

**Caroline County, Virginia  
Request for Proposals  
Project 25 Radio Communications System**

***MEETING ADDRESS HAS BEEN CHANGED***

***Mandatory Pre-Proposal Conference***

A MANDATORY pre-proposal conference will be held on Tuesday, June 21, 2011 at 9 a.m. Eastern Time Zone at

**17202 Richmond Turnpike, Bowling Green, Virginia 22427 - Room 2.**



# **Caroline County, Virginia Request for Proposals Project 25 Radio Communications System**

**May 27, 2011**

**Prepared by**



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## 1. Project Overview

### 1.1 Introduction

Caroline County, Virginia, invites proposals for the provision of an APCO Project 25 (P25) trunking radio communications system that will support mission critical communications for all of the County's departments; first responders as well as local government. The County also requires a single simulcast analog channel for the purposes of paging, fire station alerting and interoperable communications within the County. The proposed communications system shall provide enhanced two-way wireless communications capabilities to all users.

### 1.2 Overview of This Document

This section provides a high level overview of the sections of this RFP.

Section 1, *Project Overview* – This section provides a general overview of requirements contained in this RFP.

Section 2, *Instructions to Proposers* – This section provides instructions to proposers, including, but not limited to; proposal due date, pre-proposal conference information, proposal format, and evaluation criteria.

Section 3, *Radio Communications System Requirements* – This section provides requirements for the desired communications system. The County requires a 700 MHz, Project 25, Phase 2, trunked eight talk path system or a UHF Project 25, five channel trunked system and a single VHF simulcast analog channel.

Section 4, *Backhaul Network* – This section provides requirements for the digital IP microwave backhaul network.

Section 5, *Dispatch Console* – This section provides requirements for a P25 compliant dispatch console network, including a P25 compatible trunked logging recorder.

Section 6, *Infrastructure Development* – This section provides requirements for tower construction, site preparation, fencing, equipment shelters, generators, and UPS equipment.

Section 7, *Network Management System* – This section provides requirements for the network management system.



Section 8, *Subscriber Equipment* – This section provides requirements for portable radios, mobile radios, control stations, and multiband radios.

Section 9, *Training* – This section provides requirements for training programs to be developed by the SELECTED VENDOR.

Section 10, *Warranty, Maintenance, and Support* – This section provides requirements for the warranty, extended warranty, maintenance, and support of the proposed system and subsystems.

Section 11, *System Implementation, Test and Acceptance* – This section provides requirements for system cutover, staging, installation, fleet mapping, coverage testing, and final acceptance.

### **1.3 Project Summary**

- A. The SELECTED VENDOR shall be responsible for the following:
1. Furnishing and installing system equipment and ancillary facilities
  2. Engineering and system design
  3. Project management
  4. Software installation and programming
  5. Training
  6. Acceptance testing
  7. Coverage testing
  8. Cutover plan and execution
  9. Warranty and maintenance
- B. The SELECTED VENDOR shall be responsible for furnishing a complete and fully functional system including, but not limited to the following components:
1. Radio communications system, including the guarantee of radio coverage
  2. Digital microwave backhaul network
  3. Radio dispatch consoles
  4. Infrastructure facilities (e.g., towers, shelters, fencing)
  5. Network management system



6. Subscriber 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 RESPONDENTS to propose the best equipment, technology, and methods available to provide a state of the art public safety communications system of the highest quality and performance.
  - E. All equipment shall be provided in new condition and be covered by a full manufacturer's warranty of not less than three years.
  - F. Proposals shall not be accepted that include systems or equipment at the end of their respective lifecycles.
  - G. A product for which development and/or distribution will be discontinued within the next four years shall be considered "end of lifecycle" products.
  - H. In the event that requirements are stated in more than one section and appear to conflict, the more stringent requirement shall apply.
  - I. The proposed radio system shall comply with the latest applicable APCO P25 Statement of Requirements (SoR) adopted as TIA and/or ANSI standards at the time of proposal submission.

#### **1.4 Proposals Desired**

- A. The County desires, but does not require, a complete turnkey solution addressing all project systems, subsystems, and components.
- B. Proposal Options: Requirements described as an "OPTION" or "OPTIONAL" refer to features or equipment which may or may not be purchased by the County, or items whose quantities are not yet determined. It is not the RESPONDENT's option to respond to these requirements; therefore, each RESPONDENT is required to respond to all OPTIONAL requirements to the greatest extent possible.
- C. Two system options shall be provided:
  1. 700 MHz P25 Phase 2 trunking system



2. UHF P25 trunking system

D. Alternate Proposals:

1. In the event a RESPONDENT has a technological solution that does not meet the exact requirements in the RFP, RESPONDENT may offer more than one proposal as long as each proposal fully addresses the functional intent of the requirements set forth in this RFP.
2. Alternate proposals shall be submitted separately under a different cover from the base proposal and clearly marked "ALTERNATIVE PROPOSAL".
3. The RESPONDENT shall comply with the same submittal instructions in Section 2.3, *Proposal Format*.

## **1.5 Quality Assurance and Coordination**

### **1.5.1 Standards and Guidelines**

- A. The SELECTED VENDOR shall comply with the following standards, rules, regulations, and industry guidelines:
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
- B. RESPONDENT shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), the following standards are acceptable:



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 standard – RESPONDENT shall provide to the County 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 any and all deviations in their proposal for approval by the County.

### ***1.5.2 Frequency Coordination and Licensing***

- A. Land Mobile Radio (LMR) licenses -- The County has been allocated 700 MHz frequency channels by the Region 42 Regional Planning Committee (RPC). A preliminary search of spectrum available in the UHF frequency band has been completed. 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 County. The County shall be responsible for coordination fees and licensing fees, if any and signatures, as applicable.
- B. 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 County. The County shall be responsible for coordination fees and licensing fees, if any and signatures, as applicable.
- C. Antenna Structure Registration (ASR) – The SELECTED VENDOR shall be responsible for preparing ASR applications and submittals on behalf of the County. The County shall be responsible for coordination fees and licensing fees, if any and signatures, as applicable.



### **1.5.3 Federal Aviation Administration**

The SELECTED VENDOR shall complete Federal Aviation Administration (FAA) forms as necessary. FAA required tower lighting on newly constructed towers shall be the responsibility of the SELECTED VENDOR.

### **1.5.4 Project Management**

- A. The RESPONDENT shall provide a Project Management Plan which 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 SELECTED VENDOR intends 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 County Project Team and the SELECTED VENDOR. The SELECTED VENDOR shall provide a schedule for these meetings subject to the approval of the County.

#### **1.5.4.1 Scheduling**

- A. The SELECTED VENDOR shall develop and maintain a project schedule including tasks, milestones, start and end dates, task prerequisites, 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 status meetings between the County and the SELECTED VENDOR.
- D. The schedule shall address the following at a minimum:
  - 1. Site surveys
  - 2. Detailed design review
  - 3. Site preparation
  - 4. Equipment manufacturing



5. Factory acceptance test
6. Equipment delivery
7. System installation
8. System configuration
9. System optimization
10. Acceptance testing
11. Coverage testing
12. User training
13. Fleetmap development
14. System cutover
15. System documentation development and delivery
16. System and equipment warranty

#### **1.5.4.2 Project Meetings**

- A. A project kickoff meeting shall be scheduled prior to the beginning of the project.
- B. Weekly 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. In addition to those identified in Section 1.5.4.1, *Scheduling*, above, 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



#### **1.5.4.3 Project Punch List**

- A. The SELECTED VENDOR shall establish and maintain a punch list, as mutually agreed to with the County, for site facilities, equipment, and for acceptance tests.
- B. The punch list shall be maintained in real time and 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. Full details about how each punch list item was resolved and tested
  - 8. 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 County of any changes. The status of punch list items shall be updated during each weekly status meeting.
- E. Software/Firmware updates must be thoroughly regression tested prior to being released and implemented.
- F. Software updates must include release information identifying the changes made, either to repair a problem or enhancements made.

#### **1.5.4.4 Project Staffing**

- A. Project staffing shall be managed by the SELECTED VENDOR based on workload and the level of effort throughout the implementation / installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not be changed without prior approval by the County.



B. SELECTED VENDOR Project Manager:

1. The SELECTED VENDOR's Project Manager shall be the primary point of contact between the County and the SELECTED VENDOR.
2. 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.
3. The SELECTED VENDOR's Project Manager shall be responsible for coordination of the weekly status meetings.

C. SELECTED VENDOR Project Engineer:

1. The SELECTED VENDOR's Project Engineer shall have the primary responsibility for managing the system design and ensuring that the system is installed in accordance with the approved system design.
2. Any deviation from the system design shall be subject to project change control procedures and will not be undertaken until approved by the County.
3. The SELECTED VENDOR's Project Engineer shall ensure the development of block diagrams, system level diagrams, and rack diagrams to assist the installation team in completing the system installation.
4. The Project Engineer shall also supervise the development and execution of the Acceptance Test Plan, the Coverage Acceptance Test 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 County.

### **1.5.5 QA/QC Program**

- A. The SELECTED VENDOR shall include a Quality Assurance / Quality Control (QA/QC) plan for the radio communications system project. The QA/QC plan shall be submitted for review during preliminary design as described in this section. 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 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 (if required)
  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



## **1.6 Project Submittals**

### **1.6.1 General Requirements**

Key project deliverables and submittals are outlined below and are described in further detail throughout this RFP.

