



City of Cape Girardeau, Missouri Project 25 Radio System Request for Proposals

October 31, 2016

Prepared by



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1. Project Overview

1.1 Introduction

The City of Cape Girardeau, Missouri (City) is requesting proposals from qualified vendors to provide a Project 25 (P25) compliant simulcast trunked radio system. Responding vendors should have experience in providing P25 systems to public safety and public service users. The following are the primary goals for this project:

1. Deploy a P25 standards-based, five-channel radio system to enhance interoperability, coverage, and capacity
2. Deploy new P25 Internet Protocol (IP)-based radio dispatch consoles designed to support all of the features of the new P25 radio system, while also retaining any required legacy capabilities to support current features and interoperability
3. Deploy a new microwave system to support an all-IP backbone and Ethernet traffic in a loop configuration, to enhance availability, and to provide the scalability to support P25 voice, and potentially, future data implementations
4. Deploy a P25 radio system providing balanced 95% portable radio round-trip coverage (talk-out and talk-in) within the city limits of Cape Girardeau inside 15 dB buildings and within critical buildings (see Appendix C)
5. Deploy new P25 subscriber (user) radios that can operate in VHF and 700/800 MHz bands to maximize the potential for enhancing interoperability with adjacent cities, counties, and users of the Missouri Statewide Interoperability Network (MOSWIN) system

Due to potential funding limitations, the City also desires to explore the following initiatives as OPTIONS in the new system procurement and deployment.

1. Deployment of an Inter-RF Subsystem Interface (ISSI) connection, further enhancing interoperability
2. Deployment of geo-graphically diverse P25 control equipment
3. Deployment of additional subscriber units allowing all City departments to share a single standards-based system
4. Backhaul network options including the re-use of existing City fiber, where available, and increasing microwave throughput to 150 Mbps
5. Expansion to a six channel radio system to support interoperable users from adjacent jurisdictions



6. Deployment of other system features including:
 - a. P25 Phase 2 Time Division Multiple Access (TDMA) operation
 - b. Encryption
 - c. GPS/AVL (Global Positioning System/Automatic Vehicle Location)
 - d. Over the Air Rekeying (OTAR)
 - e. Over the Air Programming (OTAP)
 - f. Smartphone integration

1.1.1 Existing System

The City's current primary radio system utilizes two analog VHF channels, providing separate dispatch channels for fire and police. Both systems consist of a single transmit location and three voted receiver locations. The channels currently utilize the following radio site locations:

- North County Park Tower
- Gordonville Tower
- KFVS12 Building

Of these locations, the Gordonville Tower is utilized as the transmit and voting location for both channels. The other two locations contain the voted receivers. Currently, a microwave network provides backhaul service for the receivers.

A third VHF analog channel, the Fire Operations channel, has a transmitter and receiver located at the North County Park Tower, and a receiver located at the KFVS12 Building.

The current dispatch center is collocated with Fire Station #3 at: 1975 Sprigg Street, Cape Girardeau, MO. The dispatch center currently utilizes six "C-Soft" consoles manufactured by Telex. These consoles control a variety of radio control stations located either in the equipment room of the dispatch center, Fire Station #1 or the Cape Girardeau Police Station. City owned fiber connectivity is available between the dispatch center, the Gordonville Tower, Fire Station #1 and the existing Police Department.

1.1.2 Existing Backhaul Network

The City utilizes a mixture of unlicensed point-to-point microwave and City fiber for backhaul of the existing radio system. Figure 1 details the connectivity between sites.



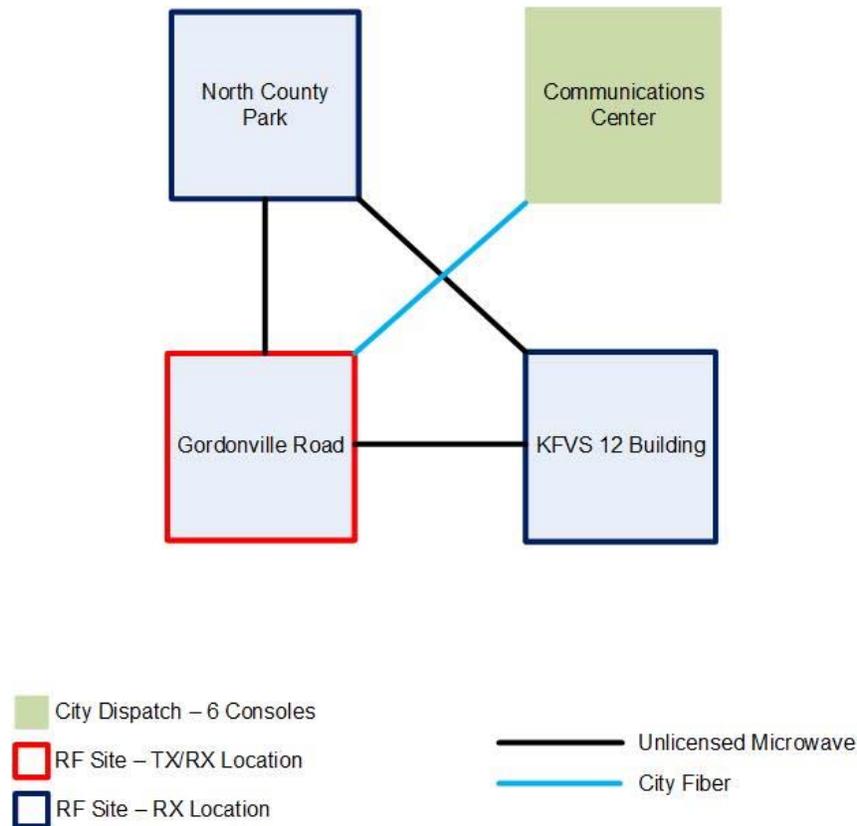


Figure 1 – Backhaul System Layout

Currently the Communications center and Gordonville Road tower locations contain City fiber. The current connection between the Communications Center and the Gordonville Road tower should be considered a logical connection and not a physical one. The City expects that City fiber will also serve the North County Road tower site in the future.

1.1.3 Missouri Statewide Interoperability Network (MOSWIN)

The City currently has subscribers capable of operating on the MOSWIN system for interoperability. RESPONDENTS shall ensure that subscriber radios proposed are capable of operating on the existing MOSWIN system in both the VHF and 700/800 MHz bands.

1.2 Overview of this Document

- A. The following list provides a view to the structure of this Request for Proposals (RFP):



1. Section 1, *Project Overview* – Provides background information and a general overview of the requirements contained in this RFP.
 2. Section 2, *Instructions to Proposers* – Provides instructions to proposers, including, but not limited to: proposal due date; pre-proposal conference information; and evaluation criteria.
 3. Section 3, *Radio Communications System Requirements* – Provides requirements for the desired communications systems.
 4. Section 4, *Subscriber Equipment* – Provides requirements for portable radios, mobile radios, and control stations.
 5. Section 5, *Facilities and Infrastructure Development* – Provides requirements for tower construction, site preparation, fencing, equipment shelters, generators, and UPS equipment.
 6. Section 6, *Training* – Provides requirements for training programs to be developed by the SELECTED VENDOR.
 7. Section 7, *System Implementation, Test, and Acceptance* – Provides requirements for detailed design review, system staging, installation, fleet mapping, coverage testing, system cutover and final acceptance.
 8. Section 8, *Warranty, Maintenance, and Support* – Provides requirements for the warranty, extended warranty, maintenance, and support of the proposed system and subsystems.
- B. Appendices to this RFP:
1. Appendix A – Compliance Matrix
 2. Appendix B – Proposal Pricing Forms
 3. Appendix C – Critical Building List

1.3 Project Summary

- A. The SELECTED VENDOR shall be responsible for providing the following project components:
1. Engineering and system design
 2. Project management
 3. Preparing and submitting FCC Licensing forms
 4. Furnishing and installing system equipment and ancillary facilities



5. Software installation and programming
 6. Training
 7. Acceptance testing, including coverage testing
 8. Cutover planning and execution
 9. Warranty and maintenance support
 10. Decommissioning/removal of legacy communications system and ancillary devices not required for the operation of the new communications system or, any equipment not being utilized in conjunction with the new communications system.
- B. The SELECTED VENDOR shall be responsible for furnishing complete and fully functional systems to include:
1. Radio communications system, including a guarantee of radio coverage and Grade of Service (GoS)
 2. Digital microwave backhaul network
 3. Radio dispatch consoles
 4. Infrastructure facilities (e.g., towers, shelters, fencing)
 5. Network management system
 6. Subscriber radio equipment
- C. Work shall be planned, coordinated, and conducted with minimal interruption of service to existing critical systems.
- D. Proposals shall completely describe the equipment and methods that will be used to implement the system. The intent of this document is to allow RESPONDENT to offer the best equipment, technology, and methods available to provide state-of-the-art public safety communications systems of the highest quality and performance.
- E. Should the systems provided fail to operate as proposed due to the SELECTED VENDOR's errors or omission, these issues will be corrected by the SELECTED VENDOR at no additional cost to the City.
- F. All equipment shall be provided in new condition and covered by a full manufacturer's warranty and support services for not less than three years.



- G. Proposals shall not be accepted that include systems, equipment, or components at or near the end of their respective lifecycles.
- H. In the event that requirements are stated in more than one section and appear to conflict, the more stringent requirement shall apply.

1.4 Proposals Desired

- A. The City desires a complete turnkey solution addressing all project systems, subsystems, and components for the primary radio communications network. This network shall provide public safety grade communications capabilities across the City, allowing agencies within the City to safely, effectively, and efficiently carry out their duties. The City seeks to obtain proposals for a 700MHz, Project 25 Phase 1 simulcast trunked radio system, backhaul network, dispatch console subsystem, and user devices.
- B. Proposal Options: Requirements described as an “OPTION” or “OPTIONAL” refer to features or equipment that may or may not be purchased by the City, or items whose quantities are not determined yet. RESPONDENTS are required to respond to all OPTIONAL requirements.

1.5 Alternative Proposals

- A. In the event a RESPONDENT has a technological solution that does not meet the exact requirements set forth in this RFP, but fully addresses all the functional requirements, RESPONDENT may offer more than one proposal as long as each proposal fully addresses the intent of the requirements set forth in this RFP. Example: RESPONDENT may propose an alternative that includes expansion of another jurisdiction’s existing system that still provides all the City’s functional requirements; however, RESPONDENT must clearly identify any deviations from the exact requirements as well as any limitations, restrictions, and costs associated with the proposed alternative approach.
- B. Alternate proposals shall be submitted separately under a different cover from the base proposal and clearly marked “ALTERNATIVE PROPOSAL”. RESPONDENT must submit a fully compliant proposal in order to submit an alternate proposal.
- C. The RESPONDENT’s Alternate Proposal shall comply with the same submittal instructions in Section 2.1, *Proposal Format*.



1.6 Quality Assurance and Coordination

1.6.1 Standards and Guidelines

- A. The SELECTED VENDOR shall comply with the following applicable standards, rules, regulations, and industry guidelines, provided here in no particular order without implication of priority, as they apply to the RESPONDENT's proposed solution:
1. American National Standards Institute (ANSI)
 2. National Electrical Manufacturer's Association (NEMA)
 3. Electronics Industry Association (EIA)
 4. Telecommunications Industry Association (TIA)
 5. Telecommunications Distribution Methods Manual (TDMM)
 6. National Electrical Code (NEC)
 7. Institute of Electrical and Electronics Engineers (IEEE)
 8. Federal Communications Commission (FCC)
 9. Underwriters Laboratories, Inc. (UL)
 10. American Society of Testing Materials (ASTM)
 11. National Fire Protection Association (NFPA) 1221
 12. Telcordia GR-63-CORE NEBS™ Requirements: Physical Protection
- B. RESPONDENT shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in the following guidelines, provided here in no particular order with no implication of priority:
1. Motorola R56 – Standards and Guidelines for Communication Sites (latest revision)
 2. Harris Site Grounding and Lightning Protection Guidelines (AE/LZT – 123 4618/1 – latest revision)
 3. Other contractor / industry standards that RESPONDENT shall provide to the City for review and approval prior to contract award.



- C. Governing codes and conflicts: If the requirements of this RFP conflict with those of the governing codes and regulations, then the more stringent of the two shall become applicable.
- D. If the RESPONDENT cannot meet any of the standards or guidelines listed above, the RESPONDENT shall list all deviations in their proposal.

1.6.2 Frequency Coordination and Licensing

- A. Land Mobile Radio (LMR) licenses – The SELECTED VENDOR shall be responsible for all frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the City. The City shall be responsible for coordination fees and licensing fees, if any, and required signatures, as applicable. Following approval of the detailed design, the SELECTED VENDOR shall provide all modifications and applicable forms to the City for review and approval. The SELECTED VENDOR shall also be responsible for any additional frequency research, support, and preparation if necessary. The City shall sign and submit all forms following approval.
- B. Antenna Structure Registration (ASR) – The SELECTED VENDOR shall be responsible for preparation and submittal of any ASR forms as required for any new or existing towers.
- C. Microwave Licenses – The SELECTED VENDOR shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the City. The City shall be responsible for coordination fees and licensing fees, if any, and required signatures, as applicable.

1.6.3 Federal Aviation Administration (if applicable)

- A. The SELECTED VENDOR shall complete and submit to the Federal Aviation Administration (FAA) any required FAA forms, as necessary.

1.6.4 Project Management

- A. The RESPONDENT shall provide a Project Management Plan that includes, a detailed Work Breakdown Structure (WBS), project scope, deliverables, schedule, QA/QC processes, and risk management sections.



- B. The plan shall describe how the RESPONDENT proposes to monitor and control the installation and deployment of the proposed system, and mitigate risks, in order to ensure that the system meets the design specifications and is delivered on time.
- C. Regularly scheduled status meetings shall be established between the City's Project Team and the SELECTED VENDOR. The SELECTED VENDOR shall provide a schedule for these meetings subject to the approval of the City and shall be responsible for the agendas for these status meetings.

1.6.4.1 Scheduling

- A. The SELECTED VENDOR shall develop and maintain a project schedule utilizing Microsoft® Project. That schedule shall include tasks, milestones, start and end dates, task predecessors, and task owners based on an approved WBS.
- B. The schedule shall represent tasks associated with completing work on all items identified in the WBS. The project schedule shall be updated with actual dates as tasks are completed.
- C. The updated schedule shall be provided as an agenda item for all weekly or biweekly status meetings (at the discretion of the City) between the City and the SELECTED VENDOR.
- D. The schedule shall address the following at a minimum:
 - 1. Site surveys
 - 2. Detailed design review including engineering analyses and schedules
 - 3. Site preparation
 - 4. Equipment manufacturing
 - 5. Factory acceptance test
 - 6. Equipment delivery
 - 7. System installation
 - 8. System configuration
 - 9. System optimization
 - 10. Field acceptance test
 - 11. Coverage testing
 - 12. Technical training



13. System administration training
14. User training
15. System cutover
16. 30-day operational testing
17. System documentation development and delivery
18. Punch list resolution
19. System acceptance
20. System and equipment warranty periods

1.6.4.2 Project Punch List

- A. The SELECTED VENDOR shall establish and maintain a punch list, as mutually agreed to with the City, for site facilities, equipment, and for acceptance tests.
- B. The punch list shall be maintained in real time and published weekly. The punch list shall include the following at a minimum:
 1. Sequential punch list item number
 2. Date identified
 3. Item description
 4. The party responsible for resolution
 5. Expected resolution date
 6. Resolution date
 7. The party resolving the issue
 8. Details about how each punch list item was resolved and tested
 9. Project manager signoff (SELECTED VENDOR/the City)
 10. Any notes about the item
- C. If responsibility for resolving an item is transferred to another person or group, a new entry shall be added to the punch list and the original entry shall be appropriately noted.
- D. The SELECTED VENDOR shall be responsible for reviewing each punch list item, and advising the City of any changes. The status of punch list items shall be



updated during each biweekly status meeting. All punch list items must be fully resolved before system acceptance will be granted.

1.6.4.3 Project Meetings

- A. A project kickoff meeting shall be scheduled prior to the beginning of the project.
- B. Weekly or biweekly project status meetings shall be scheduled following contract award and the initial kickoff meeting.
- C. The SELECTED VENDOR shall be responsible for scheduling the meetings as well as preparing meeting agendas and minutes. meeting agenda items shall include, as a minimum, the following items:
 - 1. Schedule review
 - 2. Status of deliverables
 - 3. Risk items
 - 4. Changes
 - 5. Plans for the next period
 - 6. Action item assignments
 - 7. Punch list review

1.6.4.4 Project staffing

- A. Project staffing shall be managed by the SELECTED VENDOR based on workload and the level of effort required throughout the implementation / installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not change without prior approval of the City.
 - 1. SELECTED VENDOR's Project Manager:
 - a. The SELECTED VENDOR's Project Manager shall be the primary point of contact between the City and the SELECTED VENDOR.
 - b. The SELECTED VENDOR's Project Manager shall bear full responsibility for supervising and coordinating the installation and deployment of the communications system; be responsible for development and acceptance of the Project Management Plan; managing the execution of the project against that plan; and



overseeing the day-to-day project activities, deliverables, and milestone completion.

- c. The SELECTED VENDOR's Project Manager shall be responsible for coordination of the status meetings.

2. SELECTED VENDOR's Project Engineer:

- a. The SELECTED VENDOR's Project Engineer shall have the primary responsibility for developing and managing the system design and ensuring that the system is installed in accordance with the approved system design.
- b. Any deviation from the system design shall be subject to project change control procedures and will not be undertaken until approved by the City.
- c. The SELECTED VENDOR's Project Engineer shall develop block diagrams, system block diagrams, and rack diagrams to assist the installation team in completing the system installation.
- d. The Project Engineer shall also supervise the development and execution of the Factory Acceptance Test Plan, System Acceptance Test Plan, the Coverage Acceptance Test Plan, Cutover Plan, and guide the project team through the processes and procedures necessary to prove that the system performs as specified in the contract. No test plan will be executed until approved by the City.

1.6.5 QA/QC Program

- A. The RESPONDENT shall include a Quality Assurance / Quality Control (QA/QC) plan for the City's radio system project. The plan shall address all stages of the project, including, but not limited to:
 1. Procurement
 2. System design
 3. Installation
 4. Implementation
 5. Testing
 6. Cutover



- B. The QA/QC plan shall specifically describe the plans and procedures that ensure the proposed system is designed in accordance with the standards and requirements described in this RFP.
- C. The QA/QC plan shall be included as part of the Project Management Plan developed by the SELECTED VENDOR's Project Manager.
- D. The QA/QC plan shall be an integral part of the project and include County personnel as part of the review and approval process for all deliverables and submittals.
- E. The proposed QA/QC plan shall address the following project tasks at a minimum:
 - 1. Design analysis and verification
 - 2. RF coverage analysis and verification
 - 3. Design changes and document control
 - 4. Material shipping, receiving, and storage
 - 5. Site preparation
 - 6. Field installation and inspection
 - 7. Equipment inventory and tracking
 - 8. System testing and validation
 - 9. Software regression testing
 - 10. Deficiency reporting and correction
 - 11. Implementation and cutover
 - 12. Training and certification



2. Instructions to Proposers

2.1 General

- A. Proposals must be received by **3:00pm on 20th day of January, 2017**. **Proposals received after this time will not be considered.**
- B. RESPONDENTS shall submit a bound original and seven bound copies of the proposal to the City of Cape Girardeau. Each package shall also include a copy of the proposal in electronic format. The front of the package shall be marked "Proposal for P25 Radio System." Proposals shall be addressed to:

Attn: Molly Hood
Deputy City Manager
City of Cape Girardeau
401 Independence Street
Cape Girardeau, MO 63703
573-339-6320
mhood@cityofcape.org

2.2 Mandatory Pre-Proposal Conference

- A. A mandatory pre-proposal conference will be held on **15th day of November 2016, at 2:00 p.m.** The conference will be held at:
 - City Emergency Operations Center
 - Fire Station No. 3
 - 1975 North Sprigg Street
 - Cape Girardeau, MO 63701
- B. Site visits will be conducted on 16th day of November 2016, and is expected to take the full day. These visits are optional. If you do plan to attend, please notify Molly Hood, Deputy City Manager, at mhood@cityofcape.org with the number of participants, by close of business on 10th day of November 2016.
- C. RESPONDENT may submit questions to the City at least five business days prior to the pre-proposal conference in either written or electronic format (email). During the conference, the City will provide answers to any questions received and hold an open discussion regarding the project. Oral responses shall not be binding on the City during the conference.



