2.3.5 **Features:**
- 2.3.5.1 Features available for use by the system, already enabled in the radio subscribers, that shall be maintained on the new system includes:
 - 2.3.5.1.1 Scanning
 - 2.3.5.1.2 Emergency Alert button
 - 2.3.5.1.3 External shoulder mics, ear pieces, and other radio accessories.
- 2.3.6 **Capacity:**
- 2.3.6.1 The current channel/talkgroup structure is provided in Appendix B: Existing Channel/Talkgroup Structure.
- 2.3.7 **Licenses:**
- 2.3.7.1 The current licenses held by relevant parties to this RFP are provided in Appendix B: Existing Licenses
- 2.3.8 **Backhaul:**
- 2.3.8.1 The Customer utilizes microwave for backhaul between sites. This is included in Appendix A: Current Infrastructure.
- 2.3.8.2 The Customer utilizes fiber for backhaul between sites. This is shown in Appendix A Current Infrastructure.

3 Section 3 - System Configuration and Growth

3.1 General System Configuration

- 3.1.1 The Customer has valid licenses for its current radio and microwave network, as outlined in Appendix E: FCC Licenses. The Vendor will be required to undertake necessary FCC license modifications, as required, to accommodate the modernized/expanded System. Any frequency modifications and site additions will be coordinated with the Midwest Region 5, and Wisconsin Regional Planning Committee.
- 3.1.1.1 The Vendor shall provide technical support/engineering as required to modify existing FCC licenses or to acquire additional licenses required to facilitate operation of the system.
- 3.1.1.2 This activity shall include all FCC licensing application development, frequency coordination, frequency coordination fees, engineering fees, or any other associated fees to license the proposed RF and microwave frequencies necessary for the proposed network. Any frequency work will be coordinated with the State of Wisconsin Frequency Coordinator following the Regional Planning Committee process.
- 3.1.2 The Vendor is required to provide a comprehensive functional and technical solution for a new 700/800 MHz P25 Phase 2 Simulcast Radio System. The new digital radio configuration shall utilize the necessary number of infrastructure sites, as determined by the Vendor, to meet the Customer's expressed coverage requirements as described by Section 6 Coverage Criteria.
- 3.1.2.1 The system must be designed and deployed to utilize both P25 Phase 1 FDMA & P25 Phase 2 TDMA modulation formats.
- 3.1.2.2 Utilize the TIA specified example P25 Common Air Interface (CAI) digital FDMA control channel scheme, in which user-initiated feature requests and talk-group/working channel assignments are processed digitally over site-specific control channels with TDMA call timing organized on the same control channel.
- 3.1.2.3 Ensure the remaining channels at sites shall operate as working channels for digital voice traffic.
- 3.1.2.4 Ensure the control channel configuration will automatically rotate to other channels, in sequence, should an abnormal number of carrier hits occur on the pre-set control channel.
- 3.1.2.5 The Vendor shall indicate a guaranteed level of portable and mobile area coverage and delivered audio quality indicative of their designed solution. The Customer recognizes that portable radio coverage to the same degree as required for mobile operations increases system complexity. These requirements are outlined in Section 6 Coverage Criteria.
- 3.1.2.5.1 Proposed Phase 1, or Phase 2, radio coverage throughout the area defined in Section 6 Coverage Criteria, in the digital encrypted mode, shall be equal to that in the digital clear mode.

3.2 Redundancy

- 3.2.1 The proposed system shall utilize both existing and Vendor-recommended radio infrastructure sites and shall include, minimally, a primary and secondary/redundant network controller. These network controllers shall be located at sites that provide a geo-redundant configuration to be mutually agreed between the Vendor and the Customer.
- 3.2.2 The Vendor is required to incorporate a dual primary / redundant, geographically separated network control point design into its proposed infrastructure solution. This requirement is mandatory and a RFP Response failing to include such a dual-site redundancy configuration will be considered as being unresponsive. This redundancy requirement also applies to the simulcast control point.
- 3.2.3 The Vendor shall describe its network controller and simulcast control point redundancy configuration scheme and, if virtualized controller/control point configurations are proposed, the number of such configurations allowable within the proposed solution.
- 3.2.4 Utilize an interference-monitored control channel scheme with a level of redundancy that is sufficient to meet the overall requirements and intent of this RFP for a no single point of failure, mission critical radio communications system.
- 3.2.5 The Vendor shall provide detailed descriptions of how the system incorporates high levels of redundancy to assure continued trunked system operation. To provide the highest level of trunked reliability, site/system control schemes shall be IP-based, fully redundant and utilize distributed processor technology to the maximum extent possible.
- 3.2.6 Primary/Redundant Network and Site control schemes must include protected, redundant power supply units so that the loss of a single power supply will not interrupt control scheme operations.
- 3.2.7 Radio site controllers shall minimally provide the following features:
 - 3.2.7.1 Working channel assignment.
 - 3.2.7.2 Verification of user identification.
 - 3.2.7.3 Assignment of call priority.
 - 3.2.7.4 Electronic tracking of call type, caller/called, call time, channel assignment, etc.
 - 3.2.7.5 Monitor/control of special system features.
 - 3.2.7.6 Ability to disable/enable call access to specific field units, to include smart-devices.

3.3 System Planning and Capacity

- 3.3.1 The Customer understands that the current channel/talkgroup assignments will not be reused as part of this RFP.
- 3.3.2 The system shall support the Customer's current user capacity, three times the current channel/talkgroup plus no less than a 25% growth in net traffic. This will include all necessary, hardware, software, and frequencies. Please refer to Appendix A: Existing Channel/Talkgroup Structure for details.
- 3.3.3 The Vendor shall utilize the best engineering practices in selecting the system's frequency plan to maximize the effectiveness of channel resources.

- 3.3.3.1 The proposed hardware and frequency plan must ensure that frequencies installed at the sites cause no adverse receiver desensitization because of intermodulation products.
- 3.3.3.2 The Vendor's frequency plan must comply with FCC regulations with respect to co-channel and adjacent-channel interference protection criteria.
- 3.3.4 The Vendor must provide a contingency plan, should the initial frequency plan not be available for implementation.
- 3.3.5 The minimally-acceptable Quality of Service Objective for the system shall be a call blocking rate of no more than 1%, with the delay for such calls that are queued to be no greater than 0.5 seconds. The vendor shall show the calculation used to determine this requirement is met.
- 3.3.6 The Vendor shall describe in the response:
 - 3.3.6.1 Typical call setup times for trunked radio calls, which in no case shall exceed 0.5-seconds.
 - 3.3.6.2 Typical audio processing delays, due to vocoding and digital signal processing, within the Vendor's specific radio technology solution. These delays shall be described for Emergency Calls, Group Calls, Patched Calls, ISSI Calls, Base Station Gateway Calls and Broadband Gateway Calls.
 - 3.3.6.3 The various levels of call transaction priority as assigned to: Emergency Calls; Group Calls; Fleet Calls; Patched Calls; ISSI Calls; Base Station Gateway Call transactions and Broadband Gateway Calls.
 - 3.3.6.4 How these various call transaction delays can potentially impact site capacity loading, and how does the Vendor mitigate this in the design process.
- 3.3.7 **System Fleet/Talkgroup Requirements**
 - 3.3.7.1 The Vendor shall assist the Customer and various user agencies in determining user identification and talk path assignments.
 - 3.3.7.2 The Vendor shall assist the Customer in preparing user talkgroups, initial priority levels and shall complete the necessary user equipment installation, programming and record keeping, as required. This activity must be completed prior to service cutover.
 - 3.3.7.3 All talkgroup structure documentation will be provided to the Customer by the Vendor.
 - 3.3.7.4 The Vendor shall provide training for the Customer's System/Network Managers sufficient to permit this personnel to add users, create new, or delete obsolete talk paths and to access all other System software-controlled features.
- 3.3.8 **Programming**
 - 3.3.8.1 The Vendor shall program all portable, mobile and control station radios, all System or site controllers and all other equipment to operate on the FCC-licensed operating frequencies and determined talk path profiles. This includes existing customer equipment that is capable, and may operate on the proposed system, at the time of cutover. This includes customer owned equipment supplied by other P25 manufacturers.
 - 3.3.8.2 The Vendor shall prepare and furnish to The Customer "as programmed" records for each subscriber radio and pager placed on the System.

- 3.3.8.3 The Vendor shall provide the Customer with samples of all programmed subscriber equipment for testing prior to cutover.
- 3.3.8.4 Any reprogramming of equipment to correct errors or omissions that will negatively impact the Customer's ability to use the equipment shall be completed at the cost of the Vendor.
- 3.3.8.5** The Vendor must provide 4 sets of relevant radio and equipment programming software, appropriately equipped laptop/desktop computers, and all other support equipment and special cables necessary to program all subscriber equipment and dispatch consoles supplied by the Vendor.
- 3.4 Regional Interoperability**
- 3.4.1 The neighboring agencies have differing or similar technologies. The Customer has a frequent need to communicate with these neighboring systems and seamless interoperability between these radio networks as a desired goal.
- 3.4.2 The Customer will use new or existing subscriber equipment to operate on these neighboring systems directly where possible or through a gateway otherwise. In preparation for such regional interoperability. The known systems at the time of this RFP, are provided in Appendix G: Interoperability Plan.
- 3.4.3 The utilization of gateway technology shall be provided to allow integration of outside trunked and non-trunked radio systems.
- 3.4.3.1 The Customer requires the implementation of each of these gateway technologies as part of the Vendor's proposed configuration.
- 3.4.3.2 While Gateway connectivity is preferred, if a gateway is not allowed by a neighboring system, the Vendor shall provide other radio-to-radio interconnectivity options.
- 3.4.4 ISSI Gateway**
- 3.4.4.1 Vendors shall describe how the proposed System can be interfaced to nearby P25 radio networks now in operation, under development or procurement planning using ISSI.
- 3.4.4.2 Further, the Vendor shall describe each operational feature that is supported by its proposed ISSI technology.
- 3.4.4.3 A minimum of six ISSI connections with twenty talk paths each shall be provided and installed by the Vendor as part of this project's implementation.
- 3.4.4.3.1 Vendors shall describe the scalability of the core to expand out beyond the minimum six ISSI connections.
- 3.4.4.4 The Vendors shall propose as an option a redundant ISSI gateway configuration that will automatically become operable should the primary gateways sustain an electronic/functional failure. The Vendor shall describe its planned ISSI redundancy scheme and functionality.
- 3.4.4.5 Vendors with cloud-based ISSI shall offer on-premises ISSI hardware as an option if not already included in the base proposal.

- 3.4.4.6 The Vendor's solution shall support future seamless agency user roaming across jurisdictional boundaries via ISSI connections. Functionally, a field radio user who initiates and is in communication with telecommunicators or others on a specific talkgroup within a specific P25 radio system must remain affiliated with those parties while driving across the coverage footprint of ISSI-linked P25 systems. This roaming feature must operate automatically without the need for field users to physically change systems/talk-groups while traversing across tower site/system coverage zones.
- The Vendor shall describe radio user roaming functionality within its proposal. This description shall include an explanation of the process used by user radios to determine when to transition onto the adjacent/neighborhood P25 system, in conjunction with an explanation of radio availability while this ongoing adjacent-system availability determination is underway.
- 3.4.4.6.1 Adjacent/neighborhood systems can be defined as:
- 3.4.4.6.1.1 Same manufacturer P25 network controller on-premises with similar or different software/hardware revisions
- 3.4.4.6.1.2 Differing manufacturer P25 network controller on-premises with similar or different software/hardware revisions.
- 3.4.4.6.1.3 Cloud-based P25 network controller with similar or different software/hardware revisions to other manufacturers P25 network controller.
- 3.4.4.6.1.4 P25 on-premises network controllers with cloud-based ISSI gateways.
- 3.4.4.7 The need for a radio user to manually transition between tower site/system coverage zones within a Vendor's proposed network configuration is unacceptable. A manual approach shall be down-graded during the proposal evaluation.
- 3.4.5 **Base Station Gateway**
- 3.4.5.1 Base Station Gateway technology shall be provided to interface both analog and digital land mobile radio base stations, on a talkgroup or channel basis, within the P25 trunked solution. By so doing, it would then be possible for radio users equipped with P25 radios operable on the System to select, monitor and individually control these various link-radio resources.
- 3.4.5.2 Vendors shall describe how the proposed System can be interfaced via a Base Station Gateway.
- 3.4.5.3 Base Station Gateway devices shall be located at the radio tower sites and allow the interconnection of legacy analog, and other digital radio systems onto the new radio network. The location of the gateways should be part of the vendor's design and located to best serve the interoperability requirements of Customer.
- 3.4.5.4 The Base Station Gateway shall additionally facilitate appropriate Radio-to-IP interfaces or Four-Wire 'Ear and Mouth' (4W E/M) interfaces that are compatible with new radio system's infrastructure and dispatch center configuration.)

- 3.4.5.5 Base Station Gateway shall allow System users to initiate and drop appropriate control link/base stations via talk-group selection on appropriately-programmed System user radios. Any control station or radio device that is interfaced to the Base Station Gateway shall be steerable to a minimum of sixteen (16) channels or talkgroups.
- 3.4.6 **Broadband Gateway Solution**
- 3.4.6.1 Broadband Gateway functionality shall be provided within the System to permit selected outside third-party Smart-device users equipped with the appropriate application software to communicate with users/agencies via allowed System talkgroups.
- 3.4.6.2 The ubiquitous use of commercial broadband Smart-devices presents new opportunities for providing P25 radio access to those entities having the need for communications with The Customer's user agencies. Vendor shall provide:
 - 3.4.6.2.1 The Broadband Gateway Solution proposed, shall be located in conjunction with both the primary and redundant Network Controllers. However, vendors may provide optional cloud-based ISSI solutions with the same connectivity to both the primary and redundant network controller.
 - 3.4.6.2.2 Each Gateway shall, as an option, be configured as an "automatic-protected" from whereas if the primary Broadband Gateway at a Network Controller site should fail, the equipment would "self-heal" and automatically transition to the backup, redundant Gateway device.
 - 3.4.6.2.3 The Vendor shall identify the required smart-device and licensing for Broadband users. Licensing shall be proposed as a "per system" licensing structure, defined as a unlimited number of active users per system, regardless of subscriber quantities. Per user fee structures, may be optionally included. Progressively larger license tiers must be identified, and additional hardware or software needed to support these tiers must be included in the proposal.
 - 3.4.6.2.4 The Broadband Gateway Solution shall support normal P25 voice radio user functionality, inclusive of AES 256-bit encryption.
 - 3.4.6.2.5 This Broadband Gateway Solution shall be required to interface with commercial cellular carriers utilized by the Customer.
- 3.4.7 **NPSPAC 800MHz Mutual Aid Sub-System**
- 3.4.7.1 If NPSPAC channels are utilized in the proposed system, the Vendor shall describe in detail the configuration of its NPSPAC 800MHz Mutual Aid subsystem that is optimized to provide mobile radio coverage and conforms to the following requirements:

- 3.4.7.2 The mutual aid subsystem will be comprised of five duplex channels that conform to the National Plan, as follows:
 - 3.4.7.2.1 8CALL90 - 851/806.0125MHz
 - 3.4.7.2.2 8TAC91 - 851/806.5125MHz
 - 3.4.7.2.3 8TAC92 - 852/807.0125MHz
 - 3.4.7.2.4 8TAC93 - 852/807.5125MHz
 - 3.4.7.2.5 8TAC94 - 853/808.0125MHz
 - 3.4.7.3 All channels use CTCSS 156.7Hz
 - 3.4.7.4 The Vendor shall interconnect these various mutual aid base stations into the P25 trunked radio network via site-located conventional base station gateway devices. Radio telecommunicators shall be capable of monitoring each of these various mutual aid channels.
 - 3.4.7.5 In addition, the system shall be capable of a five-channel 700/800MHz NPSPAC analog conventional mutual aid subsystem having the capability of being electronically patched to the system's 700/800MHz talk-groups via conventional base station gateway interfaces with the mobile coverage requirements described in Section 6 Coverage Criteria.
 - 3.4.7.6 The Vendor shall provide a description of its proposed mutual aid subsystem configuration, inclusive of coverage maps depicting VHF, UHF and 700/800 MHz mobile coverage as applicable. Further refinement of the mutual aid subsystem is anticipated and may be undertaken by the Customer as part of the project's design review meeting process.
- 3.5 Digital Security and Monitoring**
- 3.5.1 **System Voice Encryption**
 - 3.5.1.1 Each of the network's P25 trunked digital RF channels shall be equipped to support voice encryption using the Advanced Multiband Excitation +2 (AMBE+2) or newer vocoder.
 - 3.5.1.2 The system shall include AES 256 encryption at a minimum.
 - 3.5.1.2.1 Unit-to-unit, where conversations transacted in an encrypted talk group are secure. These cannot be monitored at a dispatch or control point;
 - 3.5.1.2.2 Telecommunicator-to-unit, where conversations between the Customer's dispatch center(s) and field units.
 - 3.5.1.2.3 P25 Smart-device Application call transactions (via commercial cellular and FirstNet) to typical field/telecommunicator operations within the system.
 - 3.5.1.3 The enhanced P25 System shall provide encrypted transmission functionality so that user radio access delays are equal to those in the clear (non-encrypted) mode to comply with published TIA P25 standard specifications. Encrypted transmissions shall not degrade the operation of clear-voice features nor lengthen system access or audio transport delays to other users. Encryption shall not impair the range of coverage to any level less than that for typical P25 clear-mode digital performance.

3.5.2 **Cybersecurity**

3.5.2.1 The system may contain various entry points that include ISSI/CSSI, Broadband gateway, network monitoring, and other connections to external radio communications facilities operated by others and the accessibility of the radio system to technical and engineering resources via the Internet. Each of these points must be appropriately secured using firewalls, data encryption, and other means to prevent intentional hacking of critical information or installing viruses and malware that could inhibit or disrupt mission-critical communications.

3.5.2.2 The Vendor shall provide within its Technical Response, a detailed description of the various cybersecurity measures it would employ to protect the proposed new System, both initially and throughout the warranty and post-warranty maintenance periods.

3.5.2.3 The vendor shall clarify its service offering in response to an attack, both short and long-term as part of the proposal response.

3.5.2.4 The Vendor shall describe which standards are met to ensure cybersecurity.

3.5.3 **Radio Network Alarm System and Network Operations Monitoring**

3.5.3.1 The use of a software-based alarm network scheme is desired since this would allow for off-site maintenance personnel to interrogate the system in response to agency/user-reported operational deficiencies.

3.5.3.2 A summed major/minor alarm indication should be displayed on each alarm system terminal position.

3.5.3.3 The alarm monitoring shall notify individuals via email and text messaging during major alarm events.

3.5.3.4 These alarm positions will be located at both network controller locations and the Customer dispatch location.

3.5.3.5 This alarm indication should appear as both an audible alert and a flag at a conspicuous area on the flat-screen display field.

3.5.3.6 Determination of specific alarm point conditions shall be obtainable from any dedicated alarm system terminal position.

3.5.3.7 These alarms must be capable of email or other common messaging alert to the Customer-designated or proper technical personnel.

3.5.3.8 This solution shall allow for a view of individual component functionality and status involving, at a minimum, base stations, controllers, gateways, charging systems, GPS timing equipment, and other devices essential to the System's operation.

3.5.3.9 The Vendor shall include, as an optional service, Network Operation Center (NOC) monitoring of the system. The Vendor shall include a description of this service as part of their Response.

3.5.3.10 Provisions shall be incorporated into the system to allow the Contractor, from its home office, to remotely interrogate the operating system, provide remote technical assistance and install software patches if requested by The Customer.

- 3.5.3.11 The Contractor shall furnish and install an automatic alarm system to monitor and alert, at a minimum, operational status (per site) for the following parameters:
 - 3.5.3.12 Major Alarm Conditions (Defined as a condition that could lead to equipment failure in less than 2 hours):
 - 3.5.3.12.1 Primary Network Controller Failure
 - 3.5.3.12.2 Redundant Network Controller Failure
 - 3.5.3.12.3 Primary Simulcast Control Point/Prime Site
 - 3.5.3.12.4 Secondary Simulcast Control Point/Prime Site
 - 3.5.3.12.5 Site Channel Failure
 - 3.5.3.12.6 Control Channel Failure
 - 3.5.3.12.7 Console/Audio Controller Failure
 - 3.5.3.12.8 ISSI/Base Station Gateway Failure
 - 3.5.3.12.9 Receive Multicoupler Failure / Tower Top Amplifier
 - 3.5.3.12.10 AC Power Failure
 - 3.5.3.12.11 High Reflected Power -TX Antenna
 - 3.5.3.12.12 Battery Charger Failure, Major
 - 3.5.3.12.13 Generator Failure/Shutdown
 - 3.5.3.12.14 Tower Light Failure
 - 3.5.3.12.15 Over/Under Temperature Alarm
 - 3.5.3.12.16 HVAC Failure
 - 3.5.3.12.17 Low Transmitter Output (each transmitter)
 - 3.5.3.12.18 Microwave Link Failure
 - 3.5.3.13 Minor Alarm Conditions (Defined as a condition that has little, to no risk of leading to equipment failure prior to arrival of technical staff).
 - 3.5.3.13.1 Door Alarm
 - 3.5.3.13.2 Tripped DC Breakers(s)
 - 3.5.3.13.3 Battery Charger Failure, Minor
 - 3.5.3.13.4 Low Fuel
 - 3.5.3.13.5 System Alarm Monitoring
- 3.6 Over-the-Air Management**
- 3.6.1 The System shall be configured and include both Over-the-Air-Programming (OTAP) and Over-the-Air-Rekeying (OTAR) of user radio equipment as an option. Both of these configurations must include the server to accommodate this functionality.
 - 3.6.2 Vendors should provide any optional Over-the-air-management tools that can be used for assets management, programming management, or firmware management of radios on the system.
 - 3.6.3 If this option is exercised by the Customer, all radios shall be onboarded into the management tool prior to final system acceptance.
- 3.7 Major System Equipment Groupings**
- 3.7.1 The Vendor shall provide and shall describe, minimally, the following major equipment groupings as contained within the proposed configuration:
 - 3.7.1.1 Radio Network Controller (Primary and Secondary)
 - 3.7.1.2 Radio Simulcast Control Point/Prime Site (Primary and Secondary)
 - 3.7.1.3 Console Electronics/ Audio Controller (Primary/Secondary)
 - 3.7.1.4 P25 Tower/Shelter Sites

- 3.7.1.5 Conventional Mutual Aid Subsystem (700/800MHz)
- 3.7.1.6 Microwave Backhaul Network
- 3.7.1.7 Redundant local area network (LAN) (routers, switches, firewalls)
- 3.7.1.8 Battery Plant & Charger Systems
- 3.7.1.9 Auxiliary power generators
- 3.7.1.10 Interoperability Link Base Stations
- 3.7.1.11 ISSI Gateways
- 3.7.1.12 Base Station Gateways
- 3.7.1.13 Broadband Device Gateways
- 3.7.1.14 All other devices integrated into proposed network (Example: Cameras, Door Control, etc.....)

3.8 Failover Scenario Equipment Requirements

- 3.8.1 The Vendor shall furnish a description of the effect each of the below listed failure modes would have on their proposed P25 system configuration. The Vendor shall also describe appropriate mitigation/restoration steps to return the system to full operational capability in response to each of the below listed failure conditions, and the time required to achieve restoration.
 - 3.8.1.1 Loss of transmitter(s) operation
 - 3.8.1.2 Loss of receiver(s) operation
 - 3.8.1.3 Failure of dispatch console terminal(s)
 - 3.8.1.4 Failure of console/audio interface
 - 3.8.1.5 Failure of tower site controller
 - 3.8.1.6 Commercial power failure
 - 3.8.1.7 Site generator failure
 - 3.8.1.8 Failure of entire tower site
 - 3.8.1.9 Loss of Control Channel(s)
 - 3.8.1.10 Loss of Control Point/Prime Site
 - 3.8.1.11 Loss of Secondary Control Point/Prime Site
 - 3.8.1.12 Loss of Primary Network Controller
 - 3.8.1.13 Loss of Redundant Network Controller
 - 3.8.1.14 Loss of single/multiple microwave path connectivity
 - 3.8.1.15 Loss of ISSI, Base Station or Broadband Gateway Devices
- 3.8.2 The Vendor shall describe the method used to automatically transition to such backup configurations and the transitional latency such transitions apply to the radio network, in seconds or milliseconds. This description shall include the time necessary for the proposed system to sync to the network controller or the simulcast control point, should a system failure require it.

4 Section 4 - Implementation

4.1.1 Project Manager

4.1.1.1 The Vendor will assign a Project Manager as a single point of contact between the Customer and the Consultant. The Vendor's Project Manager shall be approved by the Customer or designee prior to assignment. The Customer reserves the right to require replacement of the Vendor's Project Manager or its Subcontractors at any time during the project should those party's specific workmanship fall below Industry-accepted levels and/or where mandatory project submittals are deficient, are of poor quality or are materially delayed.

4.1.2 Project Team

4.1.2.1 The vendor shall provide resumes of all project team members assigned to this project.

4.1.3 Subcontractors

4.1.3.1 it is intended that a single Vendor have turnkey responsibility for the proposed project so as to assure a fully operational system. Any Vendor desiring to use Subcontractor(s) must include within their response a list and description of potential, qualified Subcontractor(s). the Customer may require documentation and references to ensure that the qualification of a proposed Subcontractor.

4.1.3.2 The vendor shall provide resumes of all subcontractor members assigned to this project.

4.1.4 Project Timeline

4.1.4.1 The Project's anticipated time frame for completion is no greater than 24 months from a formal Notice to Proceed.

4.1.4.2 The Vendor shall complete the project kick-off meeting within 30 days of Notice to Proceed.

4.1.4.3 The Project will not be deemed completed until all equipment has been installed; all training has been completed; receipt of configuration documentation has occurred; and a Certificate of Substantial Completion has been issued by the Consultant for any remaining punch list items.

4.1.4.4 The Vendor shall provide a project timeline given starting date assumptions as part of the technical response.

4.2 Detailed Design Review

4.2.1 At the detailed design review, the Vendor shall provide:

4.2.1.1 An overview of the system design.

4.2.1.2 Site-by-site information required for site acquisition.

4.2.1.3 Provide and updated and detailed schedule.

4.2.1.4 Any other items pertinent to the system design.

4.2.2 Vendor Standards

4.2.2.1 The Vendor must have manufactured, delivered and installed at least three projects including radio equipment of comparable technology (700/800 Project-25 TDMA), having comparable size, scope, and with similar features. These three radio deployments shall be described with enough information that the Customer or its Consultant can reasonably determine their project equivalency. RFP responses must

include a detailed summary of the radio deployment and its significant operational features/components, as well as a current customer contact, including name, address, and phone number, title, department, and their responsibility.

4.2.2.2 Vendors will likewise be required to provide sufficient information necessary to support claims that proposed radio equipment will be functionally and operationally compatible with public safety 700MHz channels (764-767MHz and 773-776MHz, paired with 794-797MHz and 803-806MHz, respectively) as well as the newly configured 800MHz NPSPAC channel plan as a result of FCC-Ordered 800MHz Rebanding. Failure to propose equipment capable of operations on this new spectrum and/or unable to support Project-25 Phase 1 and Phase 2 operations shall be considered non-responsive and that Vendor's response shall be given no further consideration.

4.2.2.3 The following standards shall apply, as a minimum, to all equipment, installation methods and materials:

- A. EIA/TIA-Electronic/Telecommunications Industry Association
- B. NEC - National Electric Code
- C. NEMA - National Electrical Manufacturers Association
- D. IEEE - Institute of Electrical and Electronic Engineers, Inc.
- E. FCC - Federal Communications Commission
- F. FAA - Federal Aviation Administration
- G. NFPA - National Fire Protection Association
- H. International Building Codes for State where project is located
- I. OSHA - Occupational Safety and Health Administration
- J. (R56) Motorola Standards and Guidelines for Communications Sites or equivalent
- K. ISO - International Organization for Standards.

4.2.3 **Warranty of Performance**

4.2.3.1 The Vendor acknowledges that it has carefully reviewed the functional requirements and warrants that the proposed equipment and features shall function according to equipment specifications, industry standards, and the minimum operative characteristics specified herein in this RFP.