- A. All project submittals shall be subject to review and approval by the County and its Engineer / Consultant.
- B. All submittals shall be provided in hard copy, properly bound, and in electronic format on CD-ROM. The quantity of hard copies required shall vary for each type of submittal and shall be determined by the County prior to submission.
- C. All submittals shall include a cover letter or letter of transmittal, signed, dated, and fully describing the contents of the submittal.

### **1.6.2 Proposal**

Proposals shall include the following items:

- A. Detailed description of the proposed system and services to be provided
- B. Qualifications and experience
- C. Preliminary detailed project schedule
- D. System design including complete description, block diagrams, equipment layouts, and equipment list
- E. RF coverage predictions and guarantee of coverage
- F. Detailed equipment specification sheets for all proposed equipment
- G. System and subsystem warranty information
- H. Training programs
- I. Itemized pricing information
- J. Point-by-point compliance



### **1.6.3 Preliminary Design**

The SELECTED VENDOR shall submit a Preliminary Design Document within 30 days of contract award. The Preliminary Design Document shall include the following:

- A. QA/QC Plan
- B. Detailed project schedule
- C. System block diagrams
- D. System description including subsystems
- E. Radio and microwave channel plans
- F. Microwave path engineering reports
- G. Detailed list of materials for each site
- H. Draft copies of acceptance test plans
- I. Tower profile drawings indicating antenna mounting locations

### **1.6.4 Final Design**

The SELECTED VENDOR shall submit the Final Detailed Design Document within 90 days of contract award. The Final Detailed Design Document shall include the following:

- A. Any updates to previously submitted design information
- B. System operation and maintenance manuals for all equipment
- C. Site installation drawing
- D. All acceptance test plans as defined in this RFP
- E. Detailed equipment list
- F. Detailed description of system operation
- G. Detailed description of system operation during various failure scenarios
- H. Detailed description of all subsystems



- I. Final project schedule
- J. List of responsibilities for all parties involved



## 2. Instructions to Proposers

### 2.1 Overview

- A. Proposals must be received by 2:00 PM Eastern Time Zone, Friday, August 26, 2011, to:
- P.O. Box 447
- 212 North Main Street
- Bowling Green, Virginia 22427
804. 633.5380
- B. RESPONDENT shall submit a bound original and six bound copies of the proposal to the County. Each package shall also include a copy of the proposal in electronic format on CD-ROM. The front of the package should be marked "Proposal for Caroline County Radio Communications System".
- C. Faxed bids will NOT be accepted.
- D. Bids not received by the date and time listed above will be returned to the RESPONDENT unopened.
- E. Proposals must contain a statement of disclaimer and contractor eligibility certification. Items can be found in Appendix – A, *Mandatory Submittals*.
- F. The County reserves the right to reject any or all proposals.

### 2.2 Mandatory Pre-Proposal Conference

- A. A MANDATORY pre-proposal conference will be held on Tuesday, June 21, 2011 at 9 a.m. Eastern Time Zone at 212 North Main Street, Bowling Green, Virginia 22427
- B. Any individuals with disabilities, who require assistance or special arrangements in order to participate in bidding, should contact the County. Please provide at least 48 hours notice so that reasonable efforts may be made to provide the proper arrangements. You may be requested to specify the nature of any accommodation or assistance which may be required for your participation.



- C. RESPONDENT may submit questions to the County no later than five business days prior to the pre-proposal conference in either written or electronic format (e-mail). During the conference, the County will provide answers to any questions received and hold an open discussion regarding the project. Oral responses shall not be binding on the County during the conference.

County contact for submission of technical questions:

Alan Partin

Interim County Administrator

P.O. Box 447

212 North Main Street

Bowling Green, Virginia 22427

804. 633.5380

- D. Following the conference, all attendees will be provided with a copy of the sign-in sheet, questions, and responses.
- E. Site visits will be conducted immediately following the Pre-Proposal Conference.

### **2.3 Proposal Format**

- A. RESPONDENT shall complete all mandatory submittals provided in Appendices – A, *Mandatory Submittals*, and B, *Mandatory Proposal Pricing Format*. Failure to provide any of the mandatory submittals with the proposal may be cause for rejection.
- B. RESPONDENT shall adhere to the proposal format provided below, organized by Section:
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, or upon request from the County, 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. Section 5 – Description of the System, including equipment, software, design, and services to be provided
- a. Radio communications system
  - b. Microwave backhaul connectivity
  - c. Radio dispatch console
  - d. Subscriber equipment
  - e. Site infrastructure
  - f. Additional subsystems
  - g. RF coverage predictions
  - h. Detailed equipment specification sheets for all proposed equipment
  - i. 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 – Preliminary project schedule with detailed Gantt chart
7. Section 7 – Training programs and additional information that is not covered in other sections
8. Section 8 –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 C – 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.
9. Section 9 – System, subsystem and subscriber warranty information
  10. Section 10 – Total proposal cost and detailed pricing breakdown

Respondent shall provide total proposal cost and itemized pricing 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.

## **2.4 Evaluation**

- A. The County shall evaluate proposals based on a number of criteria, including:
  1. RFP compliance
  2. Coverage guarantee
  3. Vendor experience
  4. Cost of system
  5. Lifecycle costs
  6. Unit costs of subscriber equipment
  7. Capability, features, and functionality of the system
  8. Feasibility of design
  9. Warranty, maintenance, and support



## **2.5 Addenda to the RFP**

During the proposal period, the County may issue written addenda to each person, firm, or corporation who has secured a copy of these specifications, making changes or corrections to the specifications as issued. Such changes or corrections shall be included in the work and/or materials covered by the proposal, and such addenda shall become part of the specifications and contract.

## **2.6 Award of Contract**

The County intends to award a contract(s) for the complete system. However, the County specifically reserves the following rights, consistent with procuring a system that best meets the needs of the County and system users:

- A. The County reserves the right to accept or reject any or all proposals or any portion thereof.
- B. The County reserves the right to accept all or part of any proposal depending solely upon the requirements of the County.
- C. The County reserves the right to seek clarifications of any proposal submitted or specific aspects of any proposal prior to the award of the contract. After seeking such clarification, the County will allow the PROPOSER an opportunity to provide the requested clarification.
- D. The County reserves the right to adjust item quantities and/or reconfigure the communications system in the best interest of the County subsequent to award of the contract.
- E. If multiple contracts are awarded, in lieu of a turnkey contract, the County may either:
  - 1. Negotiate additional scope with one or more of the successful RESPONDENTS to assume Prime Contractor status, or
  - 2. Provide system integration or prime contractor services provided the SELECTED VENDOR has submitted a proposal for those services.
- F. The County reserves the right to award to other than the lowest bidder if deemed in the best interest of the County.



### 3. Radio Communications System Requirements

- A. The communications network shall include the following system components:
1. Project 25 Radio Communications Network
  2. VHF Paging and Interoperability Network
  3. Backhaul Network
  4. Dispatch Consoles
- B. All site equipment supplied shall be new, of high quality, and designed to provide high reliability to support mission critical communications. The site equipment, or RF infrastructure, consists of the following components:
1. System and site control equipment
  2. Simulcast equipment
  3. Receiver voting
  4. Base Stations
  5. Combiners / multicouplers / Duplexers
  6. Antenna systems
- C. Simulcast Equipment:
1. The RESPONDENT shall provide all necessary simulcast components and signal processing elements that are required to optimize voice quality in coverage overlap areas.
  2. 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.
  3. Simulcast systems shall operate without the need for frequent 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.).



D. Receiver Voting:

1. Receiver voting equipment shall monitor all receivers in the simulcast system and select the best signal for processing and rebroadcast through the network.

E. Antenna Systems

1. RESPONDENT shall propose all antenna system equipment necessary for a complete design. Antenna system equipment shall include tower frames and/or antenna mounts as necessary.
2. Antennas shall be appropriate to provide the required coverage and meet applicable FCC rules and regulations.
3. Transmission line type and length shall be appropriate to provide the required coverage.
4. RESPONDENT shall fully describe expansion capacity for combiner and multicoupler systems to allow for additional channels in future upgrades.
5. RESPONDENT shall include detailed specification sheets for all proposed equipment, including, but not limited to antennas, receiver multicouplers, transmitter combiners, tower top receiver pre-amplifiers (if applicable).

### **3.1 Project 25 Radio Communications Network Requirements**

- A. The Radio Communications Network Requirements section details the technical aspects of the anticipated radio system. This section lists the minimum requirements for the respondent's proposed radio system. The following list shall act to define the minimal operational requirements of the proposed radio system:

1. Push-To-Talk Identification (PTT-ID)
2. Emergency Alert
3. Emergency Call
4. Selective Call
5. Selective Alert
6. Status / Message
7. Text Messaging
8. Radio Inhibit



9. Dynamic Regrouping
  10. Talkgroup Patch
  11. Busy Queue
- B. IP based equipment shall be utilized to the greatest extent possible.
- C. System shall be capable of encrypted talkgroups. Encryption algorithm shall be compatible with P25 requirements
- D. The proposed system shall be configured as:
1. Project 25 trunked system
  2. Single simulcast cell
- E. Project 25 TIA-102 Standards
1. The proposed radio system shall comply with the latest applicable TIA-102 documents as adopted by TIA at the time of proposal submission. The RESPONDENT is responsible to ensure that the proposed radio system is compliant with the latest revision.
  2. 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.
  3. RESPONDENTS shall provide a list of Project 25 TIA-102 standards documents applicable to each P25 feature supplied and confirm compliance with each.