- D. The City will respond to all questions and provide answers via an amendment. Amendments shall be posted on the City's website and sent electronically to attendees of the Pre-Proposal Conference.
- E. Questions regarding the Request for Proposal must be presented in writing, via e-mail, fax or courier service. Answers will only be provided in writing, and all responses will be distributed to all known vendors who have requested the proposal documents except when Addenda is in response to pre-proposal conference questions. All addenda as a result of the pre-proposal conference will be sent only to vendors attending pre-proposal conference. Submit questions to:

Attn: Molly Hood
Deputy City Manager
City of Cape Girardeau
401 Independence Street
Cape Girardeau, MO 63703
573-339-6320
mhood@cityofcape.org

2.3 Proposal Schedule

Event	Date
RFP Issued	October 31, 2016
Pre-Proposal Conference	November 15, 2016
Site Visits	November 16, 2016
Final Deadline for Questions	December 2, 2016
Responses to Questions	December 16, 2016
Proposals Due	January 20, 2017
RFP Evaluation Clarification	February 17, 2017
RFP Evaluation Concludes	February 27, 2017
Notice of Intent to Award	March 10, 2017

2.4 Format

- A. RESPONDENT shall adhere to the proposal format provided below, organized by Section, with each section tabbed and numbered:
 - 1. Section 1: *Cover Letter*
 - 2. Section 2: *Table of Contents*



3. Section 3: *Executive Summary*

4. Section 4: *Qualifications*

All RESPONDENTS shall provide information describing experience and qualifications with similar projects in their proposal, including, but not limited to the following:

- a. Descriptions of the RESPONDENT's qualifications
- b. Resumes of key personnel
- c. Supplementary information
- d. A list of five systems of similar size and complexity, successfully completed by the RESPONDENT, including:
 - 1) Name of the system
 - 2) Location
 - 3) Contact person
 - 4) Contact telephone number
 - 5) Key dates:
 - i. Contract execution
 - ii. System installation complete
 - iii. Cutover
 - iv. Final system acceptance

5. Section 5: *Description of the System*, including equipment, software, design, and services to be provided:

- a. Radio communications system
- b. Radio dispatch consoles
- c. Voice logging recorder integration
- d. Network management subsystem
- e. Microwave backhaul connectivity including preliminary path profiles
- f. Radio and microwave channel plans
- g. Subscriber equipment
- h. Site infrastructure



- i. Tower profile drawings including antenna mounting locations and ancillary equipment
 - j. Equipment room drawings
 - k. Equipment rack elevation drawings
 - l. Additional subsystems
 - m. Radio system coverage predictions
 - n. Detailed equipment specification sheets for all proposed equipment
 - o. Scope of Work (SOW) documentation detailing complete system installation on a site-by-site basis
 - p. System design information shall include a complete detailed description, block diagrams, equipment layouts, and equipment lists necessary to provide a complete and comprehensive description.
6. Section 6: *Project Management Plan*, including preliminary project schedule with detailed Gantt chart
7. Section 7: *Quality Assurance / Quality Control (QA/QC) Plan*
8. Section 8: *Training Programs*
9. Section 9: *Point-By-Point Compliance*
- RESPONDENT shall provide compliance statements for each outline level or bullet point of this RFP. RESPONDENT shall complete the compliance matrix provided in Appendix A – *Compliance Matrix*. Compliance statements are limited to the following three choices:
- a. COMPLY - The proposal meets or exceeds the specified requirement.
 - b. COMPLY WITH CLARIFICATION – The proposal does not meet the exact stated requirement; however, meets a substantial portion of or meets the intent of the requirement. RESPONDENT must provide a detailed explanation when using this statement.
 - c. EXCEPTION - The proposal does not meet the specified requirements. RESPONDENT must provide a detailed explanation when using this statement.
10. Section 10: *System, Subsystem, and Subscriber Warranty Information*
11. Section 11: *System Testing Documentation*, including but not limited to the following:



- a. Draft Staging/factory acceptance testing
- b. Draft Coverage acceptance testing
- c. Draft 30-day operational test
- d. Draft Final acceptance testing
- e. Other testing documents not listed above

12. Section 12: *Post-Warranty Maintenance*

13. Section 13: *City of Cape Girardeau Required Documentation*

- B. Respondent shall provide total proposal cost, itemized pricing, proposed payment milestones and dates, by using the pricing forms provided in Appendix B – *Proposal Pricing Forms*, to the greatest extent possible. Costs for OPTIONAL items shall also be provided on the forms. RESPONDENT may provide proposed fees for any other services that are not included in this schedule but that can be provided by the RESPONDENT and that are consistent and responsive to the services requested.

NOTE: THE COST PROPOSAL SHALL BE SUBMITTED IN A SEPARATE, SEALED ENVELOPE. THE INCLUSION OF ANY COST INFORMATION IN THE TECHNICAL PROPOSAL MAY RESULT IN SUCH PROPOSAL BEING REJECTED BY THE CITY.

2.5 Evaluation

The City reserves the right to modify the evaluation methodology if determined to be in the best interest of the City. Evaluation criteria will not be changed after receipt of proposals. Proposals received in response to this RFP will be reviewed by an Evaluation Committee. The factors to be considered in the evaluation of submissions are the following.

2.5.1 Evaluation Criteria

- A. The City will evaluate each proposal based on the degree to which it complies with the City's requirements, as articulated in this RFP. The primary categories to be evaluated are:
1. RFP compliance
 2. Coverage guarantee



3. Vendor experience
4. Cost of system
5. Lifecycle costs
6. Total cost of ownership
7. Unit costs of subscriber equipment
8. Capability, features, and functionality of the system
9. Feasibility of design
10. Warranty, maintenance, and support

2.6 Insurance Requirements

2.6.1 Workers' Compensation and Employers' Liability Insurance

This insurance shall protect Contractor against all claims under applicable State Workers' Compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. Contractor shall also be protected against claims for injury, disease, or death of employees which, for any reason may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" or "other states" endorsement.

The liability limits shall be not less than:

Worker's compensation	Statutory
Employers' liability	\$2,735,000*
Persons and entities to be shown as insured include CONTRACTOR and OWNER: CITY OF CAPE GIRARDEAU	*Plus increases as provided by Section 537.610 RSMo.

2.6.2 Professional Liability Insurance (Errors and Omissions)

This insurance shall be issued in the name of CONTRACTOR and shall protect against claims arising as a result of the operations of CONTRACTOR in the design, engineering, manufacture, and other professional skills used in the performance of this agreement,



whether based on negligence, errors in judgment, product liability, strict liability, or any other theory.

The liability limits shall be not less than:

Professional Liability, including, but not limited to bodily injury and property damage	\$2,735,000 combined single limit for each occurrence* \$411,000 each person*
Persons and entities to be shown as insured include CONTRACTOR and OWNER: CITY OF CAPE GIRARDEAU	*Plus increases as provided by Section 537.610 RSMo.

2.6.3 Commercial General Liability Insurance

This insurance shall be occurrence type written in comprehensive form and shall protect CONTRACTOR and OWNER as additional insured, against claims arising from injuries, sickness, disease or death of any person, or damage to property arising out of performance of the Work. The policy shall also include personal injury liability coverage, contractual liability coverage completed operations and products liability coverage, and coverage for blasting, explosion, collapse of buildings, and damage to underground property.

The liability limits shall not be less than:

Bodily injury and Property damage	\$2,735,000 combined single limit for each occurrence* \$411,000 each person*
Persons and entities to be shown as insured include CONTRACTOR and OWNER: CITY OF CAPE GIRARDEAU	*Plus increases as provided by Section 537.610 RSMo.



2.6.4 Comprehensive Automobile Liability Insurance

This insurance shall be occurrence type written in comprehensive form and shall protect CONTRACTOR, and OWNER as additional insured, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the Project site whether they are owned, non-owned, or hired.

The liability limits shall be not less than:

Bodily injury and Property damage	\$2,735,000 combined single limit for each occurrence* \$411,000 each person*
Persons and entities to be shown as insured include CONTRACTOR and OWNER: CITY OF CAPE GIRARDEAU	*Plus increases as provided by Section 537.610 RSMo.

2.6.5 Professional Liability Insurance

Without limiting the liability hereunder, CONTRACTOR shall maintain during the life of this agreement the foregoing insurance and furnish the City, certificates of insurance as evidence thereof. Such certificates shall provide that cancellation of said insurance shall not be affected without 30 days' prior written notice to the City. The certificates shall plainly designate the name of the project for which the certificate is provided.

Insurance limits shall meet or exceed the insurance limits for Automobile and General required under Missouri Revised Statutes Chapter 537.610 for the contract period.

The Professional Liability Insurance shall include contractual Liability Coverage for the liability assumed by CONTRACTOR under this agreement, subject to the terms and conditions of the policy. The City shall be named as an additional insured in the Certificate for Commercial General Liability and for Comprehensive Automobile liability.



2.6.6 Additional Requirements

CONTRACTOR shall also be required to pay Prevailing Wages as required by the law of the State of Missouri, and to provide Payment and Performance Bonds in the forms and amounts customarily required in contracts with the City.



3. Radio Communications System Requirements

3.1 Overview

- A. RESPONDENTS shall propose a complete Project 25, Phase 1 Frequency Division Multiple Access (FDMA) simulcast trunking radio communications system utilizing five 700 MHz frequency pairs.
- B. The City authorized this RFP as part of an ongoing effort to enhance mission critical radio communications and interoperability throughout the City.
- C. Each RESPONDENT shall provide financing options for the complete system, offered over 5-, 10-, and 15-year periods. The financing options offered may be lease or term financing.
- D. Upon authorization by the City, the SELECTED VENDOR shall offer other agencies or municipalities in the County, user equipment and system components at the same pricing as that offered to the City.
- E. The SELECTED VENDOR shall be responsible for working with the Region 24, Regional Planning Committee to obtain the required 700 MHz frequency pairs. Any and all documents required of the Region 24 RPC shall be completed and submitted on behalf of the City.
- F. The existing dispatch consoles shall be replaced with new P25 IP-based dispatch consoles and gateways designed to support all of the features of the new P25 radio system while retaining any required legacy capabilities or features and interoperability that must be retained by the City that are not supported by the new radio system.
- G. The system shall contain a ring protected microwave backhaul network providing a 99.999% reliability.
- H. The radio system shall provide, at minimum, 95% portable round-trip coverage (talk-in and talk-out) within the city limits of Cape Girardeau inside 15 dB buildings. Coverage shall meet or exceed a Delivered Audio Quality (DAQ) of 3.4 with 95% reliability of signal, as per TSB-88 recommendations for public safety systems.
- I. Subscriber units, proposed for public safety personnel, shall be capable of operating in VHF and 700/800 MHz bands, in P25 Phase 1 trunking as well as



conventional modes. Multiple tiers of subscribers shall be proposed to support a diverse group of users.

- J. OPTIONAL Features. The following shall also be proposed as OPTIONAL system features:
1. Geographically Diverse P25 Control Equipment
 2. P25 Inter RF SubSystem Interface (ISSI)
 3. Backhaul Options
 4. Single Channel System Expansion (six total channels)
 5. Encryption
 6. Over the Air Rekey (OTAR)
 7. Over the Air Programming (OTAP)
 8. GPS/AVL
 9. P25 Phase 2 (TDMA) operation
 10. Smartphone/broadband device integration

3.2 Project 25

- A. The proposed radio system shall comply with all of the latest applicable TIA 102 documents as adopted by TIA at the time of proposal submission, and the SELECTED VENDOR is expected to comply with newly adopted standards throughout the implementation until final acceptance of the system. The RESPONDENT is responsible to ensure that the proposed radio system is compliant with the latest revision.
- B. RESPONDENTS are required to provide a list of Project 25 TIA-102 standards documents applicable to each P25 feature supplied by the proposed system and confirm compliance with each.
- C. If a RESPONDENT is not compliant with a requirement, the RESPONDENT shall identify the requirement by number and name, and provide a detailed explanation of why the proposed system does not meet the requirement.
- D. RESPONDENTS are required to provide a definitive list of all equipment, features and functions included in their proposal that limit or may limit the use of P25 standard-based subscriber equipment from alternative vendors.



3.3 Redundancy and Survivability

- A. The proposed radio communications system shall support mission critical operations; therefore, a high degree of redundancy and survivability is required. A network topology utilizing fault tolerance shall be incorporated to the greatest extent possible through a distributed and/or redundant architecture.
- B. All efforts shall be made to design a system that eliminates single points of failure. For those elements that would result in a major system failure, redundancy is required. Such elements include, but are not limited to the following:
1. System control equipment and network elements (fully redundant at primary location with OPTION for geographically diverse locations)
 2. Backhaul network (loop/ring protected)
 3. Power system design including appropriate (best practice) redundant (N+1) power supplies for equipment and network gear to prevent single point failures, e.g., no subsystem shall be degraded due to loss of a single power supply.
 4. Simulcast control equipment with redundant simulcast control equipment located in a geographically diverse location
 5. Voting equipment with redundant voting equipment located in a geographically diverse location.
- C. The proposed radio system(s) shall include several modes of degraded operation or failure modes. The system(s) shall be capable of automatic activation of failure modes in the event of a failure. Additionally, the system(s) shall switchover to a graceful degradation mode. The network management system shall detect and report all failures or degraded conditions in real time. At a minimum, the following failures should invoke the activation of a failure mode and not bring the system down completely:
1. Loss of single channel (hardware or interfering signal)
 2. Loss of multiple channels (hardware or interfering signals)
 3. Loss of control channel(s)
 4. Loss of site controller(s)
 5. Loss of site router(s) or switches(s) at any site
 6. Loss of a simulcast sub-site



7. Loss of system controller(s)
 8. Loss of backhaul or network connectivity at any site in the system
 9. Loss of one or more data storage media at a core site that would impair system performance.
- D. A detailed description shall be supplied describing the system operation and impact to both subscriber and console users when any of the failures described above occurs.
- E. The RESPONDENT shall propose and fully describe network security features of the proposed systems to include, but not limited to:
1. Disabling unassigned IP and switch ports
 2. The function of specific IP ports used at firewall and DMZ boundaries
 3. Protection from unauthorized system access
 4. Security updates to items such as firmware, software, virus protection

3.4 Expansion

- A. The systems shall be scalable by adding additional hardware and/or software to increase coverage, capacity, or features.
- B. The RESPONDENT shall list the expansion capabilities of the proposed system, including but not limited to the following:
1. Total discrete channels
 2. Simulcast cells
 3. Sites per simulcast cell
 4. Multicast sites
 5. Unit IDs
 6. Total users
 7. Talkgroups
 8. Dispatch positions



3.5 Coverage

A. Required Coverage:

1. Within the city limits of Cape Girardeau, the radio system shall provide balanced portable radio round-trip coverage (talk-out and talk-in), in over 95% of the following areas:
 - a. On street (outdoor)
 - b. Within all buildings listed in Appendix C – *Critical Building List*
 - c. Within other buildings, which for design purposes, shall be considered to have 15 dB of penetration loss
2. Coverage shall meet or exceed a DAQ 3.4 with 95% reliability of signal, as per TSB-88 recommendations for public safety systems. Coverage design efforts shall adhere to TSB-88 recommendations where applicable, and all components in the calculations of the Channel Performance Criteria (CPC) to meet the required design target shall be specified and supplied by the RESPONDENT.
3. Any uncovered areas (i.e., the uncovered %) shall not be composed of a large number of contiguous grids or cells, such that large areas of the service territory are not covered. In no case will highly populated areas be included in the uncovered portion.
4. Coverage design, implementation, and testing for the system shall adhere to the latest revision of Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin (TSB) #88.
5. Radio system coverage is defined as the digital Bit Error Rate (BER) that provides a minimum Delivered Audio Quality (DAQ) 3.4 audio signal for both outbound (talk-out) and inbound (talk-in) communications. Coverage will be tested using BER and must be tested both inbound and outbound.

B. City and International Fire Code Coverage Requirements:

1. As specified within City building codes, as well as the International Fire Code (IFC), within the City limits the radio system shall provide portable radio round-trip in building coverage (talk-out and talk-in), at a minimum signal strength level of -95 dBm or better, with 95% reliability of signal. This level of in-building coverage shall cover at least 95% of the service area.



2. For design purposes, buildings within the City shall be considered to have 15 dB of penetration loss.
3. If the predicted in building coverage at a minimum signal strength level of -95 dBm or better does not meet or exceed a DAQ 3.4 (as defined within TSB-88), then RESPONDENT must specify the predicted DAQ level that the proposed radio system will provide.

3.5.1 Coverage Model and Maps

- A. The RESPONDENT shall employ a suitable coverage prediction model using appropriate terrain and land cover data for the environment, and shall include a detailed description of the propagation models used and the assumptions made in preparation of the maps. A concise description of the methodology and software used to calculate coverage shall also be included in the proposal narrative.
- B. RESPONDENT shall submit both talk-out and talk-in system composite coverage maps for all proposed design configurations. The maps shall be clearly labeled and shall show system gain calculations for each of the following:
 1. Mobile radios – Standard dash or trunk mount with a unity gain antenna mounted in the center of the roof
 - a. Talk-out to a mobile radio
 - b. Talk-in from a mobile radio
 2. Portable radios – Standard portable radio outdoors:
 - a. Talk-out to a portable radio on hip with swivel belt clip
 - b. Talk-in from a portable radio on hip with speaker mic
 3. Portable radios – Standard portable inside a 15db loss building
 - a. Talk-out to a portable radio on hip with swivel belt clip
 - b. Talk-in from a portable radio on hip with speaker mic
- C. Coverage shall be depicted using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage threshold. The background map layer shall show the geographic boundary of the County, cities and towns, as well as major roads.



- D. All maps must clearly delineate the difference between areas predicted to be equal to or greater than DAQ 3.4 equivalent coverage and areas that do not meet coverage requirements. RESPONDENT shall include the effects of Time Delayed Interference (TDI) in all coverage maps (if applicable).
- E. Coverage areas shown on maps shall not be limited by the City boundaries. Maps should detail any coverage outside the City boundaries.
- F. Coverage maps shall be provided in the proposal in two formats:
 - 1. 11"x17" (minimum) full color hardcopy format
 - 2. In PDF file format on CD-ROM or USB flash drive
- G. Thirty meter U.S. Geologic Survey (USGS), NAD-83 terrain elevation data shall be used for coverage simulations. Alternatively, 3 arc-second data may be used where 30-meter data is not available.

3.5.2 TIA TSB-88 - Annex A VOICE CATP User Choices

- A. Section 4.2.4.4 - TIA TSB-88.3-D - Annex A - Voice CATP User Choices provides a number of guidelines and choices for system design and validation. The following are user choices for the proposed City system:
- B. A.2 Service Area:
 - 1. The service area is the geographical area of the City.
- C. A.3 Channel Performance Criterion (CPC):
 - 1. DAQ 3.4
- D. A.4 Reliability Design Target:
 - 1. Service Area reliability of 95%
- E. A.5 Terrain Profile Extraction Method:
 - 1. Snap to Grid Method
- F. A.6 Interference Calculation Method:
 - 1. Monte Carlo Simulation Method



- G. A.7 Metaphors to be used to describe the plane of the service area:
 - 1. Tiled Method
- H. A.8 Willingness to Accept a Lower Area Reliability in Order to Obtain a Frequency:
 - 1. The City is not willing to accept lower area reliability in order to obtain a frequency.
- I. A.9 Adjacent Channel Drift Confidence:
 - 1. 95%
- J. A.10 Conformance Test Confidence Level:
 - 1. 99%
- K. A.11 Number of Subsamples per Test Sample (RSSI only):
 - 1. True value error: ± 1 dB
 - 2. Number of subsamples: 50
- L. A.12 Pass/Fail Criterion:
 - 1. "Greater Than" test
- M. A.13 Treatment of Inaccessible Grids:
 - 1. All inaccessible grids shall be eliminated from the calculation.