4.2.3.2 Any deviation from the specifications, industry standards, or minimum operative characteristics identified in this RFP must be clearly disclosed in writing at the time of proposal submission. Deviations determined by the Customer, in its sole discretion, to create interoperability limitations, operational inefficiencies, safety concerns, or widespread performance issues shall be deemed unacceptable and may result in rejection of the proposal or required remediation at the Vendor's sole cost and expense.

4.2.4 Section 4 - Workmanship

4.2.5 All proposed workmanship supportive of the RFP must conform to normal and accepted standards for the telecommunications industry. All electrical wiring, antennas, mounts, etc. are to be installed by or under the supervision of the Vendor. The Vendor's must completely remove and properly dispose of residue due to its work, return the vehicles and site to a usable state each day and will be responsible for the cost of repairing all damage caused by the Vendor or its Subcontractors during equipment installation. The Customer and/or its Consultant reserves the right to halt any radio equipment or civil installation process due to poor workmanship, housekeeping, scheduling, work interruptions, etc. Work halts that are the result of poor workmanship would not relieve the Vendor of their responsibility to conform to the installation time requirements as stated by Contract.

4.2.6 All test equipment used throughout the project must be of current calibration and labeled accordingly.

4.2.6.1 The Customer or designee reserves the right to inspect and reject any test equipment that does not have documented and current calibration.

4.2.6.2 Any equipment that is found not to be calibrated will require any testing that has been previously completed to be done again.

4.3 Transition Planning

4.3.1 As part of their response, the Vendor must prepare and submit a preliminary migration plan that will prevent disruption of communication on the existing radio network and provide a smooth transition to the proposed system:

4.3.1.1 The Vendor must supply a preliminary sequence of events for the installation of the system showing any effect the different stages of installation may have on existing systems. Any relocation or modification to existing equipment by the Vendor as part of its work must be stipulated and prior approval obtained from the Customer.

4.3.1.2 The Vendor shall provide a completion period (in days) for the project, based on the Customer's execution of a Notice to Proceed. The Vendor shall provide a schematic representation of the implementation process as well as a hypothetical migration plan.

4.3.1.3 These required proposal responses will be used by the Customer to evaluate the Vendor's ability and understanding of the RFP requirements to perform this work in a manner that offers no disruption to ongoing public safety communications operations.

4.3.1.4 Prior to Final Acceptance, System shall be updated to the latest system software release that is approved for shipping and generally available.

4.4 Training

4.4.1 The Vendor shall provide:

4.4.1.1 Detailed time schedules for the training of system managers, telecommunicators, radio managers and other personnel.

4.4.1.2 Preliminary schedules for the orderly transfer of departments onto the new system and the estimated time-period during which the transfer could be completed.

- 4.4.1.3 The Vendor must supply comprehensive training for system diagnostics, management systems, preventative and routine maintenance and system operation for System Managers and designated The Customer staff as required.
- 4.4.1.4 A detailed repair maintenance training plan for the Customer's in-house technical staff members. It shall encompass all operational elements included in the System:
 - 4.4.1.4.1 Network Controllers
 - 4.4.1.4.2 Simulcast Controller if applicable
 - 4.4.1.4.3 Base Stations Gateways
 - 4.4.1.4.4 Microwave Subsystem
 - 4.4.1.4.5 Alarm System
 - 4.4.1.4.6 Dispatch Consoles
 - 4.4.1.4.7 Radio Control Stations, related appurtenances, and all third-party equipment.
- 4.4.2 This training shall be completed prior to the System's Acceptance Testing activity and is to be performed at the Customer's selected location. Training locations and dates will be determined between the Customer and the Vendor.
- 4.4.3 All curriculums for the training plan must be approved by the Customer prior to the commencement of training. The Vendor must provide training and identify necessary tools, to include test equipment and software, to the Customer's technical staff, as they would to their internal or contracted technical staff.
- 4.5 Decommissioning**
- 4.5.1 The Vendor must not dismantle or modify the existing radio system without prior approval of the Customer.
- 4.5.2 Some portions of the existing system may remain operational after acceptance of the new system as determined by The Customer.
- 4.5.3 The Customer will notify the Vendor when elements of the old infrastructure equipment may be reallocated to meet interoperability needs or otherwise can be decommissioned.
 - 4.5.3.1 It is the Vendor's responsibility to remove and dispose of, or, relocate all the old infrastructure equipment.
 - 4.5.3.2 The Vendor must remove the existing equipment, cables, and ancillary equipment as identified and approved by the Customer. These costs and related engineering services must be included in the RFP Response Pricing Pages.
 - 4.5.3.3 The Customer desires a trade in value on any existing equipment that is part of current communications system. Pricing for any trade in should be listed in the RFP Response Pricing Pages.
- 4.6 Acceptance Testing**
- 4.6.1 Vendor shall provide all test equipment, diagnostic services, documentation, software, personnel, vehicles and other items as necessary to test the delivered and installed radio network in accordance with the Factory Staging Test and Field Acceptance Test Plan, inclusive of operational features, to complete a total system functional test.

- 4.6.2 The Vendor shall disclose test procedures and equipment that will be used to verify radio system coverage as specified in Section 6: Coverage Criteria.
- 4.6.3 The Vendor shall submit within their response a sample test and acceptance plan that is representative of the scope and complexity of the proposed system radio network infrastructure.
- 4.6.4 The Vendor and Customer will jointly modify and approval a final comprehensive test and acceptance plan prior to factory staging and again prior to field testing.
- 4.6.5 The test shall include reliability and failure scenarios.
- 4.6.6 The plan shall minimally address, as applicable to the proposed system, the following major functionality and operability issues:
 - 4.6.7 Microwave Network Acceptance Testing**
 - 4.6.7.1 Provide RF power and Receive measurements for the microwave;
 - 4.6.7.2 Test path fade loss for each direction on each path of the microwave network;
 - 4.6.7.3 Fade margin verification of microwave link segments as used to interconnect radio sites, network controllers and radio dispatch facilities;
 - 4.6.7.4 Test for proper frequency, modulation, digital signaling and stability;
 - 4.6.7.5 Verify data integrity on the microwave system including network components utilizing BER Testing.
 - 4.6.8 Transmitter Equipment Acceptance Testing**
 - 4.6.8.1 Provide RF power stage measurements at different levels of the transmitter system such as transmitter, filters, combiner, cable, antenna, etc.;
 - 4.6.8.2 Test RF components for specified insertion loss (i.e., transmission line return loss);
 - 4.6.8.3 Test for proper frequency, modulation, digital signaling and stability;
 - 4.6.8.4 Test and report of delivered audio quality and signal margins throughout proposed service area.
 - 4.6.9 Receiver Equipment Acceptance Testing**
 - 4.6.9.1 Test of compliance to specifications of equipment provided;
 - 4.6.9.2 Provide log of signal gain or loss to equipment within the receiver system such as antenna, cable, preamp, splitter, or receiver antenna port;
 - 4.6.9.3 Test of audio quality and level (reciprocal of that required for the transmit path) of system balance;
 - 4.6.10 Dispatch Console Acceptance Testing**
 - 4.6.10.1 Test of compliance to manufacturer's published specifications of equipment proposed;
 - 4.6.10.2 Test of audio quality and level;
 - 4.6.10.3 Provide written results of testing of operational features per dispatch position;
 - 4.6.10.4 Test system operation during simulated failures of system components i.e. console electronics, power loss, etc.
 - 4.6.10.5 Provide functional testing and verification of any third party equipment used;

4.6.11 Network Acceptance Testing

- 4.6.11.1 Verification of network failure modes in response to forced failures of individual communications/ control lines and complete site failures complete written explanation is required;
- 4.6.11.2 Verification of compliance to TIA/EIA P25 ISSI/CSSI Standards that allow for seamless interoperability with P25 radio networks fielded by other manufacturers;
- 4.6.11.3 Bit error-rate and voiced audio quality testing of System infrastructure, backhaul and site-specific local area networking infrastructure;

4.7 Implementation

- 4.7.1 The Vendor is responsible for the provisions and cost of warehousing, insurance, storage and security of radio network infrastructure until Final Acceptance.
- 4.7.2 Prior to installation of any portion of system, the Customer must approve Vendor furnished detail drawings.
- 4.7.3 The Vendor is responsible for any site modifications required to accommodate infrastructure equipment proposed for location in the Customer-owned, as well as in non Customer-owned properties. This includes cost associated with site modifications.
- 4.7.4 The Vendor shall supply "as built" drawings and complete written and electronic documentation of modifications or relocation to existing systems to facilitate maintenance of this equipment in the future.
- 4.7.5 Any modification or relocation of existing equipment will require prior approval by the Customer.
- 4.7.6 The Vendor shall coordinate the orderly transfer of services to the system network only after having successfully concluded equipment alignment and installation procedures, successful completion of the project's acceptance test, and completion of manager, telecommunicator, user, and staff training programs.
- 4.7.7 **Project Communications**
- 4.7.7.1 The vendor is responsible for creating and managing a communications plan for the project which includes:
 - 4.7.7.1.1 The Vendor's PM shall develop, monitor, and adapt/update the project's implementation schedule. The schedule shall be presented using the Customer-approved project task-maintenance software such as Microsoft Project or similar software that doesn't require the Customer to purchase a software platform to track the project schedule. Schedule updates must be submitted by the Vendor on regular dates that are approved by the Customer, or but no less than monthly.
 - 4.7.7.1.2 The Vendor's PM shall prepare and submit no less frequently than monthly, on regular dates approved by the Customer, a project status report that details the anticipated accomplishments, work to be completed and risks for the period depicted by the revised, updated schedule.
 - 4.7.7.1.3 Specific attention should be made to those items and due dates to be met by the Customer to facilitate the unimpeded completion of the work.

- 4.7.7.1.4 The Vendor's System Engineer shall develop and submit through the Vendor's PM appropriate block and level diagrams, site-specific configuration drawings, field technician workbooks and other related technical materials necessary for the accurate, timely completion of the work.
- 4.7.7.1.5 The Vendor's PM shall present the Vendor's internal Quality Control/Quality Assurance and Risk Mitigation plans that depicts the steps and safeguards being undertaken to eliminate field issues with respect to hardware and software quality. This material and process shall be orally presented by the Vendor as part of its Detailed Design Review meeting with the Customer, prior to the commencement of any field installation activities by the Vendor, and monthly throughout the project.
- 4.7.7.1.6 **Design Iterations**
- 4.7.7.2 In the event any modification to the approved working design or associated documentation becomes necessary during project implementation, the Vendor shall submit revised design documents, drawings, specifications, and supporting documentation promptly, and in no case later than the timeframe agreed upon in writing by the parties.
- 4.7.7.3 Within five (5) business days of receiving a redesign request from the Customer, the Vendor shall provide written confirmation of the required turnaround time and shall specify the maximum number of business days necessary to deliver the revised design iteration.
- 4.7.7.4 Any project delays resulting from the Vendor's failure to deliver a design iteration within the agreed-upon timeframe shall be the sole responsibility of the Vendor, and all associated costs, including schedule impacts and downstream expenses, shall be borne by the Vendor.
- 4.7.8 **Parallel Implementation**
- 4.7.8.1 In developing RFP Responses, Vendors must consider that new equipment must be installed in a parallel with the existing equipment. The current system is the Customer's only Public Safety Voice communications system and must operate 24/7/365. No interruptions in service of any duration may be allowed without prior approval of the Customer or their designee. Operation of both old and new equipment may need to be coexist for some time. The Customer shall provide a formal written notice before old equipment is no longer required in service.
- 4.7.8.2 Remedies similar to the those listed earlier in this RFP apply if public safety equipment operation is disrupted beyond scheduled installation services.

4.7.9 **Materials**

- 4.7.9.1 All equipment, except with the expressed written permission of the Customer and its Consultant, must be new and unused, meet telecommunications industry standards, and, where applicable, be registered with and approved by the Federal Communications Commission. The Customer and its Consultant reserve the right to reject and require the return, at the Vendor's expense, of any defective components that fail to comply with this RFP or lack FCC type approval. Rejections of material for cause would not provide an extension of time to the Vendor in the performance of contracted requirements. Such rejections or returns will neither validate nor invalidate the remainder of any Contract.
- 4.7.9.2 Vendors may propose alternative options for remanufactured shelters or similar facilities components only after submitting a fully responsive proposal to the base bid requirements. Any such alternative proposal must be clearly identified as an alternate, must not replace or modify the required base bid submission, and must include detailed documentation demonstrating compliance with all applicable industry standards, structural integrity requirements, environmental specifications, warranty terms, and remaining useful life. Acceptance of any alternate proposal shall be at the sole discretion of the Customer and shall not be considered unless the base bid is deemed responsive.
- 4.7.9.3 Vendors must indicate any special requirements, including but not limited to architectural, mechanical, electrical, civil, or structural modifications, that their equipment may require at Customer-owned or non-Customer-owned locations or in vehicles intended to receive new equipment. Estimated costs for such special requirements shall be disclosed in the RFP Response. Failure to inquire about special requirements or to provide associated cost estimates may result in the proposal being deemed non-responsive or scored lower during evaluation.

5 Section 5 - System Equipment Requirements

5.1 General Requirements

- 5.1.1 It shall be the responsibility of the Vendor's to provide a turnkey system and to install Industry-accepted standard electrical grounding systems and lightning protection devices to protect proposed equipment from damage due to electrical transients on antenna systems, power, telephone and/ or control cables including upgrading existing facilities if the Vendor plans on reuse of any of those facilities in their proposal. These facilities include all tower and dispatch center sites.
- 5.1.2 The Vendor acknowledges and agrees that it is acting as the prime system integrator for this Project and shall be solely responsible for the complete integration, coordination, compatibility, and functional performance of all equipment, software, components, subsystems, and services provided under the Contract, whether furnished directly by the Vendor or through subcontractors or third-party manufacturers. The Vendor shall ensure that all pieces and parts operate together as a fully integrated and operational system that meets or exceeds the requirements of this RFP. No claim of incompatibility, third-party deficiency, or manufacturer limitation shall relieve the Vendor of responsibility for delivering a complete, functional, and compliant system.
- 5.1.3 The Vendor shall furnish and install all wiring hardware, network cable management, cable trays, interface electronics, terminal blocks, and materials necessary to complete the successful implementation and operation of this site and its equipment groupings. Infrastructure equipment proposed for all sites or dispatch centers must meet the minimum requirements specified in this RFP.
- 5.1.4 The delivery and installation of: equipment shelters, security systems, standby and emergency power systems, towers, antenna systems, electrical grounding systems, lightning protectors, transmission lines, cable attachment hardware, transmission line shields, tower-to-building cable tray hardware, and all necessary permitting is part of this project and must be furnished by the Vendor.
- 5.1.5 The Vendor shall furnish and install all radios, antennas, wiring, wiring hardware, interface electronics and materials necessary, and at no additional cost than that identified in their Contract, to complete the successful implementation and operation of this system and its related equipment groupings.
- 5.1.6 The Vendor shall provide all pertinent information concerning their equipment, relative to electrical, mechanical, structural and physical space requirements.
- 5.1.7 The network's primary/backup controllers and related LAN switch/router devices shall be housed in freestanding equipment racks like those used for repeater stations.

5.2 Physical Modifications

- 5.2.1 Physical plant modifications to newly-proposed tower sites, rental sites, existing Customer-owned sites, or the dispatch center(s) as necessary to accommodate the Vendor's proposed system configuration, shall be the responsibility of the Vendor and must be factored into the Vendor's Cost Proposal. The Vendor's failure to disclose physical plant modifications (and cost) is contrary to the Customer's turnkey project requirement and shall result in an unfavorable grade of the Vendor's proposal.
- 5.2.2 Grounding modifications at any existing site or dispatch location regardless of its current grounding status shall be brought up to proper grounding standard as part of the proposed system configuration and all associated cost shall be included in the Vendor's Pricing Proposal. Failure to disclose grounding upgrade requirements or pricing will result in an unfavorable score of the Vendor's Proposal.
- 5.2.3 The Vendor shall be responsible for conducting tower and foundation structural analysis and reinforcement as necessary to any of the existing radio towers in use by the Customer. An allowance shall be added to cost figures for anticipated reinforcement.

5.3 Typical Infrastructure Site Deployment

- 5.3.1 The Vendor is required to supply a turnkey solution to include: all technical support, equipment, material and labor necessary to develop each proposed infrastructure radio site into a functional P25 digital radio facility, fully incorporated.
- 5.3.2 A typical P25 radio infrastructure site equipment shelter shall contain, minimally, the following major equipment groupings:
 - 5.3.2.1 700/800MHz P25 Phase 1/Phase 2 Base Stations
 - 5.3.2.2 GPS-Disciplined Frequency Standard (Redundant)
 - 5.3.2.3 Transmitter Combiner System
 - 5.3.2.4 Transmitter Antenna Systems
 - 5.3.2.5 Receiver Multi-Coupler System
 - 5.3.2.6 Receiver Antenna System
 - 5.3.2.7 Remote Site MPLS Microwave Linkage
 - 5.3.2.8 Local Area Network Equipment
 - 5.3.2.9 700/800MHz Mutual Aid Subsystem
 - 5.3.2.10 Mutual Aid Antenna System
 - 5.3.2.11 Conventional Base Station Gateway
 - 5.3.2.12 Site Alarm Equipment
 - 5.3.2.13 Battery Plant & Charger Systems
 - 5.3.2.14 Standby Generator Transfer Switch

5.4 Tower Site Equipment Configuration

5.4.1 Power and Backup Requirements

- 5.4.1.1 The P25 simulcast configuration and conventional radio base stations shall operate from a 48 VDC battery-based power source, sized for no less than 8-hours of uninterrupted operation at 100% duty cycle of proposed equipment.
- 5.4.1.2 The backhaul network equipment, including microwave radios, shall operate from a 48 VDC battery-based power source, sized for no less than 48-hours of uninterrupted operation at 100% duty cycle of proposed equipment.
- 5.4.1.3 The battery system shall utilize sealed, long-life lead-calcium, or similar modern cells and 100% redundant battery charger components rated for telecommunication service.
- 5.4.1.4 An automatic, low voltage disconnect device shall be provided to protect the battery plant from discharge-related damage.
- 5.4.1.5 Electrical power switching/disconnect capability shall exist at all sites such that rectifiers, batteries as well as commercial power sources may be separately isolated in a way each component may be serviced safely.
- 5.4.1.6 This switching/disconnect capability shall be designed and configured such that radio network operation is otherwise unimpaired and uninterrupted during any repair or maintenance cycle.
- 5.4.1.7 Each equipment rack shall incorporate a circuit-breaker power distribution panel incorporating protection for power amplifier, exciter and receiver groupings.
- 5.4.1.8 Each equipment rack shall be protected by a DC-power circuit breaker, sized for nominal load plus 35% overload factor.
- 5.4.1.9 The primary battery chargers, low-voltage disconnect equipment and a primary DC circuit breaker panel shall be installed in a freestanding enclosed cabinet unit.
- 5.4.1.10 Auxiliary tower site electrical loads essential to proper system operation (i.e. tower top preamp, redundant GPS reference oscillators and receiver multi-coupler) shall be interconnected directly to the site's battery system.

5.4.2 Base Station Requirements

- 5.4.2.1 All Base/Repeater P25 radios proposed shall:
- 5.4.2.2 Meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety digital trunked/conventional radio systems (depending upon application within sites).
- 5.4.2.3 Furnished equipment must be capable of operation as a combined Phase 1 and Phase 2 infrastructure.
- 5.4.2.4 Be designed for 100% continuous-duty operation at full manufacturer specification.
- 5.4.2.5 In P25 multi-site and simulcast configurations, base stations shall utilize linear RF power amplifiers and function in a linear simulcast mode that minimizes to the greatest extent possible destructive time-delay interference within site coverage-overlap regions and minimizes digital modulation distortion, termed modulation fidelity.
- 5.4.2.5.1 Modulation fidelity, for this RFP, is a measurement of the degree of closeness that the transmitted modulation matches the ideal theoretical modulation for P25 Phase 2 waveforms.

- 5.4.2.6 Incorporate site monitor and infrastructure alarm systems having the ability to report major/minor infrastructure functionality alarms on multiple dispatch-located alarm console display devices. Additionally, the alarm reporting system shall have the capability of being remotely accessed for the monitoring and remote-interrogation of field/site related alarms, using a laptop configuration from any node within the network.
- 5.4.2.7 Utilize the proposed 48 VDC battery backup subsystem.
- 5.4.2.8 Include a "Fail-over/Fail-Soft" trunking scheme designed to maintain network performance as critical site components fail. System must be fault tolerant with redundant levels of computer hardware/software, as necessary, to maintain trunked operation during equipment failures.
- 5.4.2.9 Support special services, i.e. encrypted voice, data transmission, multiple Computer Aided Dispatch (CAD) system interfaces, Automatic Vehicle Location (AVL) interfaces, audio recording of talk groups, and collection of system operational data.
- 5.4.2.10 Base stations shall be housed in open equipment racks. Racks shall be free standing and incorporate drilled rails to accept standard 19" rack panels.
- 5.4.2.11 A minimum of six, but no more than eight DC-operated base stations should be located within a single equipment rack.
- 5.4.2.12 Individual base station ventilation fan(s), if required, shall be DC powered, thermostatically controlled, internally installed, and shielded.
- 5.4.2.13 700/800MHz P25 Repeater station specifications are as follows:
 - 5.4.2.13.1 General Specifications:
 - 5.4.2.13.1.1 Frequency Range: 764-776MHz, 851 to 870MHz
 - 5.4.2.13.1.2 Number of Frequencies: One transmit; one receive
 - 5.4.2.13.1.3 Channel Spacing: 25/12.5KHz
 - 5.4.2.13.1.4 Channel Capacity: 1
 - 5.4.2.13.1.5 Input Voltage: 48 VDC operation
 - 5.4.2.13.1.6 Temperature Range: -30°C to +60°C
 - 5.4.2.13.1.7 Humidity: 90 % relative humidity @ 50°C (typical)
 - 5.4.2.13.2 Transmitter specifications are as follows:
 - 5.4.2.13.2.1 Output Impedance: 50 Ohms
 - 5.4.2.13.2.2 Power Output: 100 watts
 - 5.4.2.13.2.3 Frequency Stability: 0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.
 - 5.4.2.13.2.4 Emission: 8K30F1W; 8K70D1W; 9K80F1D; 11K2F3E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission
 - 5.4.2.13.2.5 Modulation Deviation: +/-2.5KHz (12.5KHz), +/- 4KHz (NPSPAC)
 - 5.4.2.13.2.6 Channel Spacing: 25KHz; 12.5 KHz
 - 5.4.2.13.2.7 Audio Distortion: 2% at 1KHz
 - 5.4.2.13.2.8 Audio Response: Within +1, -3db of 6dB/octave per EIA
 - 5.4.2.13.2.9 Spurious/Harmonic: -65dB
 - 5.4.2.13.3 Receiver specifications are as follows:
 - 5.4.2.13.3.1 Frequency Range: 792-825MHz

- 5.4.2.13.3.2 Modulation Acceptance: 1KHz off channel 5.4.2.13.3.3 Selectivity: -70dB
- 5.4.2.13.3.4 Sensitivity: 0.25uv
- 5.4.2.13.3.5 Intermodulation: -80dB
- 5.4.2.13.3.6 Spurious/Image: -85dB
- 5.4.2.13.3.7 Frequency Stability: 0.01-PPM (GPS standard) 5.4.2.13.3.8 Channel Spacing: 12.5KHz
- 5.4.2.13.3.9 Audio Distortion: 2% at rated audio line level (600-Ohm) 5.4.2.13.3.10 Audio Response: Within +1/-3dB of 6dB/octave per EIA 5.4.2.13.3.11 Duty Cycle (EIA): Receiver 100%
- 5.4.2.13.4 Minimum 800MHz Analog Base/Repeater station specifications are as follows:
- 5.4.2.13.5 General Specifications:
- 5.4.2.13.5.1 Frequency Range: 806 to 869MHz
- 5.4.2.13.5.2 Number of Frequencies: One transmit; one receive 5.4.2.13.5.3 Channel Spacing: 25/12.5KHz
- 5.4.2.13.5.4 Channel Capacity: 10, minimally
- 5.4.2.13.5.5 Input Voltage: 48 VDC operation 5.4.2.13.5.6 Temperature Range: -30°C to +60°C
- 5.4.2.13.5.7 Humidity: 90 % relative humidity @ 50°C (typical)
- 5.4.2.13.6 Transmitter specifications are as follows:
- 5.4.2.13.6.1 Output Impedance: 50 Ohms
- 5.4.2.13.6.2 Power Output: 100 watts
- 5.4.2.13.6.3 Frequency Stability: 0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.
- 5.4.2.13.6.4 Modulation Deviation: 0 to +/- 5KHz (25KHz), 0 to +/- 4KHz (NPSPAC) 5.4.2.13.6.5 Modulation Type: Analog FM 16K0F3E
- 5.4.2.13.6.6 Channel Spacing: 25KHz; 12.5 KHz
- 5.4.2.13.6.7 Audio Distortion: 2% at 1KHz
- 5.4.2.13.6.8 Audio Response: Within +1, -3db of 6dB/octave per EIA 5.4.2.13.6.9 Spurious/Harmonic: -65dB
- 5.4.2.13.7 Receiver specifications are as follows: 5.4.2.13.7.1 Frequency Range: 806-825MHz
- 5.4.2.13.7.2 Modulation Acceptance: 1KHz off channel
- 5.4.2.13.7.3 Selectivity: -70dB (-80db for 25KHz channel) 5.4.2.13.7.4 Sensitivity: 0.25uv
- 5.4.2.13.7.5 Intermodulation: -80dB
- 5.4.2.13.7.6 Spurious/Image: -85dB
- 5.4.2.13.7.7 Frequency Stability: 0.01-PPM (GPS standard) 5.4.2.13.7.8 Channel Spacing: 12.5KHz
- 5.4.2.13.7.9 Audio Distortion: 2% at rated audio line level (600-Ohm) 5.4.2.13.7.10 Audio Response: Within +1/-3dB of 6dB/octave per EIA 5.4.2.13.7.11 Duty Cycle (EIA): Receiver 100%

5.5 Tower Site Antenna Systems

- 5.5.1 The Vendor shall:
 - 5.5.1.1 Furnish and install antenna systems designed to meet the coverage requirements and objectives described by Section 6 Coverage Criteria.
 - 5.5.1.2 Equip all antenna transmission lines with gas tube lightning arrestor devices (Polyphaser or equivalent).

- 5.5.1.3 Ensure all coaxial cable elements used as interconnecting jumpers for outdoor-mounted equipment or indoor transmitter/receiver components are 1/2" Andrew FSJ4-50B or recommended vendor standard to support optimal performance.
 - 5.5.1.4 Furnish and install hot dip galvanized side mount hardware sufficient to extend the transmitter and receiver antennas a minimum of 60-inches from the nearest tower-structure element.
 - 5.5.1.5 Ensure transmission lines are grounded at the antenna, at 200-foot tower intervals, at the top most part of the tower location, at the midpoint (for all towers greater than 200-feet in height), at the location where the transmission lines enter the cable bridge and at the equipment shelter's transmission line copper entry port.
 - 5.5.1.6 Utilize only manufacturer-approved grounding strap kits for the type of transmission line installed.
 - 5.5.1.7 Ensure all connecting hardware will be a snap-in type of a size designed for the cable and wind requirements of the RFP. No tie wraps or electrical tape will be allowed for attaching cables to towers or cable ladders between shelter and tower.
 - 5.5.1.8 Utilize antenna system mounting brackets, components and associated transmission line attachment hardware that are either stainless steel or hot-dipped galvanized steel.
- 5.6 Microwave and Backhaul Requirements**
- 5.6.1 All transmit/receive site-related equipment is to be backhaul-connected via digital microwave linkages to be supplied by the Vendor. This microwave backhaul layer shall be configured as a monitored hot-standby loop-protected ring(s) that encompass radio tower sites, simulcast control points, dispatch centers, and network controller locations.
 - 5.6.2 The new microwave backhaul layer shall operate principally at 6GHz. 11GHz microwave link segments are permissible only for path segments that are less than 4-miles in length.
 - 5.6.3 The Vendor is not required to present a detailed fixed path design of the proposed microwave subsystem for the purpose of the Technical response, as such work is dependent upon exact antenna placements that may change during site acquisition. The Vendor shall provide the following information as part of the Technical proposal:
 - 5.6.3.1 Technical specification literature for its proposed microwave radio, antenna and related equipment.
 - 5.6.3.2 A detailed description of the path profile tool and settings within the tool being used for the path profile analysis.
 - 5.6.3.3 A sample path profile analysis indicative of the scope to be used during the actual microwave analysis process. The sample analysis shall include all of the tower sites that encompass the Vendor's proposed radio infrastructure configuration.
 - 5.6.3.4 A sample test and alignment verification process, to be used during the commissioning of the new microwave subsystem.