### ***3.1.1 Redundancy and Survivability***

- A. The proposed radio system is intended to 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 should be made to design a system without a single point 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 controllers



2. Backhaul network
  3. Power systems
- C. The proposed radio system shall include several modes of degraded operation or failure modes. The system shall be capable of automatic activation of failure modes in the event of a failure. Additionally, the system shall switchover to a graceful degradation mode. The following failures should invoke the activation of a failure mode and not bring the system down completely:
1. Loss of system controller
  2. Loss of multiple sites
  3. Loss of single site
  4. Loss of multiple channels
  5. Loss of single channel
- D. A detailed description shall be supplied describing the system operation when any of the failures described above occurs.

### **3.1.2 Coverage**

- A. The service area is defined as the geographical boundaries of Caroline County.
- B. The system shall be designed to provide portable on-street coverage to 95% of the service area with 95% reliability and a Delivered Audio Quality (DAQ) of 3.4 or better.
- C. The system shall also provide in-building coverage for the critical infrastructure locations found in Appendix F.
- D. Any uncovered areas (i.e., the uncovered 5%) shall not include the major highways within the County.
- E. Coverage design, implementation, and testing for the system shall adhere to the Telecommunications Industry Association (TIA), Telecommunications System Bulletin (TSB) 88C, or the latest revision at time of proposal.
- F. Delivered Audio Quality (DAQ) as defined in this document applies to both inbound and outbound communications. Appendix E contains a matrix of DAQ values and definitions.



### **3.1.3 Site Locations**

- A. RESPONDENT shall determine the number and location of sites needed to provide the required coverage. Appendix D contains a list of existing tower sites located within the County for potential use in the proposed system. In the event the RESPONDENT does not feel that the provided locations are sufficient to provide the necessary coverage, alternate sites may be suggested.
- B. To reduce cost associated with implementing tower sites, every attempt should be made to utilize existing tower sites. Existing County sites and leased towers are preferred over Greenfield sites. However, if existing site do not provide adequate coverage, Greenfield sites shall be proposed.
- C. RESPONDENTS shall be responsible for detailing any and all cost associated with the development of existing towers.

### **3.1.4 Site Equipment**

#### **3.1.4.1 System and Site Control Equipment**

- A. The system and site control equipment shall be capable of controlling all voice and data channels in the proposed system. The control equipment may use a distributed or centralized architecture.
- B. The control equipment shall fully support APCO P25 functional requirements, including the Common Air Interface (CAI) and Inter-RF Subsystem Interface (ISSI).
- C. The RESPONDENT shall fully describe the manner in which the proposed system and site controllers function and operate.
- D. Routers, switches and servers shall consist of “off the shelf” components. The SELECTED VENDOR shall provide any operating systems or configuration files required for the operation of these “off the shelf” components.
- E. It is anticipated that the system and site control equipment shall be located at the 911 Dispatch Center. The dispatch center is located at: 109 County Street, Bowling Green, VA 22427



- F. It is anticipated that the simulcast and voting equipment shall be located at the County's main tower site. The main tower site is located at 109 County Street, Bowling Green, VA 22427

### **3.1.4.2 Fixed Transmitter/Receiver Equipment**

A. General:

1. Repeaters and/or base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity. Only linear repeaters are acceptable.
2. Equipment shall have alarm interfaces to provide status to the Network Management System.
3. The units shall be as compact as possible, with mounting configurations for standard relay rack or cabinets.
4. The units shall consist of modular components or Field Replaceable Units (FRU) allowing for in the field repairs whenever possible.

- B. Repeaters and/or base station equipment shall comply with Part 90 of the FCC Rules and Regulations, as well as appropriate EIA and similar agency standards and be FCC type accepted for the required UHF and 700 MHz frequency band proposals.

- C. 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.
2. Maximum Permissible Exposure (MPE) study (per latest revision of OET bulletin 65) – The SELECTED VENDOR shall consider equipment from all tenants located at the proposed site, per FCC licensed information.

- D. 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 resolve the issue without degrading system coverage or performance, for a period of up to 12 months after final acceptance at no cost to the OWNER.



- E. RESPONDENT shall include detailed specification sheets for all proposed equipment.

### 3.2 System Options

- A. RESPONDENTS shall provide proposals for each of the following:
  1. 700 MHz Project 25 Phase 2 System
  2. UHF Project 25 System

### 3.3 Option 1, 700 MHz P25 Phase 2 System

- A. A number of Caroline County’s neighbors own and operate trunked systems in the 700/800 MHz frequency band. The implementation of a 700 MHz system would provide a high level of interoperability with these neighboring Counties.
- B. The system shall consist of five narrowband (12.5 kHz) trunked channels capable of providing eight talkpaths.

#### 3.3.1 Spectrum

- A. The proposed radio system shall operate in the 700 MHz spectrum with subscribers capable of operating in both the 700 MHz and/or 800 MHz spectrums. Caroline County has been allocated channels within the 700 MHz spectrum by the Region 42 RPC. The channels allocated by the RPC are provided in Table 1.

**Table 1 – Caroline County’s allocated 700 MHz Spectrum**

700 MHz Channel Number	Channel	Center Frequency of 12.5 kHz channel
137-140	137	769.856250
	139	769.868750
205-208	205	770.281250
	207	770.293750
341-344	341	771.131250
	343	771.143750



700 MHz Channel Number	Channel	Center Frequency of 12.5 kHz channel
565-568	565	772.531250
	567	772.543750
673-676	673	772.206250
	675	772.218750

- B. The SELECTED VENDOR shall ensure that frequencies selected for use are in accordance with the Region 42 Regional Planning Committee’s 700 MHz plan.

**3.3.2 Project 25 Phase 2**

- A. For the purpose of this document, P25 Phase 2 refers to the Project 25 requirements and standards for a digital Common Air Interface (CAI) using a 6.25 kHz equivalent bandwidth, including infrastructure and subscriber devices.
- B. RESPONDENTS shall provide a Project 25 radio system that is compatible with TIA-102 standards.
- C. It is understood that the completed Phase 2 requirements have not been published by the TIA/EIA, however the P25 Phase 2 TDMA Physical Layer and MAC Layer documents have been approved for publication.
- D. The proposed radio system shall only require a software upgrade (if required) to become compliant with Project 25 Phase 2 requirements once they are published. Although the proposed radio system shall be installed as a P25 Phase 2 system, the system shall be upgraded if required to the latest P25 Phase 2 standards just prior to system acceptance.

**3.4 Option 2, UHF P25 System**

- A. As with the 700 MHz option, a number of Caroline County’s neighbors operate in the UHF frequency band. The implementation of a UHF system would provide a high level of interoperability with these neighboring Counties.
- B. RESPONDENTS shall provide a Project 25 radio system that is compatible with TIA-102 standards.
- C. The system shall consist of five narrowband (12.5 kHz) trunked channels.



- D. The proposed radio system shall only require a software upgrade to become compliant with Project 25 Phase 2 requirements once they are published. A detailed path description and cost to Project 25 Phase 2 compliance are required as part of the proposal package.

### **3.5 VHF Paging and Interoperability Network**

- A. The VHF Paging and Interoperability Network will serve as a tone and voice paging channel as well as an interoperability channel.
- B. The VHF channel shall operate in narrowband (12.5 kHz) analog FM mode.
- C. To the greatest extent possible the VHF Paging and Interoperability Network shall be capable of sharing resources with the Primary Voice Communications Network including, but not limited to the following subsystems:
  - 1. Backhaul Network
  - 2. System and Site Control Equipment
  - 3. Routing and Switching Devices
  - 4. Network Management
  - 5. Dispatch Consoles

#### **3.5.1 Spectrum**

- A. Caroline County holds FCC license call signs WNJP249 and WKSO881, for its existing VHF system. The SELECTED VENDOR shall be responsible for identifying the pair of frequencies which will provide for the least amount of interference and reuse these frequencies for the VHF Paging and Interoperability Network.

#### **3.5.2 Site Locations**

- A. The VHF Paging and Interoperability Network shall be collocated with the Primary Voice Communications Network
- B. The VHF Paging and Interoperability Network shall use the minimal amount of sites required to provide 95% on the on-street portable coverage.



### **3.5.2.1 Repeaters**

- A. General:
1. Base station equipment shall be solid state in design and function with standard site conditions for temperature, altitude, and humidity.
  2. Equipment shall have alarm interfaces to provide status to the Network Management System
  3. The units shall be as compact as possible, with mounting configurations for standard relay rack or cabinets.
  4. The units shall consist of modular components or Field Replaceable Units allowing for in the field repairs whenever possible.
- 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 be FCC type accepted for the appropriate frequency band.
- C. 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.
  2. Maximum Permissible Exposure (MPE) study (per latest revision of OET bulletin 65) – The SELECTED VENDOR shall consider equipment from all tenants located at the proposed site, per FCC licensed information.
- D. 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 resolve the issue without degrading system coverage or performance, for a period of up to 12 months after final acceptance at no cost to the OWNER.
- E. RESPONDENT shall include detailed specification sheets for all proposed equipment.
- F. A single duplexer shall be utilized for the Paging and Interoperability Channel at each site.