3.5.3 Link Budgets

- A. RESPONDENT shall provide detailed link budgets, clearly defining the following minimum information, relating to each map and each site:
 - 1. Propagation model
 - 2. Simulcast timing parameters (if applicable)
 - 3. Design target
 - 4. Acceptance Test Plan target
 - 5. Faded performance criteria



6. Inferred noise floor
7. Base station / repeater Radio Frequency (RF) power output
8. Antenna gain (transmit and receive)
9. Antenna down tilt (if applicable)
10. Transmit effective radiated power (ERP)
11. Receiver sensitivity
12. Tower top amplifier gain
13. Total antenna system gains, or losses
14. Antenna height
15. Mobile and portable antenna height for talk-out and talk-in
16. Mobile and portable RF output power
17. The configuration of field units (for example - talk-out to portable inside 12 dB loss buildings)

3.6 Project 25 System Required Features

- A. All site equipment supplied shall be new, of high quality, and designed to provide high reliability in support of mission critical communications. RESPONDENTS shall provide specification sheets for all proposed equipment. The radio communications system shall consist of the following components:
 1. System control equipment/software
 2. Simulcast control equipment/software
 3. Receiver voting equipment/software
 4. Base stations
 5. Uninterruptable Power Supply (UPS)
 6. Antenna systems
 7. Interoperability gateway devices
 8. Dispatch console subsystem including logging recorder and E911 phone integration
 9. Network management subsystem
 10. Backhaul network



3.6.1 System Control Equipment

- A. The proposed system control equipment shall be configured with a primary and redundant system control equipment. As an OPTION, RESPONDENTS shall also propose geographically diverse primary and secondary system controllers.
- B. The RESPONDENT shall fully describe the manner in which the proposed system and system controllers function and operate.
- C. It is expected that the system control equipment's primary location would be the City dispatch center. RESPONDENTS shall provide supporting information as to whether the dispatch center would be the preferred location for the system control equipment for the proposed system. If the RESPONDENT believes another location would better serve to house the system control equipment they shall provide such detail as well

3.6.2 Simulcast Control Equipment

- A. The SELECTED VENDOR shall provide all necessary simulcast components and signal processing elements required to optimize voice quality in coverage overlap areas.
- B. The simulcast control equipment shall be configured with a primary and redundant controller separated in geographically diverse locations, allowing for an automatic switch without human intervention resulting in no loss of communications.
- C. RESPONDENTS shall fully describe all components required for simulcast control.
- D. Simulcast control equipment typically relies on GPS receivers for timing and frequency stability. RESPONDENTS shall detail how the system will continue to operate during a GPS failure.
- E. Non-captured overlap areas with delay spreads in excess of those required to meet the Delivered Audio Quality (DAQ) objective shall be minimized inside the service area.
- F. Simulcast systems shall operate without the need for manual optimization and system / subsystem alignment. All alignment and adjustments shall be automated where possible (e.g., signal conditioning adjustments for channel banks, signal launch times at sites, etc.).



- G. Simulcast equipment shall be monitored by the Network Management System (NMS) to allow for monitoring and remote configuration.

3.6.3 Receiver Voting

- A. Receiver voting equipment shall monitor all receivers in the simulcast system and select the best signal for processing and rebroadcast through the network.
- B. The receiver voting equipment shall be configured with primary and redundant equipment separated in geographically diverse locations allowing for an automatic switch, without human intervention resulting in no loss of communications
- C. RESPONDENTS shall fully describe all components required for receiver voting operations.
- D. Receiver voting equipment shall be monitored by the NMS.

3.6.4 Base Station Equipment

- A. General:
 - 1. Base station equipment shall be solid state in design and function within standard site conditions for temperature, altitude, and humidity.
 - 2. Base station equipment shall be monitored and remotely configurable by the NMS. Monitoring shall include, but not be limited to interrogating the base station equipment for; power amplifier temperatures, high/low voltage conditions and high Standing Wave Ratio (SWR). RESPONDENTS shall detail any additional operating conditions capable of being monitored.
 - 3. The units shall be as compact as possible, with mounting configurations for use in standard 19" relay racks or cabinets.
 - 4. Base station equipment shall be controlled via IP connection and not analog control methods such as 2, or 4 wire E&M signaling.
- B. Base station equipment shall comply with Part 90 of the FCC Rules and Regulations, as well as appropriate EIA and similar agency standards and shall be FCC type accepted for the 700 & 800 MHz frequency bands.



3.6.5 Uninterruptable Power Supply (UPS)

- A. The SELECTED VENDOR shall provide a single phase, online, double conversion, static type, uninterruptible power supply (UPS) at each RF Site with the following features:
1. Surge suppression
 2. Input harmonics reduction
 3. Rectifier / charger
 4. Inverter
 5. Static bypass transfer switch
 6. Battery and battery disconnect device
 7. Internal maintenance bypass / isolation switch
 8. Output isolation transformer
 9. Remote UPS monitoring provisions
 10. Battery monitoring
 11. Remote monitoring
- B. The SELECTED VENDOR shall perform electrical loading analysis for shelter equipment, excluding HVAC, during preliminary design to verify UPS size requirements. All electrical loading calculations shall include a 50% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.
- C. For the purpose of the proposal, the SELECTED VENDOR shall assume the following:
1. Calculated output with a 50% expansion factor as stated
 2. Single phase
 3. 60 Hz
 4. 0.8 Power Factor
 5. Minimum two-hour runtime
- D. Quality Assurance:



1. Electrical components, devices, and accessories shall be listed and labeled, as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.
2. UL compliance shall be listed and labeled under UL 1778 by a Nationally Recognized Testing Laboratory (NRTL).
3. UPS components shall be suitable for installation in computer rooms, as defined by NFPA 75.

E. Operational Requirements:

1. Automatic operation includes the following:
 - a. Normal Conditions – Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
 - b. Abnormal Supply Conditions – If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated current.
 - c. If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.
 - d. When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
 - e. If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.
 - f. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal AC supply circuit without disturbance or interruption.
 - g. If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass



- transfer switch operates to bypass the fault current to the normal AC supply circuit for fault clearing.
- h. When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
 - i. If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.
2. Manual operation includes the following:
 - a. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal AC supply circuit without disturbance or interruption
 - b. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter
 3. Controls and indications: Basic system controls shall be accessible on a common control panel on the front of the UPS enclosure.

3.6.6 Antenna Systems

- A. RESPONDENT shall propose all antenna system equipment necessary for a complete design.
- B. Antennas shall be appropriate to provide the required coverage and meet applicable FCC rules and regulations.
- C. Transmission line type and length shall be appropriate to provide the required coverage.
- D. SELECTED VENDOR shall label each coaxial cable and waveguide with coaxial/waveguide length, height of antenna/microwave dish and azimuth.
- E. RESPONDENT shall fully describe expansion capacity for combiner and multicoupler systems.
- F. Muticouplers shall be provided with a test port and associated test lines allowing for complete testing of the receive antenna system.



- G. Receive preselectors shall be utilized and configured for the appropriate sized passband. RESPONDENTS shall detail the passband bandwidth of the provided preselector devices.
- H. RESPONDENT shall take precautions to ensure coaxial cable is sized to minimize the effects of Tower Top Amplifier (TTA) failures.
- I. TTAs shall be equipped with a primary amplifier, a secondary amplifier to serve in the event the primary fails, and a bypass mode to serve if both amplifiers fail.
- J. The multicoupler/power distribution unit shall provide DC power, control and monitoring for the TTA.
- K. The multicoupler/power distribution unit shall display the voltage and current draw of the TTA unit. Switch settings shall allow for manual bypass of either the TTA or the antenna for testing
- L. The multicoupler and TTA units shall be monitored by the NMS.
- M. RESPONDENT shall include detailed specification sheets for all proposed equipment, including, but not limited to antennas, receiver multicouplers, transmitter combiners, and tower top amplifiers.
- N. The SELECTED VENDOR shall be responsible for relocating any existing City antennas, or antennas to which the City obtains approval to relocate if the antennas are located at the same level required for the new P25 system. (e.g. Fire antennas are located at highest location on tower and this location is the desired location for the P25 system.)

3.6.7 Interoperability Gateway Devices

- A. Gateway devices shall be provided to allow existing non-trunked radio resources to be controlled via the dispatch console subsystem. Each radio site shall be equipped with a gateway device allowing for a minimum of four conventional resources to be controlled via the dispatch console network. RESPONDENTS shall detail expansion capabilities of these gateways.
- B. Gateway devices shall allow for the dispatch console operator to select multiple channels for connected multichannel base stations.
- C. Any gateway connected device will have the ability of having its audio recorded on the logging recorder.



- D. Gateway stations will be capable of being patched to any Project 25 talkgroup, or conventional resource by the dispatch console system.

3.6.8 Dispatch Console Subsystem

- A. The dispatch console is a critical link for public safety personnel. It is here that the dispatch operator must relay critical information from the general public to public safety personnel in the field. At times, the dispatcher may be in stressful conditions with lives at risk. It is imperative that the dispatch console be configured such that the operation of such console is second nature to the dispatch personnel. The dispatch console should provide the operator with as much information as necessary without the screen being cluttered and be easily navigated to perform necessary functions.
- B. The current dispatch console system controls the radio system via radio control station. The replacement dispatch console system shall control the radio system via a direct IP connection. A radio control station backup shall be provided for redundancy.
- C. General Requirements and Features:
 - 1. Six dispatch console positions shall be provided and installed in the City's Dispatch Center.
 - 2. The console system shall be integrated with the following existing equipment retaining legacy capabilities.
 - a. Eventide NexLog 740, version 2.5.7 logging recorder
 - b. Federal Signal SS2000 early siren warning system
 - c. E911 phone system, allowing for use of single headset for both 911 calls and radio operation
 - 3. Dispatch console equipment (Operator Positions) shall be designed to be placed on modular workstation furniture and provide operators with an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.
 - 4. Operator position display monitors shall be 21" LCD/LED
 - 5. Operator positions shall be provided with a standard keyboard and mouse
 - 6. Dispatch consoles shall be able to monitor and transmit on all proposed and existing systems.



D. Operational Requirements:

1. Console positions shall be able to acoustically cross-mute channels in order to eliminate acoustic feedback between operators.
2. Operators shall have the ability to utilize a wireless headset or stationary gooseneck type microphone for transmitting audio.
3. Gooseneck microphones and two sets of wireless headsets shall be provided for each console position.
4. The capability to converse on the telephone utilizing the same operator headset that is used for radio conversations shall be provided.
5. Two headset jack boxes and headsets shall be provided at each position allowing the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset. The jack boxes are to be equipped with manual volume controls on each side of the box, one for the telephone and one for the radio. The headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the select speakers.
6. A minimum of two speakers, with the option to expand to a total of eight speakers, shall be provided for selected and unselected audio.
7. The screen display shall be very flexible, allowing authorized personnel the ability to determine which functions are available at each operator position.
8. RESPONDENTS shall detail to what extent the dispatch consoles, CAD and E911 equipment may be integrated to support a single keyboard and mouse.
9. During Detailed Design the SELECTED VENDOR shall work with the City to develop and configure a screen layout which meets the City's needs. All possible functions and features shall be demonstrated to the City for the City to evaluate which functions, or features are required for City operations.
10. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.
11. Operator screen configurations and alias database shall be stored locally or on a centrally located server.
12. The SELECTED VENDOR shall be responsible for loading alias information for all existing and provided subscriber devices into the console's database.



13. The dispatch console shall display the alias information for each field user providing the dispatcher with the field unit's alias and system resource being utilized.
14. To aid dispatchers in a busy system, a list of the last 15 radio aliases shall be available in a recent call list.
15. Upon activation of an emergency alarm by field units, dispatch positions shall provide an audible alert, display ID of calling unit, and provide a visual alert of an emergency activation.
16. An instant recall option shall be provided allowing the operator to verify his or her recent traffic. Both telephony and radio traffic shall be available for playback.
17. A transmit/receive audio level (Vu) meter shall be provided showing the level of transmitted voice. This meter should also indicate the level of receive audio present on the selected channel.
18. Operator positions shall have the ability to independently set each talkgroup/channel's volume level. Minimum audio levels should be capable of being set to avoid missed calls.
19. A control/indicator shall be provided to allow the operator to mute or un-mute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.
20. Dispatch consoles shall be equipped with an instant transmit switch for each resource.
21. It shall be possible to temporarily mute unselected resources. The unselected audio will unmute automatically after a programmable preset time. Mute shall be 20 dB minimum.
22. Dispatch consoles shall have the capability to patch two or more resources together so users may communicate directly. Patched trunking system resources shall require a single talk path resource.
23. Dispatch consoles shall have the capability to select multiple talkgroups for simultaneous transmit. Multi-select transmissions shall require a single talk path resource.
24. A busy indication shall be provided informing dispatch users when a trunking resource is not available.
25. Radio traffic shall be muted from telephony sessions when a Push-To-Talk (PTT) is activated.



26. A heavy-duty footswitch shall be provided to allow the operator to key the selected channel hands free.
27. PCs supplied shall be capable of providing a Graphical User Interface (GUI) using a currently supported version of Microsoft Windows®. RESPONDENTS shall detail which Operating System (OS) will be provided.
28. PCs supplied shall be based on present state of the art PC technology and must utilize solid state hard drives.
29. OPTION - Consoles shall be provided with an encryption option providing operator positions with the ability to decrypt and encrypt voice communications. Resources shall have a distinctive icon that indicates whether or not encryption is in use.

E. Console Networking Equipment:

1. It is anticipated that the common electronics equipment required of console networks from the past have been replaced with networking equipment including routers, switches and PCs. This equipment ties the console system back to the central control/Project 25 core network. RESPONDENTS shall fully describe the console subsystem's networking environment.
2. The console networking equipment should not have a single point of failure.
3. Redundant routers and/or switches shall be utilized for networking of the console system and connectivity to the system's core network.
4. The console networking equipment and console positions shall send alarm information to the NMS. Alarms specific to the dispatch console system shall be displayed at the console operator positions.

F. Console Backup System:

1. In the event of console or console interface failure, control stations shall be provided for each console position that allows the dispatcher to access the radio system.
2. Backup control stations shall be connected to an outside antenna via a control station combining network, or individual antennas.
3. Backup control stations shall operate in Project 25 trunking and conventional modes in the VHF, UHF, and 700/800 MHz bands.

G. Voice Logger Recorder:



1. The City currently utilizes an Eventide NexLog 740, software version 2.5.7 logging recorder for recording and playback of radio and telephony audio.
2. The SELECTED VENDOR shall be responsible for integrating the proposed radio system to the existing Eventide recording system.
3. The RESPONDENT shall detail any required upgrades, or licenses required of the Eventide recording system to be compliant with the replacement radio system.
4. The SELECTED VENDOR shall be responsible for any cost associated with the integration and upgrade of the Eventide recording system with the proposed radio system.

H. Federal Signal SS2000 Early Warning System

1. The City currently utilizes a Federal Signal SS2000 for emergency siren warning system activation.
2. The City expects to retain the existing VHF network to support the emergency siren system, the SELECTED VENDOR shall ensure the proposed dispatch console system is integrated with the new dispatch console network.

3.6.9 Network Management Subsystem (NMS)

- A. The RESPONDENT shall propose a hierarchical NMS capable of incorporating multiple management systems into a high-level management system that provides a single point to manage multiple subsystems.
- B. The NMS shall display system status and alarm conditions and must provide the ability to remotely access the system to check the operational status and view alarms through the network. This includes the ability to:
 1. Monitor the health of all networked devices
 2. Monitor environmental alarms (site temperature, door intrusion, etc.)
 3. Remotely interrogate equipment
 4. Configure components remotely
 5. Routinely backup remote equipment configurations
 6. Remotely restore equipment configurations
 7. Push updates to remote equipment
 8. Generate system statistical reports



9. Provide paging functions based on multiple levels of fault configurations
 10. Fully integrated with microwave backhaul system
- C. Key elements of the NMS are:
1. Real time airtime usage
 2. Real time monitoring of network element status
 3. Real time status of network usage
 4. Real time alarm management
 5. Simple Network Management Protocol (SNMP) support allowing interfaces with higher-level network management systems.
- D. The RESPONDENT shall fully explain which Network Management applications require a license and which, if any can be accessed via a browser application
- E. All systems and subsystems provided shall be monitored by the NMS.
- F. The NMS shall provide email notification of alarms.
- G. The NMS shall support a hierarchical user authorization mechanism allowing assignment of various roles to users and those users can act on a specific subset of devices.
- H. Network Management Terminals (NMT)
1. The NMTs shall provide primary processing, display, and control of information to and from a variety of locations. System status and alarm conditions shall be displayed. The NMTs shall provide the ability to remotely access the system to check the operational status of the system, configure system parameters, generate usage reports and view alarms.
 2. Three Network Management Terminals shall be provided for the following locations:
 - a. Cape Girardeau Police Department
 - b. Cape Girardeau Fire Department
 - c. Cape Girardeau Communications Center
- I. NMTs shall meet the following general requirements:



1. Expandable software architecture shall be easily updated by adding software applications.
2. Hardware and software platform shall be PC based using current versions of hardware and software.
3. Both graphic and tabular displays shall provide instantaneous and comprehensive network status information.
4. The NMTs shall provide full archiving and control functions.
5. All NMTs shall be licensed to operate concurrently the entire suite of management applications available to manage the system.
6. The NMT shall be designed to monitor a large cross section of equipment so that it can consolidate multiple alarm systems rather than just poll alarms from RTU locations.
7. The NMT must be capable of performing full management functions.
8. The NMT shall provide alarm filtration and consolidation.
9. The NMT shall allow for multiple levels of operator privilege accounts set via a master, or administrative login account.
10. The SELECTED VENDOR shall be responsible for configuring all NMT user accounts according to City requirements.

3.6.10 Backhaul Network

A. Licensed Digital Microwave Network:

1. The proposed digital IP microwave network shall consist of a ring protected loop system. Unlicensed microwave will not be accepted. The microwave system shall be designed to achieve 99.999% overall availability.
2. The radio shall deliver two-frequency, full duplex operation. Space diversity configurations are acceptable if necessary to meet reliability requirements.
3. The microwave network throughput shall support the radio system during full loading of all voice paths and account for system control, simulcast/voting and management functions.
4. The microwave network shall be implemented as an IP/MPLS network.
5. The microwave network shall also be designed to accommodate the proposed radio system and 100% growth in channel/talkgroup capacity.



6. OPTION – As an option RESPONDENTS shall provide the costs associated with implementing the microwave backhaul network with a minimum of 150 Mbps throughput.
7. RESPONDENTS must indicate packet latency and jitter performance of the microwave backhaul network. In addition, RESPONDENTS must confirm that such performance is sufficient to accommodate all radio and dispatch communications traffic for the proposed radio system as transported by the proposed microwave backhaul network.
8. The network must reroute network traffic in case of a path or device failure in a sufficient amount of time to support the proposed radio system. RESPONDENTS must describe how the proposed system fulfills this requirement.
9. Each individual microwave link must be designed to meet or exceed a two-way annual quality performance (availability) of 99.999% (BER = 10⁻⁶) at the required capacity.
10. The SELECTED VENDOR shall be responsible for all microwave frequency research, prior coordination, and preparation of all associated FCC license applications and submittals on behalf of the City.
11. All microwave radio paths shall be tested, and test results provided to the City, to demonstrate proper antenna alignment by measuring the net path loss between sites as measured at the equipment rack interface.