- 5.6.4 The Vendor may reuse/reconfigure The Customer's existing microwave equipment as this equipment if it is supported and is expected to have operational value within the new P25 System.
- 5.6.5 The Vendor will provide the bandwidth provided by the proposed microwave system. This information should include the amount of bandwidth for all portions of the radio system and any other equipment/systems integrated in the proposed network. It should also include any additional bandwidth that could be used by the Customer and the interface at each site for the additional bandwidth.
- 5.6.6 The microwave network shall adhere to The Customer's network management plan as defined in Appendix C: Network Management Requirements.
- 5.6.7 Digital voice/data technology shall be used to minimize audio-phase delays and/or incompatibility of audio levels within the proposed network solution.
- 5.6.8 Where VoIP techniques are used to interconnect infrastructure sites, in lieu of traditional PCM multiplex channel schemes, a robust means shall be provided thereby assuring that the highest priority possible is given to voice packet delivery.
- 5.6.9 Redundant transmit, receive, and baseband equipment for each site, configured for automatic hot standby operation, shall be provided by the Vendor. This redundant equipment will automatically switch to the hot standby component(s) upon failure of the primary equipment.
- 5.6.10 A Microwave Alarm System shall be provided by the Vendor to monitor microwave site functions and to provide alarm status of abnormal operational parameters of equipment associated with the microwave system. Microwave major alarms shall be integrated within the radio alarm packaged supplied by the Vendor.
- 5.6.11 An orderwire channel with individual site handsets will be provided to link all microwave locations for testing and troubleshooting.
- 5.6.12 A separate 48 VDC microwave standby battery system will be provided and sized for 48-hours of continuous microwave equipment operation at each infrastructure site.
 - 5.6.12.1 An automatic low-voltage disconnect system will be employed to protect the battery plant from deep-cycle discharge damage.
- 5.6.13 Microwave system availability shall be no less than 99.999%. 6GHz path segments longer than 12-miles must utilize space-diversity. The system shall be loop-configured with hitless directional switching.
- 5.6.14 Microwave antennas, radomes, and antenna mounts supplied and installed will be capable of surviving wind speeds of up to 150mph and maintaining reliable operations during sustained storm force winds of up to 125mph. Each furnished antenna system will be equipped with dual stiff arms/ruggedized mounts to limit antenna vibration and flexing during high wind events.

- 5.6.15 Minimum operational service parameters of each microwave link are as follows:
 - 5.6.15.1 Unfaded Bit Error Rate (BER): Not Less Than 10⁻¹⁰
 - 5.6.15.2 Calculated RF Link Fade Margin: Not Less Than 40dB
 - 5.6.15.3 Link Outage Level: To coincide with 10⁻³ BER, to occur at a signal level not less than 3db in excess of the calculated RF link fade margin.
- 5.6.16 Microwave system shall incorporate a quadrature amplitude modulated adaptive protocol that automatically adjusts protocol to maintain critical communications during abnormally faded conditions. This technique is intended to extend the microwave system's functionality to beyond that of the normal 40db flat fade margin.
- 5.6.17 Vendors may use high-power amplifiers (i.e., 36dBm to 39dBm), as may be necessary, to achieve the best balance between antenna size versus the 40db flat fade margin requirement.
- 5.6.18 In no case should antennas larger than 8ft. in diameter be considered for this project unless high-performance antennas are required due to interference mitigation requirements as noted by the Frequency Coordinator.
- 5.6.19 The Vendor shall be responsible for the engineering and filing costs for microwave system frequency coordination, prior coordination notification, FCC license application preparation and submittal of necessary microwave licensing documents on behalf of the Customer.

6 Section 6 - Coverage Criteria

6.1 General

- 6.1.1 The System's P25 700/800 digital trunked radio network shall be designed to support portable hand-carried radio subscriber equipment on the hip with a speaker microphone, operated on-street, at physical locations throughout the identified service area. The Vendor must fully determine and guarantee the coverage predicted for the proposed solution, as per the functional and operational requirements of this RFP. The Vendor shall provide within the response a sample Coverage Test and Acceptance Plan that encompasses the elements described in this section.
- 6.1.2 This sample Coverage Test and Acceptance Plan should be a clear example of how the vendor should test coverage to include in-building coverage. Failure to provide details in this effort can result in a reduced score.
- 6.1.3 The Customer reserves the right, at its sole discretion, to suspend, pause, or terminate coverage testing at any time if any system component, subsystem, or supporting equipment is experiencing user-impacting failures, operational instability, or performance degradation that, in the judgment of the Customer or its Consultant, materially affects system functionality or reliability. Coverage testing shall not resume until the Vendor has corrected the identified deficiencies and demonstrated to the satisfaction of the Customer that the system is stable and operating in accordance with Contract requirements. Any delays, additional testing, or retesting resulting from such suspension shall be at the sole cost and responsibility of the Vendor and shall not constitute grounds for a Contract time extension.

6.2 Coverage Parameters

- 6.2.1 The Vendor must consider the following operating parameters in the development of their coverage guarantee:
 - 6.2.1.1 Shoulder/microphone units without antennas will be used with portable radio units in most instances and shall be the normal configuration considered for coverage design. Body and obstruction losses must therefore be considered in the proposed network design for both talk-in/talk-out coverage analyses.
 - 6.2.1.2 Flexible, quarter wavelength antennas shall be required for portable units. Coaxial-skirt type or ½ wave antennas are not acceptable due to size and other mechanical/ergonomic limitations.
 - 6.2.1.3 Mobile unit configurations shall utilize low profile 3db gain 700/800MHz antennas. These antennas shall be located on the vehicle's trunk, having an average base level height of 3.5 feet.

6.3 Noise Floor & Interference

6.3.1 It is the intent and requirement that the system shall be designed such that the indicated coverage goals and requirements herein be met irrespective of external noise and interference. Therefore, it is essential that the Vendor undertake whatever measurements, surveys, and studies as necessary such that the state of the noise and interference environment is quantified prior to the system's final design. The final system design shall make such allowances as necessary, including but not limited to reduced repeater site effective sensitivity (predictions) in the presence of noise and interference (as measured) to achieve The Customer's required degree of coverage.

6.3.2 The Vendor shall not excuse a failure of any portion of the coverage test due to external noise or interference, with one exception: If the Vendor can show, with certified measurement data, that the noise and/or interference environment has substantially changed between the initial pre-design measurements/surveys and the time of the performance of the coverage acceptance test. If such findings can be demonstrated, then the coverage requirement for the affected portion of the coverage test may be conditionally accepted by the Customer as an exception.

6.3.3 As part of its proposal development, the Vendor shall undertake a best-faith effort to investigate the existence of abnormal noise/interference levels, if any, and shall incorporate those findings within its coverage map submittals for the proposed system. These measurements shall be conducted between the hours of 8 a.m. – 5 p.m. on normal working days. Off hours and holiday periods will not be acceptable periods for measurements. Ultimate final acceptance of the affected portion of the completed system may be given only if The Customer is shown sufficient information to demonstrate that any observed degradation is beyond the reasonable, Industry-recognized control of the Vendor. If, however, coverage degradation to the system is found to be within the Vendor's control, then whatever additions, modifications, or costs incurred to resolve the coverage deficiency shall be borne solely by the Vendor.

6.4 Intermodulation Study Requirement

6.4.1 The Vendor shall ensure that the proposed System will be within the accepted limits of Industry-accepted engineering practice, free of interference or degradation due to intermodulation (IM) noise/sideband products.

6.4.2 An IM study shall be required to be provided by the Vendor prior to the project's the Customer Design Review (CDR) meeting, and subsequent meetings, as the new radio network is deployed. This study shall investigate the impact of both trunked system channels as well as those channels utilized by the conventional mutual aid and interoperability subsystem. This study shall also include any current co-located equipment that may be present in the shelter and/or tower.

- 6.4.3 As part of the Technical Response, the Vendor shall fully describe the planned methodology to develop and complete the required noise and IM studies. The Vendor shall submit a representative sample of the noise and IM reporting documentation of sufficient scope and detail to support the methodology, as provided in the Technical Response.
- 6.5 Service Area**
- 6.5.1 Portable radio on-street, on the hip with a speaker microphone coverage must extend throughout no less than 97% of that area within the land region encompassed by Dodge County, Wisconsin at Delivered Audio Quality (DAQ) 3.4.
- 6.5.2 The system shall support mobile radio user coverage throughout the County and two miles outside of the County at 97% coverage at Delivered Audio Quality (DAQ) 4.0.
- 6.5.3 Portable radio and including paging to radio coverage within buildings is required. The system shall support no less than 95% coverage/DAQ-3.4 within residential structures and Law/Fire/EMS facilities throughout all areas of Dodge County. In addition, portable radio coverage to this same or greater reliability and audio quality is required within a specific set of critical building locations and critical areas, as listed in Appendix D Critical Building/Area List.
 - 6.5.3.1 The system shall support no less than 95% coverage within critical buildings and other type 20dB structures within the city limits of the following cities plus one half mile outside the border and along the corridor of major roads with one half mile boundary on either side.
 - 6.5.3.1.1 Beaver Dam
 - 6.5.3.1.2 Beaver Dam Town
 - 6.5.3.1.3 Brownsville
 - 6.5.3.1.4 Clyman
 - 6.5.3.1.5 Columbus
 - 6.5.3.1.6 DOSO
 - 6.5.3.1.7 Emmet, Town
 - 6.5.3.1.8 Fox Lake
 - 6.5.3.1.9 Fox Lake, Town
 - 6.5.3.1.10 Horicon
 - 6.5.3.1.11 Hustisford
 - 6.5.3.1.12 Iron Ridge
 - 6.5.3.1.13 Juneau
 - 6.5.3.1.14 Lomira
 - 6.5.3.1.15 Lowell
 - 6.5.3.1.16 Mayville
 - 6.5.3.1.17 Neosho
 - 6.5.3.1.18 Rubicon
 - 6.5.3.1.19 Ashippun
 - 6.5.3.1.20 Randolph

- 6.5.3.1.21 Reeseville
- 6.5.3.1.22 Theresa
- 6.5.3.1.23 Watertown
- 6.5.3.1.24 Waupun
- 6.5.3.2 The vendor should put emphasis on providing reliable coverage in all schools regardless of the loss factor for each school. The vendor will guarantee coverage in all schools at no less than 95% coverage at 20db.
- 6.5.3.2.1 The vendor should put an emphasis on providing reliable coverage in the Dodge County Jail and Courthouse regardless of the loss factor for each Building. The vendor will guarantee coverage at no less than 97% coverage.
- 6.5.3.3 All references to coverage reliability in this RFP refer to statistical area reliability. For example, the phrase "95% coverage" indicates that the total area described shall exhibit at least 95% statistical probability that coverage areas, if tested, would be found to support electrical performance which equals or exceeds that minimum signal level necessary for that Contracted delivered audio quality.
- 6.5.3.4 It will not be acceptable to provide a coverage guarantee which includes a relatively large number of failed points within any single vicinity, while still meeting the overall goal of 95% coverage.
- 6.5.3.5 It will not be acceptable to have a failure of six or more contiguous test points. Contiguous grids are defined as being in actual contact : touching along a boundary or at a point.
- 6.6 Propagation Analysis**
- 6.6.1 The Vendor shall provide written descriptions of the processes and propagation models used to calculate proposed area coverage objectives.
- 6.6.2 Coverage maps and other pertinent calculations must be submitted with the following minimum information clearly defined for each map or submittal:
 - 6.6.2.1 Transmitter site power output.
 - 6.6.2.2 Antenna gain and type (Include transmission line losses).
 - 6.6.2.3 Effective signal level necessary, at both infrastructure and user radio antenna ports, to produce DAQ 3.4 delivered audio quality in the typical land mobile radio environment (inclusive of noise floor degradation, if any).
 - 6.6.2.4 Antenna height.
 - 6.6.2.5 Portable unit effective radiated power.
 - 6.6.2.6 Portable unit effective receiver sensitivity.
 - 6.6.2.7 Transmitter site talk out range, individual sites as well as composite coverage.
 - 6.6.2.8 Portable unit talk-in range, individual sites as well as composite coverage.
- 6.6.3 A statement defining the percentage of land area covered shall be provided for each submitted map configuration.
- 6.6.4 Okamura modeling should be used for propagation projection. If an alternative model is used, proposer shall disclose model.

6.7 Radio System Coverage Acceptance Criteria

- 6.7.1 Verification of the installed system's coverage is a component overall acceptance testing of the system.
- 6.7.2 Vehicular coverage testing (performed within a road vehicle during terrestrial coverage testing or watercraft when performing river or lake coverage testing) shall be done with computer-controlled test equipment.
- 6.7.3 This equipment shall automatically record the position of the test vehicle (by means of GPS positioning) at the time of a reading and records the signal strength of at least 200 signal samples over a 40-wavelength period for each reading taken within a test grid. Signal strength measurements shall be made continuously along the drive route.
- 6.7.4 Test grid sizes within all city limits shall utilize grid sizes no greater than 1320 feet x 1320 feet (1/4 mile). Grids sizes within rural areas shall be 2640 feet x 2640 feet (1/2-mile).
- 6.7.5 A minimum number of accessible grids, sufficient to provide statistical accuracy of results in the order of 1.25db or less, shall be tested.
- 6.7.6 The Customer and the Vendor shall mutually determine the size/location of grids and a suitable drive route that encompasses the entirety of accessible grids. This testing shall apply to any area capable of being traversed by a 4x4 vehicle. Inaccessible grids will be excluded from the coverage result calculations.
- 6.7.7 Field strength test results obtained throughout the coverage area, in accordance with minimally required reliability percentages, shall be of sufficient level to produce a Delivered Audio Quality (DAQ) rating of 3.4 or higher where required (see Figure 1 below) throughout the predicted service area to be considered passing.

DAQ	DESCRIPTION
5	Reception is very clear, and the message is perfectly readable. No background noise is present, and every word is understood.
4	Reception is clear, but with slight background noise. Message is readable and every word is understood.
3.4	Reception is clear, but with slight background noise. Message is readable and understood with few/occasional missing syllables.
3	Background noise is evident. Message is readable and understood even with missing syllables.
2	Background noise is prevalent. Message is readable with difficulty and requires repetition.
1	Evidence that transmission is being made. Voice message is barely discernible, and no words are understood. Unusable.
0	No transmission is heard. No activity on the channel is evident.

- 6.7.8 Mobile radio signal strength measurements shall be made from either a terrestrial (land) vehicle moving at approximately 35 mph, or a watercraft (river/lake) vehicle traveling at approximately 20-knots.
- 6.7.9 The device used to measure field intensity shall be stable and have a dynamic range suitable for the conditions under test.
- 6.7.10 Prior to the execution of these test activities, all test equipment and data gathering equipment to be used shall be fully certified by an independent testing laboratory having calibration tools traceable to the National Institute of Standards and Technology. These certification documents shall be presented to the Customer’s project staff prior to coverage testing.
- 6.7.11 The test output shall be retained by a laptop computer or an equivalent computer device. The Vendor shall submit a written and/ or graphical report containing an analysis of the test results to the Customer daily, and a formal report at the end of the test.
- 6.7.12 The Vendor’s analysis shall include maps of the coverage area divided into grids, with the test results for drive tests displayed in each grid on a separate map.
- 6.7.13 The Vendor's analysis will also be provided in a .KMZ format to include the coverage grids according to the specific requirement for each coverage defined.
- 6.7.14 All test data, in its raw form, shall be made available for independent inspection.
- 6.7.15 The Customer reserves the right to reject any instrumentation or procedures.
- 6.7.16 During these tests, the system’s P25 transmitter(s) output power shall be monitored by the Customer and no adjustments shall be made to the base station(s), antenna

system(s), transmitter(s), portable/mobile radio units or test instrumentation after appropriate calibration of all involved equipment.

- 6.7.17 Optimization data for the infrastructure will be provided to the Customer prior to the commencement of these tests. Optimization data will include at a minimum, antenna sweeps, TX power measured at the base station output and the combiner output, receive sensitivity, and any other data deemed necessary to prove the system is optimized and ready for testing.
- 6.7.18 Should The Customer reject any portion of the test, the Vendor shall correct the errors and omissions as defined by the Customer at no additional cost.
- 6.7.19 All additional costs incurred due to retesting or a failed Coverage Acceptance Testing process will be the responsibility of the Vendor. This includes customer and customer designee time and expenses.

6.7.20

6.8 Audio Quality Test Process

- 6.8.1 In addition to the signal level collection method describe above, the Vendor shall be required to conduct a voice audio quality test of the system.
- 6.8.2 The P25 digital portion of the new radio system shall encompass an automated BER Test for both in-bound and outbound transmission pathways.
- 6.8.3 The Vendor shall, as part of its Acceptance Test, produce a BER Test Report that correlates actual BER to predicted results.
- 6.8.4 Of those accessible grids evaluated because of the field-testing process, no fewer than 95% shall achieve a BER that is directly correlated to DAQ-3.4, as defined by EIA/TIA TSB-88D, as depicted by Table 1. A call transmission failure in either direction shall be considered a failure of the tested grid.
- 6.8.5 The BER test shall encompass the same grid structure as devised for the signal level test process.
- 6.8.6 A manually-conducted voice quality test simulating in-residence portable radio operations shall also be conducted.
 - 6.8.6.1 In conducting portable voice quality testing, vehicular-mounted mobile radios and proposed portable radios will be utilized in Vendor-equipped vehicles, but with appropriate transmission line attenuators installed to replicate outdoor portable radio operations.
 - 6.8.6.2 The Customer's service area shall be comprised of test grids equal to those used in BER testing.
 - 6.8.6.3 Test calls for each grid will be transacted, as required vehicle-to-base/console and base/console-to-vehicle or portable-to-base/console and base/console-to-portable, with the results for each call segment scored as per TSB-88D recommendations.
 - 6.8.6.4 No fewer than 97% of the total number of grids tested in this manner shall be ranked as achieving DAQ-3.4 audio quality, or higher.
 - 6.8.6.5 A failure in either call direction shall be considered as a failure of the tested grid.

- 6.8.6.6 The following voiced audio quality verification process shall apply:
 - 6.8.6.6.1 The portable radio voice quality testing shall be performed using a minimum of phonetically balanced phrases, commonly known as Harvard Phrases are to be supplied by the Vendor.
 - 6.8.6.6.2 A successful test measurement shall be one which requires no repetition, and as defined in Table 1 to understand the spoken phrase and with a DAQ-3.4.
 - 6.8.6.6.3 A successfully tested grid is defined as one in which communications from a dispatch console to a field radio unit, as well as for the reverse path, are not less than DAQ 3.4 as described above.
 - 6.8.6.7 The Customer shall designate the test team(s) to participate in coverage testing.
 - 6.8.6.8 All test vehicles shall be provided by the Vendor and be off-road capable. Where boats are required, these shall be provided by the Customer.
 - 6.8.6.9 Testing shall commence each day at 8:00 AM and conclude at 4:30 PM local time. A minimum of three (3) testing teams shall be deployed concurrently to ensure timely completion of all required testing activities.
 - 6.8.6.10 Failure, malfunction, or unavailability of Vendor-provided test equipment shall not constitute grounds for a Contract time extension or schedule relief.
 - 6.8.6.11 The Customer shall not be responsible for any costs associated with retesting required due to Vendor-caused delays, equipment failures, incomplete preparation, or failure to meet performance criteria. All such retesting shall be conducted at the sole expense of the Vendor.
 - 6.8.6.12 Testing activities may proceed on weekends as necessary to maintain the project schedule.
 - 6.8.6.13 All coverage testing shall be performed during peak foliage conditions and shall continue without interruption until successfully completed. Any portion of testing performed outside of peak foliage conditions shall be repeated during the next peak foliage season at the Vendor's sole cost and expense.
 - 6.8.6.14 Final System Acceptance shall not be granted until the constructed system demonstrates, through approved testing procedures, coverage performance that equals or exceeds the performance levels guaranteed under the Contract.
- 6.9 Critical Building Coverage Test Process**
 - 6.9.1 Coverage shall be no less than 97% inside of the listing of representative buildings contained in Appendix D Critical Building/Area List. It is desired that most of these building structures shall be supported by the proposed fixed infrastructure (tower sites). However, the Vendor shall exercise good judgment in balancing the proliferation of costly infrastructure tower sites with the number of building sites. The use of building amplifier systems, while necessary in some instances, shall likewise be minimized to the most practical and fiscally responsible extent possible.
 - 6.9.2 The Vendor shall specifically identify those buildings from that list that are likely to require building amplifier systems.

- 6.9.3 If any of these representative buildings fail to demonstrate 97% reliable coverage (DAQ 3.4 Audio Quality), the following procedure will be followed:
 - 6.9.3.1 The Vendor must propose a detailed testing method showing how the failed building will be tested to verify that it does or does not meet the in-building coverage criteria.
 - 6.9.3.2 If System radio coverage gaps are identified versus Vendor as-proposed coverage models, the Vendor will be responsible for modifying the System, at no additional cost to the Customer, to achieve the required coverage within the failed building. Remediation may include any or all the following approaches, as mutually agreed by the County and its Consultant:
 - 6.9.3.2.1 Bi-directional amplifier (BDA) system installed in the building.
 - 6.9.3.2.2 Passive repeater systems installed in the building.
 - 6.9.3.2.3 Satellite receiver systems in or near the building.
 - 6.9.3.2.4 Modifying/adjusting repeater site antenna systems.
 - 6.9.3.3 The determination to utilize a BDA within any structure shall be engineered as a part of a comprehensive system design. The Vendor shall not install any BDA system in structures that shall introduce interference into the overall P25 System operation.
 - 6.9.3.4 If any changes are made to the fixed sites (such as re-orienting antenna patterns) in order to resolve building coverage failures, then a complete re-test of coverage shall be required at no additional cost to the Customer.
- 6.9.4

7 Section 7 - Dispatch Console Requirements

7.1 General

7.1.1 The Customer requires new dispatch consoles as part of this procurement.

7.2 Radio Console Locations

7.2.1 The Customer currently utilizes Motorola MCC 7500 dispatch consoles for 911, Law, Fire, EMS, and other public safety agencies. The county dispatch center is located within the Sherriff's Office at 124 West St, Juneau WI. There is a quantity of five consoles at this location.

7.2.2 Customer has one console at the Dodge County jail located at 216 W Center St, Juneau, WI.

7.3 Console Installation Requirements

7.3.1 In proposing a console solution, the Vendor shall:

7.3.1.1 Replace all existing radio dispatch consoles at The Customer's dispatch center(s) with an IP-based solution and have seamless integration with the newly proposed system radio network.

7.3.1.2 Install new radio dispatch equipment cabling that must, likewise, be completed in a manner that causes no interference with the operation of the existing legacy network.

7.3.1.3 The Customer's existing (legacy) radio system configuration, including all dispatch consoles and associated mutual aid and interoperability functionality, shall remain fully operational and continuously available throughout the installation, cutover, migration, and acceptance phases of the P25 System implementation.

7.3.1.4 The Vendor shall plan and execute all installation and migration activities in a manner that preserves uninterrupted legacy system functionality. The Customer will permit the co-location of new dispatch console equipment with the existing legacy equipment during the user migration phase and until Final System Acceptance. Such co-location shall not impair, disrupt, or degrade the performance of the legacy system in any way.

7.3.1.5 Any solution that would cause the temporary interruption of the existing radio system for any duration must be reviewed and approved, in advance, by the affected entities and the Customer.

7.3.1.6 Carefully evaluate dispatch facilities prior to initial design review to determine the most effective means to install and implement its new dispatch console equipment and associated subsystems.

7.4 Desired Functionality and Uptime

7.4.1 Due to the mission-critical nature of the communications services provided by these public safety dispatch facilities, the new radio dispatch console subsystem shall be designed, furnished, installed, and configured to ensure continuous 24/7 operation with appropriate redundancy, automatic failover, and no single points of failure. The subsystem shall achieve a minimum monthly availability of 99.999% uptime, excluding only Customer-approved scheduled maintenance, with availability calculated as total operational minutes divided by total minutes in the measurement period. Any outage, degradation, or instability impacting dispatch operations shall constitute a material deficiency requiring immediate corrective action and may subject the Vendor to contractual remedies.

7.5 General Operations

- 7.5.1 The console subsystem, to the greatest extent possible, shall:
 - 7.5.1.1 Be automatically self-correcting.
 - 7.5.1.2 Provide continuous and automatic self-testing and diagnosis.
 - 7.5.1.3 Alert the operator in the event of component or sub-system failure.
 - 7.5.1.4 Allow continued operation of the remaining consoles in the event of failure to a specific console, through isolation of the defective console device.
 - 7.5.1.5 Be of a design that eliminates single points of failure.
 - 7.5.1.6 Utilize packet-based, in lieu of traditional circuit-switched, technologies.
 - 7.5.1.7 Modularity is likewise envisioned to reduce the number of sub-systems affected by a single component failure. Repair of sub-systems without totally disabling multiple radio console positions shall be required, as continued console operation is necessary during repair.

7.6 Diagnostics

- 7.6.1.1 The new dispatch console subsystem shall be equipped with several self-diagnostic elements that continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics, and between the console electronics and the system.
- 7.6.1.2 Diagnostic capability shall be distributed among independent and redundant subsystems and shall not rely on one central diagnostic circuit.

7.7 Power Supply

- 7.7.1 It is a critical requirement that power loss or surges shall not affect radio dispatch operations.
- 7.7.2 Power loss or surges shall not alter the system software or operating parameters at the radio dispatch positions.
- 7.7.3 External power to each console shall be supplied by a nominal 120VAC, 60Hz, single-phase power source.
- 7.7.4 If the Customer does not provide standby or backup power to the entire dispatch facility, the Vendor shall furnish, install, and configure a complete backup power solution sufficient to support the radio dispatch console subsystem and all associated supporting equipment for a minimum of eight (8) continuous hours at full operational load. The backup power system shall include appropriately sized UPS and/or battery systems and any required transfer or charging equipment necessary to ensure uninterrupted operation during a commercial power failure. The Vendor shall be responsible for proper load calculations, integration, testing, and demonstration of the required runtime prior to Final System Acceptance.
- 7.7.5 The proposed backup power device will have a graphical display that shows battery life and voltage incoming and outgoing on the device.

7.8 Flat Panel Display

- 7.8.1 A state-of-the-art color, non-interlacing minimum twenty-Four (24)-inch display shall be provided.
- 7.8.2 Each operator shall have the ability to change screen displays to suit operator preferences.

7.8.3 No less than eight console preferences shall be configurable for each console.

7.8.4 The screens are required to be touch screens.

7.9 Headset Jack Configuration

7.9.1 All radio consoles shall, at a minimum, accommodate both right-handed and left-handed operators.

7.9.2 All radio consoles shall be configured for dual headset and local microphone operations.

7.9.3 Each console shall provide independent transmit audio level settings for audio inputs from the headset microphone and a desktop microphone, such that telecommunicators may freely switch operation without affecting dispatch audio quality.

7.9.4 Dual headset jacks shall be provided at each position for training and supervisory purposes.

7.10 Footswitch

7.10.1 The Vendor shall supply and install a switch for each console.

7.10.2 Each footswitch will operate PTT of the selected channel(s).

7.10.3 The footswitch shall be heavy duty, rated for constant and continuous use, and shall be designed so as not to skid on a smooth flooring surface.

7.11 Master Time Source

A time generator system shall be provided, by the Vendor, that references the Global Positioning System to synchronize all dispatch clocks and logging recorders at all radio console positions/centers.

7.11.1 This time generator system shall be made to fully interface to and control the event-time display of the radio consoles, console audio recorder, radio network management tools, radio network alarm system, and microwave alarm system at each radio dispatch location.