### **3.6 Coverage Maps**

- A. RESPONDENT shall include a detailed description of the propagation models used and the assumptions made in preparation of the coverage maps. A brief description of the methodology the 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 (700 MHz P25 Phase 2 system, UHF P25 system, VHF Paging and Interoperability system). 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 antenna mounted in the center of the roof
  - 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 at head level
  - 3. Portable radios – Standard portable radio with 12 dB medium building penetration margin:
    - a. Talk-out to a portable radio on hip with swivel belt clip
    - b. Talk-in from a portable radio at head level
- C. Coverage shall be depicted using a light transparent color or cross-hatching for those areas that meet or exceed the minimum coverage reliability threshold.
- D. All maps must clearly delineate the difference between areas predicted to be greater than DAQ 3.4 equivalent coverage and areas that do not meet coverage requirements. RESPONDENT shall include the affects of simulcast interference in all coverage maps.
- E. Coverage maps shall be provided in the proposal in two formats:
  - 1. 11"x17" (minimum) full color hardcopy format
  - 2. PDF file format on CD-ROM
- F. All maps shall include a background layer suitable for County reference (e.g., topography, roads, rivers, etc.).



- G. Link budgets shall be provided, clearly defining the following minimum information, relating to each map and each site:
1. Base station / repeater RF power output
  2. Antenna gain
  3. Antenna down tilt (if applicable)
  4. Transmit ERP
  5. Receiver sensitivity
  6. Antenna height
  7. Mobile and portable antenna height for talk-out and talk-in
  8. Mobile and portable RF output power



## 4. Backhaul Network

### 4.1 *Digital Microwave Network*

- A. The digital IP microwave network shall consist of either monitored hot standby (MHSB) or ring protected loop system. No unlicensed microwave will be accepted.
- B. Microwave terminal equipment shall include transmitter, receiver, modem, power supply, automatic switching device, multiplexer, service channel(s), and all associated interconnections to provide a complete and functional system.
- C. RESPONDENTS shall provide preliminary microwave path details including centerline mounting heights recommendations, fade margins, antenna sizes, annual reliability percentages, system gains and system losses.
- D. The radio shall deliver two-frequency, full duplex operation. Space diversity configurations are acceptable if necessary to meet reliability requirements.
- E. Each hop shall deliver a minimum payload capacity equivalent to OC3. RESPONDENTS shall fully describe methodology for equipping radios to full capacity.
- F. Each microwave hop shall be designed to meet or exceed a one way end-to-end annual reliability of 99.999% at the required capacity.
- G. The RESPONDENT shall be responsible for all microwave frequency research, prior to coordination and preparation of all associated FCC license applications and submittals on behalf of the County.
- H. The County shall be responsible for coordination fees and licensing fees, and any signatures, if applicable.
- I. 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. Pressurized elliptical waveguide shall be used. Connectors shall be standard, premium type, and compatible with the antenna and radio EIA interfaces.



3. All mounting brackets, connectors and other hardware shall be supplied as necessary for a complete installation.
  4. An automatic dehydrator / pressurization system shall be provided to maintain at least 5 psig positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distributed manifold shall be provided for each line.
  5. All installed antenna / transmission lines shall be purged, pressure tested, and tested for low VSWR using return loss measurements.
  6. All RF paths shall be tested to demonstrate proper antenna alignment by measuring the net path loss between sites as measured at the equipment rack interface.
- J. Network Management:
1. RESPONDENTS shall fully describe alarm, monitor, and control capabilities of the microwave terminal equipment.
  2. Network management of microwave systems shall be integrated into the radio system's Network Management capabilities as described in Section 7, *Network Management System*.
- K. The SELECTED VENDOR shall conduct physical path surveys to assure that all proposed paths meet proper clearance criteria.



## 5. Dispatch Console

### 5.1 *General Requirements and Features*

The dispatch console is a critical link for public safety personnel. It is here that the dispatch operator has to relay critical information from the public to the 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 is configured in a manner allowing the operation of such console to be second nature to the dispatch personnel. The dispatch console shall be configurable to provide the operators with all information necessary to perform their duties without unnecessary clutter and be easily navigated. Requirements for the console equipment shall include, but not be limited to:

- A. Six dispatch positions are required and shall be located at the primary dispatch center at 109 County Street, Bowling Green, VA 22427
- B. Dispatch console equipment (operator positions) shall be designed to be placed on existing modular workstation furniture and configured to provide operators with an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.
- C. The County currently has a central uninterruptible power supply (UPS) system providing power to each of the console positions. The RESPONDENT shall evaluate the existing UPS for re-use. If the existing UPS is deemed inadequate, a new UPS shall be provided by the SELECTED VENDOR.
- D. The installation of all Console equipment included in Section 5, *Dispatch Console*, shall comply with Section 11, *System Installation, Test and Acceptance*.
- E. Console positions shall acoustically cross mute channels in order to eliminate acoustic feedback between operators.
- F. The screen display shall be designed so that all communications dispatching functions shall be operable from one display.
- G. The screen display(s) shall be very flexible, allowing authorized personnel the ability to determine which functions are available at each operator position.
- H. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.



- I. All operational features of the proposed radio system shall be available on the dispatch consoles.
- J. Capability to program, store, retrieve, and edit multiple, custom operator screens and configurations for each operator position shall be provided.
- K. Operator screen configurations and alias databases may be stored either on a centrally located server or at each position.
- L. The dispatch console shall display an alias name on screen when a unit with a radio ID stored in the alias database is transmitting.
- M. The SELECTED VENDOR shall configure the alias database to include all aliases defined by the County.
- N. The console system shall have the ability to decrypt and encrypt secure voice communications. Channels shall have a distinctive icon if encryption is being used for that channel.
- O. 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. The visual alert shall remain until acknowledged by the console operator.
- P. Field units initiating an emergency alarm shall have priority over all other users.
- Q. Headset jacks and headsets shall be supplied for each operator position. Dual jacks shall be made available at each position and wireless headset technology shall be employed. Headsets will be selected by the customer.
- R. Operators shall have the ability to utilize a headset or stationary external microphone for transmitting audio.
- S. A transmit audio level 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 / talkgroup.
- T. Operator positions shall have the ability to independently set each channel's volume level. Minimum audio levels should be capable of being set to avoid missed calls.



- U. A control / indicator shall be provided to allow the operator to mute or unmute audio from unselected channels. Selected audio and unselected audio shall be audible from separate speakers.
- V. Consoles shall be capable of transmitting at least three distinctive alert tones indicating to field units the priority or type of dispatch to follow.
- W. The capability to converse on the telephone utilizing the same operator headset that is used for radio conversations shall be mandatory. A separate volume level control shall be provided for telephone and radio.
- X. Operators shall have the ability to patch two or more conventional repeaters and/or base stations with trunking talkgroups so users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.
- Y. An instant recall option shall be provided allowing the operator to play back his or her recent radio or telephone traffic. Playback shall be available on each operator position. This feature will be independent of the external logging recorder.
- Z. A call log shall be displayed on the screen enabling the operator to view recent calls from field units. Log detail shall include calling unit and time of call.
- AA. Dispatch consoles shall meet current APCO Project 25 Statement of Requirements/TIA documents.

## **5.2 Trunked Requirements**

- A. Dispatch consoles shall be compatible with the proposed trunked radio system and shall allow interoperability between trunked and non-trunked channels in the system.
- B. Dispatch consoles shall be equipped with an instant transmit switch for each talkgroup displayed.
- C. The Push-to-Talk (PTT) ID of the unit calling shall appear in addition to a call indicator. After the call is completed, the unit PTT ID shall remain displayed until another call is received.
- D. A list of the last 15 or more radio IDs shall be available in a recent call list.



- E. In the case of multi-talkgroup transmit or talkgroup patch, the use of more than one trunked repeater shall not be allowed; the talkgroups shall be merged onto a single repeater in order to make the most efficient use of the repeaters.
- F. Dispatch consoles shall have the capability to patch two or more talkgroups together so users may communicate directly.
- G. Dispatch consoles shall have a minimum of eight separate patches.
- H. Dispatch consoles shall be capable of operating on all talkgroups available to system users.
- I. A control and indicator shall be provided allowing the dispatcher to simulselect multiple talkgroups.
- J. Dispatch consoles shall have the ability to hear field units while dispatch operators are transmitting.
- K. In the event that all resources are busy, a visual and audible alert will be initiated at the dispatch consoles.

### **5.3 Conventional Requirements**

- A. The consoles shall have the ability to enable or disable the repeat function of the repeaters utilized for interoperable communications. Control of these stations shall be IP based and not circuit switched.
- B. Dispatch equipment shall include an instant transmit switch for each conventional repeater channel and/or base station.
- C. On conventional base station or repeater capable of operating on multiple frequencies or modes, a control/indicator shall be provided that allows the selection of the desired transmit frequency or mode. A control / indicator shall be provided allowing the operator to select multiple channels allowing the dispatcher the ability to broadcast to several channels at once.
- D. Operators shall have the ability to patch two or more conventional repeaters and/or base stations together so users may communicate directly. Operator positions shall be equipped such that a minimum of eight simultaneous patches shall be available.



- E. Existing conventional resources shall be available on the proposed console system.
- F. A separate control station will be provided to each of the dispatch positions talkgroups to serve as backup in the event of a console subsystem failure.