B. Microwave Backhaul Network Engineering:

1. The RESPONDENT shall provide preliminary microwave path details including centerline mounting height recommendations, fade margins, antenna sizes, system gains and system losses, and path profiles.
2. The SELECTED VENDOR shall conduct physical path surveys to assure that all proposed paths meet proper clearance criteria.
3. The SELECTED VENDOR must provide modified antenna centerline mounting height recommendations, if required, based on the information gathered during the physical path surveys and site visits.
4. The proposed microwave backhaul network equipment must be type accepted for licensing under Part 101 of the FCC Rules and Regulations.

C. Microwave Antenna System



1. Microwave antennas shall be compatible with the radio frequency bands and conform to applicable FCC requirements. Solid parabolic type, Category A antennas shall be used in accordance with FCC Part 101.115.
2. All mounting brackets, connectors and other hardware shall be supplied as necessary for a complete installation.
3. As an OPTION, RESPONDENT shall identify costs to provide and install ice shields to protect each microwave dish from falling ice.
4. Radomes shall be installed on every microwave dish antenna.
5. An automatic waveguide dehydrator system shall be provided for each communications shelter or location where microwave equipment is provided.

D. Microwave Backhaul Network Management:

1. RESPONDENTS shall fully describe alarm, monitor, and control capabilities of the microwave terminal equipment, including capacity for external alarms (e.g., door alarms, generator, etc.).
2. The SELECTED VENDOR shall provide a Microwave Management System with sufficient alarm, control, and tracking capabilities for the proposed microwave network and to be integrated with the system Network Management System. The system shall be capable of remotely monitoring equipment status and performance from all sites.
3. The Microwave Management System shall be fully compatible with the integrated NMS requirements defined in Section 3.6.9, *Network Management System (NMS)*, of this RFP.
4. The overall network shall have a common end-to-end management and configuration tool capable of complete control of all network elements. The tool shall be able to support building an end-to-end path without requiring manual configuration of each intermediate device. Graphical display of resulting configurations is preferred.
 - a. Automated error checking shall be included to prevent typical configuration problems such as oversubscription of a link. The tool shall alert the user when such errors occur.
 - b. The management tool shall perform automated backups of all device configurations and include a change log of all changes made to a device over time.



- c. The management tool shall support a hierarchical user authorization mechanism allowing assignment of various roles to users and those users can act on a specific subset of devices.

3.6.11 Fire Station Alerting

- A. The City's current Fire Station Alerting (FSA) system utilizes tone and voice alerting via control stations located at the four fire stations.
- B. RESPONDENTS shall propose a Fire Station Alerting system which utilizes the proposed P25 system for alerting of fire stations and fire personnel.
- C. As an OPTION, RESPONDENTS may propose an alternate Fire Station Alerting system they feel would provide a better option than utilizing the P25 radio system for Fire Station Alerting.

3.7 Project 25 System Optional Features

- A. The following sections describe feature that shall be provided as OPTIONS allowing the City to determine which, if any should be provided with the proposed radio system.
- B. RESPONDENTS shall detail how each option will operate and provide an equipment and software list of all items required for each optional feature
- C. The cost proposal shall detail all costs associated with implementing each option.
- D. RESPONDENTS shall also detail any impact, that each option may have, to post-warranty maintenance costs and provide that impact on an annual basis.

3.7.1 Geographically Diverse P25 Control Equipment

- A. As an OPTION, RESPONDENTS shall propose geographically diverse primary and secondary P25 control equipment allowing for the system to maintain complete operation during a failure of either the Primary, or Secondary control equipment.
- B. Switching from Primary to Secondary control equipment shall be automatic without the need of any user intervention.
- C. Secondary control equipment shall mirror the operation of the primary equipment with no loss of functionality.



3.7.2 P25 Inter RF SubSystem Interface (ISSI)

- A. As an OPTION, RESPONDENT shall propose a P25 Inter RF Subsystem Interface (P25 ISSI), a non-proprietary interface that enables RF subsystems (RFSS) built by different manufacturers to be connected together into wide area networks. The wide area network connections using the ISSI provide an extended coverage area for Subscriber Units (SU) that are roaming. The ISSI supports the messaging, and procedures necessary to enable RFSSs to track and locate SUs, set up and teardown calls and transfer voice information to the subscriber units. The RESPONDENT's ISSI shall conform to the latest released revision of the P25 standard. Subsequent standards and upgrades that follow during and after system installation shall be included by the SELECTED VENDOR and implemented in the Project 25 system, at no additional charge, up to final system acceptance.
- B. The RESPONDENT's ISSI shall support all P25 system features that have been adopted including but not limited to:
1. The ISSI shall support a minimum of two other RF subsystems operating in a trunked mode and up to 20 talkpaths.
 2. The ISSI shall consist of a control element and a traffic element. The control element shall:
 - a. Convey messages for management and location tracking of subscribers including alias and serving RFSS system identification
 - b. Authentication of subscribers
 - c. Management of the setup, maintenance and tear down of a call
 - d. Provision of over-the-air control and over-the-air encryption rekeying of subscriber units.
 - e. Emergency indication if activated
 3. The traffic element shall convey Project 25 voice and/or data traffic in either encrypted or clear (unencrypted) formats between connected Project 25 RFSSs.
- C. The ISSI shall support the management of subscribers who roam onto the ISSI interconnected RFSSs.
- D. The ISSI shall support home network authentication of units that roam to a visited RFSS.



- E. The ISSI shall allow transfer of P25-defined encryption key management information across the ISSI.
- F. RESPONDENT shall list all ISSI supported features including identifying any features that are not supported between disparate manufacturers' RFSS.
- G. RESPONDENT shall describe the interfaces required to support ISSI, including those needed for another manufacturer's RFSSs.

3.7.3 Backhaul Options

- A. As listed in Section 3.6.10, *Backhaul Network*, RESPONDENTS shall propose, as an OPTION, a microwave backhaul network capable of 150 Mbps throughput.
- B. As an OPTION, RESPONDENTS shall provide microwave backhaul links for only those sites that are not served by the existing City fiber.
- C. If utilizing a mixture of existing fiber and microwave equipment, a ring topology is preferred.
- D. Refer to Section 1.1.2, *Existing Backhaul Network*, for an overview of sites currently served by the City's fiber network.

3.7.4 Single Channel System Expansion (six total channels)

- A. As an OPTION, RESPONDENTS shall propose a six-channel system, to support interoperability with adjacent jurisdictions
- B. RESPONDENTS shall detail the costs associated with expanding the number of channels, bringing the total channel count to six.

3.7.5 Encryption

- A. As an OPTION, the system shall be enabled for encrypted operation on all system channels and available to all system talkgroups
- B. The encryption option shall include the following features:
 - 1. Multikey
 - 2. AES algorithm
 - 3. DES algorithm



- C. Three key loader devices and associated cables shall be provided allowing for manual loading of encryption keys into purchased subscriber devices.

3.7.6 Over the Air Rekeying (OTAR)

- A. As an OPTION, the system shall be provided with the appropriate hardware, software and licenses to enable OTAR operation.
- B. RESPONDENTS shall detail the specifications of the provided OTAR feature including but not limited to OTAR operation, capacity of individual keys supported by the provided feature, any expansion capabilities of the proposed OTAR solution.
- C. The three NMTs shall be provided with the appropriate licenses and hardware required for OTAR operation

3.7.7 Over the Air Programming (OTAP)

- A. As an OPTION, the system shall be enabled with an OTAP feature allowing for over the air programming of subscriber units.
- B. The OTAP application shall allow for subscriber devices to be grouped by departments allowing only those users with the proper authorization to adjust programming.
- C. The OTAP application shall be provide on each of the three NMTs and allow for concurrent use from all three terminals.

3.7.8 GPS/AVL

- A. As an OPTION, the system shall be integrated with the City's GIS application enabling proposed subscriber devices to be located on a map.
- B. The existing GIS application currently used in the dispatch center is ArcGIS for desktop version 10.2.2.
- C. Any hardware, or software updates required of the ArcGIS application shall be the SELECTED VENDOR's responsibility.
- D. RESPONDENTS shall detail how the radio system will be integrated with the existing GIS application.



- E. The RESPONDENTS shall detail the impact of the GPS/AVL feature to the proposed radio system's voice traffic, if any.
- F. SELECTED VENDOR shall provide two 37" monitors, one located at the Police Department and the other at the Fire Department, which shall provide real-time location data for all P25 radio system users.
- G. As an OPTION, RESPONDENT may propose a GPS/AVL solution that does not utilize the City's existing GIS application or the proposed P25 system to provide radio unit location data.

3.7.9 Phase 2 Operation

- A. As an OPTION, the system shall be configured to operate in P25 Phase 2, Time Duplex Multiple Access (TDMA) mode.
- B. P25 Phase 2 refers to the Project 25 requirements and standards for a digital Common Air Interface (CAI) using 2-slot TDMA on 12.5 kHz radio channels for a 6.25 kHz equivalent bandwidth, including infrastructure and user radio devices.
- C. If the OPTIONAL P25 Phase 2 features are purchased and implemented, then all system equipment shall be configured, licensed, and equipped to provide for concurrent, dynamic use of both Phase 1 Frequency Division Multiple Access (FDMA) and Phase 2 (TDMA) subscribers, without user or console operator intervention at the repeater, talkgroup and channel level. RESPONDENT shall fully describe the technical and operational aspects of this capability in the proposed system.

3.7.10 Smartphone Integration

- A. As an OPTION, RESPONDENT shall propose an interface to the proposed radio system that integrates voice and data communications between P25 radio system users and users with broadband devices and/or smartphone applications. This interface should generally support the services and capabilities described in the National Public Safety Telecommunications Council (NPSTC) *Recommendations for PTT over LTE Requirements* dated July 18, 2013.
- B. The system shall support Push-to-Talk (PTT) communications operating over private or public Wi-Fi networks, 3G/4G carrier networks, and Public Safety 4G LTE (Band 14) networks.



- C. The system shall include the necessary hardware, software, and licensing to support TIA-102.BACA network-level communications. RESPONDENT shall specify Project 25 services as well as ancillary services and features that the interface supports.
- D. The SELECTED VENDOR shall supply 250 user licenses for both user devices and interface device(s) to support 250 user devices.
- E. RESPONDENT shall identify incremental costs for additional users and/or interfaces.
- F. The system shall support Android™, Windows®, and iOS™ mobile platforms and support managed group and PTT communications utilizing most consumer smartphones.

3.8 VHF Interoperability Subsystem

- A. In efforts to maintain the current level of interoperability with mutual aid participants who do not have access to 700/800 MHz subscriber devices, the City wishes to incorporate a conventional VHF interoperability channel with the proposed P25 system.
- B. The VHF interoperability channel shall consist of a single transmit location and multiple voted receive sites. VHF transmit and receive equipment shall be collocated with the P25 RF Sites.
- C. The transmit location shall provide the greatest amount of Citywide talk-out portable coverage.
- D. Each P25 RF site shall contain a voted receiver.
- E. RESPONDENT shall describe, to include coverage maps as detailed Section 3.5.1 – *Coverage Model and Maps*, the portable outdoor coverage (talk in and talk out) provided by the proposed VHF interoperability subsystem at DAQ 3.0
- F. Should a single transmit site not provide portable outdoor coverage at DAQ 3.0 in 95% or greater of the City, RESPONDENT shall propose, as an OPTION, the equipment and costs needed to achieve 95% coverage.



4. Subscriber Equipment

4.1 Overview

- A. Subscriber equipment includes all non-fixed user equipment, such as:
 - 1. Portable radios
 - 2. Mobile radios
 - 3. Control stations
- B. Subscriber devices proposed for Public Safety Users, as detailed in Appendix B- *Proposal Pricing Forms*, shall be capable of dual-band operation.
- C. Subscriber devices proposed for Non-Public Safety Users, as detailed in Appendix B - *Proposal Pricing Forms*, shall be capable of single band operation.
- D. RESPONDENTS shall also provide detailed unit pricing, including current make and model, for all Project 25 subscriber equipment currently offered by RESPONDENT that is capable of operating on the proposed P25 radio system.
- E. Table 1 provides a summary of potential quantities of subscriber equipment that may be purchased under this procurement.

Table 1 – Potential Subscriber Radio Quantities

User Groups	Mobile Qty.	Portable Qty.	Control Stations	Totals
Public Safety Users (Dual-Band VHF&700/800)	105	169	10	284
Non-Public Safety (Optional – Single Band 700/800)	102	56	6	164

- F. RESPONDENTS shall detail any quantity level discounts associated with each model proposed.
- G. The City reserves the right to purchase subscriber units as part of a package deal from a single vendor, or as a separate subscriber only purchase from a vendor not selected to provide the P25 radio system.



- H. RESPONDENTS shall also propose Radio User Training as described in Section 6 - *Training*.
- I. The SELECTED VENDOR shall be responsible for programming all purchased subscriber devices to operate on the proposed network, with any surrounding jurisdictions, and on the Missouri Statewide Interoperability Network (MOSWIN). MOSWIN operation shall be supported in both the VHF and 700/800 MHz bands.
- J. The SELECTED VENDOR shall supply the City with three sets of programming software and programming cables for each subscriber model purchased.

4.2 General Requirements

- A. All user radio equipment must be FCC type accepted in accordance with FCC Part 90 rules and regulations.
- B. All user radio equipment shall meet MIL-STD-810 latest revision.
- C. All user radio equipment shall be software configurable.
- D. All user radio equipment shall support the following operating modes:
 - 1. Conventional P25 Phase 1
 - 2. Trunked P25 Phase 1 with enhanced vocoder
 - 3. Optional - Trunked P25 Phase 2 with enhanced vocoder
 - 4. Radio-to-radio direct communication (talk-around) P25 Phase 1
 - 5. Conventional analog
 - 6. Optional features
- E. All user equipment supplied shall be configured for use on the proposed radio system as well as MOSWIN
- F. Multi-band subscribers, operating on the MOSWIN system shall be capable of affiliating to both VHF sites and 700 MHz sites, depending upon coverage, without any user intervention (e.g., automatic roaming between VHF and 700 MHz sites).
- G. All user radios proposed shall be compliant with TIA-603-D Land Mobile FM or PM Communications Equipment Measurement and Performance Standards and TIA-102.CAAB-D: Land Mobile Radio Transceiver Performance



Recommendations Project 25 - Digital Radio Technology C4FM/CQPSK Modulation Transceiver Performance Recommendations.

- H. RESPONDENT shall provide detailed equipment specifications for all proposed user radios and accessories, including the following:
1. General specifications:
 - a. Radio dimensions
 - b. Weight with battery (portable)
 - c. Antenna and antenna connector type
 - d. Channel/mode capacity
 2. Environmental specifications and applicable standards
 3. Performance in strong signal environments including:
 - a. Digital adjacent channel rejection
 - b. Digital offset adjacent channel rejection
 - c. Spurious response rejection
 - d. Intermodulation rejection
 - e. Blocking rejection

4.2.1 Portable Radios

- A. The City has estimated the quantities of portable radios. For the purpose of this RFP, RESPONDENT shall provide pricing with the assumption that the County may purchase the number of portable radios shown in Table 1 and as outlined in Appendix B – *Proposal Pricing Forms*.
- B. Features:
1. Full compliance with P25 features and operation
 2. PTT button
 3. Top-mounted on/off volume knob
 4. Top-mounted talkgroup/channel selector
 5. Emergency button, physically protected from inadvertent activation, with software defined configurable activation delay



6. Alphanumeric display (on applicable models), minimum of 8 characters
7. Transmit and receive indicator
8. Accessory connector for remote speaker microphone, or vehicular adapter for operational use in a vehicle
9. Battery life indication or low battery alert, graphical indication on display
10. Minimum 500mW speaker audio output
11. Dual microphone background noise abatement or cancellation system optimized to reject audio signals identified by the Audio Performance Working Group (APWG) such as, but not limited to, Personal Alert Safety System (PASS) alarms, and chain saws. RESPONDENT shall explain operation of this feature in P25 trunked and conventional modes.

C. Battery:

1. RESPONDENT shall propose batteries without cadmium. Pricing shall be provided for the following:
 - a. Nickel-Metal Hydride (NiMH)
 - b. Lithium-ion
 - c. Lithium Polymer
 - d. Intrinsically safe
2. Batteries shall provide a minimum operational use of twelve hours in a public safety environment. RESPONDENT shall specify assumed duty cycle.
3. RESPONDENT shall provide detailed specifications for all batteries proposed, including the following at a minimum:
 - a. Battery life
 - b. Total battery life-cycle expectancy
 - c. Recharge time
 - d. Dimensions
 - e. Weight
 - f. Warranty

- D. Accessories: RESPONDENT shall provide OPTIONAL pricing for all accessories and software features including the following at a minimum:



1. Data cables
2. Battery chargers – single unit, multiple bay, and vehicular chargers:
 - a. RESPONDENT shall provide smart, mixed chemistry battery chargers. The RESPONDENT shall provide complete specifications on all chargers offered.
 - b. Battery chargers must have the ability to cycle the battery by application of load to condition it.
 - c. Battery chargers must have the ability to gauge the capacity of the battery after recharge, and indicate whether the battery failed the test. Indicator lights or display is a minimum requirement.
 - d. Battery chargers must have the ability to detect the battery chemistry and configure itself to charge accordingly.
3. Radios certified as intrinsically safe
4. Alternate antennas
5. GPS (internal to radio)
6. Bluetooth (accessories)
7. Remote speaker microphone without antenna
8. Remote speaker microphone with antenna
9. Remote speaker microphone with GPS capability
10. Remote speaker microphone with keypad
11. Remote speaker microphone with Amplified Speaker (Audio)
12. Bluetooth remote speaker microphone
13. Headset:
 - a. Wired
 - b. Bluetooth
14. Carrying cases / belt clips
15. Wireless (e.g., Wi-Fi, Bluetooth, LTE, LMR) connectivity for OTAP
16. AES Encryption
17. DES Encryption
18. AES & DES Encryption



19. OTAR
 20. OTAP
 21. Send and receive text messages
 22. Vehicular adapter – provides in vehicle portable radio battery charging, mobile microphone, amplified speaker, transmit power amplifier, external antenna connection.
- E. Multiband portable radios:
1. As an OPTION, RESPONDENT shall propose multiband portable radios capable of operating in the following frequency bands:
 - a. VHF: 136 – 174 MHz
 - b. UHF: 380 – 520 MHz
 - c. 700/800 MHz: 762 – 870 MHz
- F. As an OPTION, RESPONDENTS shall propose carrying solutions that may provide an increase in radio performance, as compared to the use of a standard belt clip. RESPONDENTS shall detail how the carrying solution will increase performance and to what extent.