7.12 Dispatcher Headsets

7.12.1 Each position shall be capable of utilizing a wireless headset hardware for connectivity into the proposed radio console headset jack hardware. The following headsets are primarily in use by the Customer and are required to operate with the new dispatch consoles:

7.12.1.1 Plantronics HW710

7.12.1.2 Plantronics H31CD

7.13 Digital Fixed Station Interface

7.13.1 The console system shall be capable of modern digital fixed-station interface (DFSI) connectivity to base stations and other fixed radios.

7.14 Dispatch Console Positions

7.14.1 Each of the radio dispatch consoles shall include all controls that apply to the various channel/talk-groups and auxiliary functions for the console.

7.14.2 Each console position shall contain as a minimum:

7.14.2.1 Select Speaker – for audio from selected channels/talk-groups, with volume control.

7.14.2.2 Two unselect speakers – for audio from unselected channels/talk-groups, with volume control.

7.14.2.3 One resource selectable speaker – Minimum of one additional speaker which allow for console audio resources to be dynamically assigned by the operator.

7.14.2.4 Transmit Function – a color-coded transmit function to control the push to talk (PTT)

function for the selected transmitter(s) and/or talk-group(s).

- 7.14.2.5 CTCSS Monitor or Disable Function – shall disable the receiver CTCSS decoder of selected conventional base station(s) operating on conventional channels for monitoring purposes.
- 7.14.2.6 Clock – shall display time in twenty four-hour formats and shall be synchronized with the time server.
- 7.14.2.7 VU Meter or Audio Level Display.
- 7.14.2.8 Keypad or screen representation of a keypad for numeric data entry.
- 7.14.2.9 Microphone – desktop microphone type. This microphone shall be resistant to interference, such as transmitting hum from lights, cathode ray monitors, or other devices used in the proximity of the console.
- 7.14.2.10 Dual Headset Jack – a dual headset jack shall be provided which will allow for use of a headset equipped with RJ-327 type plug with modular adapter. Separate headset volume controls for radio and telephone audio output shall be provided.
- 7.14.2.11 Intercom – intercom between operator positions shall be provided. A visual display shall be provided to identify both the calling and called parties by console name. Multiple simultaneous intercom conversations between individual consoles shall be possible.
- 7.14.2.12 ID Display on the channel window for standard calls and emergency calls with a minimum of eight alphanumeric characters.
- 7.14.2.13 All Receiver Mute Function – a function, which will mute the received audio from all unselected channels, shall be provided. This muting function shall be programmable in predetermined increments.
- 7.14.2.14 Simultaneous Select and Instant Transmit Function – controls shall be provided that allows the operator to manually select any combination of console controlled base stations for simultaneous transmissions. Three selectable combinations shall be allowed at the discretion of the telecommunicator.
- 7.14.2.15 The patch shall utilize a single trunked channel when patching more than one talk group.
- 7.14.3 The Vendor will describe how the system will communicate from different type talkgroups or resources integrated to base station gateways.
 - 7.14.3.1 P25 - P25 Talkgroup
 - 7.14.3.2 P25 Encrypted Talkgroup - P25 Talkgroup
 - 7.14.3.3 P25 Encrypted Talkgroup Key 1 - P25 Encrypted Talkgroup Key 2
 - 7.14.3.4 Conventional - P25 Talkgroup
 - 7.14.3.5 Conventional - P25 Encrypted Talkgroup
 - 7.14.3.6 Base State Gateway P25 Talkgroup - P25 Talkgroup
 - 7.14.3.7 Base Station GW P25 Encrypted Talkgroup - P25 Encrypted Talkgroup

7.15 Emergency/ Reset

- 7.15.1 Consoles shall receive emergency alerts from the trunked radio system regardless of the status of the channel control window.
- 7.15.2 Emergency messages shall be indicated by a flashing ID, and emergency ID character and an audible alert.

- 7.15.3 Telecommunicator acknowledgment of the message shall silence the audible alert and stop the flashing display.
- 7.15.4 Multiple emergency messages shall be queued in the display stack and the emergency ID character shall continue to flash until all messages have been viewed and subsequently cleared by the telecommunicator.
- 7.15.5 The console shall be provided with three distinct tones used for alerting purposes over the air. Each alert tone shall be immediately broadcast, when activated, on the selected radio channel.
- 7.15.6 The following selections shall be available as a minimum:
 - 7.15.6.1 Alert Tones
 - 7.15.6.1.1 Alert 1 – Steady Alert Tone – shall generate a nominal 1000 Hz steady tone.
 - 7.15.6.1.2 Alert 2 – Warbling Tone – shall generate a warbling tone.
 - 7.15.6.1.3 Alert 3 – Pulsed Alert Tone – shall initiate an automatic sequence, consisting of a nominal 1000 Hz tone, for a period of two (2) seconds.
 - 7.15.6.2 Paging Encoders – Each console shall include a multi-tone paging/signaling encoder that is accessible, minimally, through the data entry keyboard.
 - 7.15.6.3 Call Indication – a color-coded status call indicator shall be provided for each receiver in a channel control window on the display screen.
 - 7.15.6.4 Individual Volume Adjust – shall be provided for each channel on the console. Associated color-coded status indicators shall continuously show whether the channel is in the full or adjustable volume control shall be automatically bypassed when a channel is placed in select status.
- 7.16 Talk-group/Channel Cross Patch**
 - 7.16.1.1 Channel/Group Name – designated channel/group control modules shall include a minimum of eight-character alphanumeric display symbols to identify the channel/group.
 - 7.16.1.2 Talk-Group/Channel Busy Indication
 - 7.16.1.3 NENA interface – Connectivity to existing E911 and future NG911/IP telephony system (provided by others) for single headset operation.
- 7.17 Video Display Installation**
 - 7.17.1 The installation of the Video Display(s) used for the radio dispatch positions shall be capable of desk mounted on furniture or dispatch console furniture display arms.
 - 7.17.2 Vendor-furnished cabling shall be neatly installed and protected from physical damage. Installation plans will be approved by The Customer prior to physical installation.
 - 7.17.3 Cable raceways shall be used where possible.
 - 7.17.4 No cabling shall create a safety or mobility problem for dispatch personnel.
- 7.18 Console Electronics Description**
 - 7.18.1 Console electronic circuitry shall be housed in an equipment rack/enclosure specific for each dispatch console position.
 - 7.18.2 When installed by the Vendor, sufficient space for front and rear servicing of this equipment shall be provided.

- 7.18.3 The use of a centralized console electronic bank that supports audio and control signaling between multiple dispatch console positions is non-compliant and will be rejected.
- 7.18.4 Console electronic enclosures shall contain the various microprocessors, console interfaces, auxiliary function interfaces and other interfaces needed for radio dispatch operations.
- 7.18.5 If multiple circuit cards are required within the Vendor's enclosure solution, these shall be of plug-in design and shall be able to be inserted and/or removed with power applied and the location's other dispatch positions/equipment remaining on-line.

7.19 System Interfaces

- 7.19.1 The digital voice network's radio dispatch subsystem shall include the circuitry required to operate remotely-controlled base stations and the system repeaters as described by this RFP.
- 7.19.2 At a minimum, each base station interface shall consist of a plug-in circuit card (or the software equivalent) containing VoIP-related circuitry, line driver amplifiers, two-wire and four-wire receive amplifiers, digital automatic level adjustment circuitry and fault-diagnostic circuitry.
- 7.19.3 The interface shall also be capable of remotely controlling base stations via E/M multiplex-channel, and 2175Hz tone-burst signaling, as may be needed for legacy equipment.

7.20 Auto Diagnostics/Self-Healing and Diagnostic Features

- 7.20.1 The radio dispatch subsystem shall be equipped with many self-diagnostic capabilities that shall be configured to continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics and between the electronics and each radio network base station site.
- 7.20.2 In the case of voice transactions using the Internet Protocol, specialized coding shall be used to assure the timely delivery of audio packets to destinations such that recovered or transmitted audio is absent of noticeable voice delays or audio truncation.

7.21 Console Auxiliary I/O Functions

- 7.21.1 All external auxiliary input and/or output (Aux I/O [logic or relay]) functions shall be controlled through an auxiliary interface module.
- 7.21.2 These functions shall be controlled from the console position as required.
- 7.21.3 The Aux I/O shall be capable of operating an optional 3-light status light/alert system, supplied by the Vendor, to indicate each position is operating a radio transmission, or telephone call, on each console position.

7.22 Fallback Control Stations

- 7.22.1 Each dispatch and supervisory position shall be equipped with a P25 trunked control station to permit radio dispatch operations to continue in the event of radio console equipment or connectivity failures.
- 7.22.2 These control stations, in addition to the minimum requirements specified by Section 5.3, must contain an alphanumeric display to provide information on talk-group selection and emergency call alerts.

7.22.3 Each control station shall be operated either by a stand-alone footswitch and headset jack or be integrated to the console and operate with the console footswitch and headset jack.

7.22.4 The control stations and associated equipment must be located in an equipment room adjacent to the dispatch console area.

7.23 Training

7.23.1 The Vendor shall propose training for up to 38 telecommunicators and 4 telecommunicator supervisors.

7.24 Recorder Interface

7.24.1 The vendor shall upgrade the existing logging recorder to provide capability for recording any talkgroup on the System.

7.24.2 The existing Logging recorder is a recently purchased from Eventide Communications. The vendor shall be responsible for upgrading software and hardware to support the newly proposed radio system.

7.24.3 The recorder shall include:

7.24.4 Capability to record from a Solacom Guarding, via IP recording.

7.24.5 At least twenty-four (48) channel VOIP recorder inputs for telephone lines.

7.24.6 Recording require one year of retention.

8 Shelter, HVAC, and Compound Requirements

8.1 Environmental and Hazard Risk Considerations

8.1.1 Vendors shall use the Americal Society of Civil Engineers (ASCE) Hazard Tool to develop specifications for all relevant items in this section for the latest ASCE/SEI standard at risk category IV with a default soil class. A full report from the online hazard tool shall be included for each proposed site.

8.2 Climate and Weather Ratings

8.2.1 The Vendor shall identify in its Technical Response any proposed site that may be susceptible to flooding. All mitigation measures shall be based on current FEMA 100-Year Floodplain data.

8.2.2 Where flood risk exists, equipment shelters shall be elevated such that all new equipment is installed no less than twenty-four (24) inches above the FEMA-predicted 100-Year flood elevation.

8.2.3 Each equipment shelter shall be mounted on a reinforced concrete pad and secured with anchoring systems designed to withstand Risk Category IV hurricane loading or 150-mph straight-line wind forces, whichever is greater.

8.2.4 For each proposed site, the Vendor shall provide a copy of the applicable FEMA Risk Report. Any site located within a FEMA-designated 100-Year Floodplain shall require elevation due to increased flood risk. Elevated shelters shall be supported on approved reinforced concrete piers or galvanized structural steel framework.

8.2.5 The finished height of the supporting piers or framework shall extend a minimum of four (4) feet above finished grade and shall otherwise comply with FEMA 100-Year floodplain elevation requirements plus an additional twenty-four (24) inch freeboard contingency margin.

8.2.6 Equipment shelters shall provide an interior environment suitable for sensitive electronic equipment. Shelters shall be as dustproof, watertight, and airtight, as reasonably possible to prevent the intrusion of debris, insects, rodents, and other animals.

8.3 Section 8 - Shelter Design Minimum Consideration

- 8.3.1 Equipment shelters shall be of a concrete floor, bullet-resistant, prefabricated concrete aggregate type designed to house radio communications, the standby power generator/transfer switch, and sensitive electronic equipment.
- 8.3.2 The shelter shall include a separate power generator equipment area. The generator shall be located inside the shelter.
- 8.3.3 Vendor shall provide detailed fabrication drawings for the concrete foundation (or steel frameworks), designed to adequately support the proposed building structures and wind loads.
- 8.3.4 Building, and foundation detail drawings and related calculations must be reviewed, approved and stamped by a State of Wisconsin licensed Professional Engineer (P.E.)

8.4 Shelter Exterior Requirements

- 8.4.1 The exterior wall finish shall be exposed aggregate concrete. Seeding of aggregate for an exposed aggregate finish is not acceptable.
- 8.4.2 Exterior concrete surfaces shall be sealed with a minimum of two coats of THOROGLAZE® H Concrete Sealer or equivalent.
- 8.4.3 Cement used in concrete shelters shall be standard Portland cement conforming to the requirements of the "Standard Specification of Portland Cement", ASTM Designation C150. Concrete aggregate shall conform to the requirements of the "Specifications for Concrete Aggregates" ASTM C33 and "Specifications for lightweight aggregates for structural concrete" ASTM C330.
- 8.4.4 Exterior walls must be bullet resistant as defined below. The term "bullet-resistant" is defined, for this RFP, as unable to be penetrated by a .30-06 or .308 commercial cartridge firing a lead tipped, 160-grain projectile, at not more than 2600 fps muzzle velocity. The projectile will be test-fired at a range of 100 yards. The structure/material must not be completely penetrated at that distance.
- 8.4.5 All exterior wall, floor and roof joints shall be sealed using a compressible, resilient sealant. There shall be no exposed roof-to-wall or wall-to-floor joints.

8.5 Shelter Roof Requirements

- 8.5.1 The roof shall be a flat, tapered type having a minimum slope of 1/2" per foot from the roof centerline.
- 8.5.2 The roof shall be designed to support a minimum of 100-lbs/sq. ft. distributed load.
- 8.5.3 A roof shield shall be provided and installed by the Vendor, above the equipment shelter and of sufficient size to adequately protect the shelter and personnel from falling materials via the nearby radio site's tower.
- 8.5.4 Fiberglass exterior awnings shall be provided to protect the door entrance(s) and air-conditioner units.
- 8.5.5 All hardware used on the exterior surfaces of this shelter shall be either hot-dipped galvanized or stainless steel. Wafer, MDF (Medium-Density Fiberboard), or particleboard wood products are not an acceptable construction material for this project.

8.5.6 Any metal components, attachment hardware, cross-braces and lifting eyes shall be hot-dip galvanized metal after fabrication.

8.5.7 Additionally, the building frame shall be mechanically bonded to the concrete/steel foundation. Strapping and anchor materials shall be hot-dipped galvanized protected.

8.6 Shelter Interior Requirements

8.6.1 The shelter's interior floor shall be covered with 1/8" x 12" x 12" industrial weight solid vinyl floor tile. Floor color shall be light beige.

8.6.2 The subfloor shall be designed to support a minimum of 200 lbs. / sq. ft. distributed floor load, while on foundation, or as needed to support proposed equipment. Consideration should be given to the area(s) for the proposed 48VDC battery plant weight load.

8.6.3 The energy efficiency of the shelter shall conform to the IECC 2021 code for commercial energy efficiency.

8.6.4 Interior wall surfaces shall be faced with white vinyl/coated wood paneling.

8.6.5 The interior ceiling surface shall be white, vinyl coated plywood. Seams in the plywood shall be trimmed with batten strips painted to match the ceiling.

8.6.6 Building openings for the door, air-conditioners, transmission line entrance and other entries shall be framed and sealed in such a manner that moisture cannot penetrate the insulation within the walls or the interior walls of the structure.

8.6.7 Each door measuring 36"W x 84"H x 3" made of thick insulated bullet-resistant steel, and equipped with a three-point latch, shall be provided. All door hardware shall be stainless steel and incorporate three external hinges having non-removable hinge pins. Door shall open outward to maximize internal building utilization.

8.7 Shelter Electrical Requirements

8.7.1 Each shelter shall be equipped with overhead cable trays located above all planned equipment rack groupings.

8.7.2 Auxiliary cable trays shall be provided to support transmission lines and telecommunications cables, as necessary.

8.7.3 All cable tray joints shall be electrically bonded using No. 6 AWG copper wire jumpers with approved compression fittings.

8.7.4 Trays shall be bonded to the interior ground halo.

8.7.5 Individual, properly grounded with home run grounds, 120VAC, 20A electrical circuits shall be provided to each of the equipment racks/cabinets.

8.7.6 Each shall be terminated as a single, duplex outlet mounted on the cable tray directly above the center of each planned equipment rack.

8.7.7 Individual, properly grounded with home run grounds, 240VAC, 30A electrical circuits shall be provided for each battery charger unit.

8.7.8 Sufficient flexible conduit shall be provided above the rack to permit interconnection to chargers located at the bottom of the rack.

8.7.9 DC wiring for the radio network's battery plant and interconnection to the various equipment groupings shall be furnished and installed, as required.

- 8.7.10 DC wiring for the radio network's battery plant and interconnection to the various equipment groupings shall be furnished and installed, as required.
- 8.7.11 Install eight (8), properly grounded with home run grounds, quad 120VAC convenience outlets, two each on the two longest walls and one each on each of the remaining walls.
- 8.7.12 Twelve (12) 120VAC ceiling mounted outlet boxes shall be provided, each with one (1) duplex receptacle and home run ground. These receptacles should be spaced according to areas of located 120VAC equipment or future expansion space areas.
- 8.7.13 The Vendor shall furnish and install one circuit breaker panel board. Panel board shall be sized for all the indicated branch circuits, equipment loads plus a fifty percent growth factor.
- 8.8 Electrical/Transient Grounding System**
- 8.8.1 The Vendor shall furnish and install an interior and buried exterior electrical grounding system and power surge protection for each location, as follows:
- 8.8.2 A single #2AWG copper conductor ground halo shall be installed on all four interior walls, spaced approximately six inches below ceiling level. The halo shall include a twelve-inch gap/break at the furthest point from the single-point ground attachment, which shall coincide with the RF transmission line entrance.
- 8.8.3 Ground halo shall be mounted on six-inch standoffs, located on twelve-inch centers. It shall be affixed to the transmission line ground entry-port buss bar.
- 8.8.4 This ground entry-port buss bar must be equipped with an Alarm, connected to the network's alarming system, to indicate ground failure, tamper, or theft.
- 8.8.5 All equipment cabinets, racks, transmission line entrance and cable trays shall be individually bonded to the halo using #6AWG copper conductors with approved compression fittings.
- 8.8.6 Interior halo shall be bonded to an exterior, buried ground network using low impedance copper conductors.
- 8.8.7 Electrical transient protectors shall utilize MOV and avalanche clamp devices such as the Transector Systems Model 1101-808 series or equivalent. This device shall be installed on the commercial power feed as well as the standby generator feed to the power transfer switch.
- 8.8.8 A single, stranded #00AWG copper exterior ground system shall be installed about the building and tower perimeter, located below the frost line, as identified locally, and exothermically bonded to the building frame, interior halo, transmission line ladder, generator system, ice shields, and radio tower legs. All site grounding practices and methods shall meet a recognized telecommunications standard such as IEEE, Motorola R56 or the current revision of Harris AE/LZT 123 46181/1.
- 8.9 Shelter Lighting Requirements**
- 8.9.1 Lighting shall be installed per NFPA 70 (NEC 110.26(D)) and IES RP-1 / RP-29; with a minimum 20 foot-candle illumination throughout the shelter.

- 8.9.2 Lighting shall be installed in a manner to allow adequate lighting to the front and rear of all equipment and for service support personnel
- 8.9.3 Install emergency exit and interior lighting as required by fire code.
- 8.9.4 Exterior lights above the door(s) and area lights on each of the exterior shelter corners shall be controlled by, at a maximum, two light switches located just inside the main door opening on the side away from the hinges at shoulder height.
- 8.9.5 No LED lights are permitted without prior pre-approval by the Customer. Any LED lighting proposed should also come with documentation that demonstrates testing has occurred that will not cause any interference with the current or proposed equipment.
- 8.10 HVAC Requirements**
- 8.10.1 The Vendor shall furnish and install a heating, cooling, and dehumidifying system based on NFPA 75 (2024), Section 8.2.1.1:
“Temperature and humidity shall be maintained within the limits specified by the information technology equipment manufacturer.”
Annex A.8.2.1.1 (Informational Note):
Typical recommended conditions are 18°C–27°C (64°F–80°F) and 40%–60% relative humidity, consistent with ASHRAE TC 9.9 recommendations.
- 8.10.2 The Vendor shall furnish and install a dual, wall-mounted heating and air-conditioning system appropriately sized for each shelter/equipment heat load.
HVAC and equipment mounting must be done in the effort to prevent any hot spots in the shelter due to equipment blocking the HVAC system.
- 8.10.3 Each HVAC unit shall incorporate circuitry to ensure that both compressors do not attempt to restart at the same time.
- 8.10.4 HVAC configuration must include timer circuits to rotate use of the air conditioner units on a weekly basis.
- 8.10.5 The HVAC configuration shall include appropriate sensors to cause both air conditioners to run simultaneously as needed to more rapidly reduce the internal temperature to a safe operating level.
- 8.10.6 Equipment shall be furnished with compressor anti-cycle circuitry to prevent short-cycle starts against high compressor head pressure.
- 8.10.7 Design of HVAC system shall take into consideration the following environmental conditions:
 - 8.10.7.1 Desired Interior Temperature Range: 18°C–27°C (64°F–80°F)
 - 8.10.7.2 Desired Interior Relative Humidity Range: 40%–60%
 - 8.10.7.3 Maximum Outdoor Temperature: 105 degrees F
 - 8.10.7.4 Minimum Outdoor Temperature: 0 degrees F
 - 8.10.7.5 Transmitter Power Dissipation: 8,000 watts (24 RF Channels)
 - 8.10.7.6 System Controller: 850 watts
 - 8.10.7.7 Battery Charger/Inverter: 2,000 watts
 - 8.10.7.8 Lighting: 750 watts (intermittent)

8.10.8 Buildings shall incorporate a thermostatically controlled fan system designed to operate in the event of a total HVAC failure and where the building's interior temperature exceeds 90°F.

8.10.9 This system shall incorporate appropriate dampers, screens and filters to limit dust and insect entry into the building.

8.11 Shelter Alarm Systems

8.11.1 The Vendor shall furnish and install an over/under temperature sensor, continuously adjustable over the range of 32°F to 120°F, having independent Form-C output contacts suitable for high/ low temperature alarm activation.

8.11.2 The Vendor shall furnish and install a door entry alarm sensor, magnetic type, having a Form-C contact closure output.

8.11.3 The Vendor shall furnish and install single-loop smoke/ fire alarm system.

8.11.4 Smoke/fire alarm sensors shall be mounted above battery charger equipment, in the generator room, and in vicinity of AC power distribution panel board.

8.11.5 Smoke/fire alarm panel shall have visual indicators depicting individual alarm sensor status.

8.11.6 Smoke/fire alarm panel shall operate from both 120VAC and 12VDC battery power sources.

8.11.7 The Customer's Fire Marshal or code enforcement personnel will inspect the proposed fire alarm system.

8.11.8 All shelters shall be equipped with an inert gas fire suppression system that is environmentally approved and not injurious to communications personnel. The system shall be connected to the shelter fire/ smoke system alarms. Trigger of the system causing a gas discharge shall cause the air conditioners to automatically shut off.

8.11.9 The air conditioner units must be manually restarted to purge the shelter of the gas, after all evidence of combustion is resolved. All necessary plumbing and overhead dispersal equipment shall be provided. The system shall have modes for test and maintenance that do not trigger activation. The system shall be installed and delivered with a primary tank, online and a spare, full tank, offline.

8.12 Physical Security

8.12.1 The Vendor shall propose a comprehensive set of physical and cybersecurity safeguards to protect the integrity of the new system. The physical portion of the furnished communications network shall include:

8.12.1.1 Video surveillance of fixed remote infrastructure sites. Storage of the video surveillance footage shall be stored internal to the cameras for a minimum of 90 days.

8.12.1.2 A mechanical keylock set and a keycard system shall be supplied for each of the remote tower site facilities.

8.12.1.3 The vendor should provide as an option a standalone keypad system for access to the proposed shelters.

9 Section 9 - Dual Fuel Generator Equipment Requirements

- 9.1 A standby dual-fuel power generator system that operates on LPG and Natural Gas, shall be furnished by the Contractor for each infrastructure site. For its proposed infrastructure sites, the Vendor shall include:
- 9.2 The necessary labor and materials, as required, to furnish and install LPG fuel tanks, automatic transfer switches, manual-operated auxiliary generator connector facilities, alarm functionality and electrical wiring services to provide fully operational standby power systems.
- 9.3 A dual-Fuel generator housed inside the provided equipment shelter, in accordance with the manufacturer's specifications for shock and vibration mounting, ventilation, fuel supply and electrical connections.
- 9.4 The radiator air inlet shall incorporate a baffle to protect the radiator core from exterior wind-blown debris damage.
- 9.5 It shall be the responsibility of the Contractor to provide, install and test a complete and operable standby power generator with automatic transfer switch.
- 9.6 Equipment shall be new, factory tested at 0.8 power factor for 3-hours and shall be installed within the required equipment shelters, in accordance with local area building and electrical codes.
- 9.7 The following documentation shall be supplied by the Contractor for the generator set and transfer switch supplied:
 - 9.7.1 Specification and data sheets for the exact type and model generator and transfer switch supplied pursuant to this procurement, including all options and accessories included.
 - 9.7.2 Manufacturer's certification of prototype testing.
 - 9.7.3 Manufacturer's warranty documents.
 - 9.7.4 Shop drawings showing plan and elevation views of the equipment.
 - 9.7.5 Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
 - 9.7.6 Manufacturer's installation instructions.
 - 9.7.7 Operator's and maintenance manuals that outline routine maintenance and troubleshooting procedures.
 - 9.7.8 Transfer switch manual and wiring diagram.
- 9.8 Start-Up Service shall be included with the following requirements:
 - 9.8.1 A factory authorized service representative shall provide initial start-up service and shall conduct on site acceptance testing.
 - 9.8.2 The representative must remain until site acceptance is completed, as witnessed by the Customer.
 - 9.8.3 Load test records for the installed generator system shall be furnished to The Customer.
- 9.9 The following type of engine configuration will be used:
 - 9.9.1 The generator package shall include a dual-fuel configured engine that can run on LPG and Natural Gas, coupled with low reactance, brushless 120/240vac single-phase, 60Hz

- 9.10 generator.
- 9.10.1 The generator package shall be equipped with:
 - 9.10.1.1 A temperature compensated automatic voltage regulator;
 - 9.10.1.2 Under/over-speed protection function;
 - 9.10.1.3 A control panel;
 - 9.10.1.4 Engine block heater;
 - 9.10.1.5 High ambient-temperature cooling system.
- 9.10.2 Output power rating of the generator shall be sized for the full calculated load of the affiliated site, inclusive of a 50% excess load factor.
- 9.10.3 In no instance shall the proposed generator be configured for less than 45KW output.
- 9.10.4 The generator shall also be capable of continuous 24-hour operation, full single-phase output at 1.0 pf.
- 9.11 The following specifications shall also apply:**
 - 9.11.1 Voltage Regulation: Maintained with +/- 2% of rated voltage for constant load between no load and full load.
 - 9.11.2 Frequency Regulation: Maintained within 0.5% from steady state no load to steady state rated load.
 - 9.11.3 Single-Step Load Pickup: 100% of rated output power, less applicable derating factors, with the engine generator at operating temperature.
- 9.12 The generator shall have the following Set Controls:**
 - 9.12.1 The generator shall be a remote-start type compatible with the automatic transfer switch to be supplied pursuant to this procurement.
 - 9.12.2 Manual starting and stopping shall be provided from the control panel.
 - 9.12.3 Cranking control: Shall provide a minimum of three cranking cycles of at least 15-seconds before lockout and activation of an over-crank alarm condition.
- 9.13 The generator shall automatically shut down and lock out upon:**
 - 9.13.1 Failure to start (over-crank)
 - 9.13.2 Over speed
 - 9.13.3 Low lubricating oil pressure
 - 9.13.4 High engine temperature
 - 9.13.5 Low Coolant level
 - 9.13.6 Other factors that may be harmful to the generator
- 9.14 Alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre-warning, high coolant temperature pre-warning, low coolant temperature, low fuel and an alarm indication when the generator set is running.**
 - 9.14.1 These alarm contacts shall be wired into, and shall be reported by, the radio network alarm system.
 - 9.14.2 Meters shall be provided and located both at the generator and within the equipment shelter, to indicate output voltage, output current, running time, and frequency/RPM.