#### **5.4 *Paging Requirements***

- A. The console shall be capable of tone and voice paging over the VHF paging and Interoperability Network.
- B. The console shall support the Motorola Quick Call II paging format
- C. Tone and voice pages shall be supported.
- D. The console shall support the creation and modification of preprogrammed pages and groups.
- E. The console shall support the following paging features:
  - 1. Manual paging
  - 2. Visual indication that a page was sent successfully
  - 3. Operator ability to select or stack pages to be sent to multiple recipients.
  - 4. An instant page feature allowing operators to send multiple pages to a predetermined group of recipients with the single press of a button

#### **5.5 *Logging Recorder***

- A. The RESPONDENT shall provide an IP-based networked Project 25 compatible, digital logging recorder system. This logging recorder shall provide the ability to log / record the following:
  - 1. All trunked radio traffic
  - 2. All conventional radio traffic
  - 3. All 911 calls
  - 4. Call taker administrative calls
- B. The logging recorder shall be equipped to archive radio and telephony audio to various storage media including, but not limited to: internal, Redundant Array of



Independent Discs (RAID) Level 1 or greater hard drive storage, CD-R/W, DVD-R/W devices and/or network attached storage (NAS) devices.

- C. The logging recorder shall be capable of storing audio in variable bit rate, industry-standard digital formats such as WAV, WMP, MP3, etc.
- D. The logging recorder shall be capable of storing 30,000 channel-hours before archiving is required. The logging recorder shall be capable of being upgraded to allow for greater capacity before archiving is necessary.
- E. The logging recorder shall be capable of recording a minimum of 96 simultaneous sources of audio.
- F. Client / server architecture shall be utilized that allows for the access, playback and transfer of digital audio files across a TCP / IP-over Ethernet network.
- G. The logging recorder shall be constructed so as to meet the requirements of 24 hour, seven day a week operation.
- H. The logging recorder shall meet or exceed all FCC, IEEE, EIA/TIA and APCO standards.
- I. The ability of multiple search and playback techniques shall include, but not be limited to:
  - 1. Console position
  - 2. P25 emergency call activation
  - 3. Subscriber unit ID
  - 4. Talkgroup
  - 5. Individual Call
  - 6. RF channel (for conventional repeaters/base stations only)
  - 7. Date
  - 8. Time
  - 9. ANI/ALI data
- J. The logging recorder subsystem shall share the common timing reference with the radio system.



- K. The logging recorder shall be capable of being mounted in an EIA/TIA standard 19" wide rack.
- L. The logging recorder shall interface directly with the radio system for audio and Project 25 data. Recorders that interface through the dispatch consoles or the console subsystem are not allowed. This may require a standalone encrypt/decrypt device.
- M. The logging recorder shall be equipped with dual power supplies.
- N. The logging recorder shall be capable of individual user logon and various levels of access to channels and authorized permissions.

### **5.6 Operator Position Equipment**

- A. All equipment supplied for use by the dispatch operators will be capable of withstanding the 24 hours a day, seven days a week environment.
- B. Operator position display monitors will at a minimum be 19" LCD touchscreen, with resolution of 1024 x 768 or better.
- C. Keyboards shall be a standard 101- key keyboard.
- D. Operator functions shall be executed by positioning a screen pointer (cursor) over the appropriate icon and pressing the mouse button or by touching the monitor screen.
- E. A high quality gooseneck microphone shall be provided for each operator position.
- F. Headset jacks and headsets shall be provided allowing the operator to hear select audio via a headset and allow the operator to respond via a microphone attached to the headset. The headset plug inserted into the jack shall automatically disconnect the console's microphone and mute the select speakers when employed. As an OPTION, RESPONDENTS may propose wireless headsets.
- G. A heavy duty footswitch shall be provided to allow the operator to key the selected channel hands free.
- H. Computers supplied shall be capable of providing a Graphical User Interface (GUI) using the Windows<sup>®</sup> 7 Operating system, capable of Local Area Network



(LAN) client-server architecture for network access, capable of supporting multiple Windows® 7 compliant applications.

- I. Computers supplied shall be based on present state of the art technology.

### ***5.7 Common Electronics Equipment***

Common Electronics Equipment, if used, must not contain a single point of failure. Redundant hot standby cards, power supplies, etc., shall be used to prevent a single point of failure.



## 6. Infrastructure Development

### 6.1 General Requirements

- A. RESPONDENT shall use existing infrastructure to the greatest extent possible.
- B. RESPONDENT shall identify and propose any additional equipment or modifications necessary, including, but not limited to:
  - 1. Towers
  - 2. Shelters
  - 3. Backup power
  - 4. Site preparation
  - 5. Fencing
- C. During preliminary design, the SELECTED VENDOR shall provide detailed drawings including all structures and foundations, sealed by a professional engineer.
  - 1. Detailed dimensioned drawings showing all system components and locations
  - 2. Drawings
  - 3. Drawings and/or specifications shall describe any auxiliary equipment.
  - 4. Manufacturer slick sheets of all equipment used shall also be provided.
- 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 1.5.1, *Standards and Guidelines*.



- E. Prior to any excavations, the SELECTED VENDOR or subcontractor shall follow appropriate procedures outlined at the following website: [www.call811.com](http://www.call811.com).
- F. The SELECTED VENDOR will coordinate with utility companies for all utility related items, including Telco installations and electrical service hookups and disconnects.
- G. Concrete:
  - 1. For all foundations and concrete work, the SELECTED VENDOR or subcontractor will provide to the Project Engineer a test sample of each mix of concrete demonstrating that is 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.

## **6.2 Communications Towers**

- A. General:
  - 1. The RESPONDENT shall propose self supporting towers for new tower sites, or for existing towers that must be replaced.
  - 2. Any tower manufacturer supplying a tower(s) for this system is required to guarantee structural integrity of the tower for a period of not less than 20 years from the date of acceptance.
- B. Tower Loading:
  - 1. The tower and foundation shall be designed for all proposed equipment, legacy equipment, appurtenances, ancillary equipment, initial antenna loading plus 100% future antenna system growth, 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. A typical cellular array shall be defined as three tower frames with each holding three 12" x 96" cellular panel antennas. Tower frames may be equal to Andrew Solutions Part # SF-U12-3-126
4. The proposed tower structure shall be designed and installed in accordance with the latest revision of the ANSI/EIA-222 standard.

C. Existing towers:

1. Structural analysis shall be performed on existing towers according to the latest TIA-222 standard.
2. Structural analysis shall be performed to ensure towers are capable of additional loading of proposed equipment.
3. Structural analysis reports shall be provided to the County upon completion of study.
4. Any tower that fails a structural analysis, the SELECTED VENDOR shall notify the County and appropriate measures will be taken to correct the failure.
5. In the event towers will not support required modifications, a replacement tower shall be recommended.

D. 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.
2. Transmission line support – A vertical cable ladder shall be provided and attached to the tower to securely attach the antenna transmission lines. Holes shall be provided on the cable ladder to allow the 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 ten 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, either going up or coming down. Two OSHA approved safety climbing belts shall be supplied with each new tower.



E. Lighting:

1. Tower lighting shall be LED or strobe combination lighting 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.
2. 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.
3. The SELECTED VENDOR or subcontractor shall wire all alarms to a Type 66 block located in the communications shelter or equipment room. All alarms shall be clearly labeled.

F. 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.

G. Labeling shall be clearly provided near the base of all new towers for the following:

1. Make
2. Model
3. Serial number
4. Tower height
5. Latitude and longitude
6. FAA and FCC identification numbers (if applicable)

H. Transmission line labeling:

1. All transmission lines shall be labeled with brass tags and non-plastic attachments indicating the following:
  - a. Frequency
  - b. Receiver transmit
  - c. Approximate cable length
2. Tags are to be affixed on the main line at the junction of the antenna jumper, at the cable entry port exterior and at the cable entry port interior.

I. 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 and every piece of steel and every weld is to be deburred and smooth finished.
- J. 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
    - b. All bolts tight and torqued to specification
    - c. No damaged or missing structural members
    - d. All surface scratches and damage to the galvanization occurring during shipping or construction shall be repaired using a hot stick galvanization process. Spray galvanizing materials are not permitted.
    - 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 shall be free of cracks and blemishes.
    - b. Grouting, if used, will have drain holes if the tower uses hollow leg construction or monopole design.
    - c. Backfill shall be clean material and graded according to industry best practices and applicable standards according to this RFP.
  3. Grounding:
    - a. Verify lugs and CADWELD<sup>®</sup>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 site from north, east, south, and west
  - b. Footers
  - c. Grounding

### **6.3 Shelters**

#### **A. General:**

- 1. RESPONDENT shall propose a new equipment shelter at new site locations and when existing shelters are deemed inadequate.
- 2. The shelter shall be a prefabricated, preassembled shelter. The shelter shall be constructed from concrete or concrete composite.

#### **B. Size:**

- 1. Shelter exterior dimensions shall be 12' x 20' with a minimum interior height of 9'.

- #### **C. Foundation –**
- The foundation for the shelter shall consist of concrete piers or a poured concrete slab constructed by the SELECTED VENDOR or 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. The interior floor surface 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 sustain a minimum 120 MPH wind loading, including overturning moments.
2. Walls 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 an aggregate composition.
4. A wall feed-through with 12 each, 4 inch openings shall be provided on the tower side of the building to accommodate elliptical waveguide and coaxial transmission lines. The openings shall be properly booted to provide a good weather seal. All unused openings shall be sealed utilizing a removable rubber or composite plug. The wall feed-through shall be bonded to the site ground system per guidelines specified in Section 1.5.1, *Standards and Guidelines*.
5. The shelter shall be insulated to provide a minimum insulation factor of R-11.

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.