4.2.2 Mobile Radios

- A. The City has estimated the quantities of mobile radios. For the purpose of this RFP, RESPONDENT shall provide pricing with the assumption that the County may purchase the number of mobile radios shown in Table 1 and as outlined in Appendix B – *Proposal Pricing Forms*.
- B. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable and unity gain antennas to provide for a complete installation.
- C. RESPONDENT shall provide pricing for dash mounted units, dual head units and remote mounted units.
- D. Features:
 1. Full compliance with P25 Phase 1 features and operation
 2. Mobile remote mount, with separate control head



3. Front-mounted on/off volume knob
 4. Talkgroup / channel / mode selector
 5. Talkgroup / channel bank / zone or deck selection
 6. Emergency button, protected from inadvertent activation, with software defined configurable activation delay
 7. Multi-line alphanumeric display
 8. Transmit and receive indicator
 9. Programmable buttons on control head
 10. Minimum 5-watt speaker audio output
- E. Accessories – RESPONDENT shall provide OPTIONAL pricing for all accessories and software options, including the following at a minimum:
1. Cables:
 - a. Data cables
 - b. Extension cables
 - c. Adapters
 - d. Power cables
 2. Optional user activated external speaker (outside vehicle)
 3. Optional call alert/page feature for horn/lights
 4. Microphone full keypad functional for telephone interconnect and other functions such as call alert/page or private call
 5. Programmable side buttons on keypad microphone
 6. Dual control head
 7. External speakers
 8. Public address kits
 9. OTAP
 10. AES Encryption
 11. DES Encryption
 12. AES & DES Encryption
 13. OTAR



14. Antennas (different gains and/or mounts)
 15. External weatherproof speakers
- F. Multiband mobile radios:
1. As an OPTION, RESPONDENT shall propose multiband mobile radios capable of operating in the following frequency bands:
 - a. VHF: 136 – 174 MHz
 - b. UHF: 380 – 520 MHz
 - c. 700/800 MHz: 762 – 870 MHz

4.2.3 Control Stations

- A. The County has estimated the quantities of Control Stations. For the purpose of this RFP, RESPONDENT shall provide pricing with the assumption that the City may purchase the number of control station radios shown in Table 1 and as outlined in Appendix B – *Proposal Pricing Forms*.
- B. Control stations shall be supplied complete with desktop microphone, mounting hardware, power supply, coaxial cable and unity gain antennas to provide for a complete installation.
- C. Control stations and antenna system shall be installed following the vendor's provided site grounding specifications.
- D. Control stations shall be remotely controllable via multiple desk set devices. RESPONDENTS shall detail how many desk set devices can control a single control station.
- E. Full function desk sets shall be able to control every feature available on the front panel of the control station.
- F. Features:
 1. Full compliance with P25 features and operation
 2. Desk top microphones
 3. Front-mounted on/off volume knob
 4. Talkgroup/channel selector
 5. Emergency button, protected from inadvertent activation



6. Alphanumeric display
 7. Transmit indicator
- G. Accessories – RESPONDENT shall provide OPTIONAL pricing for all accessories, including the following at a minimum:
1. Cables:
 - a. Data cables
 - b. Extension cables
 - c. Adapters
 - d. Power cables
 2. Antennas
 3. External Speakers
 4. Public address kits
 5. Desktop microphone
 6. Send and receive text messages
 7. OTAR
 8. AES Encryption
 9. DES Encryption
 10. AES & DES Encryption
 11. OTAP
- H. Multiband control station radios:
1. As an OPTION, RESPONDENT shall propose multiband control stations capable of operating in the following frequency bands:
 - a. VHF: 136 – 174 MHz
 - b. UHF: 380 – 520 MHz
 - c. 700/800 MHz: 762 – 870 MHz



4.2.4 Vehicular Repeater Option

- A. RESPONDENT should propose vehicular repeaters that provide two-way traffic between the RESPONDENT's proposed radio system and portable radios.
- B. The use of vehicular repeaters shall not require a separate portable radio from those proposed to operate on the proposed radio system.
- C. Preferred operation for the vehicular repeater would be digital-to-digital communications with no analog to digital, or digital to analog conversion required within the vehicular repeater.
- D. Vehicular repeater designs shall include the following information:
 - 1. Descriptions of how the vehicular repeater solution operates to provide extended portable radio coverage
 - 2. Descriptions of the operational steps required to "attach" portable devices to the vehicular repeater
 - 3. Descriptions of any issues which may arise for having "too many" vehicular repeaters responding in a single operational area and how these issues can be mitigated through user, or automated intervention
- E. As an OPTION, vehicular repeaters should allow for "off network" operation extending the range of portable devices within a smaller area, much like a portable onsite repeater option.



5. Facilities and Infrastructure Development

5.1 General

- A. The SELECTED VENDOR shall be responsible for completing any documents required by local, state and federal departments including, but not limited to permitting documents and State Historic Preservation Office (SHPO) forms.
- B. The SELECTED VENDOR shall be responsible for any issues related to site selection and will be responsible for resolving any issues related to site permitting or zoning.
- C. RESPONDENTS shall adhere to Industry best practices as defined in Section 1.6.1, *Standards and Guidelines*. RESPONDENTS shall provide a copy of the grounding standard to be utilized during site development/installation.
- D. Code Compliance:
 - 1. Installation of all electrical equipment, power distribution, lighting assemblies and associated wiring shall comply with the most recent edition of the National Electric Code (NEC) and Occupational Safety and Health Administration (OSHA) regulations.
 - 2. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).
 - 3. The SELECTED VENDOR and any contractor employed by the SELECTED VENDOR shall comply with all local codes and industry best practices and guidelines stipulated in Section 1. 6.1, *Standards and Guidelines*.
- E. The SELECTED VENDOR shall assume total responsibility for maintaining liability insurance covering the following items:
 - 1. Project design
 - 2. Implementation
 - 3. Licensing
 - 4. Shipping
 - 5. Receiving
 - 6. All site work required



7. Any items required for the SELECTED VENDOR or any required sub-vendors or subcontractors.
- F. Prior to any excavations, the SELECTED VENDOR or subcontractor shall follow appropriate procedures outlined at the following website: www.call811.com.
- G. The SELECTED VENDOR will coordinate with utility companies for all utility related items, such as electrical service hookups and disconnects.
- H. During detailed design, the SELECTED VENDOR shall provide detailed drawings including all structures and foundations, sealed by a professional engineer registered in the state of Missouri.
 1. Detailed dimensioned drawings showing all system components and locations
 2. Drawings and/or specifications describing any auxiliary equipment
 3. Manufacturer specification sheets of all equipment used
- I. All control functions and alarms from towers, shelters and backup power shall be interfaced to the NMS detailed herein, for remote control and monitoring.

5.2 Site Selection

- A. RESPONDENTS shall use the City's existing communications sites to the greatest extent possible. The preferred order of site selection shall be; current tower sites utilized by the City, existing tower sites not currently utilized, then new or "green field" sites.
- B. If at all possible, the existing KFVS12 site should not be reused in the proposed P25 system.
- C. Table 2 lists preferred sites to be considered.



Table 2 – Radio Site Locations

Site Name	City Owned	Tower Heights	Street Address	Lat.	Lon.
Gordonville Tower	Yes	160'	2990 Gordonville Road, Cape Girardeau, MO	37-18' 15.21" N	89-33' 58.32" W
North County Park Tower	No	250'	302 Limbaugh Lane Cape Girardeau, MO	37-20'- 57.80" N	89-35'- 46.07" W
SEMO	No	180'	931 College Hill Place Cape Girardeau, MO	37-18'- 35.9" N	89-31'- 49.3" W

- D. In the event the RESPONDENT feels that the provided site locations are insufficient to deliver the required coverage, alternate sites may be suggested.
- E. Cost associated with each existing or proposed site shall be detailed separately, on a per site basis.
- F. Prior to implementation, the SELECTED VENDOR shall perform the following studies at each site:
1. Intermodulation analysis – The SELECTED VENDOR shall consider equipment from all tenants located at the proposed site, per FCC licensed information and observation of the equipment located at the site.
 2. Maximum Permissible Exposure (MPE) study (per latest revision of Office of Engineering Technology (OET) bulletin 65 – The SELECTED VENDOR shall consider equipment from all tenants located at the proposed site, per FCC licensed information.
 3. Noise Floor Levels – The SELECTED VENDOR shall perform RF measurements of the site noise floor and locally-generated signals over a 24-hour period at each site. These measurements shall be provided to the City as a baseline of the existing noise floor within the 700 MHz spectrum utilized by the new P25 system.
- G. The SELECTED VENDOR shall resolve all issues predicted during the intermodulation analysis and MPE studies. If an intermodulation problem is identified following implementation, the SELECTED VENDOR shall identify the issue and provide a resolution to the City during the warranty period at no additional cost to the City, which would not degrade system coverage or performance.



5.3 Existing Site Development

- A. RESPONDENTS shall verify that any existing sites selected for use have sufficient space available for antenna and ancillary equipment to be mounted on the tower/structure. In the event a RESPONDENT proposes a location on the tower/structure that is not available, the RESPONDENT'S guarantee of coverage shall not change even though an alternative design may be required.
- B. Cost associated with development of existing sites shall be detailed separately, on a per site basis as detailed in Appendix B – *Proposal Pricing Forms, Table C.4A*.
- C. The SELECTED VENDOR shall perform structural analysis. If no current drawings are available, the SELECTED VENDOR shall also be responsible for any tower mapping services required for the structural analysis.
- D. Structural analysis shall be performed on existing towers according to the ANSI/TIA-222 standard, latest version applicable at the time of structural analysis.
- E. Structural analysis shall include existing and proposed equipment; however, it is the City's intent that the SELECTED VENDOR remove unused system equipment once cutover and acceptance of the new system is completed.
- F. Structural analysis reports shall be provided to the City upon completion of study or studies.
- G. In the event a tower fails the structural analysis, the SELECTED VENDOR shall be responsible for modifying the tower to correct the deficiencies. A passing structural analysis report shall be provided to the City detailing the tower modifications.
- H. In the event that use of an existing commercial tower location is proposed, the RESPONDENT shall provide the City with lease costs for tower and ground space required to support communications systems. Additionally, the RESPONDENT will exercise due diligence to verify availability of the tower elevations proposed, and that the tower can support the proposed equipment.
- I. RESPONDENT shall identify and propose any additional work necessary to make existing sites and infrastructure usable in the proposed radio system.
- J. The SELECTED VENDOR shall be responsible for updating all existing sites that are part of the proposed system to be compliant with their provided grounding



standards. SELECTED VENDOR shall be accountable for updating all deficient site conditions.

- K. The SELECTED VENDOR shall be responsible for any issues related to site selection and will be responsible for resolving any issues related to site permitting or zoning.
- L. Code Compliance:
1. Installation of all electrical equipment, power distribution, lighting assemblies and associated wiring shall comply with the most recent edition of the National Electric Code (NEC) and Occupational Safety and Health Administration (OSHA) regulations.
 2. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).
- M. The SELECTED VENDOR and any subcontractor employed by the SELECTED VENDOR shall comply with all applicable local codes as well as industry best practices and guidelines stipulated in Section 1.6.1, *Standards and Guidelines*.
- N. The SELECTED VENDOR shall assume total responsibility for maintaining liability insurance covering the following items:
1. Project design
 2. Implementation
 3. Licensing
 4. Shipping
 5. Receiving
 6. All site work required
 7. Any items required for the SELECTED VENDOR or any required subcontractors.
- O. Prior to any excavations, the SELECTED VENDOR or subcontractor shall follow appropriate procedures outlined at the following website: www.call811.com.
- P. The SELECTED VENDOR will coordinate with utility companies for all utility related items, such as electrical service hookups and disconnects.



- Q. During preliminary design, the SELECTED VENDOR shall provide detailed drawings including all structures and foundations, sealed by a professional engineer registered in the state of Missouri.
1. Detailed dimensioned drawings showing all system components and locations
 2. Drawings and/or specifications shall describe any auxiliary equipment
 3. Manufacturer specification sheets of all equipment used shall be provided
- R. Concrete:
1. For all foundations and concrete work, the SELECTED VENDOR or subcontractor will provide to the City or the City's representative, a test sample of each mix of concrete demonstrating that it has been tested for compliance with the foundation specifications set forth by the requisite site engineer. Written reports certifying the strength of the concrete are to accompany each test cylinder.
 2. If any concrete used in the foundation does not meet specifications, the SELECTED VENDOR or subcontractor will be required to remove the foundation and pour a new foundation using compliant materials, at no expense to the owner.
- S. All control functions and alarms from towers, shelters, and backup power equipment (generator, transfer switch, and UPS) shall be interfaced to the Network Management System (NMS) detailed herein, for remote control and monitoring.

5.4 Towers

- A. General:
1. Any new tower(s) proposed shall be self-supporting.
 2. Towers proposed shall be Class III towers designed for the appropriate exposure and topographic categories.
 3. Any tower manufacturer supplying a tower(s) for this system will guarantee structural integrity of the tower for a period of not less than 20 years from the date of acceptance.
 4. The SELECTED VENDOR shall be responsible for all geotechnical analyses (soil testing) and proper foundation design.



B. Tower Loading:

1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances and ancillary equipment, without addition to or modification of the finished tower or foundation.
2. Designed loading shall also consider two typical cellular carrier antenna arrays near the top of the structure for future growth or leasing opportunities.
3. The proposed tower structure shall be designed and installed in accordance with the latest revision of the ANSI/TIA-222 standard.

C. Proposed towers shall include the following:

1. Ice bridge – A horizontal transmission line ice bridge, extending from the tower cable ladder to the equipment building entry port, shall be provided. The ice bridge will be self-supported and cannot be directly connected to the tower or the shelter.
2. Transmission Line Support – A vertical transmission line support system shall be provided to securely attach the antenna transmission lines. Holes shall be provided in the tower support members, tower hanger adapter plates or separate ladder structures to allow installation of snap-in cable hangers and bolt-in cable hangers at maximum 3-foot intervals. The mounting holes shall be precision punched or drilled and sufficiently separated to accommodate the snap-in or bolt-in hangers.
3. Climbing Access – A ladder, beginning at a point at least 10 feet off the ground, shall be provided as an integral part of the tower to permit access by authorized personnel. The tower shall be equipped with an OSHA approved anti-fall safety device in accordance with EIA-222. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, going up or coming down. Two safety climbing belts shall be supplied with each new tower.
4. Lighting:
 - a. Tower lighting shall be supplied as required by the applicable determination as issued by the FAA for this project and fully compliant with FAA AC 70/7460-1K or latest revision.
 - b. The system control circuitry shall provide synchronization and intensity control of the obstruction lighting system and shall monitor the overall integrity of the lighting system for component failures or improper operation.



- c. The SELECTED VENDOR or subcontractor shall wire all alarms to a contractor provided Type 66 block located in the communications shelter or equipment room. All alarms shall be clearly labeled.
 5. A lightning ground rod shall be installed at the very top of the tower to extend at least two feet above the top of the tower or lighting fixture.
 6. Labeling shall be clearly provided near the base of all new towers for the following:
 - a. Make
 - b. Model
 - c. Serial number
 - d. Tower height
 - e. FAA and FCC identification numbers (if applicable)
- D. Construction:
1. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.
 2. The tower shall be constructed of high-strength steel. All components and hardware being hot dip galvanized with zinc coating per EIA standards after fabrication. A zinc coating shall be permanently fused to the steel, both inside and outside, so all surfaces are protected and no painting is required for rust protection.
 3. Prior to galvanizing, each piece of steel and every weld is to be deburred and smooth finished.
 4. RESPONDENT shall carefully examine and study existing site conditions. Difficulties in accessing sites for tower delivery and installation will be the responsibility of the SELECTED VENDOR. Later claims for additional compensation due to additional labor, equipment or materials required due to difficulties encountered during tower delivery or installation will not be considered.
- E. Final Testing and Acceptance – Upon completion of the work, documentation detailing final inspection and testing shall be submitted, documenting the following:
1. Steel structure:
 - a. Vertical alignment and plumbness



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- b. All bolts tight and torqued to specification
 - c. No damaged or missing structural members
 - d. All surface scratches and damage to the galvanized surfaces will be repaired using the hot stick process.
 - e. No signs of stress or vibration
 - f. All climbing ladders, and other devices installed correctly
 - g. Labels and tags
2. Foundation:
 - a. Concrete finish with no cracks or blemishes
 - b. Grouting, if used, will have drain holes if the tower uses hollow leg construction or monopole design
 - c. Backfilling and grading
 3. Grounding:
 - a. Verify lugs and CADWELD®s
 - b. Ground resistance test and record
 - c. Ground lightning rod installed at top of tower
 4. Ice Bridge: Installed per specification
 5. Lighting and controls:
 - a. Inspect conduit and wiring installation
 - b. Verify proper lamp operation
 - c. Verify alarm contact operation
 - d. Verify labeling
 6. Photographs:
 - a. Overall structure from N, E, S, W
 - b. Footers
 - c. Grounding



5.5 Shelters

A. General:

1. RESPONDENT shall propose a new equipment shelter for all new RF site locations.
2. The shelter shall be a prefabricated, preassembled shelter. The shelter can be constructed from concrete, and/or aggregate materials.
3. The shelter shall consist of an equipment room and generator room.

B. Size:

1. Minimum shelter size shall be 12' x 20', with a minimum interior height of 9'. Shelter will contain a room to house supplied generator and transfer switch separate from the radio equipment.
2. The RESPONDENT shall be responsible for determining if a larger shelter size is required, or if a smaller shelter is acceptable based on proposed equipment to be installed. Alternative sized shelters may be proposed as an OPTION.

C. Foundation:

1. The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by the SELECTED VENDOR or approved subcontractor that properly supports and secures the shelter. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

D. Flooring:

1. RESPONDENTS are to propose a structure with floor and/or solid foundation featuring a minimum uniform load rating of 200 pounds per square foot with no more than 3,000 pounds over any four-square-foot area. This rating shall be increased in sections as necessary to support heavy weight equipment. If delivered assembled with floor, the floor shall exhibit a minimum 90 pounds per square foot uniform live load capacity while the building is being lifted.
2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.



3. The floor shall be covered by a high quality, industrial / commercial grade asphalt or vinyl tile. All edges shall be covered by wall molding.

E. Walls:

1. Walls shall be constructed to a minimum 120 MPH wind loading, including overturning moments.
2. Bullet Proof: Walls and doors shall withstand the effects of bullets or other projectiles equivalent to a 30.06 high power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the wall. No interior damage shall be sustained including insulation, interior walls, etc.
3. The outside walls shall be finished concrete or an aggregate composition.
4. The inside walls shall be finished with minimum 5/8-inch plywood (or equivalent) trimmed with coordinated molding to allow mounting of panels, blocks, etc.
5. High performance insulation shall provide a minimum insulation factor of R-11.
6. All ducts and openings shall be protected with a screen barrier to prevent the entry of insects, birds, or small animals

F. Roof:

1. The building roof shall support a minimum 100 pounds per square foot uniform live load.
2. The roof is to be pitched to facilitate runoff of water.
3. The shelter roof shall withstand the impact of ice falling from the adjacent tower without suffering any damage or shall otherwise be protected from such damage. RESPONDENTS are to describe in their proposal how this requirement will be met.
4. High performance insulation shall provide a minimum insulation factor of R-19.



G. Door:

1. Shelters shall have one 42" x 84" insulated door, with three stainless steel tamperproof hinges, passage style lever handle, deadbolt lockset and fiberglass weather hood or awning. The door shall be equipped with a hydraulic door closer.
2. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish to match the building finish.
3. The door shall withstand the effects of bullets or other projectiles equivalent to a 30.06 high power rifle load fired from a distance of 50 feet with no penetration to the inner cavity of the door. No interior damage shall be sustained from such events, including damage to insulation, interior walls, etc.
4. The doorsill shall be of stepped construction to prevent rainwater from entering the shelter at the bottom of the door or from around the doorframe. The doorframe shall have a weather seal around the door to limit air and water intrusion.

H. Finishing:

1. The RESPONDENT shall describe the interior and exterior finishes. Color and finishes shall be selected by the City from samples provided by the SELECTED VENDOR or subcontractor.
2. All joints shall be sealed with a compressible, resilient sealant.

I. AC Power System:

1. The SELECTED VENDOR shall deliver the building complete with a 200 ampere capacity, 240 volts, single phase electrical panel box with a ground bar.
2. This panel shall be equipped with a 200 ampere capacity main circuit breaker used to supply power for all electrical functions related to the site.
3. Overall panel size shall be determined by the need to provide the number of individual breakers required plus a reserve of at least six 240 Volt slots.
4. Receptacles:
 - a. Each radio equipment unit (or rack) shall be supplied with two 20 Amp circuits, each terminated at a typical NEMA 5-20 receptacle. Receptacles shall be mounted to the side of the overhead cable tray.