- 9.14.3 An AC rheostat (or electronic equivalent) shall be supplied for fine tuning of the generator's output voltage.
- 9.14.4 These devices shall be mounted either on the transfer switch door or a separate, remote panel.
Each generator must have the capability to communicate to a central control software terminal, via the IP network, to allow for remote start and other diagnostic capabilities.
- 9.15 Each Natural Gas/LPG Generator shall have the following Fuel Supply requirements:**
- 9.15.1 The Contractor shall supply a new, corrosion-proof, 1,000-gallon LPG storage tank to be installed on a concrete or elevated steel foundation, as dependent upon site flood plain conditions.
- 9.15.2 The fuel tank shall provide sufficient fuel to provide six days of continuous operation of the generator set, at full load under low ambient temperature.
- 9.15.3 The fuel tank shall have a shield installed above to prevent debris from the nearby tower puncturing or damaging the tank shell.
- 9.15.4 The tank shall be refilled after the conclusion of radio network acceptance tests.
- 9.15.5 Fuel lines shall be buried below the frost line, as determined by the location. At any point at which the fuel line exits above grade, the line shall be insulated to reduce condensation at the regulator.
- 9.15.6 A low fuel level alarm shall be provided.
- 9.15.7 All fuel supply lines will be sized accordingly for the generator running at full load.
- 9.15.8 All necessary regulators, drip pots, piping, meters, or other supplies needed for installation that meets local fire and building codes shall be furnished and installed.
- 9.15.9 Contractor shall supply a full fuel tank at time of System Acceptance.
- 9.16 Generator shall be capable of being connected to a natural gas line with constant supply of natural gas rather than the supplied tank with the option to switch to the LPG tank if the natural gas supply is interrupted.**
- 9.17 A residential-grade exhaust silencer shall be installed on the generator.**
- 9.18 Battery and Charger specifications are as follows:**
- 9.18.1 A lead acid starting battery, rated for the engine type to be supplied, shall be furnished and installed with the generator package.
- 9.18.2 This battery shall be float charged by a 10-ampere, voltage-regulated charger which is powered by a protected 120VAC source.
- 9.18.3 Float, taper and equalize charge settings shall be provided.
- 9.18.4 Battery charger shall be physically located within the generator transfer switch enclosure.
- 9.18.5 Battery and charger must be able to operate in, as low as, 0 degrees F.
- 9.18.6 Form-C charging system alarm contacts shall be provided and connected to the network's alarm system to report loss of AC power, low battery voltage and excessively high battery charging current.
- 9.19 The following Cooling System components are required:**
- 9.19.1 A radiator-cooled engine is required.

- 9.19.2 The radiator shall be filled with a water/coolant mixture in accordance with the engine manufacturer's recommendations.
- 9.19.3 A thermostatically-controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations.
- 9.20 The Generator Base shall have the following characteristics:**
- 9.21 The generator set shall be mounted on a heavy-duty steel base which is anchored to a Contractor-furnished building foundation.**
- 9.22 The base shall maintain alignment between generator set components and shall include vibration isolators.**
- 9.23 The Generator Transfer Switch**
- 9.23.1 An automatic transfer switch which provides switching of the equipment shelter electrical load between commercial power and generator power shall be supplied and installed for each Vendor proposed standby generator.
- 9.23.2 Each transfer switch shall be completely factory assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources.
- 9.23.3 Permanently attached manual handles shall also be installed on the transfer switch.
- 9.23.4 The switch shall provide positive mechanical and electrical interlocking, and mechanically-held contacts.
- 9.23.5 Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.
- 9.23.6 Each transfer switch shall be installed in a key locking, UL listed, NEMA rack to be mounted on a wall within the radio equipment shelter.
- 9.23.7 The switch shall be fully wired and integrated with the engine generator set in accordance with local electrical and fire codes.
- 9.23.8 A manually-operated transfer switch, as well as appropriate power connectorization, shall be provided to allow the interconnection of an auxiliary, trailered generator set should the permanently-located generator fail in operation, utilizing an Appleton plug.
- 9.23.9 All transfer switches and accessories shall be U.L. listed and labeled, tested per U.L. Standard 1008 and CSA Approved.
- 9.23.10 Transfer switches shall be double-throw electrically and mechanically interlocked and mechanically-held in both positions.
- 9.23.11 Main switch contacts shall be high-pressure silver alloy.
- 9.23.12 Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent inter phase flashover.
- 9.23.13 Form-C contacts shall be provided in each main switch position for alarm reporting purposes.
- 9.23.14 These contacts shall be connected to the network's alarm system for reporting transfer status.
- 9.23.15 Each transfer switch shall be continuously rated for operation in ambient temperature

ranges of -30 to +105 degrees F.

- 9.23.16 Transfer switches shall be rated, minimally, to carry the generator's full rated output, inclusive of the 50% added capacity over calculated equipment loading.
- 9.23.17 The Line-In, Generator-In and Load side terminations for the automatic transfer switch shall be protected from lightning transients using a combination of Metal Oxide Varistor (MOV) and avalanche Zener diode technologies.
All alarm and instrumentation wiring from the generator, that enters the equipment shelter, must likewise include appropriate lightning surge protection in the form of solid-state, fast-acting voltage clamp devices whose clamping voltage is closely matched to normal individual-alarm signal amplitudes.
- 9.23.18 Transfer switch control shall be solid state and designed for a high level of immunity to power line surges and transients.
- 9.23.19 The device shall be tested in accordance with IEEE Standard 587-1980 (or latest revision).
- 9.23.20 Controls shall have optically isolated logic inputs, and isolation transformers for AC inputs.
- 9.23.21 Relays shall be installed on all outputs.
- 9.23.22 Solid state under voltage sensors shall simultaneously monitor all phases of the standby power source and the commercial power source.
- 9.23.23 Pick up and drop out voltage settings shall be adjustable.
- 9.23.24 Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase.
- 9.23.25 Controls shall be provided with solid state over voltage sensors, adjustable from 100-130% of nominal input voltage to monitor the source.
- 9.23.26 An adjustable time delay shall be provided.
- 9.23.27 Automatic controls shall signal the engine generator to start upon signal from normal source sensors.
- 9.23.28 A time delay start, variable from 0 to 5 seconds, shall be provided to avoid nuisance startups.
- 9.23.29 Battery voltage starting contacts shall be gold, dry type contacts which have been factory wired to a field wiring terminal block.
- 9.23.30 The switch shall transfer when the emergency source reaches the set point voltage and frequency.
- 9.23.31 A time delay shall be provided for transfer that shall be continuously variable from 0 to 120 seconds.
- 9.23.32 The switch shall retransfer the load to commercial power after a delay.
- 9.23.33 This time delay shall be variable (adjustable) from 0 to 30 minutes to avoid short engine run times.
- 9.23.34 The retransfer time delay shall be immediately bypassed if the emergency generator fails.
- 9.23.35 A control shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting upon return to commercial power.

- 9.23.36 Power for transfer operation shall be from the source to which the load is being transferred.
- 9.23.37 Diagnostic indicators shall be provided to allow the last successful step in the sequence of control functions to be pinpointed.
- 9.23.38 The present status of the control functions shall also be indicated.
- 9.23.39 These functions, at a minimum, shall include:
 - 9.23.39.1 Source 1 OK
 - 9.23.39.2 Start generator set
 - 9.23.39.3 Source 2 OK
 - 9.23.39.4 Transfer timing
 - 9.23.39.5 Transfer complete
 - 9.23.39.6 Retransfer timing
 - 9.23.39.7 Retransfer complete
 - 9.23.39.8 Timing for stop
- 9.23.40 A key-operated Front Panel selector switch shall be provided which will provide the following functions:
 - 9.23.40.1 Test to simulate commercial power loss to allow testing of the generator set with or without transfer of the load.
 - 9.23.40.2 Normal - leaves the transfer switch in its normal operating position.
 - 9.23.40.3 Retransfer a momentary position which will provide an override of the retransfer time delay and cause immediate return to the commercial power source (if available).
- 9.23.41 An Exerciser Clock setting shall be included which allows setting the day, time and duration of a generator set exercise/test period. Tests under load or with no load shall be selectable.

10 Section 10 - Tower Requirements

10.1 General Requirements

- 10.1.1 All vendors shall comply with the Customer tower ordinances and local codes in addition to the requirements listed in this RFP.
- 10.1.2 The basic standard for the design of newly required steel antenna towers, wave guide bridges and supporting structures, shall be ANSI/TIA-222-H.
- 10.1.3 New towers shall be triangular shaped, solid-rod structure having an overall height to be determined by the Vendor, based on the requirements of area coverage and availability of unobstructed microwave paths for site connectivity. Limits of available space in certain areas may dictate the use of self-supported towers.
- 10.1.4 All fabricated tower assemblies and parts shall be hot-dipped galvanized after fabrication per ASTM Standard A123. Hardware shall be galvanized per ASTM Standard A153 and B695. Other types of zinc coating or plating are not acceptable.
- 10.1.5 All antennas, tower top amplifier (TTA), and transmission lines specified by the licensed frequencies and Contractor's system design shall be furnished and installed by the Contractor.

10.2 Environmental and Climate

- 10.2.1 All tower structures shall be designed in accordance with the most current edition of ANSI/TIA-222 and classified as Risk Category IV. The tower shall be capable of withstanding the greater of 150 mph straight-line wind speed or the site-specific ultimate design wind speed (Vult) as defined by the most current edition of ASCE 7 wind speed maps. Where published site wind speeds exceed 150 mph, the higher value shall govern. Wind loading calculations shall include all antennas, transmission lines, mounts, platforms, and appurtenances at full projected capacity.
- 10.2.2 The tower shall also be designed to meet applicable ice loading criteria as defined in ANSI/TIA-222 and ASCE 7 for the geographic location. Ice thickness assumptions, concurrent wind with ice conditions, and exposure category shall be clearly identified in the structural analysis. All wind and ice loading calculations shall be prepared and sealed by a Professional Engineer licensed in the state of installation.
- 10.2.3 For existing towers proposed for reuse, the Vendor shall perform a complete structural analysis to verify compliance with the wind and ice loading requirements specified herein. The analysis shall evaluate the existing structure, all currently mounted equipment, and all proposed additional loading. Any identified deficiencies shall be corrected through engineered modifications or reinforcement necessary to achieve full compliance. All structural analyses and associated reinforcement designs shall be prepared and sealed by a Professional Engineer licensed in the state of installation.

10.3 Tower Climbing and Safety

- 10.3.1 Towers shall be equipped with an outside climbing ladder/cable type safety devices and LED lighted in accordance with FAA and current OSHA regulation 29 CFR 1910.27.

- 10.3.1.1 This device shall not interfere with the ease of climbing from one rung of the ladder to the next.
- 10.3.1.2 There must be at least two sources of climbing safety belts compatible with the safety climb anti-fall system, as supplied with the tower.
- 10.3.1.3 All tower climbing and elevated work associated with installation, modification, inspection, or maintenance shall be performed by a properly licensed and fully insured tower crew. The Vendor shall ensure all personnel are trained and certified in accordance with applicable OSHA requirements and industry best practices for tower safety. Proof of current licensing, insurance coverage, and worker training certifications shall be provided upon request.

10.4 Tower Loading

- 10.4.1 Antenna loads shall be as determined by Vendor; however, the design shall include a minimum 30% growth factor in the top 1/3 of the tower, inclusive of microwave antennas. Vendors are encouraged to investigate local tower code information and respond accordingly.
- 10.4.2 Towers shall be supplied with a full-length transmission line ladder(s) designed to accept transmission lines needed for the proposed design plus a 30% growth factor.

10.5 Tower Lighting

- 10.5.1 Tower lighting shall conform to FAA Advisory Circular AC 70/7460-1M, or current revision, Obstruction Marking and Lighting. VHF, UHF and 800 MHz radio equipment may be operational/co-located at the various trunked radio sites. Therefore, it is imperative that only shielded, RFI-conditioned lighting devices be provided.
- 10.5.2 The Vendor shall provide detailed tower lighting equipment specification literature in its response sufficient in scope where The Customer can determine the suitability of the proposed lighting system with respect to planned or anticipated radio operations.
- 10.5.3 The Contractor shall install tower lighting controls in a temporary fixture adjacent to the tower, operated by a photo control, and provide a Form-C contact wired into the alarm panel. (Note: This controller device is to be relocated within the site equipment shelter once fully constructed. Please allow sufficient lighting control cable slack to allow for re-installation inside the equipment shelter.

10.6 Tower Electrical and Grounding

- 10.6.1 A site's Electrical Grounding System shall be furnished and installed by the Contractor in accordance with the following minimum practices:
 - 10.6.1.1 Install a ground ring around the base of the tower, consisting of 10'x 5/8" ground rods driven to a depth necessary to meet the required resistance measurement of the specifications, adjacent to the foundation of the tower at each leg.
 - 10.6.1.2 Ground rods shall be interconnected by a minimum #00AWG stranded copper wire, which is to be exothermically welded to the top of each ground rod.
 - 10.6.1.3 Copper wire and ground rods shall be installed in a trench below the local frost line.
 - 10.6.1.4 Maximum spacing between rods shall not exceed twice the length of the ground rod.

- 10.6.1.5 Each tower leg shall be bonded to the ground ring using #00 AWG stranded tinned copper cable, which has been exothermically welded to a flat, 4-inch square solid steel tab located near the base of each tower leg.
- 10.6.1.6 Each cable lead will run to the closest ground rod through an insulated sleeve to minimize wire damage.
- 10.6.1.7 The upper end of the sleeve should be sealed with a non-shrinking compound such as RTV to prevent water from collecting within the sleeve.
- 10.6.1.8 The Contractor shall avoid making any acute bends as the ground wire transitions from the foundation.
- 10.6.1.9 Bends should be a minimum of 9-inches in radius.
- 10.6.1.10 To complete the exothermic welding process, attachment area on the tower tab shall be cleaned and coated with a cold galvanizing compound.
- 10.6.1.11 The ground bar must be tamper and theft resistant. The wire lead must be sleeved so that it is protected from physical damage.
- 10.6.1.12 Like above, the upper end of the sleeve shall be sealed with a non-shrinking compound like RTV to prevent water from entering and collecting within the sleeve.
- 10.6.1.13 This ground wire lead shall be installed at the time the tower ground ring is installed.
- 10.6.1.14 The ground rod/ring system shall extend around the perimeter of the equipment shelter, transmission line copper entrance port into the shelter and to the perimeter fence.
- 10.6.1.15 Ground system ring around the tower base shall be located a minimum of 36 inches away from the tower foundation.
- 10.6.1.16 The tower ground system ring shall be connected to the equipment shelter ground ring in at least two places, on the closest corners of the shelter ring.
- 10.6.1.17 The Contractor shall electrically bond all transmission line outer shields to the structure at the top of the tower immediately below the antenna and at the line midpoint if the tower's height is over 200-feet.
- 10.6.1.18 Likewise, bond all transmission line shields near the bottom segment of the tower, approximately one-foot above the bend made to enter the waveguide-bridge and again at the shelter's antenna entry port/panel.
- 10.6.1.19 Use only transmission line grounding kits approved by the manufacturer for use on the type and diameter of transmission lines provided. All installed grounding kits shall be weather sealed.
- 10.6.1.20 Fencing shall be grounded to the ground ring via #2 AWG solid copper wires, bonded via exothermic welding at each fence post.
- 10.6.1.21 Exothermic welds shall be cleaned and protected with a minimum two coats of cold galvanize material. Gates shall utilize braided, flexible straps.
- 10.6.1.22 The shelter's interior halo ground and transmission line copper inside entrance port (buss bar) shall exothermically bond to the outdoor ground.
- 10.6.1.23 A ground test well shall be provided at a minimum of two locations along the ground loop.

- 10.6.1.24 One test well shall be located adjacent to the tower and the other at the far side of the equipment shelter loop.
- 10.6.1.25 Each test well shall consist of a minimum 6-inch diameter PVC material that extends down to the depth of two feet and shall allow the attachment of a test wire to measure ground resistance.
- 10.6.1.26 A screw on or drop on cover that is easily removable to allow testing shall be provided.
- 10.6.1.27 Grounding system resistance shall be measured to be 3-ohms or less between any point on the ground system and earth ground.
- 10.6.1.28 Measurement shall be done with a 4-point ground resistance tester and not by a clamp on resistance tester.

10.7 Guy Wires

- 10.7.1 Galvanized guy strand shall conform to the minimum requirements of ASTM Standard A475 Extra High Strength (EHS) or equivalent recognized standard.
- 10.7.2 Preformed guy grips and dead-ends shall be designed specifically for the length, size and type of cable being used. This shall include the size, number, and lay of the wires and electrochemical compatibility of the material.
- 10.7.3 An adequate bend radius shall be provided, as per the manufacturer's recommendations, at the inside of cable attachments consisting of a thimble.
- 10.7.4 Shackles used to connect guy assemblies shall be forged from AISI grade 1035 or 1045 steel or equivalent and suitably heat-treated (quenched and tempered, normalized or annealed).
- 10.7.5 Turnbuckle devices shall be installed at the anchor end of the guy assembly for adjusting the guy tension. In initial installations, the minimum take-up adjustment available after the structure is plumb and the guy tensions are set shall be 6 inches for guys with normal diameter of 0.5-inches and 10-inches for guys with normal diameter greater than 0.5 inches.
- 10.7.6 All guy wires shall be bonded to ground rods using, minimally, a #2AWG solid, tinned copper wire. Bonding shall include use of guy wire grounding clamps that are tin-plated bronze (or similar type material) to prevent electrolysis. Grounding attachment clamps shall be installed above the guy wire turnbuckle.
- 10.7.7 Guy wire anchor plates are to be grounded using, minimally, a #2AWG solid, tinned copper wire that is exothermically welded to the anchor plate. Welds shall be cleaned and treated with cold galvanized coatings to prevent rusting.
- 10.7.8 All guy wires shall include ice clips ahead of the preforms. Turnbuckle safety cables must use a "Figure 8" configuration.

- 10.7.9 The Contractor shall furnish wind-load stress, geotechnical reports and foundation calculations used in the design of the proposed tower structure. Existing towers shall be evaluated for structural, electrical grounding and foundation stability, inclusive of identification/resolution of corrosion within tubular members and the suitability to support additional antenna loads as necessary to accommodate the newly added Contractor-furnished equipment.
- 10.7.10 The Contractor shall furnish documentation approved by a registered professional engineer, licensed in the State of Wisconsin certifying that the proposed new tower(s) and foundation(s), as well as required modifications to be made to existing towers, meet the requirements of EIA/TIA-222-H.
- 10.7.11 Prior to initial design review, Contractor shall perform soil pH value testing at all proposed new tower sites.
- 10.7.12 The Contractor shall furnish written certification that all installed tower components on both new and existing towers have been properly constructed and hot-dipped galvanized.
- 10.7.13 The Vendor shall furnish documentation as to any special condition or restriction applied to the use of materials, products or equipment contained in their response.
- 10.7.14 Contractor shall provide to The Customer, a minimum of two sets of completed “as-built” on each tower and shelter installed or modified in this project. In the case of new structures, this shall include engineering and design documentation from the tower and shelter manufacturer.

Installed structural members or welded structural assemblies, except for standard hardware, shall have a part number. The part numbers shall correspond with the Contractor’s assembly drawings. Part numbers are to be permanently attached (stamped, welded lettering, and/or stamped on a plate that is welded to the member, etc.) to the member before all protective coatings are applied. Attached/affixed part numbers shall have a minimum character height of 0.50 inches.
- 10.7.15 The Contractor shall provide a detailed report of electrical ground resistance measurements of the completed, as-installed, electrical grounding system, on a per-site basis with field drawings to indicate the measurement at a specific location.
- 10.8 Identified Candidate Sites for New Towers**
- 10.8.1 Customer owned land not specifically listed may be considered for new site placement.
- 10.8.1.1 The Customer has identified candidate tower sites from customer owned land that may be used for new tower sites proposed by the Vendor. This list is located in Appendix E: Tower Candidate Sites List.
- 10.8.2 Existing partnership Towers may be considered for co-location site placement.
- 10.8.2.1 The Customer has identified candidate tower sites made available through partnerships that may be used for new tower sites proposed by the Vendor. This list is located in Appendix E: Tower Candidate Sites List.
- 10.8.2.2 If a partnership site not included in the Appendix C: Tower Candidate Sites List is

proposed, the Vendor shall submit a letter from the tower owner listed the conditions of use.

11 Section 11 - Site Work Requirements

11.1 Environmental and Hazard Risk Considerations

11.1.1 Vendors shall use the Americal Society of Civil Engineers (ASCE) Hazard Tool to develop specifications for all relevant items in this section for the latest ASCE/SEI standard at risk category IV with a default soil class. A full report from the online hazard tool shall be included for each proposed site.

11.2 Site Preparation and Sub-grading

11.2.1 Site clearing, initial earthwork, rough grading, and final grading as needed for installation of towers and equipment shelters is the Contractor's responsibility. The following describes a set of minimum requirements for the execution and completion of site-related construction activities.

11.2.2 Dewatering of the Site

11.2.2.1 Control grading around excavations to prevent surface water from flowing into excavation areas.

11.2.2.2 Drain or pump as required, thereby maintaining all excavations, trenches, and pier holes free of water from any source and discharge to approved drains or channels. Commence dewatering action when water first appears and continue until work is complete to the extent that no damage will result from hydrostatic pressure, flotation, or other causes.

11.2.2.3 Use pumps of adequate capacity to ensure rapid drainage of area, and construct and use drainage channels and sub-drains with sumps, as required.

11.2.2.4 Remove unsuitable excessively wet sub-grade materials and replace with approved backfill material.

11.2.3 Soil Compaction

11.2.3.1 Compact sub-grades, fills, embankments and backfills using spreading equipment, tamping rollers, rubber-tired rollers, vibratory compactors, or power tampers, as required to obtain reasonable uniformity. Nuclear soil testing results are required to be provided in a report to the Consultant.

11.2.3.2 Perform within moisture content range as specified to obtain required results with equipment used.

11.2.3.3 Achieve minimum densities specified as references to:

11.2.3.3.1 Cohesive soils - 95 percent maximum density at optimum moisture, AASHTO T99.

11.2.3.3.2 Cohesionless Soils – 70 percent of maximum relative density. 11.2.3.3.2.1 ASTM, STP 479 Bunnister method.

11.2.3.3.2.2 USBR - E12 relative density. 11.2.3.3.2.3 Relative density, ASTM D2049

11.3 Drilled Pier Foundations

11.3.1 Extent of Work: Perform all drilling and excavation and supply all labor and materials to construct drilled pier foundations, as necessary.

11.4 Performance

- 11.4.1 Quality Assurance will be met with a field inspection of The Customer's quality control designee.
- 11.4.2 The Customer's Project Representative will be designated to be responsible for field inspection of the drilled pier foundations. The representative will transmit, in writing, to the consultant and contractor any materials or methods observed that do not conform to this specification and, if required, will not be considered for payment. The Customer's Project Representative must inspect each drilled pier.
- 11.4.3 Specific responsibilities of The Customer's Project Representative will be:
 - 11.4.3.1 Observe drilling excavation of drilled pier foundations. Ensure the placement of anti-caving physical barriers or the use of special drilling mud to prevent excessive cavitation.
 - 11.4.3.2 Inspect bearing elevation of drilled piers.
 - 11.4.3.3 Observe placement of concrete and rebar within the drilled pier foundation to match design specification. Ensure that no excessive earth contamination occurs. Contamination of poured concrete is sufficient to cancel the pour and request engineering inspection.
 - 11.4.3.4 The Customer's representative shall photograph or film all foundation excavation and pouring activities Contractor's Qualifications.
- 11.4.4 The Contractor's qualifications must be minimum of two-year's experience in drilled pier construction, including experience with similar subsurface material, water conditions, shaft sizes, and special techniques as required.
- 11.4.5 Drilled Pier Details
 - 11.4.5.1 Drilled pier shaft dimensions and top elevations shall be in accordance with foundation design calculations and drawings.
 - 11.4.5.2 The drilled pier shaft bearing, or bottom elevation shall be at the elevation indicated, unless it is determined by The Customer that the bearing elevation should be adjusted.
 - 11.4.5.3 The excavate pier shaft shall be drilled to required dimensions and elevations as indicated. Sidewall stability will be maintained during drilling and extend excavation to suitable material.
 - 11.4.5.4 Inspection of each pier will be by The Customer's Project Representative and Contractor to determine suitability of supporting material for drilled piers.
 - 11.4.5.5 Remove from bottom of drilled piers, loose material or free water in quantities sufficient to cause settlement or affect concrete strength as determined by The Customer.
 - 11.4.5.6 Install temporary casing, where required, to prevent caving of drilled pier sides or excessive seepage.
 - 11.4.5.7 Dewater all drilled pier excavations prior to cleaning, inspection, and placing concrete.
 - 11.4.5.8 Each drilled pier must be inspected and approved by The Customer's Project Representative before any concrete may be placed.
 - 11.4.5.9 Dispose of any excavated material at locations approved for that purpose.
- 11.4.6 Reinforcing Steel
 - 11.4.6.1 Place reinforcement for drilled piers in accordance with foundation design documents.

- 11.4.6.2 Place bars as shown on foundation drawings with concrete cover of not less than 3-inches where exposed to soil.
 - 11.4.6.3 A reinforcing cage shall be designed as a structural element and braced to retain its configuration throughout the placing of concrete and the extraction of the casing (if used) from the shaft.
 - 11.4.6.4 Dewater drilled piers and maintain the excavation free of water prior to placing concrete.
 - 11.4.6.5 Place concrete immediately after final inspection.
 - 11.4.6.6 Place concrete immediately after completion of excavation and after The Customer's Project Representative has completed his inspection. Do not leave uncased excavations open overnight.
 - 11.4.6.7 Free fall concrete (not over 6 feet) may be used provided it is directed through a hopper, or equivalent; such that fall is vertical down center of shaft without hitting sides. Vibrate concrete only after casing, if used, has been pulled.
 - 11.4.6.8 Place concrete in pier in one continuous pour operation from bottom to top.
 - 11.4.6.9 The Customer's Project Representative will provide inspection during the removal of casing and placing of concrete. Withdraw casing, if used, only as shaft is filled with concrete. Always maintain an adequate head of concrete to balance outside soil and water pressure above the bottom of the casing during withdrawal. Specific procedures that the Contractor will follow to accomplish this objective shall be submitted for approval.
 - 11.4.6.10 Where the casing is removed, provide specifically designed concrete with a minimum slump of 5-inches and with a retarder to prevent arching of concrete (during casing pulling) or setting concrete until after casing is pulled. Check concrete level prior to, during, and after pulling casing. Pull casing before slump decreases below 5-inches as determined by testing.
 - 11.4.6.11 During casing extraction, upward movement of the reinforcing steel shall not be permitted. Downward movement should not exceed 2-inches per shaft length.
 - 11.4.6.12 Remove all water and concrete contaminated with soil, or water before resuming concrete placement.
 - 11.4.6.13 Center reinforcing cages in the drilled pier excavation and suspend them in an approved manner prior to placement of concrete to the cutoff elevation.
 - 11.4.6.14 Leave forms on pier for a period of three days.
 - 11.4.6.15 Set anchor bolts to the manufacturer's required tolerances, using substantial templates or other approved method.
- 11.5 Concrete, Forms and Reinforcement**
- 11.5.1 This RFP includes concrete, forms, and steel reinforcement. This includes drilled pier foundations with square caps for steel structures, concrete pads for transformers and breakers, equipment shelter and tower foundations, and cable trenches.
 - 11.5.2 Quality Assurance and Applicable Standards
 - 11.5.2.1 American Concrete Institute (ACI)

- 11.5.2.1.1 ACI 304 - Recommend Practice for Measuring, Mixing, and Placing Concrete.
- 11.5.2.1.2 ACI 305 - Committee Report on Hot-Weather Concreting.
- 11.5.2.1.3 ACI 306 - Committee Report on Cold-Weather Concreting.
- 11.5.2.1.4 ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.
- 11.5.2.1.5 ACI 318 - Building Code Requirements for Reinforced Concrete.
- 11.5.2.2 American National Standards Institute (ANSI)
 - 11.5.2.2.1 B 1 8.2.1 - Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Screws, and Lag Screws.
 - 11.5.2.2.2 B 1 8.2.2 - Square and Hex nuts.
- 11.5.2.3 American Society for Testing and Materials (ASTM)
 - 11.5.2.3.1 A36 - Structural Steel.
 - 11.5.2.3.2 A82 - Cold-Drawn Wire.
 - 11.5.2.3.3 A1 85 - Welded Steel Wire Fabric for Concrete Reinforcement.
A307 - Low-Carbon Steel Externally and Internally Threaded Standard Fasteners.
 - 11.5.2.3.4 A615 - Deformed Billet Steel Bars for Concrete Reinforcement.
 - 11.5.2.3.5 C31 - Making and Curing Concrete Compression and Flexure Test Specimens in the Field.
 - 11.5.2.3.6 C33 - Concrete Aggregates.
 - 11.5.2.3.7 C39 - Compressive Strength of Cylindrical Concrete Specimens.
 - 11.5.2.3.8 C94 - Ready-Mixed Concrete.
 - 11.5.2.3.9 C 143 - Slump of Portland Cement Concrete. 11.4.2.3.11 C 150 - Portland Cement.
 - 11.4.2.3.12 C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- 11.5.2.4 Midwest Concrete Industry Board (MCIB)
- 11.5.3 Equipment and Materials
 - 11.5.3.1 Concrete Materials
 - 11.5.3.1.1 Cement must conform to ASTM C 150. Portland cement Type 1.
 - 11.5.3.1.2 Water shall be clean and free from injurious amounts of oil, acids, alkaline, or other deleterious substances. Any potable drinking water will be acceptable.
 - 11.5.3.1.3 Fine Aggregates such as Clean natural sand. Manufactured sand may be used upon written approval of The Customer's designee. They shall Conform to ASTM C33.
 - 11.5.3.1.4 Coarse aggregates such as Clean crushed stone or processed gravel, not containing organic materials shall conform to ASTM C33.
 - 11.5.3.1.5 4-6 percent air shall be used in all concrete.
 - 11.5.3.1.6 Water reducing admixture shall conform to ASTM C494, Type A.
 - 11.5.3.2 Concrete Mix
 - 11.5.3.2.1 Ready-mixed Concrete shall meet requirements of ASTM C94, and of materials and proportions specified.
 - 11.5.3.2.2 Ready-mixed concrete plant shall be subject to approval of The Customer's Project Representative.
 - 11.5.3.3 Form materials
 - 11.5.3.3.1 Exterior grade plywood minimum 5/8 inch thick.
 - 11.5.3.3.2 Approved wood fiberboard.