G. Door:

1. The shelter shall have one 42" x 84" insulated door, with three stainless steel tamper-proof 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 including insulation, interior walls, etc.
4. The door sill shall be of stepped construction so as to prevent rain water from entering the shelter at the bottom of the door or from around the door frame. The door frame shall have a weather seal around the door to limit air and water intrusion.

H. Finishing:

1. The interior and exterior finishes shall be described by the RESPONDENT. Color and finishes shall be selected by the County 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 Contractor 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. One 200 Amp disconnect switch shall be provided to disconnect utility service from the shelter.
4. One 200 Amp manual transfer switch shall be provided to switch between the backup generator and generator receptacle.
5. One 200 Amp generator receptacle shall be provided – Appleton # AR20044-RS.
6. 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.
7. Breakers for shelter air conditioning will be of the bolt-down, not snap-in type.



8. 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 Interrupt (GFI) exterior power receptacle shall be provided with each shelter, to be mounted near air conditioning units.
- d. 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. 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, and fuses, if needed
  - g. UL listed components
  - h. 45 kA per phase ANSI C62.1 8/20 waveform
  - i. EMI / RFI filtering per Mil-STD-220
  - j. The unit shall be capable of handling the full 240 Volt, 200 Amp capacity of the electrical system.



K. Wiring methods:

1. All wiring noted on the site drawings or otherwise included by the SELECTED VENDOR shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.
2. All conduits and ducts 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 light, 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).

L. 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. A sufficient quantity 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.

M. Outdoor lighting:

1. An exterior fluorescent wall mounted light shall be mounted over the front entrance of the shelter.
2. The exterior lighting system shall be fed from a separate, appropriately rated breaker and light switch by the door.

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

1. RESPONDENT shall propose dual AC units with lead-lag controller and adjustable, digital industrial quality thermostat. Each AC unit shall be sized



for 150 percent of the building's 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 sized to maintain an inside ambient temperature range between 65 and 85 degrees F when the outside temperature is between -10 and 100 degrees F.
- O. Grounding:
1. A halo ground system shall be installed utilizing #2/0 AWG stranded copper wire with down conductors at each corner.
  2. A 1" Schedule 40 PVC sleeve shall be installed at 45 degrees through walls for ground exits.
  3. Ground bar kits shall be included with interior and exterior ground buss bars and exterior copper straps shall be located at the cable entry port.
- P. Antenna cable conduit entry – A bulkhead panel shall be supplied to accommodate coaxial transmission lines between 1/2" and 1 5/8" diameter elliptical waveguides. A minimum of 12 transmission lines shall be accommodated with 4" openings. The building manufacturer shall seal the conduits into the wall to assure that they are watertight. All unused entrance ports shall be sealed with a removable insert.
- Q. Cable tray – All new shelters will be equipped with cable trays. The SELECTED VENDOR or subcontractor shall supply and install up to 60' of 18" wide cable ladder/tray.
- R. One 4' x 6' x 3/4" TELCO board shall be installed.
- S. Shelters shall be supplied with at least one 10 pound CO<sub>2</sub> fire extinguisher, an approved eye wash station and first aid kit.



#### **6.4 Generator and Automatic Transfer Switch (ATS)**

- A. 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.
- B. The SELECTED VENDOR shall provide an emergency generator system at each new radio communications site for backup power.
- C. The SELECTED VENDOR shall perform electrical loading analysis for shelter equipment, including HVAC subsystems, 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.
  - 1. For the purpose of the proposal, RESPONDENT shall assume the following:
    - a. 35 kW
    - b. Single phase
    - c. 60 Hz
    - d. Propane fuel
    - e. Minimum 72 hour run time at full load
- D. In the event of a commercial power outage, the emergency generator shall provide power to the entire shelter without system outage.
- E. 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.
- F. 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 (1000 volts maximum)
- G. 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 SELECTED VENDOR.
- H. 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 of all safety shutdowns are functioning properly
    - b. Verification of single step load pick-up 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. Provide complete report(s) of all testing performed.
- I. 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. Verify engine parameters are within specification.
    - c. Verify that no load frequency and voltage adjusting is required.
    - d. Test all automatic shutdowns of the generator.



- e. Perform a simulation of power failure to test generator start up and ATS to pick up building load correctly.
  - f. Return to commercial power and test generator and ATS to demonstrate correct cycling to normal commercial power.
  - g. Perform a load test of the generator, to ensure full load frequency and voltage is within specification by using building load. This test shall be run for a minimum of one hour.
  - h. Test and verify all remote indicators and controls.
2. The SELECTED VENDOR shall provide complete report(s) of all testing performed.

#### **6.4.1 Propane Generator**

- A. The prime motor shall be a liquid cooled, propane gas fueled, naturally aspirated engine of 4-cycle design.
- B. The engine shall have sufficient horse power rating to drive the generator to full output power without a gear box between the engine and generator.
- C. The engine shall have a battery charging DC alternator with a solid state voltage regulator.
- 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.
- H. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.
- I. 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. 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.
  3. The panel shall include:
    - a. Analog and/or digital meters to monitor:
      - 1) AC voltage
      - 2) AC current
      - 3) AC frequency
    - b. A phase selector switch
    - c. Emergency stop switch
    - d. Audible alarm
    - e. Battery charger fuse
    - f. Programmable engine control
    - g. Monitoring module
  4. 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
  5. 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 the following:
- 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"
- J. Unit Accessories:
1. The residential exhaust silencer(s) shall be provided of the size recommended by the manufacturer and shall be of critical grade.
  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.

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

- A. The automatic transfer switch shall be compatible with the generator set so as 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 automatic transfer switch 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 allow manual operation of the switch in the event of logic or electrical coil failure.
- E. Controls:
  1. A solid state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.
    - a. Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage.



- b. A utility sensing interface shall be used, stepping down system voltage of 120/240 VAC 1 phase to 24VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.
2. Controls shall signal the generator set to start in the event of a power interruption.
  - a. A solid state time delay start, adjustable, from 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
3. Controls shall transfer the load to the generator set after it reaches proper voltage.
4. 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.
5. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
6. 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.
7. Controls shall be capable of automatic generator start-up and shut-down to "exercise" the generators. Exercise schedules shall be user programmable to allow day and time of exercise to be set.
8. The transfer switch shall have a time delay neutral feature to provide a time delay, adjustable from 0.1-10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.
9. A switch will be provided to bypass all transition features when immediate transfer is required.



10. The transfer switch shall have an in-phase monitor which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of transfer initiation signal.
  - a. If the in-phase monitor will not allow such a transfer, the control must default to time delay neutral operation.
11. Contact closures shall provide for indication of ATS position – normal or bypass.

#### **6.4.3 Propane Fuel System**

- A. The SELECTED VENDOR shall provide a complete fuel system including tank(s) and all associated piping, valves, controls, etc.
- B. The SELECTED VENDOR shall be responsible for the initial fill of the propane tanks.
- C. Tank and fuel system components shall be sized to provide a minimum of 72 hours of run time at full load.
- D. Fuel tank(s) shall be located a minimum of 10 feet from the generator and building.
- E. Clear access shall be provided for refueling.
- F. Tanks:
  1. Steel and polyurethane construction
  2. 500 gallon minimum size
  3. UL labeled in accordance with UL 644 and stamped in accordance with ASME Section VIII Division 1
  4. Rated for a minimum of 250 psig
  5. All tanks to be secured to an adequately sized concrete foundation
- G. Controls and Monitoring Equipment:
  1. Fuel capacity gauge



2. A fuel level monitoring device capable of triggering low fuel alarm shall be provided
3. Multi-valve for filling, pressure relief and gauging

## **6.5 Site Power**

- A. The County prefers DC rectifiers and batteries; however, REpondents may propose either an AC powered site with an uninterruptable power supply or a DC power supply/rectifiers and batteries.

### **6.5.1 Uninterruptable Power Supply (UPS)**

- A. The SELECTED VENDOR shall provide single phase, online, double conversion, static type, uninterruptible power supply (UPS) at each shelter 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. SELECTED VENDOR shall perform electrical loading analysis for shelter equipment, excluding HVAC subsystems, during preliminary design to verify UPS size required. All electrical loading calculations shall include a 25% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.
- C. For the purpose of the proposal, RESPONDENT shall assume the following:



1. 10 kVA output
2. Single phase
3. 60 Hz
4. 0.8 Power Factor
5. Minimum one hour run time

D. Operational Requirements:

1. Automatic operation includes the following:
  - a. Normal Conditions – Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
  - b. Abnormal Supply Conditions – If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.
  - c. If normal power fails, energy supplied by the battery through the inverter 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.





shall include a 25% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

B. Controls and Indications:

1. Basic system controls shall be accessible on a common control panel on the front of the DC Power supply/rectifier. The following shall be displayed at a minimum:

- a. Battery float voltage
- b. Battery voltage temperature
- c. Battery charge current
- d. DC output voltage
- e. Form-C relay outputs shall be available for alarm conditions. The following alarms shall be available at a minimum:
  - 1) Overvoltage
  - 2) Under voltage
  - 3) Battery over temperature
  - 4) Fuse/CB trip
  - 5) Rectifier fail
  - 6) AC Fail

C. Performance Requirements:

1. Input:

- a. Single phase, three-wire
- b. Individual rectifier feeds
- c. Voltage: 120/240V Nominal
- d. Frequency: 60 Hz

2. Output:

- a. Capacity: to be determined by SELECTED VENDOR during preliminary design.