- b. Service receptacles shall be mounted on the walls at six-foot intervals or less.
- c. One weatherproof ground fault interrupter (GFI) exterior power receptacle shall be provided with each shelter, to be mounted near air conditioning units.
- d. A power receptacle shall be located near the microwave dehydrator to power the unit.
- e. Each receptacle shall be fed from an individual breaker. The feeding breaker shall be identified at the receptacle and the receptacle shall be identified at the breaker. All breakers or circuits shall be 20 Amp, unless otherwise noted.

J. Power Line Surge Suppression:

- 1. An AC surge protector shall be provided and installed inside the shelter.
- 2. An acceptable unit shall be an in-line type such as the AC Data Systems "integrated load center". An alternate unit must meet or exceed all of the capabilities of this model unit.
- 3. Minimum surge protector requirements:
 - a. Built-in redundancy of dual stages per phase with filtering
 - b. Surge energy shunted to ground, not to neutral
 - c. Front panel indicator lamps
 - d. Remote / local status contacts
 - e. Fusible link protected so as not to interrupt power
 - f. Field replacement protection blocks, fuses, if needed
 - g. UL listed components
 - h. EMI/RFI filtering per Mil-STD-220
 - i. The unit shall be capable of handling the full 240 Volt, 200 Amp capacity of the electrical system

- K. Clean Agent Fire suppression system that is compliant with the requirements of NFPA 75, Standard for the Protection of Information Technology (IT) Information Equipment, and NFPA 76, Standard for the Fire Protection of Telecommunications Facilities, as applicable and installed per the requirements of NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems.



L. Wiring Methods:

1. All wiring noted on the site drawings or otherwise included by the SELECTED VENDOR shall be installed in conduit. Where no protection method is specified, conduit shall be used.
2. All conduit shall be securely surface mounted and supported by approved clamps, brackets, or straps as applicable and held in place with properly selected screws. No wiring shall be imbedded inside any walls, floor or ceiling. Entrance power, outside lighting, air conditioning outlet and Telco are the only wiring that may penetrate shelter walls or floor.
3. All wire raceway, conduit, etc., is to be mechanically joined and secured.
4. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.
5. Unless otherwise specified, all power wiring shall be a minimum 12 AWG size solid copper conductors with insulation rated for 600 Volts alternating current (AC).
6. One 4' x 6' x 3/4" Telco board shall be installed.

M. Light Fixtures:

1. Ceiling mounted four-foot fluorescent light fixtures (two 40-watt bulbs per fixture) with RFI ballasts shall be supplied for the equipment shelters or, RESPONDENTS may propose alternate low RFI lighting fixtures. A sufficient number of light fixtures shall be supplied to provide a uniform light level throughout the building of 150-foot candles at four feet above the floor.
2. Light fixtures shall be fed as a gang from a common breaker and controlled by an on/off switch near the door.

N. Outdoor Lighting:

1. An exterior 1,000-lumen LED light fixture shall be wall mounted by the front entrance of the shelter.
2. The exterior lighting system shall be equipped with motion detectors and fed from a separate, appropriately rated breaker and light switch by the door.

O. Heating, Ventilation, and Air Conditioning (HVAC):



1. The SELECTED VENDOR shall provide an HVAC system for each shelter proposed. The RESPONDENT shall propose dual AC units with lead lag controller. Each AC unit shall be sized for 100 percent of the buildings required cooling capacity, as determined by the BTU analysis.
 2. The SELECTED VENDOR shall perform BTU analysis (heat load calculations) for all shelter equipment during preliminary design to verify HVAC system size. All calculations shall include a 50% expansion factor, and all assumptions regarding power consumption, duty factor, and heat loading shall be thoroughly explained.
 3. Each unit shall be capable of maintaining an inside ambient temperature range between 65 and 85 degrees F. Each unit shall be sized to maintain temperatures inside the shelter at 70 degrees F when exterior temperatures go as high as 100 degrees F.
 4. The HVAC system shall be controlled by a wall mounted thermostat. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65 degrees F and off when it rises to 68 degrees F. It shall turn on the air conditioner when the interior temperature reaches 78 degrees F and off when the temperature drops below 75 degrees F. Thermostat control shall be adjustable within the range of 45 to 85 degrees F.
 5. A properly sized thermostatically-controlled exhaust fan, located as high as possible in the shelter with gravity damper, hood with insect screen, and timer connected to emergency power shall be supplied to vent the building in case of HVAC failure. A corresponding cold air intake vent with motorized louvers shall also be installed low on an opposing wall to allow unobstructed air flow through the shelter.
- P. Generator Room shall be supplied, at a minimum, with the following equipment:
1. One generator, exhaust piping, thimble, and muffler wrap
 2. Motor operated exhaust shutter with outside hood and insect screen
 3. Motor operated intake shutter with outside hood and insect screen
 4. Baseboard heater with thermostat control
 5. Leak containment floor
- Q. Antenna Cable Entry – A bulkhead panel shall be supplied to accommodate coaxial transmission lines between 1/2-inch and 1 5/8-inch diameter elliptical waveguides. A minimum of 12 transmission lines shall be accommodated with



4-inch openings. The building manufacturer shall seal the conduits into the wall to assure that they are watertight.

- R. Cable Tray – All new shelters will be equipped with cable trays. The SELECTED VENDOR shall install a minimum 18-inch wide cable tray system above the equipment.
- S. Shelters shall be supplied with at least two 10-pound CO2 fire extinguisher, an approved eyewash station and first aid kit.
- T. RESPONDENT shall carefully examine and study existing site conditions. Difficulties in accessing sites for shelter delivery and installation will be the responsibility of the SELECTED VENDOR. Later claims for additional compensation due to additional labor, equipment or materials required due to difficulties encountered during shelter delivery or installation will not be considered.
- U. As an OPTION, the City would like to reuse existing shelters.
 - 1. RESPONDENTS shall detail any costs associated with improving existing shelters, or equipment rooms to ensure the shelter, or equipment rooms meet the RESPONDENT'S grounding requirements.

5.6 Generator and Automatic Transfer Switch (ATS)

This section provides specifications and requirements for standby power systems to supply electrical power in the event of failure of normal supply, consisting of a liquid cooled engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified.

- A. The SELECTED VENDOR shall provide an emergency generator system at each new and existing RF site for backup power.
- B. The generator system shall provide a minimum of 48 hours of run time on a single tank of fuel. RESPONDENTS shall detail the expected run time based upon full electrical loading from proposed and existing equipment at each site.
- C. SELECTED VENDOR shall perform electrical loading analysis for shelter equipment, including HVAC systems, during preliminary design to verify generator size and fuel tank capacity. All electrical loading calculations shall include a 50% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.



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- D. In the event loading is less than 50 kW, a 50 kW generator will be proposed.
 - E. Generators will be powered by Diesel fuel. Diesel fuel shall be contained within a base mounted fuel tank.
 - F. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without system outage.
 - G. Quality Assurance – The system shall be supplied by a manufacturer who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 10 years, thereby identifying one source of supply and responsibility.
 - H. The generator system and all accessories and ancillary equipment shall comply with the following standards:
 - 1. NFPA 37 Flammable and Combustible Liquids Code
 - 2. NFPA 55 Standard for the Storage and Handling of Compressed Gases
 - 3. NFPA 70 with particular attention to Article 700, “Emergency Systems”
 - 4. NFPA 110 Requirements for Level 1 Emergency Power Supply System
 - 5. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures
 - 6. ANSI/NEMA MG 1 - Motor and Generators
 - 7. ANSI/NEMA AB 1 - Molded Case Circuit Breakers
 - 8. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1,000 Volts maximum)
 - I. Labeling and Identification – All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by the vendor.
 - J. Factory Testing:
 - 1. Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:
 - a. Verification that all safety shutdowns are functioning properly
 - b. Verification of single step load pickup per NFPA 110-1996, Paragraph 5-13.2.6



- c. Verification of transient and voltage dip responses and steady state voltage and speed (frequency) checks
 - d. Full load test for a minimum of one hour
 2. Provision of complete report(s) of all testing performed
- K. Startup and Checkout:
 1. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to check out the completed installation and to perform an initial startup inspection to include:
 - a. Ensuring the engine starts (both hot and cold) within the specified time
 - b. Verifying that engine parameters are within specification
 - c. Verifying that no load frequency and voltage adjusting is required
 - d. Testing all automatic shutdowns of the generator
 - e. Performing a simulation of power failure to test that generator start up and automatic transfer switches (ATS) pick up building load correctly.
 - f. Returning to commercial power and test generator and ATS to demonstrate correct cycling to normal commercial power.
 - g. Performing a load test of the generator, to ensure full load frequency and voltage is within specification by using a load bank rated at 80% of the generator's capacity. This test shall be run for a minimum of one hour.
 - h. Testing and verifying all remote indicators and controls.
 2. The SELECTED VENDOR shall provide complete report(s) of all testing performed.

5.6.1 Generator

- A. The prime mover shall be a liquid cooled, Diesel fueled engine of 4-cycle design.
- B. The engine shall have sufficient horsepower rating to drive the generator to full output power without a gearbox between the engine and generator.
- C. The engine shall have a battery charging DC alternator with a solid-state voltage regulator.



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- D. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.
 - E. One-step load acceptance shall be 100% of generator set nameplate rating and meet the requirements of NFPA 110 paragraph 5-13.2.6.
 - F. The electric plant shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.
 - G. A main line output circuit breaker carrying the UL mark shall be factory installed.
 - 1. Form C auxiliary contacts rated at 250 VAC/10 amps shall be provided to allow remote sensing of breaker status.
 - H. Controls:
 - 1. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock mounted in a NEMA 1 enclosure mounted to the generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/-5% voltage adjusting control.
 - 2. The generator set shall contain a complete two-wire automatic engine start-stop control, which starts the engine on closing contacts and stop the engine on opening contacts.
 - 3. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within that time. Engine control modules must be solid-state plug-in type for high reliability and easy service.
 - 4. The panel shall include:
 - a. Meters to monitor:
 - 1) AC voltage
 - 2) AC current
 - 3) AC frequency
 - b. Emergency stop switch
 - c. Audible alarm
 - d. Programmable engine control
 - e. Monitoring module



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5. The programmable module shall include:
 - a. Manual OFF/AUTO switch
 - b. Four LED's to indicate:
 - 1) Not In Auto
 - 2) Alarm Active
 - 3) Generator Running
 - 4) Generator Ready

 6. The module shall display all pertinent unit parameters including:
 - a. Generator Status – ON/OFF/AUTO
 - b. Instrumentation - Real-time readouts of the following engine and alternator analog values:
 - 1) Oil pressure
 - 2) Coolant temperature
 - 3) Fuel level (where applicable)
 - 4) DC battery voltage
 - 5) Run time hours
 - c. Alarm Status - Current alarm(s) condition of:
 - 1) High or low AC voltage
 - 2) High or low battery voltage
 - 3) High or low frequency
 - 4) Low or pre-low oil pressure
 - 5) Low water level
 - 6) Low water temperature
 - 7) High and pre-high engine temperature
 - 8) High, low and critical low fuel levels (where applicable)



- 9) Over crank
- 10) Over speed
- 11) Unit not in "Automatic Mode"

I. Unit Accessories:

1. The exhaust silencer(s) shall be provided, of the size recommended by the manufacturer, and shall provide noise reduction for use in residential areas.
2. The generator set shall include an automatic dual rate battery charger manufactured by the generator set supplier. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.
3. A heavy duty, lead acid 12 VDC battery shall be provided by the generator set manufacturer. The generator set shall have a frame suitable for mounting the battery and include all connecting battery cables.

5.6.2 Automatic Transfer Switch (ATS)

- A. The automatic transfer switch shall be compatible with the set to maintain system compatibility and local service responsibility for the complete emergency power system.
- B. Representative production samples of the transfer switch supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency and back to normal.
- C. Wiring must comply with NEC table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular automatic transfer switch and a typical wiring diagram for the entire system.
- D. Ratings and Performance:
 1. The ATS shall be adequately sized to match the generator and shelter electrical systems.
 2. The ATS shall be a 2-pole design rated for 600 VAC 200 Amps continuous operation in ambient temperatures of -20 degrees Fahrenheit (-30 degrees Celsius) to +140 degrees Fahrenheit (+60 degrees Celsius).



3. The operating mechanism will be a single operating coil design, electrically operated and mechanically held in position.
4. A provision will be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

E. Controls:

1. Controls shall signal the generator set to start in the event of a power interruption.
 - a. A solid-state time delay start, adjustable, 0.1 to 10 seconds, shall delay this signal to avoid nuisance startups on momentary voltage dips or power outages.
2. Controls shall transfer the load to the generator set after it reaches proper voltage.
3. Controls shall retransfer the load to the line after normal power restoration.
 - a. A return to utility timer, adjustable from 1-30 minutes, shall delay this transfer to avoid short-term normal power restoration.
4. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
5. Controls shall signal the generator to stop after the load retransfers to normal.
 - a. A solid-state engine cool down timer, adjustable from 1-30 minutes, shall permit the engine to run unloaded to cool down before shutdown.
 - b. Should the utility power fail during this time, the switch will immediately transfer back to the generator.
6. Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode that bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.
 - a. The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from utility or the generator set.



- b. The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and accessible only by authorized personnel.
- c. The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.
- d. The controls shall provide LED status lights to give a visual readout of the operating sequence including:
 - 1) Utility on
 - 2) Engine warm-up
 - 3) Standby ready
 - 4) Transfer to standby
 - 5) In-phase monitor
 - 6) Time delay neutral
 - 7) Return to utility
 - 8) Engine cool down
 - 9) Engine minimum run

5.7 Site Preparation

- A. SELECTED VENDOR shall perform all site preparation for site improvements as necessary. Work includes, but is not limited to the following:
 - 1. Full adherence to all state and local codes
 - 2. Protecting existing plants and grass to remain
 - 3. Removing existing plants and grass as necessary
 - 4. Clearing and grubbing
 - 5. Stripping and stockpiling topsoil
 - 6. Removing above- and below-grade site improvements as necessary
 - 7. Disconnecting, capping or sealing, and removing site utilities as necessary



8. Temporary erosion and sedimentation control measures
 9. Access road development
- B. The SELECTED VENDOR or subcontractor shall comply with Department of Environmental Resources and Bureau of Water and Soil Conservation guidelines for Erosion and Sedimentation (E&S) Control.
- C. RESPONDENT shall carefully examine and study existing conditions, difficulties and utilities affecting execution of work. Later claims for additional compensation due to additional labor, equipment or materials required due to difficulties encountered or underground water conditions will not be considered.
- D. The SELECTED VENDOR shall verify that existing plant life to remain and clearing limits are clearly tagged, identified and marked in such a manner as to insure their safety throughout construction operations.
- E. Protection:
1. The SELECTED VENDOR shall protect and maintain bench mark, monument, property corner, and other reference points; reestablishing them by a registered professional surveyor if disturbed or destroyed, at no cost to the City.
 2. The SELECTED VENDOR shall locate and identify existing utilities that are to remain and protect them from damage, reestablishing them if disturbed or destroyed, at no cost to the City.
 3. The SELECTED VENDOR shall protect trees, plant growth and features to remain as final landscape. Branches or roots of any trees, which are to remain, shall not be disturbed. Adequate guards, fences, lighting, warning signs and similar items, shall be provided and maintained as required.
 4. The SELECTED VENDOR shall install protection such as fencing, boxing of tree trunks, or other measures as approved by the Project Engineer.
 5. The SELECTED VENDOR shall conduct operations with minimum interference to public or private accesses and facilities; Maintain ingress and egress at all times; and clean or sweep any roadways daily or as required by the governing authority. At such times as deemed necessary by the City, dust control shall be provided with water sprinkling systems or equipment provided by the SELECTED VENDOR or subcontractor.
- F. Clearing:



1. The SELECTED VENDOR shall clear areas required for access to the site and execution of work.
 2. Unless otherwise indicated, the SELECTED VENDOR shall remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with the installation of new construction. Removal includes digging out stumps, roots and root material. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid water pooling. Satisfactory fill material shall be placed in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements of this section and CSI Division 2-Site Construction-Section 02200.
 3. The SELECTED VENDOR shall remove grass, trees, plant life, stumps and all other construction debris from the site to a location that is suitable for handling such material according to state laws and regulations.
- G. Demolition: The SELECTED VENDOR shall remove existing pavement, utilities, curbing and shrubbery as necessary for construction of improvements.
- H. Topsoil Excavation:
1. The SELECTED VENDOR shall strip topsoil from areas that are to be filled, excavated, landscaped or re-graded to such a depth that it prevents intermingling with underlying subsoil or questionable material.
 2. The SELECTED VENDOR shall stockpile topsoil in storage piles in areas not scheduled for construction, job trailer location, or equipment lay-down areas, or where directed by the Project Engineer. Storage piles shall be constructed to freely drain surface water. Storage piles shall be covered as required to prevent windblown dust. Unsuitable soil shall be disposed of as specified for waste material, unless otherwise desired by the City. The SELECTED VENDOR or the SELECTED VENDOR's subcontractor shall remove excess topsoil from the site.
 3. Final topsoil coatings shall consist of organic soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2" in diameter, weeds, roots, and other objectionable material.
- I. Access Roads:
1. A 12-foot wide access road shall be provided to the fence gate at new sites.



2. Roadbeds shall be prepared, rolled and provided with 6 inches of aggregate base course.
3. Roads shall be graded appropriately for proper drainage and minimal erosion.

5.8 Fencing

- A. SELECTED VENDOR shall provide chain-link fencing around the perimeter of all new proposed sites, according to the specifications in this section including those provided in Table 3.
- B. Framework: Type I or Type II Steel Pipe.
 1. Type I – Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM (American Society for Testing and Materials) F-1083; or,
 2. Type II – Pipe manufactured from steel conforming to ASTM A569. External surface triple coated per ASTM F-1234. Type II pipe shall demonstrate the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5% red rust in a test conducted in accordance with ASTM B-117.
 3. All coatings are to be applied inside and out after welding.
 4. Unless otherwise noted, Type II framework shall be provided.
 5. Pipe shall be straight, true to section and conform to the following weights:

Table 3 – Type I and Type II Steel Pipe Specifications

Pipe Size Outside Diameter	Type I Weight lb./ft.	Type II Weight lb./ ft.
1 5/8"	2.27	1.84
2"	2.72	2.28
2 1/2"	3.65	3.12
3"	5.79	4.64
3 1/2"	7.58	5.71
4"	9.11	6.56
6.58"	18.97	



C. Fabric:

1. Aluminized fabric shall be manufactured in accordance with ASTM A-491 and coated before weaving, with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A-817. Fabric shall be 9-gauge woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.
2. Zinc-coated fabric shall be galvanized after weaving with a minimum 1.2 ounces of zinc per square foot of surface area and conform to ASTM A-392, Class I. Fabric shall be 9-gauge wire woven in a 2-inch diamond mesh. The top selvage shall be twisted and barbed. The bottom selvage shall be knuckled.

D. Fence Posts:

Table 4 – Fence Post Specifications

Fence Posts TYPE I - II Fabric Height	Line Post O.D.	Terminal Post O.D.
Under 6'	2"	2 ½"
6'-9'	2 ½"	3"
9'-12'	3"	4"

E. Gate Posts:

Table 5 – Gate Posts Specifications

Gate Posts Type II		
Single Gate Width	Double Gate Width	Post O.D. Type II
Up to 6'	Up to 12'	3"
7'to 12'	13' to 25'	4"

F. Rails and Braces: 1 5/8" O.D.

- G. Gates: Frame assembly of 2" O.D. pipe Type I or Type II with welded joints. Weld areas shall be repaired with zinc-rich coating applied per manufacturer's directions. The fence fabric shall match the fence posts, gate posts and gates. Gate accessories, hinges, latches, center stops, keepers and necessary hardware shall



be of a quality required for industrial and commercial application. Latches shall permit padlocking. The SELECTED VENDOR shall provide one padlock for each gate with three keys for each padlock. All padlocks shall be keyed alike.