- 11.5.3.3.3 Dressed lumber, free of loose knots.
- 11.5.3.3.4 Form tires shall be approved break-back type.
- 11.5.3.4 Steel Reinforcement
 - 11.5.3.4.1 Reinforcement bars shall conform to ASTM A615, Grade 60 for all bars No. 4 or larger.
 - 11.5.3.4.2 Tie and-all No.3 bars shall conform to ASTM A615, Grade 40.
 - 11.5.3.4.3 Welded wire fabric shall conform to ASTM A185, using bright basic wire conforming to ASTM A82. Wire gauge No. 11 or smaller shall be galvanized.
- 11.5.3.5 Anchor Bolts
 - 11.5.3.5.1 All anchor bolts required for complete installation shall be provided.
 - 11.5.3.5.2 Anchor bolts and accessories shall conform to ASTM A307 using A36 steel.
 - 11.5.3.5.3 Use hexagonal bolts and nuts conforming to ANSI B 1 8.2.1 and B 1 8.2.2.
 - 11.5.3.5.4 All exposed area of anchor bolts and nuts, plus a minimum of three inches of embedded area, shall be hot-dipped galvanized.
 - 11.5.3.5.5 Install as indicated on foundation drawings.
- 11.5.4 Performance
 - 11.5.4.1 Field Testing
 - 11.5.4.1.1 Field testing of concrete and making of the concrete test cylinders will be performed by an independent testing laboratory approved by the Customer's Permit Department.
 - 11.5.4.2 Laboratory Testing
 - 11.5.4.2.1 Laboratory for testing shall be selected and paid by the Contractor.
 - 11.5.4.2.2 Laboratory will furnish cylinder molds with cap seals or adequate means of identification.
 - 11.5.4.2.3 Cylinders shall be tested conforming to ASTM C39. Average strength of two test cylinders (at 28 days) shall be used as result of the test. Break one test cylinder after 7-days curing, one after 14-days, and two after 28-days.
 - 11.5.4.2.4 Results shall be provided to the Project Representative in a formal report. A copy shall be provided to the Consultant and Contractor.
 - 11.5.4.3 Low Strength Concrete
 - 11.5.4.3.1 Low strength is defined as concrete whose 7-day and 14-day test (average of 2 cylinders) is less than 70% and 85%, respectively, of the specified minimum 28-day compressive strength.
 - 11.5.4.3.1.1 Concrete shall remain accessible with no other work performed that relates to or depends upon the questionable concrete until a formal decision as to the disposition of the concrete is given by the Customer's Project Representative.
 - 11.5.4.3.1.2 Low strength concrete shall be removed and replaced if requested by the Customer's designee.
 - 11.5.4.4 Preparation and Placing of Concrete
 - 11.5.4.4.1 Clean bonding surfaces free from laitance and foreign materials.
 - 11.5.4.4.2 Place concrete on property prepared and unfrozen sub grade and only in dewatered excavations.
 - 11.5.4.4.3 Do not deposit partially hardened concrete or concrete contaminated by foreign materials.

- 11.5.4.4.4 Placing the concrete shall Conform to ACI 304.
- 11.5.4.4.5 Place concrete within 60 minutes after mixing, except The Customer's designee may extend the period to 90 minutes (maximum) dependent upon weather conditions.
- 11.5.4.4.6 Place in horizontal layers not exceeding 18-inches.
- 11.5.4.4.7 Vibrate concrete to produce solid mass without honeycomb or surface air bubbles.
- 11.5.4.5 Curing of Concrete
- 11.5.4.5.1 Cure with liquid membrane-forming compound conforming to ASTM C309, Type I. Apply per manufacturer's recommendations.
- 11.5.4.5.2 Apply curing compound to all exposed surfaces immediately after removing form or after finishing concrete.
- 11.5.4.5.3 Keep formwork wet until stripped.
- 11.5.4.6 Placing Concrete in Cold Weather
- 11.5.4.6.1 Conform to the practice recommended in ACI 306 when the temperature is below 40-degrees F or is likely to fall below 40-degrees F during a twenty-four-hour period after placing.
- 11.5.4.6.2 Protect pier caps and other concrete from freezing using insulating blankets.
- 11.5.4.7 Placing Concrete in Hot Weather
- 11.5.4.7.1 Conform to practices recommended in ACI 305 when temperature is 90-degrees Fahrenheit or above or is likely to rise above 90-degrees Fahrenheit within a twenty-four-hour period after placing.
- 11.5.4.8 Concrete Construction Joints
- 11.5.4.8.1 Locate where indicated. Conform to AC 318.
- 11.5.4.8.2 Clean and break laitance or other foreign material from bonding surface. Bed with 1-inch of grout for bonding in horizontal joints.
- 11.5.4.9 Concrete Surface Float Finish
- 11.5.4.9.1 Compact, accurately screed, and wood float all slabs to a true uniform surface.
- 11.5.4.9.2 Test surface with straightedge and eliminate high and low spots of more than 1/8-inch in 10 feet.
- 11.5.4.9.3 Use this finish in addition to the finishes specified below for all surfaces as indicated.
- 11.5.4.9.4 Use a final finish for footing slabs not exposed.
- 11.5.4.10 Concrete Hand-troweled Finish
- 11.5.4.10.1 Finish surface as in Float Finish and in addition, trowel and steel trowel to obtain a smooth dense finish after concrete has hardened to ring under the trowel.
- 11.5.4.10.2 Use this finish on all floors, slabs, and equipment bases not specifically designated for a different finish.
- 11.5.4.11 Concrete Broom Finish
- 11.5.4.11.1 Finish surface as in Float Finish and, in addition, draw a stiff bristled broom across the previously floated surface.
- 11.5.4.11.2 Corrugations shall be uniform in appearance, not more than 1/16-inch in depth and shall be perpendicular to direction of traffic.
- 11.5.4.11.3 Use this finish on all outdoor slabs subject to vehicle or pedestrian traffic and areas to

receive grout.

11.5.4.12 Concrete Burlap Finish

11.5.4.12.1 Apply burlap surface treatment to exposed edges of slabs, curbs and foundations.

11.4.4.12.2 Wet and fill all voids using mortar with the same sand-cement ratio as original concrete. Use

approximately 20 percent white cement to match concrete color.

11.4.4.12.3 Strike off all excess mortar flush with the surface using a burlap or canvas cloth with a circular motion.

11.4.4.12.4 Remove all rough spots and rub with cloth to leave a surface of uniform texture and appearance. 11.4.4.12.5 Finish shall result in a coating of mortar that will fill all small voids and air holes leaving a smooth surface.

11.4.4.12.6 Cure as specified under Curing Concrete.

11.5.4.13 Defective Concrete Surface Treatment

11.5.4.13.1 After removal of forms, remove all fins, projections and form ties. 11.4.4.13.2 Grout and cure all voids, damaged areas, and tie holes.

11.5.4.14 Concrete Forms

11.5.4.14.1 Treat forms with an approved oil or lacquer prior to placing reinforcement. 11.4.4.14.2 Wet forms with clean, clear water prior to placing concrete.

11.4.4.14.3 Adequately brace and stiffen forms to prevent deflection and settlement.

11.5.4.15 Steel Reinforcement

11.5.4.15.1 Place accurately, tie at intersection, and support on chairs. Conform to ACI 318.

11.5.4.15.2 Tie securely with 16 gauge or larger annealed iron wire.

11.4.4.15.3 Splice steel not less than 30 bar-diameters for A615, Grade 40, and 42 bar-diameters for A615, Grade 60, unless otherwise indicated.

11.4.4.15.4 Splice plain bars not less than twice that for deformed bars.

11.4.4.15.5 Lap welded wire fabric not less than the length of one mesh. 11.4.4.15.6 No.3 bars to be Grade 40, with all others to be Grade 60.

11.4.4.15.7 Provide ¾-inch chamfer for all exposed edges of concrete, vertical and horizontal.

11.6 Fences and Gates (Chain-Link Security Type)

11.6.1 Quality Insurance and Applicable Standards

11.6.1.1 Federal specification RR-F-191 - Fencing, wire and post, metal and gates, chain-link fence fabric, chain-link and accessories.

11.6.1.2 RR-F-191 - Fencing, wire and post, metal and gates, chain-link fence fabric, chain-link and accessories.

11.6.1.3 RR-F-221 - Fencing, wire, barbed wire, woven-wire and netting, fence post and accessories.

11.6.2 Manufacturer's standard materials where such materials conform to these specifications or have been approved by The Customer.

11.6.3 Fence height – 8 feet high galvanized chain link with 3-strand barbed wire at top (9½ feet overall height).

- 11.6.4 Gate widths as indicated on layout drawings.
- 11.6.5 Finish for fence framework and appurtenances (excluding fabric) – Galvanized with minimum weight for zinc per square foot as follows:
 - 11.6.5.1 Pipe – 1.8 ounces.
 - 11.6.5.2 Hardware and accessories – conform to FS RR-F-191.
 - 11.6.5.3 Barbed wire – 0.80 ounce.
- 11.6.6 Finish for Fence Fabric
 - 11.6.6.1 Galvanized per ASTM A392, Class-2 with 1.8-ounce, minimum weight, for zinc per square foot or, aluminum coated per ASTM A491, Class-2 with 0.40- ounce, minimum weight, for aluminum per square foot.
- 11.6.7 All fence and gates to have 3-strand barbed wire at top.
- 11.6.8 All materials furnished shall comply with the above requirements.
- 11.6.9 Fence Fabric
 - 11.6.9.1 No.9 gauge, 2-inch diamond mesh chain-link fabric.
 - 11.6.9.2 Top and bottom selvage twisted and barbed.
 - 11.6.9.3 Fabric fastenings of 9-gauge galvanized wire ties.
- 11.6.10 Post, Top Rail, and Braces
 - 11.6.10.1 Post
 - 11.6.10.1.1 End, angle, corner or pull posts – 3-inches O.D. at 5.79 pounds per foot. 11.5.10.1.2 Line posts – 2.5-inches O.D. at 3.65 pounds per foot.
 - 11.6.10.2 Top Rail
 - 11.6.10.2.1 1.625-inch O.D. standard weight steel pipe. 11.5.10.2.2 18-foot minimum length of each section.
 - 11.6.10.3 Expansion Type Coupling for Each Joint.
 - 11.6.10.3.1 Diagonal truss rods 3/8 inch in diameter equipped with truss tightened. 11.5.10.3.2 Horizontal braces – 1.660-inch O.D. at 2.27 pounds per foot.
 - 11.6.10.4 Post tops shall be designed as a weather tight closure cap for tubular post.
 - 11.6.10.5 Top Rail Expansion Type Coupling for Each Joint.
 - 11.6.10.6 Malleable Iron or Pressed Steel Barbed Wire Supporting Arms
 - 11.6.10.6.1 Single arm at 45-degrees with vertical, sloping to outside of fence.
 - 11.6.10.6.2 Constructed for attaching three rows of barbed wire to each arm and designed as a weather tight closure cap for tubular posts.
 - 11.6.10.6.3 Designed for 200-pound minimum pull-down load. 11.5.10.6.4 Attached to steel posts or integral with post top.
 - 11.5.10.6.5 Provided with openings to receive top rail.
- 11.6.10.7 Malleable Iron or Pressed Steel Stretcher Bars 11.5.10.7.1 One-piece, full height of fabric.
 - 11.5.10.7.2 3/6-inch x 3/4-inch, galvanized.
 - 11.5.10.7.3 Bands of galvanized steel or malleable iron.
- 11.6.10.8 Malleable Iron or Pressed Steel Bolts 11.5.10.8.1 Zinc coated.

- 11.5.10.8.2 Conform to FS FF-B-575.
- 11.6.11 Barbed Wire
 - 11.6.11.1 Two-strand, 12½ gauge wire with 4-point barbs 5 inches O.C.
 - 11.6.11.2 Conform to FS RR-F-221, Type 1, Style 2.
 - 11.6.11.3 Three rows required on all fence and gates.
- 11.6.12 Gates
 - 11.6.12.1 Framing
 - 11.6.12.1.1 Frames of tubular members, 2-inch O.D. at 2.72 pounds per foot.
 - 11.6.12.1.2 Intermediate horizontal and vertical members for proper gate operation and for attachment of fabric, hardware and accessories.
 - 11.6.12.1.3 Frames assembled by welding or watertight galvanized steel rigid fittings.
 - 11.6.12.1.4 Diagonal cross bracing of 3/8 inch diameter adjustable truss rods to provide frame rigidity.
 - 11.6.12.2 Gate hardware hinges shall be of pressed or forged steel, or malleable iron, non-lift- off type, 1 to 1.2 pair per leaf.
 - 11.6.12.3 Latches and Gate stops – Double Leaf.
 - 11.6.12.3.1 Plunger-bar type latch, full gate height, designed to engage gate stop of flush-plate type with anchors.
 - 11.6.12.3.2 Locking device and padlock eyes an integral part of latch.
 - 11.6.12.3.3 Keeper to automatically engage gate leaf and secure free end of gate in full 90-degrees open position.
 - 11.6.12.4 Latches – Single Leaf
 - 11.6.12.4.1 Forked type to permit operation from either side of gate. 11.5.12.4.2 Padlock eye as integral part of latch.
- 11.6.13 Performance and Fence Installation
 - 11.6.13.1 Follow general contour of ground and properly aligned.
 - 11.6.13.2 Fence Post
 - 11.6.13.2.1 Set in concrete retaining wall. Trowel finish tops of footings and dome to direct water away from posts.
 - 11.6.13.2.2 Install plumb and in straight alignment. 11.5.13.2.3 Temporarily brace until concrete in bases has set. 11.5.13.2.4 Spaced 10 feet center-to-center, maximum.
 - 11.5.13.2.5 Tension wire shall be weaved through the fabric and tie to each post with minimum 6-gauge galvanized wire.
 - 11.6.13.3 Post Bracing
 - 11.6.13.3.1 Installed at each end, at the gatepost, and on each side of corner posts. 11.5.13.3.2 Install after the concrete in post base has set.
 - 11.5.13.3.3 Install so posts are plumb when diagonal rod is under tension.
 - 11.6.13.4 Top Rails
 - 11.6.13.4.1 Run continuously through post caps or barbed wire supporting arms. 11.5.13.4.2 Install expansion coupling at each joint.

- 11.6.13.5 Fabric
- 11.6.13.5.1 Stretch taut with equal tension on each side of line posts. 11.5.13.5.2 Fasten to top rail and steel posts with wire ties.
- 11.5.13.5.3 Space wire ties at 12-inches O.C. maximum on posts and at 24-inches O.C. maximum on top rail.
- 11.6.13.6 Stretcher Bars
- 11.6.13.6.1 Thread through or clamp to fabric 4-inches on center.
- 11.6.13.6.2 Secure to posts with metal bands spaced 15-inches on center maximum. 11.5.13.6.3 Install at each gate, pull and end post, and each side of corner post.
- 11.6.13.7 Barbed Wire
- 11.6.13.7.1 Attach three rows to each barbed wire supporting arm. Pull wire taut and fasten securely to each arm.
- 11.6.13.7.2 Install four rows above fabric and on extended gate end members of gates.
- 11.6.13.8 Gates
- 11.6.13.8.1 Install plumb, level, and free swinging through full opening without interference.
- 11.6.13.8.2 Install all hardware, including keepers, ground set items and flush plate in concrete to engage gate stop.
- 11.6.13.8.3 Furnish and install gate alarms.
- 11.6.13.9 Repairing Damaged Coatings
- 11.6.13.9.1 Repair any damaged coating in the shop or field by recoating with compatible and similar coating.
- 11.6.13.9.2 Apply per manufacturer's recommendations.
- 11.6.13.10 Furnish and install Danger signs as approved by the Customer's designee.
- 11.7 Crushed Rock Surface**
- 11.7.1 This section includes crushed rock surface and method of depositing for the placement of permanent crushed rock surfacing in equipment shelter areas.
- 11.7.2 Applicable Standards
- 11.7.2.1 American Society for Testing and Materials
- 11.7.2.1.1 C117– Test for Materials Finer than No. 200 Sieve in Mineral Aggregate by Washing.
- 11.7.2.1.2 C131– Test for Abrasion of Coarse Aggregates by Use of Los Angeles Machine.
- 11.7.2.1.3 C136 – Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.
- 11.7.2.1.4 D423 – Test for Liquid Limit of Soils.
- 11.7.2.1.5 D75 – Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials.
- 11.7.2.2 American Association of State Highway and Transportation Officials (AASHTO)

- 11.7.2.2.1 T99—Test for the Moisture Density Relations of Soils Using a 5.5-Pound Rammer and a 12-Inch Drop.
- 11.7.2.3 Sample and Testing
 - 11.7.2.3.1 Test to determine conformance with all requirements for material quality and properties specified herein will be performed by an independent laboratory approved by the Customer and compensated by the Vendor.
 - 11.7.2.3.2 Obtain representative samples of material in accordance with ASTM D75 for testing. Furnish the Customer’s designee sufficient materials for testing from each sample at the time obtained.
 - 11.7.2.3.3 Furnish specific schedule for sampling to provide the Customer’s designee the opportunity to observe sampling.
- 11.7.2.4 Submittals. Includes, but not limited to, the following:
 - 11.7.2.4.1 Test result reports from testing laboratory indicating conformance with the specifications.
 - 11.7.2.4.2 Certification of conformance with the specifications.
- 11.7.3 Materials
 - 11.7.3.1 Crushed rock surface shall consist of ¾-inch aggregate placed on top of a 6-mil polyvinyl barrier.
 - 11.7.3.2 Aggregate shall consist of Crushed limestone or crushed natural gravel, free from lumps or balls of clay or other objectionable matter, and reasonably free from thin and elongated pieces of dirt. Aggregates shall consist of angular fragments, durable and sound, and shall be reasonably uniform in density and quality.
- 11.7.4 Performance and General Requirements
 - 11.7.4.1 Stockpiles
 - 11.7.4.1.1 Only with approval of the Customer’s designee in specified locations.
 - 11.7.4.1.2 Clear and level storage sites prior to stockpiling.
 - 11.7.4.1.3 Place in a manner and at locations designated by the Customer, providing separate stockpiles for materials from separate sources.
 - 11.7.4.2 Preparation of Sub-Grade
 - 11.7.4.2.1 Clean off all foreign substances.
 - 11.7.4.2.2 Correct any ruts, depressions, or soft yielding spots and areas with inadequate compaction.
 - 11.7.4.2.3 Treat all sub-grade areas with soil sterilant.
 - 11.7.4.2.4 The Customer’s Project Representative will inspect, prior to placing crushed rock surface, for adequate compaction and surface tolerances.
 - 11.7.4.3 Grade Control
 - 11.7.4.3.1 Establish and maintain by means of grade stakes, properly spaced so string lines may be stretched between stakes.
 - 11.7.4.4 Placing of Materials

- 11.7.4.4.1 Deposit and spread material in a uniform lift/layer and compact to the thickness indicated and as specified. Spread material uniformly on the prepared sub-grade from moving vehicles or spreader boxes.
- 11.7.4.4.2 Level material to the required contour and grades.
- 11.7.4.4.3 Remove those portions of the layer, which became segregated or mixed with sub-grade material in spreading and replace with new material as required by the Customer's designee.
- 11.7.4.4.4 Remove and repair sub-grade areas damaged during application of the crushed rock surface.
- 11.7.4.5 Shaping and Compacting Materials
- 11.7.4.6 Compact layers no less than 3-inches or more than 6-inches thick.
- 11.7.4.6.1 Roll to specified compaction requirements throughout full depth of layer with power rollers, rubber-tired rollers or combination.
- 11.7.4.6.2 Shape and smooth by blading and rolling with power roller, rubber-tired roller, or both.
- 11.7.4.6.3 Hand tamp in places not accessible to rolling equipment.
- 11.7.4.6.4 Base compaction on weight per cubic foot of material passing $\frac{3}{4}$ -inch sieve and compact to at least 100 percent of maximum density at optimum moisture.
- 11.7.4.6.5 Determine and control compaction in accordance with AASHTO T99.
- 11.7.4.6.6 Surface shall show no deviation in excess of $\frac{3}{8}$ -inch in any 10 feet when tested with a 10-foot straightened applied parallel with and at right angles to the center lines of the paved area.
- 11.7.4.6.7 Correct any deviation specified in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by the Customer's designee.
- 11.8 Herbicide Applications**
- 11.8.1 Equipment and Materials
- 11.8.1.1 Sprayers and applicators shall be suitable for intended use.
- 11.8.1.2 Mix herbicide per manufacturer's recommendations.
- 11.8.1.3 Herbicide shall be Krover (1) as manufactured by DuPont, Inc., or approved equal.
- 11.8.1.4 Do not apply herbicide if it is too windy or where other adverse weather conditions exist.
- 11.8.1.5 Apply at a rate of 10 pounds of product per acre, or in accordance with manufacturer's recommendations.
- 11.8.2 Performance**
- 11.8.2.1 Apply only after final sub-grade has been established.
- 11.8.2.2 Apply before installation of vegetation barrier cloth and placement of crushed rock.
- 11.8.2.3 Follow manufacturer's recommendations on timing of application with respect to weather and barrier/crushed rock placement.

12 Section 12 - Infrastructure Warranty and Maintenance

12.1 General Requirements

12.1.1 The following conditions shall apply for equipment Warranty:

12.1.1.1 All cost for the warranty services shall be absorbed by the Vendor.

12.1.1.2 All maintenance contracts signed and executed in relation to the equipment and features and components procured using this RFP and its corresponding contract are subject to the terms and conditions defined in this RFP and the resulting contract.

12.1.1.3 The Vendor will provide post-warranty maintenance and services comparable to the same services proposed for the warranty period.

12.1.1.4 Vendor-provided maintenance during the warranty and post-warranty period will be monitored by the Customer.

12.1.1.5 All warranty and post-warranty services will be clearly identified and provided in a matrix.

12.1.1.6 The Vendor will supply as part of the technical response, a list of services and preventative maintenance to be provided during the warranty period as well as a schedule at which these services will occur.

12.1.1.7 All warranty and post-warranty services will cover all equipment and features provided as part of this RFP, including Vendor provided OEM and third-party equipment. These services will be priced individually for customer information.

12.1.1.8 The Customer can optionally remove any post-warranty services as determined by The Customer's need to provide in-house or subcontract any of these respective services.

12.1.1.9 The Vendor shall provide all equipment software updates, at no additional cost, for the entire period under which The Customer has committed for Vendor-provided post-warranty maintenance services.

12.1.1.10 Vendor shall resolve all known software defects or "bugs" to software during warranty and post-warranty period via patch, or equipment software updates.

12.1.1.11 Vendor is responsible for all actions of its employees or subVendors. Any equipment failure(s) caused by any act or omission of Vendor's employee or subVendor shall be the responsibility of the Vendor.

12.1.1.12 The Vendor shall submit a maintenance work plan that identifies the tasks required, a listing of Vendor supplied personnel and identification of a 24x7x365 Single Point of Contact (SPOC) responsible for Vendor maintenance issues.

12.1.1.13 As part of its cost submittal, the Vendor shall provide for optional maintenance services that are equivalent to those provided by the initial warranty. The term of each optional extended maintenance support option shall be five (5) years to be paid annually by the Customer.

12.1.1.14 The Customer reserves the right to utilize outside or outsourced contract labor for maintaining its infrastructure equipment and end user devices. For outside Vendor needs, the term of this extended maintenance service shall be as long as fifteen years, structured into three 5-year optional service intervals.

12.2 Parts Support:

- 12.2.1 Replacement parts must be of new or current manufacture and meet or exceed the specifications of the original supplied equipment (OEM).
- 12.2.2 Post-warranty replacement parts service for emergency infrastructure equipment repair, not available locally, shall be shipped out on the first available flight. Any parts required for non-emergency repair that are not available locally should be shipped out for next day delivery.
- 12.2.3 The Vendor must identify and clearly disclose as part of the technical response lifecycle and parts availability of all OEM and third party equipment proposed and the risk to parts support of these items.
- 12.2.4 Vendor must guarantee the equipment's operating software, inclusive of user equipment software, for a one-year period following Final Acceptance.
- 12.2.5 For any part that is not available during the 15 years following Final System Acceptance, the Vendor must provide a suitable alternative part or product at the same price as the part that would have been procured to return equipment to working status.
- 12.2.6 Parts support shall be available regardless of a current service agreement.

12.3 Service Provider:

- 12.3.1 A factory authorized service center that is fully staffed and trained to support the proposed equipment, and all related features, and accessory equipment, must be located within a 120 minute (2 hour) response time of the Customer to be considered adequate to satisfy initial installation, configuration, warranty and ongoing maintenance needs. The Vendor and all envisioned subVendors, if any, must be able to legally conduct business within the State.
- 12.3.2 Vendor shall be required to provide a list of certified factory trained technicians performing maintenance on the equipment including all sub systems and equipment.
- 12.3.3 The Vendor shall provide documentation that supports the current certifications of factory-trained technicians. The Vendor is responsible for keeping all credentials and certifications required to maintain the equipment current and up to date.
- 12.3.4 Service providers responding to emergency service outages must provide continuous non-stop support until the problem is resolved.
- 12.3.5 Original Equipment Manufacturers (OEM) shall have a fully qualified, staffed, and equipped service facility positioned and capable of meeting this RFP's response time criteria during the warranty and maintenance agreement periods. Any subVendors used during the warranty and post-warranty maintenance period must be pre-approved by the Customer.

12.4 Response Times:

- 12.4.1 The Vendor shall have factory-trained technicians and engineers available by telephone 24x7x365. The technicians or engineers must respond by telephone within thirty (30) minutes of observed or reported service outage and be on-site, in response to a reported service outage, within two (2) hours.