- b. Voltage: -48 VDC
- c. Amperage: As required to sustain equipment operating at full load
- d. System shall be capable of completely charging all batteries in less than 24 hours while equipment is operating at full load (100% duty cycle)
- e. Individual breakers shall be supplied for each piece of equipment
- f. Circuit breakers shall be supplied for batteries

D. Mechanical:

- 1. Rack mountable in standard 19" telecommunications rack.
- 2. Hot-swappable modular rectifiers with (N+1) redundancy shall be utilized.
- 3. Rectifier modules shall be capable of on-line expansion.
- 4. An automatic low voltage disconnect device shall be provided to protect battery plants from discharge related damage.
- 5. Batteries shall be mounted on rack shelf.



## 7. Network Management System

### 7.1 General

This section provides specifications and requirements for an integrated monitoring and control system for local and remote site facilities and equipment. The system is used to provide remote indication of status, alarms, and analog values, and to provide remote control relay operations.

- A. System Alarms: The system shall acquire, process and display information in an integrated and uniform fashion for a variety of critical systems including:
  - 1. Trunked and conventional radio systems
  - 2. Local and remote site facilities
  - 3. Primary and backup power systems
  - 4. Microwave, leased line and data networks
  - 5. Dispatch console systems
  
- B. Site Alarms – Any change in the state of site equipment shall induce an alarmed state. Equipment monitored shall include, but not be limited to the following:
  - 1. Surge arrestors
  - 2. Transfer switch (normal or bypass state)
  - 3. Power fail
  - 4. HVAC
  - 5. Smoke detector
  - 6. Intrusion detection
  - 7. High temperature
  - 8. Low temperature
  - 9. High humidity
  - 10. UPS/DC power plant fail
  - 11. UPS state (normal or bypass)
  - 12. Generator (including generator run, low fuel, high temp, fail, etc.)
  - 13. Generator not in auto



14. Propane fuel level low
15. Tower lighting alarms
16. In an effort to reduce false alarms, all alarm contacts shall be normally closed when no alarm is present.

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

- A. The NMT 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 system shall provide the ability to remotely access the system to check the operational status of the system and view alarms.
- B. Two terminals shall be provided. One located with the Project 25 control equipment with a second terminal location to be determined during the design phase of the project.
- C. The NMT shall meet the following general requirements:
  1. Expandable software and hardware architecture shall be easily updated by adding software modules and hardware boards.
  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 NMT shall provide full archiving and control functions.
  5. Multiple alarm protocols for higher level network management systems shall be mediated by the NMT.
  6. The NMT shall be designed to monitor a large cross section of equipment so that it can consolidate multiple alarm systems.
  7. The NMT must perform full management functions with a local terminal.
  8. The NMT shall provide e-mail notification of alarms.
  9. The NMT shall provide alarm filtration and consolidation.
  10. A secure web browser interface shall be provided for common management functions, and to monitor alarms and perform control and management functions via Intranet or Internet.



D. Standard Features:

1. Programmable display screens including the following:
  - a. System summary – High level screen summary window with links to other screens
  - b. Change of state – Summary of points that have changed state from alarm to normal or normal to alarm
  - c. Standing alarms – Summary of all points in alarm condition
  - d. Programmable alarm windows – Allowing logical grouping of alarms such as by type or site.
2. Graphic depiction of the network allowing annunciation and point selection via icons:
  - a. Nested tree depiction of the network with drill down capability
  - b. Capability to drive external display devices
3. Programmable console environment including:
  - a. Database definition
  - b. Screen colors
  - c. Alarm summary formats
  - d. Blink attributes
  - e. Pager alarm formats
  - f. Audible alert formats
4. Status points – the following status types shall be supported:
  - a. Simple status – contact open or closed
  - b. Change detect – simple status plus change detect since last scan
5. Control points – the following relay control types shall be supported:
  - a. Direct control – open or close contact
6. Analog points – display the value of a monitored quantity such as temperature, fuel level, Voltage Standing Wave Ration (VSWR), etc.
7. Time stamp indicating date and time of message



8. Conditional assignable text messages for each point to be issued on a change of state or alarm
  9. Alarm qualification – on a point basis, programmable delay before alarm is issued
  10. Alarm deactivation – on a point basis, the ability for the operator to deactivate an alarm to inhibit additional annunciation
  11. Alarm history:
    - a. Logging of all alarms to disk and printer (selectable)
    - b. Minimum history log of 500,000 entries
  12. E-mail support – text message of alarm sent to e-mail lists
  13. Ping interrogator – to confirm that servers, routers, and IP based equipment are physically present on the network
  14. Security – multiple levels of user name and password protection to all for flexible system management
- E. In addition to the two terminals, a single monitor shall be mounted in the dispatch center that displays system health information. At a minimum the monitor will display the following information:
1. System health information including the following:
    - a. Channel usage
    - b. Busy channels
    - c. Impaired channels
    - d. System status
  2. The monitor shall be mounted so that it is easily viewed from any console position.



## **8. Subscriber Equipment**

### **8.1 Overview**

- A. Subscriber equipment includes all UHF and 700/800 MHz non-fixed user equipment, such as:
  - 1. Portable radios
  - 2. Mobile radios
  - 3. Control stations
- B. RESPONDENT shall provide unit pricing for all user subscriber equipment and accessories.

### **8.2 General Requirements**

- A. All subscriber equipment is expected to be of high quality and intended to provide high reliability under heavy use in severe environments. Equipment must be FCC type accepted in accordance with FCC Part 90 rules and regulations.
- B. All subscriber equipment shall meet MIL-STD-810 C, D, E, and F.
- C. All subscriber equipment shall be software programmable.
- D. All subscriber equipment shall support the following operating modes:
  - 1. Conventional analog
  - 2. Conventional P25
  - 3. Trunked P25 Phase 1 on-network
  - 4. Trunked P25 Phase 2 on-network
- E. All equipment shall be programmed for proposed and existing legacy radio channels (within the appropriate frequency band).

#### **8.2.1 Portable Radios**

- A. RESPONDENT shall provide pricing for each model of radio capable of operating on the proposed system.



- B. As an OPTION, RESPONDENT shall propose radios certified as intrinsically safe.
- C. RESPONDENT shall provide subscriber units that are highly reliable and intended for mission critical operations. Pricing shall be provided for a minimum of three models:
  - 1. Model 1: Basic model, typically identified with no keypad or display
  - 2. Model 2: Mid model, typically identified with limited keypad and display
  - 3. Model 3: Advanced model, typically identified with full keypad and display
- D. Features:
  - 1. Full compliance with P25 features and operation
  - 2. PTT button
  - 3. Top-mounted on/off volume knob
  - 4. Talkgroup/channel selector
  - 5. Emergency button, protected from inadvertent activation
  - 6. Alphanumeric display (on applicable models), minimum of eight characters
  - 7. Transmit indicator
- E. Battery:
  - 1. RESPONDENT shall provide batteries without cadmium. Pricing shall be provided for the following:
    - a. Nickel-Metal Hydride (NiMH)
    - b. Lithium-ion
  - 2. As an OPTION, RESPONDENT shall propose batteries certified as intrinsically safe.
  - 3. Batteries shall provide a minimum operational use of eight hours based on a 5-5-90 duty cycle.
  - 4. 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
- F. Accessories: RESPONDENT shall provide OPTIONAL pricing for all accessories, including the following at a minimum:
- 1. Encryption
  - 2. Data cables
  - 3. Battery chargers
    - a. Single-bay battery charger
    - b. Multiple-bay battery charger
    - c. Vehicular charger
  - 4. Alternate antennas
  - 5. Remote speaker microphone
  - 6. Remote speaker microphone with antenna
  - 7. Headset
    - a. Wired
    - b. Wireless / Bluetooth
  - 8. Carrying cases / belt clips
- G. RESPONDENT shall provide detailed equipment specifications for all proposed portables and accessories, including the following information:
- 1. Radio dimensions
  - 2. Radio weight with battery
  - 3. Antenna type
  - 4. Frequency channel capacity
  - 5. General features, transmit / receive parameters, and mechanical specs



- H. Multiband portable radios:
1. As an OPTION, RESPONDENT shall provide 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
  2. RESPONDENT shall provide detailed specifications for radios and all accessories.

### **8.2.2 Mobile Radios/Control Stations**

- A. RESPONDENT shall provide pricing for each model of radio capable of operating on the proposed system.
- B. RESPONDENT shall provide pricing for a minimum of three tiers.
- C. Mobile radios shall be supplied complete with microphone, external speaker, cables, fusing, mounting hardware, coaxial cable, antennas and installation services to provide for a complete installation.
- D. Mobile Radios shall interface with on-board radio headset systems on vehicles as applicable.
- E. Control station radios shall be supplied complete with desk microphone, speaker, cables, coaxial cable and antennas to provide for a complete working package.
- F. RESPONDENT shall provide pricing for dash mounted units and remote mounted units.
- G. Features:
  1. Full compliance with P25 features and operation
  2. Front-mounted on/off volume knob
  3. Talkgroup / channel selector
  4. Emergency button, protected from inadvertent activation
  5. Alphanumeric display



6. Transmit indicator
- H. Accessories: RESPONDENT shall provide OPTIONAL pricing for all accessories, including the following at a minimum:
1. Encryption
  2. Cables:
    - a. Data cables
    - b. Extension cables
    - c. Adapters
    - d. Power cables
  3. Antennas
  4. External Speakers
  5. Public address kits
  6. Remote speaker microphones
  7. Desktop microphone (control stations only)
- I. RESPONDENT shall provide detailed equipment specifications for all proposed mobiles and accessories, including the following information:
1. Radio dimensions
  2. Radio weight with battery
  3. Antenna type
  4. Frequency channel capacity
  5. General features, transmit/receive parameters, and mechanical specifications
- J. Multiband mobile radios:
1. As an OPTION, RESPONDENT shall provide 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



2. RESPONDENT shall provide detailed specifications for radios and all accessories.

### **8.2.3 VHF Pagers**

- A. RESPONDENTS shall provide pricing for paging equipment to be operated on the VHF paging/interoperability channel.
- B. Pagers shall be capable of narrowband (12.5 kHz) operation.
- C. Pagers shall be capable of being activated via group or two-tone alert with voice pages.