H. Installation:

1. General – Fence installation shall conform to ASTM F-567, Standard Practice for Installation of Chain-Link Fence.
2. Height – Fence height shall be as indicated on contract drawings. If no height is indicated, the fence shall be 7' high, plus 1' for barbed wire.
3. Post Spacing – Line posts shall be uniformly spaced between angle points at intervals not exceeding 10 feet.
4. Bracing – Gate and terminal posts shall be braced back to adjacent line posts with horizontal brace rails and diagonal truss rods
5. Top Rail – The top rail shall be installed through the line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
6. Fencing shall have a bottom rail instead of a tension wire.
7. Fabric – The fabric shall be pulled taut with the bottom selvage 2-inches above grade. The fabric shall be fastened to the terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15-inch intervals. The fabric shall be tied to the line posts and top rails with tie wires spaced at a maximum of 12-inches on posts and 24-inches on rails. The fabric shall be attached to the bottom rail with top rings at maximum 24-inch intervals.
8. Barbed Wire – Barbed wire shall be anchored to the terminal extension arms, pulled taut and firmly installed in the slots of the line post extension arms.
9. Valleys – Should the fence cross a ditch or drainage swell, 3/8" diameter aluminum alloy rods shall be driven vertically 18" into the ground on 4-inch centers, woven through the fence fabric to provide security for these areas.
10. Vegetation-stop and aggregate shall be applied to the entire compound area (the area inside the fencing) and 6" beyond the fencing. Vegetation-stop shall be constructed with weed barrier geotextile and aggregate shall be applied 3" in depth and consist of AASHTO#10 coarse aggregate.



6. Training

The SELECTED VENDOR shall develop and conduct training programs to allow City personnel to become knowledgeable with the system, subsystems, and individual equipment.

6.1 General Requirements

- A. RESPONDENT shall fully describe all proposed training programs detailing how the RESPONDENT intends to provide training. The training description shall include the following:
 - 1. A list of all subjects with a description of each
 - 2. Class material to be provided by the SELECTED VENDOR
 - 3. Number of classes
 - 4. Class duration
 - 5. Class size
 - 6. Class cost
- B. RESPONDENTS shall propose a minimum of two classes for each type of training.
- C. All training shall be conducted at various locations to be determined. The SELECTED VENDOR shall coordinate with the City regarding the attendees and schedule.
- D. Classes shall be scheduled as near to system cutover as possible, or at other times mutually agreed upon by the City and SELECTED VENDOR.
- E. The SELECTED VENDOR shall train the City employees or designated individuals. In some cases, a Train-the-Trainer approach will be used so that attendees can train other users.
- F. The SELECTED VENDOR shall provide all instructional material, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete operating instructions for all technical and operational training classes. Actual and or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training. All instructional material shall be subject to the approval of the City and shall become property of the City.



- G. Operator training classes provided by the SELECTED VENDOR shall be tailored to include actual system talkgroups and subscriber/console features that will be used. Standard training that covers general usage not applicable to the provided system shall be removed from the training syllabus.

6.2 Operator Training

- A. The SELECTED VENDOR shall provide complete and comprehensive operational training covering features, operation, and special care associated with the equipment supplied. Operator training shall include the following categories:
1. Portable Unit Operation (structured as Train-the-Trainer) (8 seats)
 2. Mobile Unit Operation (structured as Train-the-Trainer) (8 seats)
 3. Dispatch Console Operation (12 seats)
 4. Dispatch Console Supervisor (2 seats)

6.3 Technical/System Management Training

- A. The SELECTED VENDOR shall provide complete and comprehensive technical training for City technical staff charged with managing the system. Currently four seats are anticipated. This training shall include, but is not limited to:
1. Planning and setting up the system and network
 2. Building and implementing system and network profiles and configurations
 3. Performing database management functions
 4. Monitoring and managing the system's performance
 5. Writing and printing system reports.
 6. System management training shall include the following categories:
 - a. Network Management System (NMS) operation and control
 - b. Fleet mapping and radio programming
 - c. Any other purchased optional features requiring training



7. System Implementation, Test, and Acceptance

7.1 General Requirements

- A. The SELECTED VENDOR shall attend project and construction meetings as deemed necessary by the City prior to and during installation. Additional meetings may be scheduled at the discretion of the City.
- B. If any changes in the overall timeline occur, the SELECTED VENDOR shall update the project schedule for discussion during these project meetings.
- C. The SELECTED VENDOR shall provide written minutes of all meetings no later than five business days after the meeting.
- D. The SELECTED VENDOR shall provide the City with all programming cables required for the programming, or configuring of any provided piece of equipment.

7.2 Detailed Design

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

- A. Any updates to previously submitted design information
- B. System block diagrams
- C. Radio channel plans
- D. Cutover plan:
 - 1. A preliminary cutover plan describing how the radio system will be phased over into a fully operational system.
 - 2. The SELECTED VENDOR shall successfully complete all tests and training prior to the actual cutover of systems.
 - 3. The SELECTED VENDOR shall provide the necessary labor to cutover from existing systems to the proposed system.
 - 4. The plan shall include the schedule and procedures associated with the transition of each operational user group. The plan shall specifically address how the existing users will begin using the new system with minimal operational impact.



5. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.
 6. The City reserves the right to approve and change the cutover plan as it relates to any or all system components.
- E. Coverage Acceptance Test Plan (CATP)
 - F. Site-by-site equipment list
 - G. System installation, optimization, operation, and maintenance manuals for all equipment
 - H. Sample factory testing documentation for each piece of equipment
 - I. Blank installation and optimization documents to be completed during installation and provided with as-built documentation
 - J. Patching schedules and termination details for all cabling necessary for a complete record of the installation
 - K. Location of demarcation points for any items to be provided by the City
 - L. Site installation drawings, including room layouts, all cable runs, and grounding
 - M. Equipment rack/cabinet elevation diagrams
 - N. Tower drawings including antenna and coaxial cable loading information, antenna center line heights, and any other equipment mounted on the tower on a site by site basis
 - O. Tower structural analysis results for towers passing analysis
 - P. Passing structural analysis detailing required tower modifications for any towers that fail analysis
 - Q. The SELECTED VENDOR shall submit a Draft Factory Acceptance Test Plan (FATP) outlining a comprehensive series of tests that will demonstrate proof of performance and readiness for shipment.
 - R. The SELECTED VENDOR shall submit a Draft System Acceptance Test Plan (SATP) outlining a comprehensive series of test that will demonstrate proof of performance after installation and optimization is complete.



- S. The Final FATP and Final SATP shall be submitted no later than 15 business days before the testing starts, and shall be approved no later than five business days before the testing starts.
- T. Any other items as required, or requested by the City prior to Detailed Design Review.
- U. All items, required for detail design shall be submitted to the City 10 business days prior to the detailed design review meeting.

7.3 Detailed Design Review

- A. A detailed design review meeting shall be conducted to allow the SELECTED VENDOR to present the system detailed design for review and approval.
- B. The detailed design review shall be considered the last step prior to ordering and/or manufacturing of equipment. Upon approval of the detailed design by the City, the SELECTED VENDOR may begin the ordering and manufacturing of system equipment. The City shall not be held liable for any equipment ordered, or manufactured prior to approval of the detailed design.

7.4 Fleet mapping

- A. The SELECTED VENDOR shall develop the actual fleet map with input and direction from the City. The fleet map shall contain at a minimum:
 - 1. Talkgroup IDs
 - 2. Agency
 - 3. Emergency actions
 - 4. Encryption capability
 - 5. Roaming capability
 - 6. Priority
- B. The SELECTED VENDOR shall also develop subscriber programming templates for all equipment, and program the units. These templates shall have the basic features and functions defined for a particular subscriber and user type. Templates shall be developed on a per agency basis.



- C. The City will be given the opportunity to test up to 25 subscriber devices prior to cutover to ensure fleet mapping fits the needs of the users. If the fleet mapping requires modifications, the SELECTED VENDOR shall modify the fleet map and allow for more testing by the City. There shall be no limit on the number of changes required during fleet mapping in order to ensure the needs of the users are met.
- D. Once the fleet map and templates are approved by the City and completed, the SELECTED VENDOR shall use these for installation of subscribers and for further configuration of the system. The SELECTED VENDOR shall submit the final fleet maps and templates with the final as-built documentation.

7.5 Staging

- A. Each individual assembly or equipment unit shall undergo factory testing prior to shipment.
- B. Standard factory test documentation, documenting the tests performed and indicating successful completion of testing shall be submitted to the City.
- C. The RESPONDENT shall provide sample documents with their proposal for each assembly, or equipment which will receive factory testing prior to staging and shipping.
- D. System Staging:
 - 1. The complete system shall be staged and tested at the factory, in the United States, to the greatest extent practical. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation.
 - 2. The SELECTED VENDOR shall provide all necessary technical personnel, and test equipment to conduct staging tests. All deviations, anomalies, and test failures shall be resolved at the SELECTED VENDOR's expense.
 - 3. The SELECTED VENDOR shall use an approved Factory Acceptance Test Plan (FATP). The FATP shall be signed and dated by the SELECTED VENDOR and City representatives, following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.
 - 4. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the SELECTED VENDOR.



5. Retest of individual failed FATP tests or the entire plan shall be at the City's discretion.
6. The fully executed and completed FATP document shall be provided to the City.

7.6 System Shipping/Delivery

- A. SELECTED VENDOR shall submit a Bill of Materials / packing list with two copies for each shipment of equipment. The packing list shall include the following information at a minimum for each component included in the packaging:
 1. Manufacturer
 2. Model Number
 3. Serial number
 4. Unique identification of the package containing the item
- B. All items shipped by the SELECTED VENDOR or their suppliers will include the above information in a barcode format.
- C. The SELECTED VENDOR shall be responsible for storage of equipment. At the City's discretion and if available, the City may provide storage space.
- D. The SELECTED VENDOR shall retain title and risk of loss for all items until, in the case of mobile equipment, installation in a vehicle, in the case of portable units until delivery and inventory, and in the case of system components, until system acceptance.

7.7 System Installation

- A. Installation shall include a complete, tested, system to include placement of associated cabling, appropriate system layout and terminal connections. The SELECTED VENDOR shall provide associated power supplies and any other hardware, adapters and/or connections to deliver a complete operable system to the City at the time of acceptance.
- B. All installations shall be performed by factory authorized or SELECTED VENDOR affiliated service shops. Other shops or installers may be used upon mutual agreement between the City and the SELECTED VENDOR. Qualified, adequately trained personnel familiar with this type of work shall perform all installations.



RESPONDENTS shall provide the names of the service shops, a summary of their experience and a list of five references (minimum) for each proposed shop.

- C. Prior to the start of the system installation, the SELECTED VENDOR shall participate in a mandatory project site survey with the City's representative to confirm actual equipment location within each space. At that time, the exact equipment locations will be determined and documented by the SELECTED VENDOR.
- D. The SELECTED VENDOR shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the permanent work shall be new and shall meet the requirements of this RFP. All materials furnished and work completed shall be subject to inspection by the City or the City's engineer.
- E. Installation and optimization of the system shall follow manufacturers guidelines. Any and all documents contained within installation or optimization manuals shall be completed and included with as-built documents. This shall include any base station transmit, or receive readings, multicoupler, TTA, combiners, and antenna sweep documentation, etc.
- F. To the greatest extent possible networking cables, or any other cabling which share conduits, or cable trays with other City cables shall be of a distinct color allowing for easy identification as cabling specific to the radio system.
- G. All software revisions shall be documented and provided with as-built documentation.
- H. Equipment supplied as spare equipment may not be used for installation of the proposed system. All spare equipment must be supplied in an unused condition.
- I. Equipment mounting (e.g., racks and cabinets) shall conform to earthquake compliance in accordance with Telcordia (formerly Bellcore) GR-63-CORE Network Equipment Building System (NEBS) requirements. The SELECTED VENDOR shall provide certification that the racks and/or cabinets used meet the Telcordia GR-63-CORE NEBS requirements in their as-built documentation package.
 - 1. Seismic Attachments: Earthquake resistant attachments and supports for equipment shall be provided and shall include anchor bolts, equipment assembly bolts, and fastenings which are adequate to resist a horizontal force



- of 50 percent of the equipment weight applied at the center of gravity without displacing the equipment or its fastenings.”
2. Equipment placement in racks or cabinets shall be such that heavier items are placed lower in the racks while lighter items are placed higher in the racks to minimize the effect of centrifugal forces and swaying during an earthquake.
 3. Bracing must also be applied to equipment during unattended periods of construction.
- J. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.
- K. Worksites shall be left neat and broom swept upon completion of work each day. All shelter floors will be thoroughly cleaned and all scuff marks and abrasions will be removed prior to acceptance. All trash shall be removed weekly.
- L. Inspection:
1. The City and/or the City’s representative shall conduct an inspection of the installations upon substantial completion. Any deficiencies shall be documented on a single punch list and provided to the Contractor for resolution.
 2. The City reserves the right to be present and witness any portion of the installation and/or system optimization.
 3. Final acceptance testing shall not commence until all punch list items are resolved.

7.8 System Acceptance Testing

- A. Prior to final acceptance testing, the SELECTED VENDOR shall verify and document that all equipment, hardware, and software are upgraded to the latest factory revision. Multiple revision levels among similar equipment are not acceptable. The City shall be given two weeks written notice that the system is ready for system acceptance testing.
- B. System Acceptance Test Plan (SATP):
1. The Draft SATP, which was provided during detailed design shall be finalized with input from the City no less than 14 days prior to the start of system acceptance testing.



2. The SELECTED VENDOR shall use the completed and approved System Acceptance Test Plan (SATP). The SATP shall be signed and dated by the SELECTED VENDOR and City representatives following completion of all tests. All tests in the SATP shall be marked as either pass, fail, or pass qualify.
3. The SELECTED VENDOR shall provide all necessary technical personnel, and test equipment to conduct SATP tests. All deviations, anomalies, and test failures shall be resolved at the SELECTED VENDOR's expense.
4. Failed tests shall be documented, corrected, and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the expense of the SELECTED VENDOR.
5. Retest of individual failed SATP tests or the entire plan shall be at the City's discretion.
6. The fully executed and completed SATP document shall be provided to the City.
7. The SATP shall cover all systems and subsystems provided by the SELECTED VENDOR, including but not limited to the following:
 - a. P25 system operation
 - b. Console subsystem
 - c. NMS subsystem
 - d. Microwave system
 - e. Fire Station alerting

7.9 Coverage Testing

- A. RESPONDENT shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the Proposal. The final CATP shall be submitted during the Detailed Design stage of the project.
- B. CATP:
 1. The CATP shall be consistent with the procedures and guidelines outlined in TSB-88, latest revision.
 2. Coverage testing shall commence only after the radio system is fully tested and aligned. Significant changes to the system will require retesting of coverage at the City's discretion.



3. The SELECTED VENDOR shall perform three types of coverage testing measurements for each testable grid both inbound and outbound talk paths:
 - a. Automated testing for Bit Error Rate (BER) levels
 - b. Automated testing for signal strength levels
 - c. Manual subjective intelligibility testing (DAQ)
4. Automated and intelligibility testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally. BER, Signal Strength, and DAQ shall be used to fully verify that coverage requirements are met.
5. Test Configurations:
 - a. Testing configurations for automated and intelligibility testing shall represent typical operating configurations to the greatest extent possible, using portable and mobile radio equipment to be used with the system.
 - b. For testing purposes, the City shall be divided into 1/4-square mile bins (1/2-mile x 1/2-mile). The SELECTED VENDOR may subdivide grids if necessary.
 - c. Inaccessible grids shall not count as either a pass or fail in the statistical analysis.
 - d. Automated Objective Mobile Drive Testing:
 - 1) The SELECTED VENDOR shall test both the signal level and Bit Error Rate (BER), at a statistically significant number of test locations (test grids) throughout the City's service area utilizing automated test equipment.
 - 2) BER testing shall be conducted for both uplink and downlink paths.
 - e. Non-automated subjective DAQ testing:
 - 1) DAQ coverage testing for talk-in and talk-out performance shall be conducted using typical portable radios to be used on the system.
 - 2) The SELECTED VENDOR shall provide a standardized test form for testing.



- C. BER pass/fail criteria shall be based on TSB-88 values for P25 TDMA uplink and downlink paths as specified for an equivalent DAQ of 3.4 or better for the portions of City service area, at 95% reliability, as specified in Section 3.5, *Coverage*. Coverage testing is required for both the outbound signal and the inbound signal. The BER for the inbound signal may not be calculated; it must be tested. If the BER test fails, the coverage guarantee shall be deemed as invalid as well. The SELECTED VENDOR shall be responsible for making necessary adjustments to system design, securing any additional equipment needed and installation of equipment and software necessary to satisfy the coverage guarantee.
- D. Buildings listed in Appendix C – *Critical Building List*, shall be tested for 95% coverage utilizing the non-automated subjective DAQ testing.

7.10 Cutover

- A. The SELECTED VENDOR shall provide all necessary personnel required to support the Cutover Plan. These personnel will be present just prior to, during and immediately following cutover to ensure a smooth transition.
- B. Cutover will not occur until all punch list items have been resolved and all installation and testing procedures have been executed and passed. The City will reserve the right to begin the cutover process in the event there are existing open punch list items.

7.11 30-Day Operational Test Period

- A. Upon successful completion of system acceptance testing and completion of cutover, the system will be operated in the fully loaded configuration using normal operating parameters. Should a critical failure occur during this period the system will be repaired by the SELECTED VENDOR and the 30-day test will restart for an additional 30 days. The SELECTED VENDOR and the City will mutually define critical failures.

7.12 As-Built Documentation

- A. At the completion of the installation phase, the SELECTED VENDOR shall provide complete as-built documentation, including but not limited to the following:
 - 1. Equipment provided
 - 2. Plan and elevation drawings of all equipment including antennas on towers



3. Cabling and terminations
4. Software and configuration files for all equipment
5. System block diagrams
6. Site layout drawings
7. Tower mapping documentation
8. Tower structural analysis documentation
9. Detailed design documentation
10. Fleet mapping and programming
11. Setup and alignment information
12. Successfully completed, signed, and dated acceptance testing documents including staging, coverage and final acceptance testing.
13. Warranty documentation
14. Any documentation provided as part of Detailed Design

7.13 System Acceptance

The City shall deem the system ready for final system acceptance following successful completion and approval of the following:

- A. Final Design submittals
- B. Factory Acceptance Test Plan (FATP)
- C. System installation
- D. System Acceptance Test Plan (SATP), including Coverage Acceptance Test Plan (CATP)
- E. Training
- F. Cutover
- G. 30-day operational test period
- H. As-built documentation



8. Warranty, Maintenance, and Support

8.1 Warranty

- A. The proposed communications system shall have a warranty period of 3 years. The warranty period shall commence upon System Acceptance. The warranty shall cover all equipment and software provided in the final equipment list.
- B. The SELECTED VENDOR shall provide a single toll-free telephone number that answers 24 hours a day, 7 days a week, 365 days a year, for service requests and warranty claims.
- C. The RESPONDENT shall state in the Proposal the name, address, and capabilities of the service station(s) providing warranty service.
- D. The following procedures shall be followed during the warranty period:
 - 1. Warranty Maintenance shall be performed 24 hours a day with no additional charges.
 - 2. The service facility shall provide prompt repair service, with service personnel arriving onsite within 2 hours after a service request by the City and returning the system to service within 4 hours after a service request by the City.
 - 3. The City shall be provided written documentation indicating the cause of the service outage, the resolution, and all post repair testing procedures to ensure proper operation. In the event City owned spares are used to complete a repair, the model and serial number of both the defective unit and the spare shall be noted in the documentation.
 - 4. For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the SELECTED VENDOR to track units to and from the factory/depot.
- E. The following services will be provided during the warranty period:
 - 1. Network Monitoring: the SELECTED VENDOR shall remotely monitor all components provided as part of this procurement. Monitoring shall be performed 24 hours a day 7 days a week from a remote location specifically staffed with personnel performing monitoring duties for other systems throughout the United States. Any connectivity required for network monitoring shall be provided and paid for by the SELECTED VENDOR. Any and all



- network monitored events shall be logged by the SELECTED VENDOR and a report shall be provided to the City on an agreed upon schedule.
2. Dispatch Services: the SELECTED VENDOR shall notify the appropriate personnel in the event of a system event detected through the network monitoring service. Any events requiring notification of maintenance personnel shall be logged and provided to the City on a monthly basis, or as requested.
 3. On-Site Repair: the SELECTED VENDOR shall supply the appropriate personnel to provide on-site repair of any failed system components or ancillary equipment. All components provided through this procurement shall be repaired by the SELECTED VENDOR or their subcontractors. System components shall be returned to a fully functional state via direct on-site repair, replacement of faulty module, or replacement of entire component.
 4. Depot Repair: the SELECTED VENDOR shall provide for depot repair of any components found to be defective, or not within factory specifications. Depot repair shall also include an overnight delivery of replacement parts for use in place of a defective item while it is being repaired. The City shall have the option of keeping the replacement part, or returning the repaired component to service.
 5. Software Services: the SELECTED VENDOR shall provide and install any software patches, anti-virus definitions, or other software as released to any provided networking and/or system devices.
 6. Information Security Services: the SELECTED VENDOR shall monitor the network architecture to detect and respond to security related incidents, manage system firewalls, update anti-virus software, test and update security patches, and proactively manage the security of the radio system network.
 7. Software Refresh: the SELECTED VENDOR shall install all software updates as they are released and are applicable to the provided system and its components. The SELECTED VENDOR shall provide all labor and software. Prior to expiration of the warranty period, all system software shall be updated to the latest software revision shipping on the end-of-warranty date.
 8. Hardware Refresh: the SELECTED VENDOR shall replace any hardware that is not compatible with the latest revision software. In addition, all system components shall be replaced with the then current versions shipping on the warranty expiration date. This ensures system components are not at end of life upon expiration of the warranty period.