- 12.4.2 Non-critical service requests response will be within one (1) working day.
- 12.4.3 When a critical equipment failure occurs, more stringent requirements shall be met by the Vendor.
- 12.4.4 A critical system failure is defined as a significant reduction in the ability to communicate.
- 12.4.5 Critical failures shall have service restored within six (6) hours or less from notification to the Vendor, via The Customer notifying the Vendor, or monitored software notification.
- 12.5 **Notification and Reporting:**
- 12.5.1 In the event of a critical equipment failure, Vendor will notify The Customer of the failure.
- 12.5.2 During the Warranty and Maintenance period, Vendor shall supply, in a timely manner, all documentation necessary to verify and record services rendered including those necessary to maintain both direct and third-party warranty. Vendor shall include in its response response a draft checklist of planned documentation.
- 12.5.3 The Vendor must supply monthly service logs listing the site(s) where service is performed, the equipment involved and service details.
- 12.5.4 Failure of individual units, subassemblies and/or components must be reported in writing to The Customer. This report must, as a minimum, include unit identification (description and serial number), explanation and cause of failure, and corrective action taken.
- 12.5.5 The Vendor shall provide the Customer with access to an electronic ticketing system for the duration of the warranty and post-warranty maintenance term that gives the Vendor and the Customer the ability to submit and track service/repair tickets along with assets associated with the system.

13 Section 13 - Radio Requirements

13.1 Background and User Needs

- 13.1.1 In general, public safety/local government communications needs have shifted from car based, with equipment fixed within vehicles, to user-based where portable radio equipment is assigned to individual users.
- 13.1.2 This migration to portable units, with that equipment's reduced output power level and often-degraded antenna performance, has placed greater technical demands on radio communications network infrastructures.
- 13.1.3 The coverage needs for mobile-based systems are relatively straightforward as the available effective radiated power from a mobile unit can closely approach that of a base station. Talk-in/talk-out balance can thus be easily achieved with simple backbone system configuration.

13.2 General Subscriber Requirements

- 13.2.1 This Section describes minimally-acceptable requirements for subscriber radio equipment.
 - 13.2.1.1 All radio equipment proposed by Vendors and installed by the Contractor shall be FCC type accepted under Part 90 of the FCC Rules and Regulations. All supplied equipment proposed by the Vendor and provided/installed by the Contractor shall be in current production and shall meet or exceed the requirements of this Section.
 - 13.2.1.2 The Vendor shall provide documentation, and demonstrate P25 operational compliancy with, minimally, BK Technologies (RELM), EF Johnson/Kenwood, L3Harris, Motorola Solutions, & Tait portable, mobile, and control station radios. These radios must have been tested and certified to function on its proposed P25 infrastructure technology.
 - 13.2.1.3 The Vendor shall also describe those processes and methods it employs to confirm where software releases and hardware changes to its P25 equipment are verified for continued compatibility with any vendor's P25 system equipment manufactured and offered for purchase by others.
 - 13.2.1.4 The volume control is expected to be fully adjustable from zero to maximum audio output level.
 - 13.2.1.5 Subscriber units are expected to be equipped with alphanumeric displays, where specified on the subscriber list in Appendix F - Subscriber Radio List, to readily identify selected talk groups and operating modes, i.e. clear voice, encrypted voice, etc.
 - 13.2.1.6 In addition to the specific desired features indicated above, all furnished equipment is expected to meet minimum equipment requirements identified in this section.
 - 13.2.1.7 Must meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety 700/800MHz digital trunked radio equipment. Furnished equipment must be operable on conventional and both Phase 1 and Phase 2 infrastructures.
 - 13.2.1.8 Allow operations on P25 trunked and conventional (analog/P25) systems with priority scan of talk groups or channels.
 - 13.2.1.9 Offer digital voice encryption, using an Advanced Multi-Band Excitation +2 (AMBE+2) or Newer P25 Phase 1 and Phase 2 vocoder, DES-OFB and federally approved 256-bit AES

coding to provide enhanced security during transmission and reception of sensitive communications.

- 13.2.1.10 Incorporate electronic, alphanumeric displays (minimum of eight characters) to provide visual indication of system availability, channel/talk group selection, incoming user ID, call alerts and operational status such as scan and channel busy.
- 13.2.1.11 Include transmit time out timer to warn the user that the radio may be transmitting longer than a predetermined time limit and then disable the transmitter.
- 13.2.1.12 User programmable audio alert in the event of loss of control channel (must be a standard feature in present and all future proposed public safety models).
- 13.2.1.13 Ensure radios in the 800MHz band must be operable on 800MHz NPSPAC frequencies as well as 700/800MHz conventional and trunked frequencies.
- 13.2.1.14 Ensure radio operating information is contained in an electrically erasable memory device. Unit will be fully programmable from a laptop/desktop computer.
- 13.2.1.15 Radios may be optionally operable in multiple bands for interoperability purposes.
- 13.3 **Portable Subscriber Equipment**
- 13.3.1 All portable/handheld P25 radios proposed shall:
 - 13.3.1.1 Small, light-weight and easy to operate.
 - 13.3.1.2 The antenna should be physically short and in keeping with the size of the radio package.
 - 13.3.1.3 Radio unit battery packs are expected to operate to provide sufficient power for a full twelve-hour work period.
 - 13.3.1.4 A range of accessories is expected to be available to support in-field battery charging.
 - 13.3.1.5 The battery packs should provide a reasonably long-life (i.e., two years) within the typical operational profile of 5% transmit, 5% receive and 90% standby/on.
 - 13.3.1.6 The portable radio package is expected to be simple to operate having a minimum of operator controls or feature selections.
 - 13.3.1.7 Radios contain a microphone, speaker, talk group selector, volume control, power switch, emergency button, and normal transmit push-to-talk button. These input/output devices are subject to near-constant physical abuse within a public safety environment and affect overall equipment reliability.
 - 13.3.1.8 The user is expected to be able to disable backlighting and tones, when necessary; Commonly known as stealth mode.
 - 13.3.1.9 Unit is expected to be extremely rugged to withstand shock and vibration typical of public safety operations. For some agencies, other features are needed such as Hazardous Location operation and the ability for the equipment to survive short term water submersion. Vendors shall include in their response documents showing certification to their desired standard.
 - 13.3.1.10 Units are expected to be operable, within the coverage requirements using the smallest unity-gain flexible antenna available.
 - 13.3.1.11 Radios are expected to be capable of operation with traditional speaker/microphones as well as sub-miniature radio surveillance accessories. All speaker microphones must

have noise cancelling capabilities and 3.5mm jack for the ability to use a Receive-Only earpiece.

- 13.3.1.12 Radios and equipment that is proposed for fire agency use, must be the fire grade equipment that is offered by the vendor. Any additional training for this specialize fire equipment must be provided by the vendor. Any proposed accessories must be in the Fire rated category. NPFA 1802 certification is not required.
- 13.3.1.13 All proposed fire grade portable radios will be configured and have the capability for Quik Call II, two-tone signaling.
- 13.3.2 Electrical Specifications as follows:
 - 13.3.2.1 Primary Power: Battery pack (further defined in RFP)
 - 13.3.2.2 Environmental: MIL-STD 810 C, D, E, F and G for shock, vibration, humidity and high/low temperature.
 - 13.3.2.3 Temperature Range: -30°C to +60°C
 - 13.3.2.4 Humidity: 95% relative humidity at 50°C
 - 13.3.2.5 Talk Group Selection: Rotary-knob style
- 13.3.3 Transmitter specifications are as follows:
 - 13.3.3.1 Frequency Range: 764 to 870 MHz
 - 13.3.3.2 Channel Capacity: 500 channels (Single-band radio), 700 channels (Multi-band radio)
 - 13.3.3.3 RF Output Impedance: 50 ohms
 - 13.3.3.4 Output Power: 3 W 700/800MHz
 - 13.3.3.5 Frequency Stability: 1.5 PPM from -28°C to +58°C
 - 13.3.3.6 Modulation Deviation: +/-2.5KHz for 12.5KHz channel; +/-3 KHz for NPSPAC;
 - 13.3.3.7 Emissions: 16K0F3E; 11K0F3E; 8K10F1D; 8K10F1E; 9K80F1D, 9K80D7W or comparable Phase 2
 - 13.3.3.8 Audio Response: +/-3 dB of a 6 dB/octave
 - 13.3.3.9 Audio Distortion: Less than 2% at 1 KHz
 - 13.3.3.10 Spurious/Harmonic: -50 dB
 - 13.3.3.11 Hum and Noise: -35 dB
 - 13.3.3.12 Duty Cycle: Intermittent
- 13.3.4 Receiver specifications are as:
 - 13.3.4.1 Frequency Range: 764 870MHz
 - 13.3.4.2 Channel Capacity: 500 channels (Single band radio), 700 channels (Multi-band radio)
 - 13.3.4.3 Channel Spacing: 12.5/6.25 KHz/NPSPAC
 - 13.3.4.4 Adjacent Channel: -60dB (Single band radio), -65dB (Multi band radio) Rejection
 - 13.3.4.5 Digital Sensitivity: 5% BER: 0.25 µV
 - 13.3.4.6 Intermodulation Rejection: -72 dB (Single band radio) -74 dB (Multi-band radio)
 - 13.3.4.7 Spurious Response Rejection: -72 dB (Single band radio) -70 dB (Multi-band radio)
 - 13.3.4.8 Frequency Stability: 1.5 PPM from -30° to +60°C
 - 13.3.4.9 Audio Output: 1.5 W
 - 13.3.4.10 Audio Distortion: No more than 2% at 1 KHz

13.4 Control Station Subscriber Equipment

13.4.1 All control stations proposed shall:

- 13.4.1.1 Be available either as an integrated 120VAC powered desktop radio rack or a remotely located, AC powered radio package with separate remote-control unit.
- 13.4.1.2 Control station and control unit shall have an optional provision to operate from standby 12VDC source upon failure of AC power.
- 13.4.1.3 Options shall be provided for local and remote-control operation of the control station.
- 13.4.1.4 Control station packaging shall incorporate sufficient electromagnetic shielding of radio and power supply components to allow multiple control stations to be located at the same site without causing unit-to-unit interference.
- 13.4.1.5 All Control Station proposed for interoperability solutions must be capable of a minimum of 16 channel/talkgroup steering thru the base station gateway by a dispatch console.

13.5 Mobile Subscriber Equipment

13.5.1 All mobiles proposed shall:

- 13.5.1.1 Front mount and rear mount, dual control-head with single rear mount radio and dual radios with single control-head configurations must be available to meet the needs of the different public safety users. Rear mount radios may require weatherproof control heads, speakers, microphones and other accessories (specific for fire operations).
- 13.5.1.2 Support special services, i.e. encrypted voice, Computer Aided Dispatch (CAD), and Automatic Vehicle Location (AVL).
- 13.5.1.3 Be capable of an external alarm dry-contact closure to provide activation of a horn, light, etc. whenever the radio unit is individually called.
- 13.5.1.4 Be capable of providing 9.6kb/s data-messaging transmission capabilities.
- 13.5.1.5 Be installed as covert, undercover configurations in all vehicles requiring discreet installation.
- 13.5.2 Mobile Electrical Specifications are as follows:
 - 13.5.2.1 Primary Input Voltage: 11 to 16 VDC, negative ground
 - 13.5.2.2 Battery Drain: Standby: 1.5 amperes, max. Receive: 4.0 amperes, max. Transmit: 15.0 amperes, max.
 - 13.5.2.3 Environmental: MIL-STD 810 C, D, E, F, and G for shock, vibration, humidity, and high/low temperature.
 - 13.5.2.4 Temperature Range: -30 °C to +60 °C
 - 13.5.2.5 Humidity: 95% relative humidity at 50 °C
 - 13.5.2.6 Talk Group Selection: Rotary-knob style
- 13.5.3 Transmitter specifications are as follows:
 - 13.5.3.1 Frequency Range: 764 to 870MHz
 - 13.5.3.2 Channel Capacity: 500 channels (Single band radio), 700 channels (Multi-band radio)
 - 13.5.3.3 Talk Group Capacity: 16 minimum, per system
 - 13.5.3.4 RF Output Impedance: 50 ohms
 - 13.5.3.5 Output Power: 30 W (700MHz)/35W (800MHz) (Single band radio); 50 W (VHF) (Single Band Radio); 35 W (Multi-band radio)

- 13.5.3.6 Channel Spacing: 12.5/6.25 KHz/NPSPAC
- 13.5.3.7 Spurious/Harmonic: At least 64 dB below carrier
- 13.5.3.8 Frequency Stability: 1.5 PPM from -30°C to 60°C
- 13.5.3.9 Frequency Speed: 24MHz (700MHz)/18MHz (800MHz)
- 13.5.3.10 Emission: 16K0F3E; 11K0F3E; 8K10F1D; 8K10F1E; 9K80F1D, 9K80D7W or comparable Phase 2
- 13.5.3.11 Modulation Deviation: +/- 2.5KHz for 12.5KHz Channel; +/- 3KHz for NPSPAC
- 13.5.3.12 Audio Distortion: Less than 5% at 1KHz
- 13.5.3.13 Audio Response: +/-3dB of a 6dB/octave pre-emphasis characteristic from 300Hz to 3KHz
- 13.5.3.14 Hum and Noise: -45dB
- 13.5.3.15 Duty Cycle: Transmitter 20%
- 13.5.4 Receiver specifications are as follows:
 - 13.5.4.1 Frequency Range: 764 to 870MHz
 - 13.5.4.2 Channel Capacity: 500 channels (Single band radio), 700 channels (Multi-band radio)
 - 13.5.4.3 Channel Spacing: 12.5KHz/6.25KHz; NPSPAC
 - 13.5.4.4 Digital Sensitivity: 0.25 μ V 5% Bit error Rate (BER):
 - 13.5.4.5 Adjacent Channel: Rejection: -60dB
 - 13.5.4.6 Frequency Stability: 1.5 PPM from -30° to 60°C
 - 13.5.4.7 Frequency Spread: 24MHz (700MHz); 18MHz (800MHz)
 - 13.5.4.8 Intermodulation: -75dB (Single band radio)
 - 13.5.4.9 Rejection: -80dB (Multi band radio)
 - 13.5.4.10 Spurious Response Rejection: -75dB (Single band radio) -80dB (Multi band radio)
 - 13.5.4.11 Audio Output: 10 W (Single band radio), 12 W (Multi-band radio)
 - 13.5.4.12 Audio Distortion: No more than 2% at 1KHz
 - 13.5.4.13 Duty Cycle: Receiver 100%
- 13.6 **Warranty and Maintenance**
 - 13.6.1.1 The Customer requires, at a minimum, a two-year comprehensive warranty on all subscriber equipment required by this RFP. The Warranty term will commence upon Final Acceptance.
 - 13.6.1.2 The Customer requires, at a minimum, a one-year comprehensive maintenance program on all subscriber equipment required by this RFP. The Maintenance term will commence at the conclusion of the warranty term. Vendor shall supply a draft schedule, list of equipment and features included in maintenance, and responsibility matrix as part of the proposal response.
- 13.6.2 **Parts Availability**
 - 13.6.2.1 All proposed radio equipment and antennas and repair parts shall be commercially available for at least fifteen years from the date of Final Acceptance.
- 13.7 **User Equipment Training**
 - 13.7.1 A comprehensive training program must be established by the Vendor in its Technical Submittal, to be implemented if selected as the Contractor. This program would include not only user familiarization with physical features and functions of assigned radio

equipment, but also instruction pertinent to the System's talkgroup structure and how the System's infrastructure establishes local, wide-area and outside interoperable call transactions.

- 13.7.2 The Contractor's training program must include the necessary graphics, visual simulations, and printed media tools to establish an appropriate training process for users. Training videos must be available to users on a private web-based portal, thereby allowing for individual refresher training.
- 13.7.3 The Contractor must also supply technical assistance during the initial warranty period that allows for ongoing modifications to these training resources, to keep them in-step with additions and changes to the operable and interoperable resources within the System.
- 13.7.4 The Vendor shall provide a detailed description of its proposed user/infrastructure training program. Examples of training tools developed for similar P25 regional trunked and conventional radio configurations shall be provided within the Vendor's Technical Proposal Submittal.
- 13.7.5 The Customer must approve all training curriculum prior to training.
- 13.7.6 The Vendor must provide resumes of professional training staff that will train the user on how the radio operates on the proposed system.
- 13.7.7 The Vendor shall propose train-the-trainer subscriber training for up to 30 individuals.
- 13.8 Radio Acceptance Testing Process
 - 13.8.1 Acceptance testing procedures will be defined during Contract Negotiations and final procedures will be mutually agreed to by both the Customer and the Vendor 10 business days prior to the start of acceptance testing. These procedures would essentially test and verify the performance of hardware/software features; coverage performance on the system; reliability and interoperability with neighboring jurisdictions.
 - 13.8.2 A field certification completed prior to deployment runs on the same equipment expected to be used for preventative maintenance during the warranty and maintenance periods of the contract. The field certification shall include 100% of radios included in the proposal response. This includes an auto test and auto tune.
 - 13.8.3 The vendor shall provide documentation on each radio upon completion of field certification. Vendors shall include in their sample test plan attached to this section, the minimum data points they will document as part of this acceptance test plan.
 - 13.8.4 Contractor shall perform under supervision of the Customer or its designee, a random field test of ten (10%) percent of each type or model of radio provided by the Contract. Failed radios are to be repaired or replaced as necessary. If more than ten (10%) percent of a type or model of equipment tested fails to meet the manufacturer's specifications, then the Contractor shall be required to perform a test of one hundred (100%) percent of that type or model and to replace or repair all failed radios
 - 13.8.5 The Radio Acceptance Test shall minimally encompass:
 - 13.8.5.1 A bench test of all required functions and features listed in this RFP.

- 13.8.5.2 An installed determination of compliance with Industry standards and published RFP requirements of the various radios provided under the Contract.
- 13.8.5.3 Functionality of various charging systems.
- 13.8.5.4 A successful completion of a set of voice quality and signal level coverage tests of sufficient scope to confirm that the outdoor, in-vehicle and in-building coverage has not been negatively impacted by the new equipment
- 13.8.5.5 Test of accessory equipment

14 **Section 14 - Radio Pricing**

14.1 **General Pricing Information**

14.1.1 This equipment-pricing portion of this RFP shall serve as a guide for the Vendor. The necessary information is provided to The Customer to conduct an accurate assessment of the proposed price. This information is illustrative of the detail required for each subscriber, inclusive of software, accessories, and future discounts.

14.1.2 Vendors shall provide a per-radio granular price detail of proposed equipment, program management, system engineering, installation services, and maintenance services. As this is a turnkey project, any pricing omission of a scope typically considered part of a P25 subscriber procurement of this type will be provided for by the Contractor at no additional cost to the Customer.

14.1.3 The Vendors are requested to provide finance pricing options for the subscribers, and maintenance proposed. This information should include at a minimum terms, interest percentages, and payment terms.

14.2 **Lifecycle Costs**

14.2.1 The Customer reserves the right to perform a lifecycle analysis on the proposed system to determine the best price value. A critical part of such research involves knowledge of the overall lifecycle of the various OEM and 3rd Party elements making up a Vendor's System solution. From general availability to manufacture discontinue and all phases in between, the production age of the proposed system affects the ability to source spare parts, software upgrade, and support services. Lifecycle analysis is a critical factor in determining the operational life of the proposed P25 technology and supporting products.

14.2.2 Vendors shall disclose key lifecycle dates of the proposed system, including subscribers, P25 System software, infrastructure, network elements, and 3rd Party supporting equipment. From general availability (GA) release dates to manufacture discontinue (MD) dates along with important OEM hardware and software support dates for standard, extended and out-of-support milestone dates. Please detail how software support dates/phases affect service availability and pricing.

14.2.3 Vendors shall disclose as part of their Cost Proposal when System was first released for sale to the Public. Vendors shall also provide a life-cycle roadmap, referenced by year and so depict when any third party equipment is likely to be discontinued and when parts/software support will cease to be available.

14.3 **Subscriber Equipment List**

14.3.1 The Customer envisions several tiers of portable and mobile radio units for use by the various public safety and non-public safety agencies. Those non-public safety users having minimal interoperability needs may benefit from lower-tiered, less costly radios having smaller talk group capacities and a limited list of feature options. Public Safety agencies, however, may require highest-tier devices capable of voice encryption, GPS location, status messaging and other specialized features like multikey encryption, and 256-bit AES.

- 14.3.2 Appendix H: Subscriber Radio Requirements, illustrates the quantities, types and tiers of subscriber equipment required.
- 14.4 **Pricing Summaries**
- 14.4.1 Pricing Summaries for Subscriber equipment shall be provided as part of the response. All summary information will be supported by detailed cost information as detailed further in this Section. Pricing Summaries include;
 - 14.4.1.1 Subscriber Equipment (by agency/department)
 - 14.4.1.2 Subscriber Programming
 - 14.4.1.3 Subscriber Installation
 - 14.4.1.4 Project Management
 - 14.4.1.5 Engineering Services
 - 14.4.1.6 Subscriber Maintenance (by year)
 - 14.4.1.7 Total Cost of Ownership at year 5, 10, 15.
- 14.4.2 Future Purchase Considerations
- 14.5 **Subscriber Equipment Pricing**
- 14.5.1 The Vendor shall develop cost proposals for low (Public Works/Schools), mid and high-tier (Law/Fire/EMS) radio products using the following general format:
- 14.5.2 Additionally, the Vendor shall prepare a detailed optional equipment catalog that describes the full range of options available for all Tiers and indicated portable and mobile radio configurations. The submitted catalog shall include list prices and the proposed discount percentage-reduced initial purchase price.
- 14.5.3 **Minimum Features for High-Tier Subscriber Equipment**
- 14.5.3.1 At least 500 modes/talk groups/channels
- 14.5.3.2 700/800MHz operation (optional multiband operation)
- 14.5.3.3 Multi-line 12 character minimum, alpha-numeric LCD text display
- 14.5.3.4 Radio/network status icons
- 14.5.3.5 256-bit AES multi-key voice encryption
- 14.5.3.6 AMBE+2 vocoder, or newer
- 14.5.3.7 Emergency button
- 14.5.3.8 Programmable option buttons
- 14.5.3.9 Talk group scan
- 14.5.3.10 System scan
- 14.5.3.11 Integrated voice/data capability
- 14.5.3.12 GPS receiver
- 14.5.3.13 OTAP
- 14.5.3.14 OTAR
- 14.5.3.15 Wide range of optional accessories
- 14.5.3.16 Hazardous Location C1D2 (Portable Only)
- 14.5.3.17 Remote control head/rear mount/dash mount/motorcycle mount configurations (Mobile Only)

14.5.4 Minimum Features for Mid-Tier Subscriber Equipment

- 14.5.4.1 At least 250 modes/ talk groups/ channels
- 14.5.4.2 700/800MHz operation
- 14.5.4.3 Multi-line 12 character minimum, alpha-numeric LCD text display
- 14.5.4.4 Radio/network status icons
- 14.5.4.5 256-bit AES multi-key voice encryption
- 14.5.4.6 AMBE+2 vocoder, or newer
- 14.5.4.7 Emergency button
- 14.5.4.8 Programmable option buttons
- 14.5.4.9 Talk group scan
- 14.5.4.10 System scan
- 14.5.4.11 Hazardous Location C1D2
- 14.5.4.12 Integrated voice/data capability
- 14.5.4.13 GPS receiver
- 14.5.4.14 OTAP
- 14.5.4.15 OTAR
- 14.5.4.16 Wide range of optional accessories
- 14.5.4.17 Remote control head/rear mount configuration (Mobile Only)

14.5.5 Minimum Features for Low-Tier Subscriber Equipment

- 14.5.5.1 At least 48 modes/talk groups/channels – Rotary Selector
- 14.5.5.2 700/800MHz operation
- 14.5.5.3 Single line, 8 character minimum, alpha-numeric LCD text display
- 14.5.5.4 Radio/network status icons
- 14.5.5.5 AMBE+2 vocoder, or newer
- 14.5.5.6 Emergency Button
- 14.5.5.7 Programmable option buttons
- 14.5.5.8 Limited list of optional accessories
- 14.5.5.9 Front mount/dash mount package (Mobile Only)

14.6 Future Purchase Considerations

- 14.6.1 The contract list pricing and associated discounts proposed by the Vendor shall remain valid and available for additional purchases and quantity increases by the Customer from Contract award through Final System Acceptance. During this period, the Vendor shall not increase unit pricing or reduce the offered discount percentages for the items included in the Contract.

14.6.2

The Vendor shall provide the Customer with a fixed percentage discount off the Manufacturer's then-current published list price for all End User Equipment (including, but not limited to, subscriber radios, control stations, batteries, chargers, accessories, and related field hardware) purchased by the Customer for a period of fifteen (15) years following Final System Acceptance. The applicable discount percentage shall be clearly stated in the Vendor's proposal and shall remain firm and binding for the full fifteen-year term.

15 **Section 16 - System Pricing**

15.1 **General Pricing Information**

15.1.1 This equipment-pricing portion of this RFP shall serve as a guide for the Vendor. The necessary information is provided to The Customer to conduct an accurate assessment of the proposed price. This information is illustrative of the detail required for each infrastructure site, inclusive of sites having only dispatch-related equipment.

15.1.2 Vendors shall provide a per-site granular price detail of proposed equipment, towers, generators, site civil engineering, program management, system engineering, installation services, and maintenance services. As this is a turnkey project, any pricing omission of a scope typically considered part of a P25 simulcast trunked radio system of this type will be provided for by the Contractor at no additional cost to the Customer.

15.1.3 The Vendors are requested to provide finance pricing options for the infrastructure, subscribers, and maintenance proposed. This information should include at a minimum terms, interest percentages, and payment terms.

15.2 **Lifecycle Costs**

15.2.1 The Customer reserves the right to perform a lifecycle analysis on the proposed system to determine the best price value. A critical part of such research involves knowledge of the overall lifecycle of the various OEM and 3rd Party elements making up a Vendor's System solution. From general availability to manufacture discontinue and all phases in between, the production age of the proposed system affects the ability to source spare parts, software upgrade, and support services. Lifecycle analysis is a critical factor in determining the operational life of the proposed P25 technology and supporting products.

15.2.2 Vendors shall disclose key lifecycle dates of the proposed system, including subscribers, P25 System software, infrastructure, network elements, and 3rd Party supporting equipment. From general availability (GA) release dates to manufacture discontinue (MD) dates along with important OEM hardware and software support dates for standard, extended and out-of-support milestone dates. Please detail how software support dates/phases affect service availability and pricing.

15.2.3 Vendors shall disclose as part of their Cost Proposal when System was first released for sale to the Public. Vendors shall also provide a life-cycle roadmap, referenced by year and so depict when any third party equipment is likely to be discontinued and when parts/software support will cease to be available.

15.3 **Warranty and Post-Warranty Maintenance Costs**

15.3.1 All costs associated with the initial warranty period and the extended post-warranty maintenance services shall be included in the Vendor's cost proposal as a comprehensive, full-service support program covering all components furnished under the Contract, including all third-party equipment.

- 15.3.2 Such costs shall include, at a minimum, all required personnel and labor to perform the services; infrastructure software updates; hardware upgrades necessary to support current software releases as applicable; replacement of defective or failed parts; provision of spare parts; technical support; and annual preventative maintenance services for all system elements.
- 15.3.3 Multi-year pricing shall be itemized and clearly detailed by calendar year or by the Customer's fiscal year.
- 15.3.4 Post-warranty maintenance services shall provide coverage equivalent to that provided during the original warranty period and shall include all third-party equipment furnished under the Contract.
- 15.3.5 The Vendor shall offer post-warranty system support as an extended warranty program beginning immediately upon expiration of the initial warranty and continuing through fifteen (15) years following Final System Acceptance.

The Vendor shall also provide optional post-warranty depot repair services only at a fixed annual price from the start of the warranty period through fifteen (15) years following Final System Acceptance should the Customer elect to perform most of their own maintenance.

15.4 Pricing Summaries

- 15.4.1 Pricing Summaries for System/Infrastructure equipment shall be provided as part of the response. All summary information will be supported by detailed cost information as detailed further in this Section.

15.5 Pricing Details

- 15.5.1.1 The attached pricing worksheets are to be used as an example to develop the Infrastructure Price Submittal. These worksheets are indicative of the detail required and may be amended or expanded by the Vendor as necessary. Any omission or error in developing the pricing proposal, shall be the sole responsibility of the Vendor.

15.6 Future Purchase Considerations

- 15.6.1.1.1 The contract list pricing and associated discounts proposed by the Vendor shall remain valid and available for additional purchases and quantity increases by the Customer from Contract award through Final System Acceptance. During this period, the Vendor shall not increase unit pricing or reduce the offered discount percentages for the items included in the Contract.
- 15.6.1.1.2 The Vendor shall provide the Customer with a fixed percentage discount off the Manufacturer's then-current published list price for all Equipment supplied in the Contract (including, but not limited to, base stations, controllers, networking equipment, features, and licenses) purchased by the Customer for a period of fifteen (15) years following Final System Acceptance. The applicable discount percentage shall be clearly stated in the Vendor's proposal and shall remain firm and binding for the full fifteen-year term.

16 Section 16 - Additional Requirements

16.1 Fire/EMS VHF Paging

16.1.1 The Customer currently has conventional VHF simulcast fire paging solution to alert volunteer fire personnel throughout the service area defined in Section 6 Coverage Criteria. The customer desires to keep paging in the VHF band.

16.1.1.1 The current repeaters can be reused as part of the Vendor proposal.

16.1.1.2 The End-of-Life must be identified for any reused equipment.

16.1.1.3 The proposal must include upfront pricing for any equipment that has to be replaced within the life of the contract.

16.2 Ability to monitor the radio traffic in remote office areas.

16.2.1 The customer requires the ability to monitor the radio system in remote areas throughout the Sheriff's Office and other locations.

16.2.2 There are twenty (20) locations that need to be defined between the vendor and the customer.

16.2.3 There is one (1) monitor for Court Security

16.3 Fire Station Alerting System

16.3.1 The customer is considering the implementation of a fully-functional, turn-key, scalable Fire Station Alerting System (FSAS) that can be integrated with current or future data transport systems.

16.3.1.1 For information only, the city of Watertown is currently using a Phoenix G2 fire alerting system.

16.3.1.2 The vendor has the option to propose a different fire alerting solution.

16.3.2 A list of fire stations within Dodge County is located in Appendix G.

16.3.3 Pricing should be proposed with the understanding that costs could vary, depending on the installation and construction requirements of each building.

16.3.3.1 The proposed solution will use IP based connectivity to each station, while the 7/800MHz P25 radio system serves as a backup solution that provides the functionality of minimally alerting, activate station lights, using station PA system, and provide acknowledgement.

16.3.3.2 The radio system can be used as the primary network if IP connectivity is not available.

16.3.3.3 The proposed solution for the Fire Alerting system should have capabilities to interface to The Customer's Computer Aided Dispatch (CAD).

16.3.3.4 The proposed FSAS should also minimally provide:

16.3.3.4.1 FSAS must be aware that an outage has occurred and automatically re-route alerts through an alternate path to meet current department requirements.

16.3.3.4.2 The transition from the LAN based transport should be seamless and not require alerting the system manager to manually reconfigure the system for alerts to be received at the affected station(s).

- 16.3.3.4.3 Indoor/Outdoor speakers with independent volume adjustments, dry contact alarm points, and other auxiliary control devices are typically connected with copper cabling. A speaker shall be included for each bedroom, day room, kitchen, and office within each fire station.
- 16.3.3.4.4 Alternate lighting shall be provided that will illuminate with a “soft” light upon an alert being activated. This alternate lighting shall be in each bedroom, hallways, and living space to provide visual notification of an alert as well as provide the ability to see if standard station lights have been turned off
- 16.3.3.4.5 Fire stations with multiple apparatus will be provided with necessary control devices to select which apparatus they wish to be alerted to within their bedrooms or sleeping area.
- 16.3.3.4.6 Ability to turn off stoves within each fire station to prevent a fire from occurring if an alert is received while personnel are cooking on the stove.
- 16.3.3.4.7 Time synchronization
- 16.3.3.4.8 Preset day and night modes, which include volume levels inside and outside each fire station
- 16.3.3.4.9 Emergency alert switch for in-station emergencies
- 16.3.3.5 Transfer from the LAN based to radio based alert transport cannot take place unless the alerting system is aware of a LAN outage.
 - 16.3.3.5.1 This either requires that the alerting system poll the stations to see if a communication path exists and/or require an acknowledgement from the stations to assure that an alert has been received.
 - 16.3.3.5.2 With LAN based systems, multiple attempts to send an alert are automatically made. If after a programmed number of attempts occur and acknowledgement of the alert is not received, an alerting system alarm is created.
 - 16.3.3.5.3 Since this alarm may go unnoticed. It is imperative that the alerting system have the ability to transfer the station alert to an alternate path in order to assure that the alarm has been received. This action should take place without human intervention.
- 16.3.3.6 Transfer from the LAN based to radio based alert transport cannot take place unless the alerting system is aware of a LAN outage.
- 16.3.3.7 One secondary alerting path can utilize a trunked radio system.
- 16.3.3.7.1 A 7/800MHZ P25 radio system currently should be considered as alternate method and should provide the means for alerts to be sent to the stations should the primary LAN system fail. This alternative will require that an appropriate 7/800MHz P25 control station radio is present in each station and is connected to the local alert controller. The current license(s) held by the Customer should be considered for this alternate method.
- 16.3.3.7.2 This solution presents a challenge as interconnection with the local alert controller is possible but will vary depending on which alert system is chosen. As such, the alert system must have multiple means of connectivity for alert signals.
- 16.3.3.8 It must be noted that to utilize the 7/800MHz radio for alerting, some additional equipment or radio configurations may be required. The costs for the radio and the

radio configuration are considered within the scope of this project.

- 16.3.3.9 The following infrastructure equipment will be necessary:
 - 16.3.3.9.1 Centralized gateway or portal server (redundant for non-single point failure) to interface with the existing CAD system.
 - 16.3.3.9.2 Master alerting controller to distribute alerts to all current and future fire stations.
 - 16.3.3.9.3 System management console and software for configuring the alerting system interfaces, functions, capabilities, and reporting various alarm conditions. This should include options for automated voice notification and announcement.
 - 16.3.3.9.4 All proposed Fire Station alerting equipment shall have battery backup for the alternate solution and station paging system provided for a 2 hour period should power fail.
- 16.3.4 **Storm Warning System**
 - 16.3.4.1 The customer currently has seventy (70) that will require upgrading that will be upgraded to work with the proposed P25 radio system.
 - 16.3.4.1.1 The sirens are currently activated by implementing a radio call from dispatch on the Customer's DMR system to a mobile radio. The mobile radio then uses an output to activate the siren interface.
 - 16.3.4.1.2 The vendor will be responsible for integrating the new radio into the existing storm warning system and shall provide all needed radio equipment and hardware to interface with the existing emergency sirens.
 - 16.3.4.1.3 The sirens are to be activated utilizing the P25 network by making a call to each location.
 - 16.3.4.1.4 A new antenna, coaxial cable, and proper grounding are required at each radio location.
- 16.3.5 **Optional Shared System Infrastructure**
 - 16.3.5.1 The Customer is sensitive to the costly nature of P25 systems. Therefore, vendors are encouraged to submit creative additional proposals that may utilize any or all capabilities, software, and hardware of other systems that are already being provided by the vendor. This may include systems that are currently under construction but can be modified to accommodate additional equipment added for the purposes of this RFP, or systems that are complete and in normal operation (Further referenced as "existing system").
 - 16.3.5.2 Optional system configuration technical requirements
 - 16.3.5.2.1 Any proposed optional configuration must meet all technical requirements outlined within this RFP. If an optional configuration will not support all technical requirements listed in this RFP, each item not supported must have detailed explanation for why it cannot be supported. Any unsupported requirement risks being graded down or found non-compliant. Furthermore, an optional system configuration will not be considered if the primary response to this RFP is graded as noncompliant.

- 16.3.5.2.2 Optional configurations must have redundant network connection points into the existing system. Additionally, the proposed optional configuration must be able to continue regular trunking operations and communications in the event of network connectivity failure to the existing system. This includes dispatch consoles having direct network access into the remaining RF sites, or RF connectivity.
- 16.3.5.3 Optional System Configuration Pricing Requirements
 - 16.3.5.3.1 Within the pricing proposal of the optional system configuration, key cost differences (whether savings or additional cost) shall be identified and marked as such for comparison purposes. An example of this is if a specific item is needed in a stand-alone system, but already exists with the optional solution, the vendor shall highlight this cost savings.
 - 16.3.5.3.2 Optional System Configuration Submittal Requirements
 - 16.3.5.3.3 Any optional system configuration proposal must follow all dates and guidelines as prescribed in this RFP, including the separation of its pricing from the technical proposal.
 - 16.3.5.3.4 Additionally, any optional system configuration that requires joining an existing system or site, must include written authorization from the owner of the existing system or site. This authorization must be included within the technical proposal submittal for the Optional system configuration.
- 16.3.6 **Dispatch Console Furniture**
 - 16.3.6.1 Public Safety/911 Emergency Communication Centers have unique challenges and demands; conventional office furniture does not provide an acceptable level of function, technology integration, user ergonomics features, nor durability. When specifying furniture for an Emergency Communications Center, it is important to recognize that furniture should meet minimum requirements to support key performance requirements:
 - 16.3.6.2 Primary Dispatch Center currently consists of six (6) furniture positions.
 - 16.3.6.3 Consoles are utilized 24 hours per day/ 7 days per week by different employees with different physical sizes and needs; this is more than five times the average use and wear of conventional office furniture annually.
 - 16.3.6.4 Consoles must house and power extensive technology support including multiple monitors - in-line, stacked and/or combined with large-format screens models.
 - 16.3.6.5 Console furniture must provide additional storage for ancillary rack mount electronics.
 - 16.3.6.6 Consoles must provide no less than ten (10) years of 24/7 use which is required for the expected 80,000 hours of use over the course of a console's lifetime.
 - 16.3.6.7 Conventional office furniture systems will not be considered for emergency communications center applications. The following categories have been identified for critical compliance and should be met by Dispatch Console furniture manufacturers and providers.

- 16.3.6.8 Consoles should be designed and manufactured to meet the following industry standard (or equivalent), and third party tested, guidelines for safety, strength, durability, and a healthy workplace:
 - 16.3.6.8.1 CSA (Canadian Standards Association) C22.2#68.
 - 16.3.6.8.2 SCS Global Services Indoor Air Advantage Gold SCS-EC10.3-2014 v3.0 certified for protecting indoor air quality by minimizing volatile organic compound chemical off gassing through design engineering and materials selection.
 - 16.3.6.8.3 CARB (California Air Resources Board) compliant for reduction of formaldehyde emissions, identified as an airborne toxin.
 - 16.3.6.8.4 FCC eCFR Title 47, Part 15 Radio Frequency Devices, Subpart B: Unintentional Radiators.
 - 16.3.6.8.5 ICES (Interface Causing Equipment Standard) -003: Informational Technology Equipment.
 - 16.3.6.8.6 Textiles compliance with CA TB 117 (California Technical Bulletin) Flammability Standard Requirements for Upholstered Furniture products.
- 16.3.6.9 Technical Requirements
 - 16.3.6.9.1 Stability – Function
 - 16.3.6.9.1.1 The console furniture is modular in design so as to be easily reconfigured and upgraded.
 - 16.3.6.9.1.2 Technology storage and personal storage units stand free from the main console body so they can be field removed or replaced without deconstruction on the console unit.
 - 16.3.6.9.1.3 Sit-to-stand legs are bolted into the console undercarriage and to the underside of the input support surface creating maximum proportional stability; free-standing leg and feet systems will not be acceptable.
 - 16.3.6.9.1.4 There are no obstructions side-to-side obstructions within the console footprint that will inhibit movement by the user, a critical component in order to provide on-going training of users and technology. Knee space must span a minimum of 70% of the console’s overall width.
 - 16.3.6.9.1.5 Horizontal work surfaces are supported by a formed steel sub-frame for maximum durability.
 - 16.3.6.9.1.6 Horizontal work surfaces must be strong and rigid and able to meet all required standards for furniture construction as outlined by ANSI/BIFMA X5.5-2008, Desk Products.
 - 16.3.6.9.2 Computer Workstations
 - 16.3.6.9.2.1 The input support surface must lower to at least 24.5” from the floor.
 - 16.3.6.9.2.2 The input support surface must raise to 50” above the floor to accommodate the 99th percentile standing male per ANSI/HFES 100-2007 Human Factors Engineering of
 - 16.3.6.9.2.3 The height-adjustability must be engineered so as to provide infinite adjustment throughout the entire adjustment range, a critical function to meet ergonomic standards and reduce repetitive strain injuries and carpal tunnel syndrome.
 - 16.3.6.9.2.4 The input support surface must be a level platform that is wide enough to accommodate multiple input including keyboards, mice, and writing surface; the input platform surface area should be a minimum of 1300 sq. inches.

- 16.3.6.9.2.5 The input support surface must have enough surface area to accommodate input devices within a primary and a secondary work zone and to meet ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.4.1 standards.
- 16.3.6.9.2.6 The input support surface must allow the user to maintain elbow angles between 70 and 135 degrees to meet ANSI/HFES 100-2007
- 16.3.6.9.2.7 The electronic adjustment must be independent of the monitor support; other adjustment methods will be deemed unacceptable.
- 16.3.6.9.2.8 The electronic adjustment must be controlled through a digital read-out to ensure precise user-preferred replication.
- 16.3.6.9.2.9 The electronic adjustment controls must be mounted in a location that meets ADA standards for accessibility.
- 16.3.6.9.2.10 Top mounted adjustment controls will be deemed not acceptable.
- 16.3.6.9.2.11 The input support surface must adjust simultaneously with the monitor support in order to retain relative positioning between both surfaces when changing from sitting to standing. This promotes ergonomic alignment and a timely and controlled shift from sitting to standing work postures.
- 16.3.6.9.2.12 The input support surface must allow adjustment of the line-of-sight viewing distance between the eyes and front surface of the viewable display area within the range of 19.7" and 39.4" to meet ANSI/HFES 100-2007 The entire surface and all environmental controls shall move with the input surface to maintain preferred and ergonomic settings.
- 16.3.6.9.2.13 The input support surface must have a static load capacity of 1200 lbs. and an equipment load capacity of 500 lbs to accommodate multiple models and quantities of various input devices.
- 16.3.6.9.2.14 Lifting columns for the input surface should be integrated into the storage cavities for increased stability; leg set bases should not be exposed.
- 16.3.6.9.2.15 The input support surface legs must have integrated anti-collision software to promote user safety, detect obstacles and prevent damage to console or equipment.**
- 16.3.6.9.2.16 A minimum safety clearance of 1.25" shall be required between all moving surfaces per ANSI-HFES 100-2007 Human Factors Engineering of Computer Workstations
- 16.3.6.9.2.17 There shall be no entrapment zones, as defined by UL 962.
- 16.3.6.9.2.18 The input surface must have a welded steel sub-frame for increased structural integrity.
- 16.3.6.9.2.19 The position of the input support surface relative to the lifting legs and ancillary enclosures needs to be positioned so as to provide unobstructed knee clearance for users in the seated operating position and in accordance with ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.2.1.
- 16.3.6.9.2.20 The input support surface should be controlled through the use of 24 VDC motors. All powered components must be UL 962 listed and should be CSA (Canadian Standards Association) certified.

- 16.3.6.9.2.21 Must utilize a dual brake for stability and prevention of binding. Braking system must lock surface into place when the brake is released.
- 16.3.6.9.2.22 There should be surface-mounted, user-configurable, user-accessible voice and data connections (RJ12, RJ45 USB, 3.5mm Audio) available and accessible from the front of the console.
- 16.3.6.9.2.23 All moveable components of the console's input support surface and lifting mechanisms shall be designed and tested to at least 40,000 cycle full range adjustments.
- 16.3.6.9.3 Monitor Viewing Support
 - 16.3.6.9.3.1 The console design must include adjustment of monitors so that the gaze angle to the center of the screen ranges between 15° and 20° below horizontal eye level per ANSI-HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.4.3.
 - 16.3.6.9.3.2 The console design must accommodate use of up to (5) 21" widescreen LCD flat panel monitors on a single tier, and up to (10) 21" widescreen LCD flat panel monitors in a stacked configuration and provide independent angle adjustment for each.
 - 16.3.6.9.3.3 The monitor mounting array should allow for concurrent focal depth movement of at least four monitors at once.
 - 16.3.6.9.3.4 Monitor viewing support controls must be mounted in a location that meets ADA standards for accessibility; top mounted adjustment controls will be deemed unacceptable.
 - 16.3.6.9.3.5 Monitor viewing support must be controlled through the use of 24 VDC motors. All powered components must be UL 962 listed and should be CSA certified.
 - 16.3.6.9.3.6 Monitor viewing support must be independently adjustable.
 - 16.3.6.9.3.7 All moveable components of the console's monitor viewing support system shall be designed and tested to at least 40,000 cycle full range adjustments.
- 16.3.6.9.4 Support Adjustments
 - 16.3.6.9.4.1 All mechanical and powered support adjustment mechanisms shall operate at a speed approximately 1" per second.
 - 16.3.6.9.4.2 Input surface support adjustment mechanisms must be controlled through a digital read-out to ensure precise replication for individual users who share a single console workstation.
 - 16.3.6.9.4.3 All mechanical and powered support adjustment controls must be mounted in a location that meets ADA standards for accessibility; top mounted adjustment controls will be deemed unacceptable
 - 16.3.6.9.4.4 All mechanical and powered support adjustment mechanisms including "lifting systems" must operate quietly with a maximum sound level of 50db.
 - 16.3.6.9.4.5 Console technology storage enclosures must be accessible from both the front and the rear.
 - 16.3.6.9.4.6 Console technology storage enclosures must not attach directly to the primary work surface.
 - 16.3.6.9.4.7 Console technology storage enclosures must be available in 24" and 30" heights.

- 16.3.6.9.4.8 Console technology storage enclosures must be available in 30", 42" and 50" widths.
- 16.3.6.9.4.9 Enclosures must be engineered to support stacking storage components atop the units to allow for additional technology storage or personal storage without taking up added floor space.
- 16.3.6.9.4.10 Console technology storage enclosure rear access doors must offer cooling by a minimum of 2 each 50 CFM axial cooling fans.
- 16.3.6.9.4.11 Console technology storage enclosure front access doors must utilize a vented plenum system to draw cool air into the enclosure.
- 16.3.6.9.4.12 All console technology storage enclosure must have an active cooling system to ensure that cabinets are kept at the optimum temperature for peak technology performance.
- 16.3.6.9.4.13 Console technology storage enclosures must have horizontal cable management systems.
- 16.3.6.9.5 Cable Management Rail
- 16.3.6.9.5.1 There should be a horizontal cable management rail for running cabling from one side of the console to the other.
- 16.3.6.9.5.2 The wood cable management rails should be constructed of 42 lb. density particle board panel with THERMALLY FUSED MELAMINE (THERMALLY FUSED LAMINATE) on both sides.
- 16.3.6.9.5.3 All steel components within the wood cable management rail must be powder coated for durability; enamel paint is not sufficiently durable and will be considered unacceptable.
- 16.3.6.9.5.4 Internal cable management channel must be able to house a minimum of 40 each Cat-6 cables and one each 1" flexible conduit.
- 16.3.6.9.5.5 Internal cable management channels must contain fastening points to prevent unintentional movement and disconnection of cabling during active service.
- 16.3.6.9.5.6 The wood cable management rail must have a locking option to prevent unauthorized personnel access to internal cabling.
- 16.3.6.9.5.7 The wood cable management rail must be available in both single access and dual access configurations to allow maximum flexibility and future reconfiguration.
- 16.3.6.9.6 Enclosures - Personal Base Storage
- 16.3.6.9.6.1 Personal base storage enclosures must be available in 24" and 30" heights. 16.3.6.9.6.2 Personal base storage enclosures must be available in 30", 42" and 50" widths.
- 16.3.6.9.6.3 Personal base storage enclosures must have optional filing storage sized at 20" wide. 16.3.6.9.6.4 Personal base storage enclosures must be available in a 24" depth.
- 16.3.6.9.6.5 Personal base storage enclosures must be available in single and dual sided configurations. 16.3.6.9.6.6 Personal base storage enclosures must be available in combinations including open-drawer-door, open bookcase, and closed-door configurations.
- 16.3.6.9.6.7 Enclosures must be engineered to support stacking storage components atop the units to allow for additional personal storage without taking up added floor space.
- 16.3.6.9.7 Storage Enclosure Materials
- 16.3.6.9.7.1 Wood parts should be constructed of 42 lb. density particle board with THERMALLY FUSED MELAMINE (THERMALLY FUSED LAMINATE) on both sides.

- 16.3.6.9.7.2 Steel parts should be manufactured from 14-gauge cold rolled steel for maximum strength and durability.
- 16.3.6.9.8 Edge Material
 - 16.3.6.9.8.1 All storage enclosures, including fixed or mobile pedestals, must have edges finished with 1.5mm thick thermoplastic polypropylene extrusion with self-healing properties for maximum durability.
 - 16.3.6.9.8.2 All input support surfaces must use a 3mm thick thermoplastic polypropylene extrusion edging with self-healing properties for maximum durability.
 - 16.3.6.9.8.3 All input surface edging must have a minimum 3mm radius on front edge so as to comply with ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.1.4.
- 16.3.6.9.9 Laminates
 - 16.3.6.9.9.1 High pressure laminate must meet ANSI/ASME A 17.1; 1986 requirements for Class "B" laminate and ASTM D523-89, providing a non-glare matte finish.
 - 16.3.6.9.9.2 All monitor and input surfaces must be .0625" thickness horizontal grade laminate on the top surface and on the backing sheet, to prevent deflection.
 - 16.3.6.9.9.3 Thermally fused laminate must meet NEMA LI-1-1998; low pressure laminate is not acceptable.
- 16.3.6.9.10 Textiles/Fabric
 - 16.3.6.9.10.1 All textiles must be abrasion resistant to meet ASTM D-3597 MVPTS-198 standard.
 - 16.3.6.9.10.2 All textiles must meet flammability requirements in accordance with ASTM E-84 (Tunnel Test) Class A, or 1, and the State of California Technical Bulletin 117 Sec. E (SC-191-53) standards.
- 16.3.6.9.11 Powder coat
 - 16.3.6.9.11.1 Powder coat must meet ASTM D3359-09 adhesion standard for durability. 16.3.6.9.11.2 Powder coat must meet PCI #8 Solvent Cure Test for durability.
- 16.3.6.9.12 Electrical Requirements
 - 16.3.6.9.12.1 Every console will have (2) Power Distribution Units (PDU) of 15A. Each PDU Unit must provide (13) NEMA 5-15R outlets and a NEMA 5-15P input. PDU unit must include a 15-foot cord. PDU must be UL listed and CSA rated.
 - 16.3.6.9.12.2 The total power draw for an individual console may not exceed 13.3 amps; this includes the console lifting system and all environmental controls.
 - 16.3.6.9.12.3 The console should comply with UL standard 962 ensuring the highest standard of electrical and physical safety.
 - 16.3.6.9.12.4 The console should be rated to comply with FCC Title 47 Part 15 subpart B/ICES-003 for Radiated and Conducted emissions.
 - 16.3.6.9.12.5 The console should operate with 120 VAC, 60Hz. 16.3.6.9.13 Wire and Cable Management
- 16.3.6.9.13.1 The console must include two cable access drops with energy chains for vertical cable management from the input support surface to the equipment enclosures so as to comply with UL 962 standards.

- 16.3.6.9.13.2 The console must include energy chains for horizontal cable management between the moving surface and adjacent fixed surface to preserve optimal and secure operation of cords and cables during the console's active use.
- 16.3.6.9.13.3 A quick connect user-accessible interface with accommodations for up to 10 configurable ports must be available and must include ports, jacks, and cables for: USB-A, RJ45, RJ11/12, and 3.5mm stereo audio connection kits; the quick connect interface must also provide cable management for the equipment it serves.
- 16.3.6.9.13.4 The console infrastructure must support cable management from the user's position to the CPUs inside the console.
- 16.3.6.9.13.5 The console must have a horizontal cable raceway for unencumbered and easily serviceable runs.
- 16.3.6.9.13.6 The console must have a horizontal cable raceway that is easily accessible and allows drop-in cable runs to accommodate easy technology updates and service access.
- 16.3.6.9.13.7 Cables routed within the walls of a furniture panel system will not be acceptable.
- 16.3.6.9.14 Environmental Control System
 - 16.3.6.9.14.1 The control panel for all environmental settings (task lighting, heating controls, and air distribution) must be integrated with the console body.
 - 16.3.6.9.14.2 The control panel must be easy to clean and sanitize.
 - 16.3.6.9.14.3 The height for the input support surface must be shown on a digital read-out to ensure total replication of console positioning for all employees; the digital readout for the input support surface shall display inches from the floor.
- 16.3.6.9.15 ADA Compliance
 - 16.3.6.9.15.1 There must be an optional electronic adjustment control located within reach of a wheelchair to meet ADA requirements.
- 16.3.6.9.15 Lighting Levels
 - 16.3.6.9.15.1 The console must integrate LED lighting solutions.
 - 16.3.6.9.16.2 The console must have integrated ambient lighting.
- 16.3.6.9.16.3 The console must have flexible gooseneck style task lighting to allow proper placement of light over work area.
- 16.3.6.9.16.4 All integrated lighting on the console shall be mechanically fastened to the console to prevent removal; lights should be removable for maintenance.
- 16.3.6.9.16 Experience & References
 - 16.3.6.9.16.1 The manufacturer of the console furniture being proposed must have a proven record of product longevity and customer service in a 24-hour operating environment for public safety dispatch centers of similar size to this request.
 - 16.3.6.9.16.2 The manufacturer of the console furniture being proposed must have a minimum of 5 years' experience in designing, manufacturing, and servicing ergonomic console furniture will be considered.

- 16.3.6.9.16.3 The manufacturer of the console furniture being proposed must provide references for similar sized projects that were installed within the last 5 years; include the agency name, location, number of positions, and contact.
- 16.3.6.9.17 Space Planning & Console Specifics
 - 16.3.6.9.17.1 Perspective drawings are required with the response submission and must include height, width, and depth dimensions in order to determine compliance with the specifications.
 - 16.3.6.9.17.2 All accessories being proposed should be shown in the drawings.
- 16.3.6.9.19 Console Furniture Warranty, Service and Maintenance Agreement
 - 16.3.6.9.19.1 The bidder and manufacturer must provide at least one-year warranty coverage for all products, delivery, and installation; no costs associated with replacement or repair of any portion of the product or installation will be passed on to the customer during the first year of warranty.
 - 16.3.6.9.19.2 The bidder and manufacturer must provide Lifetime warranty on all structural components. After one year, labor and installation expenses associated with the product replacement under the warranty will be assessed on a case by case basis. Products not covered for life include electrical components, monitor arms, and the input platform mechanisms.
 - 16.3.6.9.19.3 The bidder and manufacturer must provide an optional service and maintenance agreement that can be quoted upon request, to mitigate hidden expenses associated with product replacement after the initial warranty period. The optional service and maintenance agreement must cover additional required installation and regularly scheduled service that may occur after the initial warranty period expires. This maintenance should be quoted for 14 years after warranty.
- 16.3.6.9.20 Installation
 - 16.3.6.9.20.1 The manufacturer must provide lead times and identify date of order and proposed final installation at each location. The manufacturer must include a shipping estimate for direct, inside delivery to the facility.
 - 16.3.6.9.20.2 Only the manufacturer's factory installers or their trained and authorized designees experienced with the working environment of a public safety dispatch center shall assemble and install the console furniture; documentation must be provided for the installation foreman.
 - 16.3.6.9.20.3 Training all users and support staff in the proper use of all adjustment controls, ergonomic functions, and technical access must be provided.
 - 16.3.6.9.20.4 The manufacturer must provide user manuals.
- 16.3.7 **Optional Use of Existing Equipment Shelter Buildings**
 - 16.3.7.1 Vendors may provide optional pricing to utilize or reuse the Customer's existing shelter buildings.
 - 16.3.7.2 Any building considered for reuse must be upgraded to support and meet all criteria previously defined in this RFP.

- 16.3.7.3 Pricing for utilizing any existing building should be shown as an optional cost savings that can be executed and not part of the primary RFP pricing.
- 16.3.7.4 The building must support, or be upgraded to support, all electrical, grounding, lighting, HVAC, and alarm systems defined in Section 8 General Equipment Shelter Requirements.
- 16.3.7.5 The site compound must meet the criteria defined in Section 11 Site Work Requirements.