9. System Manager: the SELECTED VENDOR shall provide system management functions by an individual that has been factory trained and is competent to monitor and change network settings as required by the City. These services shall be available during the system warranty period on an as needed basis and will not be limited to alias database changes, usage and alarm reports. If any changes to the system cannot be performed by the provided system manager, the SELECTED VENDOR shall provide the appropriate personnel to meet the request of the City.
10. Spare parts: the SELECTED VENDOR shall maintain a sufficient quantity of spare parts to maintain 24/7 operation of the provided system and subsystems. A spare shall be available for any system component not configured for redundant operation. Spare antennas shall be on hand for each make and model used in the system design

8.2 Parts Availability

- A. From the date of system acceptance to the seventh anniversary of the date of system acceptance, the SELECTED VENDOR shall maintain replacement parts for all delivered equipment.
- B. In the event the SELECTED VENDOR plans to discontinue stocking any part required for maintenance after the seventh anniversary of system acceptance, the SELECTED VENDOR shall send written notice to the City 24 months prior to the date of discontinuance to allow for last-time buys and replenishment.
- C. All parts, ordered on a priority basis, shall be delivered within 24 hours after placing an order. The SELECTED VENDOR shall provide year around, 24-hour ordering facilities via telephone, internet, e-mail, and fax service.

8.3 Post Warranty Maintenance

- A. As an OPTION, the RESPONDENT shall propose maintenance services for subsequent years, renewable on an annual basis. A minimum of pricing for years 4 through 10 shall be provided. Maintenance services shall be provided for all pieces of equipment proposed and installed as part of the system.
- B. The RESPONDENT shall fully describe the terms and conditions of the maintenance services.



- C. The RESPONDENT shall indicate who the local authorized repair facility will be for post warranty repairs upon completion of the Detailed Design Review process.
- D. Pricing shall include at a minimum all services provided during the warranty period. Scope of Work (SOW) documents shall be provided for all proposed services. In the event the RESPONDENT wraps several services into a larger offering, those services shall be broken in each service and SOW documents provided.



Appendix A - Compliance Matrix

RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
1	PROJECT OVERVIEW		
1.1	Introduction		
1.1.1	Existing System		
1.1.2	Existing Backhaul Network		
1.1.3	Missouri Statewide Interoperability Network		
1.2	Overview of this Document		
1.3	Project Summary		
1.4	Proposals Desired		
1.5	Alternative Proposals		
1.6	Quality Assurance and Coordination		
1.6.1	Standards and Guidelines		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
1.6.2	Frequency Coordination and Licensing		
1.6.3	Federal Aviation Administration		
1.6.4	Project Management		
1.6.5	QA/QC Program		
2	INSTRUCTIONS TO PROPOSER		
2.1	General		
2.2	Mandatory Pre-Proposal Conference		
2.3	Proposal Format		
2.4	Evaluation		
2.4.1	Evaluation Criteria		
2.5	Insurance Requirements		
2.5.1	Workers' Compensation and Employers' Liability Insurance		
2.5.2	Professional Liability Insurance		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
2.5.3	Commercial General Liability Insurance		
2.5.4	Comprehensive Automobile Liability Insurance		
2.5.5	Professional Liability Insurance		
2.5.6	Additional Requirements		
3	RADIO COMMUNICATIONS SYSTEM REQUIREMENTS		
3.1	Overview		
3.2	Project 25		
3.3	Redundancy and Survivability		
3.4	Expansion		
3.5	Coverage		
3.5.1	Coverage Model and Maps		
3.5.2	TIA TSB-88 - Annex A VOICE CATP User Choices		
3.5.2	Link Budgets		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
3.6	Project 25 System Required Features		
3.6.1	System Control Equipment		
3.6.2	Simulcast Control Equipment		
3.6.3	Receiver Voting		
3.6.4	Base Station Equipment		
3.6.5	Uninterruptible Power Supply (UPS)		
3.6.6	Antenna Systems		
3.6.7	Interoperability Gateway Devices		
3.6.8	Dispatch Console Subsystem		
3.6.9	Network Management Subsystem		
3.6.10	Backhaul Network		
3.6.11	Fire Station Alerting		
3.7	Project 25 System Optional Features		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
3.7.1	Geographically Diverse Control Equipment		
3.7.2	P25 Inter RF Subsystem Interface		
3.7.3	Backhaul Option		
3.7.4	Single Channel System Expansion		
3.7.5	Encryption		
3.7.6	Over the Air Rekeying (OTAR)		
3.7.7	Over the Air Programming (OTAP)		
3.7.8	GPS/AVL		
3.7.9	Phase 2 Operation		
3.7.10	Smartphone Integration		
3.8	VHF Interoperability Network		
4	Subscriber Equipment		
4.1	Overview		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
4.2	General Requirements		
4.2.1	Portable Radios		
4.2.2	Mobile Radios		
4.2.3	Control Stations		
4.2.4	Vehicular Repeater Option		
5	Facilities and Infrastructure Development		
5.1	General		
5.2	Site Selection		
5.3	Existing Site Development		
5.4	Towers		
5.5	Shelters		
5.6	Generator and Automatic Transfer Switch		
5.6.1	Generator		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
5.6.2	Automatic Transfer Switch		
5.7	Site Preparation		
5.8	Fencing		
6	TRAINING		
6.1	General Requirements		
6.2	Operating Training		
6.3	Technical/System Management Training		
7	SYSTEM IMPLEMENTATION, TEST AND ACCEPTANCE		
7.1	General Requirements		
7.2	Detailed Design		
7.3	Detailed Design Review		
7.4	Fleet Mapping		
7.5	Staging		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
7.6	System Shipping/Delivery		
7.7	System Installation		
7.8	System Acceptance Testing		
7.9	Coverage Testing		
7.10	Cutover		
7.11	30-Day Operational Test Period		
7.12	As-Built Documentation		
7.13	System Acceptance		
8	WARRANTY, MAINTENANCE, AND SUPPPORT		
8.1	Warranty		
8.2	Parts Availability		
8.3	Post Warranty Maintenance		
Appendix A	Compliance Matrix		

RESPONDENT: _____



RFP Section	Description	RESPONDENTS Statement of Compliance	RESPONDENTS Clarifications and Comments
Appendix B	Proposal Pricing Forms		
Appendix C	Critical Building List		

RESPONDENT: _____

October 31, 2016



Appendix B - Proposal Pricing Forms

Table B.1 – Proposal Pricing Form (Total Base System Costs)

Description	Total
System Components (Subtotals from Table B.2)	
System Control Equipment	
Simulcast Control Equipment	
Remote Site Equipment	
Microwave Network Equipment	
Network Management System	
Dispatch Console Equipment	
VHF Interoperability Network	
Other	
Total System Components Cost	
System Services (Subtotals from Table B.3)	
System Engineering, Installation and Project Management	
System Staging	
Coverage & Acceptance Testing	
Training	
Warranty	
Other	
Total Services Cost	

RESPONDENT: _____



Description	Total
Infrastructure Development (Subtotals from Table B.4A)	
Towers	
Shelters	
Generator and ATS	
PM, Engineering, and Installation	
Other	
Total Infrastructure Development Cost	
User Radio Cost (Subtotals from Table B.6)	
Portable Radios	
Mobile Radios	
Control Stations	
Other	
Total User Radio Cost	
Total Proposal Cost	

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
3	Software licenses required for simulcast control				
4	Networking equipment (if specific to Simulcast operation)				
5	Other simulcast control equipment				
6	Primary voting equipment				
7	Geo-redundant voting equipment				
8	Software licenses required for voting				
9	Networking equipment (if specific to voting operation)				
10	Other				
Simulcast Control and Voting Equipment Subtotal					
Remote Site Equipment					
	<i>List all remote site equipment on a per site basis</i>				
	Site #1				
	Base station equipment				
	Base station software/licenses required for operation				

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
	Required software licenses/options				
	Other				
	Site #N – (list all sites)				
	Any required site equipment (RTU, etc.)				
	Required software licenses/options				
	Other				
Subtotal Network Management System					
Dispatch Console System					
	Dispatch console network common equipment				
	Required software licenses/options required by common equipment				
	Dispatch console single position equipment		4		
	Required software licenses/options required by single position equipment		4		
	Backup control stations and ancillary equipment				
	Other				
Dispatch Console System Subtotal					

RESPONDENT: _____



Table B.3 – Proposal Pricing Form (System Services Cost)

NOTE: Show unit cost per site where applicable

Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
System Engineering, Installation and Project Management					
	System Control Equipment				
	Simulcast Control and Voting				
	Remote Site				
	Microwave Network				
	Network Management System				
	Dispatch Console System				
	Other				
System Engineering, Installation and Project Management Subtotal					
System Staging					
	System Staging				
System Staging Subtotal					
System Coverage and Acceptance Testing					
	Coverage Testing				
	Critical building coverage testing		6		
	Factory Acceptance Testing				
	System Acceptance Testing				
System Coverage and Acceptance Testing Subtotal					
Training					
	Radio user train the trainer		8		
	Dispatch Console Operator Training		12		

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
	Dispatch Supervisor Training		2		
	System Management Training		4		
Training Subtotal					
Warranty & Maintenance (Radio System, Microwave, and Dispatch Consoles)					
	Remote System Monitoring				
	Dispatch Services				
	On-Site Response				
	Depot Repair				
	Software Services				
	Network Security Services				
	Software Refresh				
	Hardware Refresh				
	System Manager				
Warranty and Maintenance Subtotal					
Total System Services Cost					

RESPONDENT: _____



Table B.4A – Proposal Pricing Form (Facilities and Infrastructure Development Cost)

NOTE: Show unit cost per site where applicable

Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
Towers					
	Site #1				
	Structural analysis				
	Required improvements				
	Other				
	Site #2 – N listed separately				
	Structural analysis				
	Required improvements				
	Other				
Towers Subtotal					
Shelters					
	Site #1				
	Shelter Cost				
	Freight and setting of shelter				
	Foundation and site prep				
	Clean agent fire suppression system				
	Shelter grounding system				
	Other				
	Site #2 – N listed separately				
	Shelter Cost				
	Freight and setting of shelter				
	Foundation and site prep				
	Clean agent fire suppression system				

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
	Shelter grounding system				
	Other				
Shelters Subtotal					
Generator and ATS					
	Site #1				
	Generator				
	Automatic transfer switch				
	Generator load test				
	Other				
	Site #2 – N listed separately				
	Generator				
	Automatic transfer switch				
	Generator load test				
	Other				
Generator and ATS Subtotal					
Engineering, Installation and Project Management					
	Towers				
	Shelters				
	Generators and ATS				
	Other				
Engineering, Installation and Project Management Subtotal					

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
Other					
Other Subtotal					
Total Infrastructure Development Cost					

RESPONDENT: _____



Table B.5 – Proposal Pricing Form (User Radio Cost)

Item	Description	Qty.	Model/Item/Option/ Part #	Unit Cost	Extended Cost
Subscriber Equipment					
	Public Safety Multi-Band Portable (Police): VHF & 700/800 MHz, Project 25 Trunking Phase 1, w/hi-cap battery, belt clip, standard antenna, charger, display with limited keypad. Programmed	107			
	Police Portable Radio Options:				
	AES Encryption	107			
	Multikey	107			
	High Capacity Spare Battery	107			
	Carry Solution	107			
	Speaker Microphone	107			
	Public Safety Multi-Band Portable(Fire): Intrinsically safe VHF & 700/800 MHz, Project 25 Trunking Phase 1, w/hi-cap battery, belt clip, standard antenna, charger, display with limited keypad. Programmed	62			
	Fire Portable Radio Options:				
	Intrinsically Safe High Capacity Spare Battery	62			
	Carry Solution	62			
	Speaker Microphone	62			

RESPONDENT: _____



Item	Description	Qty.	Model/Item/Option/ Part #	Unit Cost	Extended Cost
	Public Safety Multi-Band Mobile: VHF & 700/800 MHz, Project 25 Trunking Phase 1, remote mount w/external speaker, standard antenna, programmed and installed (84 police, 21 fire)	105			
	Police Mobile Radio Options:				
	AES Encryption	84			
	Multikey	84			
	Fire Mobile Radio Options				
	Dual control head	3			
	Public Safety Multi Band Control Station: VHF, UHF & 700/800 MHz, Project 25 Trunking Phase 1, with antenna and all required accessories, programmed and installed	10			
	Control Station Options:				
	AES Encryption	10			
	Multikey	10			
Total User Radio Costs					

RESPONDENT: _____



Table B.6 – Proposal Pricing Form (Optional System Costs)

NOTE: Show unit cost per site where applicable

Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
System Control Equipment					
	Geo-Diverse Control				
	Equipment and licenses required for Geo-diverse control equipment				
	ISSI				
	Equipment and licenses required for ISSI Option				
	Backhaul Options				
	Microwave upgrade to 150 Mbps				
	Microwave credit for using existing fiber equipment				
	Single Channel Expansion				
	Equipment and licenses required to add a single channel resulting in a 6 channel P25 system				
	Encryption Options				
	Encryption operation (AES & DES)				
	OTAR option				
	Key management facility				

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
	Any other equipment/licensing required for OTAR and encryption operation				
	Over the Air Programming				
	Any equipment or licensing required for OTAP operation				
	GPS/AVL				
	Any equipment or licensing require for GPS/AVL integration and operation				
	Phase 2 Operation				
	Any equipment or licensing required for Phase 2 operation				
	Smartphone Integration				
	Any equipment or licensing required for smartphone integration				

RESPONDENT: _____



Item	Description	Site Name/Location	Qty.	Unit Cost	Extended Cost
	Non-public safety user devices				
	Portable 700/800 MHz P25, Phase 1, w/charger, hi-cap battery, antenna, belt clip, spare hi-cap battery, programmed		56		
	Mobile: 700/800 MHz, P25 Phase 1, front mount w/external speaker, standard antenna, programmed and installed		102		
	Control Station: 700/800 MHz, P25 Phase 1, antenna and ancillary equipment programmed and installed		6		
	VHF Interoperability Subsystem				
	Equipment and licensing required for VHF Interoperability subsystem coverage enhancement				
	Services (PM, Installation, etc.)				
	Other (Equipment and Services)				
	Other				

RESPONDENT: _____



Table B.7 – Proposal Pricing Form (User Radio Options Cost)

Item	Description	Model/Item/Option/Part #	Qty.	Unit Cost	Extended Cost
Portables					
	Optional Portable Radio Models				
	List separately current radio models capable of P25 operation				
	Pricing to include base radio only (features listed below)				
	Battery Options				
	List separately battery options available for each model radio listed above				
	Software Options				
	Phase 2				
	OTAR				
	OTAP				
	AES encryption				
	Multi-key				
	GPS/AVL				
	Vehicular repeater software				
	Other software features not listed				

RESPONDENT: _____



Item	Description	Model/Item/Option/Part #	Qty.	Unit Cost	Extended Cost
	Additional Features and Accessories				
	Remote speaker microphone with Integrated GPS		1		
	Vehicular Charger		1		
	Remote speaker microphone without antenna		1		
	Remote speaker microphone with antenna		1		
	Remote speaker microphone with keypad		1		
	Remote speaker microphone with Amplified Speaker (Audio)		1		
	Bluetooth remote speaker microphone		1		
	Headset: Wired		1		
	Headset: Bluetooth		1		
	Wireless (e.g. Wi-Fi, Bluetooth, LTE, LMR) connectivity for OTAP		1		
	Vehicular adapter – provides in vehicle portable radio battery charging, mobile microphone, amplified speaker, transmit power amplifier, external antenna connection.		1		

RESPONDENT: _____



Item	Description	Model/Item/Option/Part #	Qty.	Unit Cost	Extended Cost
Mobiles					
	Optional Mobile Radio Models				
	List separately current radio models capable of P25 operation				
	Pricing to include radio only				
	Mounting Options				
	List separately mounting options available for each model radio listed above				
	e.g. front, remote, hand held control head, dual mount, etc.				
	Software Options				
	Phase 2				
	OTAR				
	OTAP				
	AES encryption				
	Multi-key				
	GPS/AVL				
	Vehicular repeater software				
	Other software features not listed				
	Mid-Tier Radio: Remote Split Mount				
	High Tier Radio: Remote Split Mount				

RESPONDENT: _____



Item	Description	Model/Item/Option/Part #	Qty.	Unit Cost	Extended Cost
	Optional Control Station Models				
	List separately current radio models capable of P25 operation				
	Optional Vehicular Repeater System				
	Equipment, licensing, programming and installation for complete working VRS unit				
	List all available models and features				
	Additional Features and Accessories				

RESPONDENT: _____



Table B.8 – Proposal Pricing Form (Post-Warranty Options Cost)

Item	Description	Qty.	Unit Cost	Extended Cost
System Annual Maintenance Cost				
	Each service to be priced on an annual basis for years 4 thru 10. Unless stated elsewhere services and pricing shall cover all equipment acquired as part of this procurement			
	Remote System Monitoring			
	Dispatch Services			
	On-Site Response			
	Depot Repair			
	Software Services			
	Network Security Services			
	Software Refresh			
	Hardware Refresh			
	System Manager			
	System software platform refresh (bi-annual)			
	System hardware refresh (bi-annual)			
	Other services available, but not listed above			
User Radio Equipment				
	Annual per unit maintenance cost (year 4)			
	Provide annual cost for each model listed			

RESPONDENT: _____



Appendix C - Critical Building List

Name	Address	Lat.	Long.
Cape Girardeau Airport Terminal		37.226878	-89.564841
Cape Girardeau Police Department		37.303089	-89.526890
Federal Court House		37.303349	-89.524904
Cape Central High School		37.276348	-89.565412
Schrader School		37.327910	-89.553775
Clippard School		37.322251	-89.566544

RESPONDENT: _____