## 9. Training

### 9.1 *General*

- A. The SELECTED VENDOR shall develop and conduct training programs to allow County personnel to become knowledgeable with the system, subsystems, and individual equipment.
- B. The SELECTED VENDOR shall provide:
  - 1. 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)
      - 2) Mobile Unit Operation (structured as Train-the-Trainer)
      - 3) Dispatch Console Operation
      - 4) Dispatch Console Administrator
- C. Technical/System Management training:
  - 1. The SELECTED VENDOR shall provide complete and comprehensive technical training for County technical staff charged with managing the system. This training shall include, but is not limited to:
    - a. Planning and setting up the system and network
    - b. Building and implementing system and network profiles and configurations
    - c. Performing database management functions
    - d. Monitoring and managing the system's performance
    - e. Writing and printing system reports.
  - 2. System Management training shall include the following categories:
    - a. Network Management System (NMS) Operation and Control
    - b. Fleet mapping and Radio Programming



c. Microwave Network Management

- D. 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. Need for recurring training
  6. Class size
  7. Class cost
- E. All training shall be conducted at a location specified by the County. The SELECTED VENDOR shall coordinate with the County regarding number of attendees and schedule.
- F. Classes shall be scheduled as near to system cutover as possible.
- G. The SELECTED VENDOR shall train the County employees or designated individuals. In some cases, a Train-the-Trainer approach will be used to train other users.
- H. The SELECTED VENDOR shall provide all instructional material, including printed manuals, audio, video, interactive self-paced personal computer programs, and complete equipment 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 County and shall become property of the County.



## 10. Warranty, Maintenance, and Support

### 10.1 Warranty

- A. The proposed communications system shall have a warranty period of not less than three years. **The warranty period shall commence upon Final Acceptance.**
- 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, seven days a week. There shall be no additional charges for work outside of normal 8:00 a.m. to 5:00 p.m. business hours.
  - 2. The service facility shall provide prompt repair service, with service personnel arriving onsite within two hours after a service request by the County and returning the system to service within four hours after a service request by the County.
  - 3. The County shall be provided with written documentation indicating the cause of the service outage, the resolution, and all post repair testing procedures to ensure proper operation. In the event County 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.

### 10.2 Maintenance

- A. The SELECTED VENDOR shall maintain and repair all systems, equipment, hardware and software throughout the implementation / migration and warranty periods. The County reserves the right to have technical staff onsite to witness, and if desired, assist in the maintenance and troubleshooting procedures. This



does not relieve the SELECTED VENDOR from warranty and maintenance responsibility as defined in this RFP.

### **10.2.1 General Requirements:**

- A. Comprehensive maintenance services shall be proposed for each system.
- B. RESPONDENTS shall provide a list of maintenance plans available. Plans should be based on the quantities of equipment included in the proposed system. Plans should have options for years four, five, and six from Final Acceptance. These plans shall include:
  - 1. Subscriber unit repair
  - 2. Fixed equipment onsite service:
    - a. 2-hour response time
    - b. 4-hour response time
    - c. 8-hour response time
    - d. Next day response time
    - e. Full time onsite technician
  - 3. Fixed equipment mail-in board repair:
    - a. Normal response - 7-day
    - b. Emergency response - Next day
  - 4. All fixed equipment maintenance plans shall provide 24-hour system support where users can dial one toll-free number to report problems and/or receive technical support.
  - 5. Additionally, for fixed onsite maintenance, the SELECTED VENDOR's staff will then dispatch the proper technician in the prescribed response time to resolve the problem, if the SELECTED VENDOR is unable to resolve the problem through telephone consultation.

### **10.2.2 Maintenance Standards**

- A. Replacement parts used in repairs shall be equal in quality and ratings as the original parts.



- B. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
- C. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm this has been done at intervals defined by the County.
- D. The SELECTED VENDOR shall provide only factory trained and authorized maintenance personnel.
- E. If fixed equipment or a fixed equipment module fails more than twice during the acceptance test or twice during the first year, the SELECTED VENDOR shall meet with the County to discuss and explain such failures. If, in the opinion of the County, these failures indicate that the equipment is potentially prone to continuing failures, the SELECTED VENDOR shall replace it at no cost to the County.

### **10.3 Parts Availability**

- A. From the date of final acceptance to the seventh anniversary of the date of final 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 acceptance, the SELECTED VENDOR shall send written notice to the County 24 months prior to the date of discontinuance to allow for last-time buys and 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.

### **10.4 Spare Equipment**

- A. RESPONDENT shall propose to the County as an OPTION, recommended spare parts for the system, subsystems, and individual equipment.
- B. The list of spare parts shall include, but is not limited to:
  - 1. Any vendor identified Field Replaceable Units (FRUs)



2. Any infrastructure component, which does not have FRUs that can cause a critical failure if it were to fail. Examples could include Base Station Antennas and other non-modular components.
  3. Power supplies
  4. Test measurement, calibration and repair kits
  5. Diagnostic equipment to support County maintenance activities
  6. Spares for less critical items shall also be enumerated
- C. The list shall include items that will rapidly and completely restore all critical system functionality with the least amount of effort, e.g., board replacement instead of troubleshooting to component level when a critical unit has failed.
- D. The quantities of spares in the list shall be appropriately sized to accommodate equipment quantities in the system.
- E. The list shall define the primary equipment category each spare kit supports, e.g., transceiver board for a repeater, interface board for a console, etc.
- F. The system engineering design documentation shall include a narrative on the RESPONDENT's ability to replace failed units from stock and the process and timing to repair, replace, and return failed units delivered for repair.
- G. System engineering design documentation shall also include the life cycle of equipment, parts, and other maintenance support for the system.

### **10.5 Post-Warranty Maintenance**

- A. OPTION, the RESPONDENT shall propose maintenance services for subsequent years, renewable on an annual basis.
- B. The RESPONDENT shall fully describe the terms and conditions of the maintenance services in the Proposal.
- C. The SELECTED VENDOR shall indicate who the local authorized repair facility will be for post warranty repairs upon completion of the Detailed Design Review process.



## **11. System Implementation, Test, and Acceptance**

### **11.1 General**

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

### **11.2 Cutover Plan**

- A. The SELECTED VENDOR shall be responsible for planning and coordinating the implementation of all equipment, subsystems, and the overall system.
- B. Execution of the cutover plan shall ensure that new systems are brought online with minimum interruption to all existing systems and communications.
- C. During final design, the SELECTED VENDOR shall deliver a preliminary cutover plan describing how the radio system will be phased over into a fully operational system.
  - 1. The SELECTED VENDOR shall successfully complete all tests and training prior to the actual cutover of systems.
  - 2. The SELECTED VENDOR shall provide the necessary labor to cutover from existing systems to the proposed system.
  - 3. 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.
  - 4. The plan shall provide detailed component or subsystem cutover plans, and specifically delineate between systems that affect and do not affect ongoing operations.
  - 5. The County reserves the right to approve and change the cutover plan as it relates to any or all system components.



### **11.3 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 County.
- C. 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 County that the system is ready for shipment and installation.
  - 2. The Staging Acceptance Test Plan, documenting tests to be performed during Staging, shall be approved by the County prior to System Staging.
  - 3. 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 Vendor's expense.
  - 4. The SELECTED VENDOR shall use an approved Staging Acceptance Test Plan (SATP). It is expected that the SATP has been performed and all tests have been successful before the County witnesses the official SATP. The SATP shall be signed and dated by the Vendor and County representatives following completion of all tests. All tests in the SATP shall be marked as either pass, fail, or pass qualify.
  - 5. 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 Vendor.
  - 6. Retest of individual failed SATP tests or the entire plan shall be at the County's discretion.
  - 7. The fully executed, completed and signed SATP document shall be provided to the County.

### **11.4 System Installation**

- A. Installation shall consist of 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 County 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 County and the SELECTED VENDOR. Qualified, adequately trained personnel familiar with this type of work shall perform all installations. Vendors 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 County'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 INSTALLATION CONTRACTOR shall coordinate with others, as appropriate, to confirm that any prep work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.
- E. 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 County or the County's Engineer.
- F. 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.
- G. All equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired.
- H. 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.
- I. Inspection:



1. The County 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. Final acceptance testing shall not commence until all punch list items are resolved.

### **11.5 Fleetmapping**

- A. The SELECTED VENDOR shall develop the actual fleetmap with input and direction from the County. The fleetmap shall contain at a minimum:
  1. Talkgroup ID
  2. Agency
  3. Emergency actions
  4. Encryption capability
  5. Roaming capability
  6. Priority
- B. The SELECTED VENDOR shall also develop subscriber programming templates. 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. Prior to programming subscriber units, a set of radios shall be programmed with each template. The County will test these radios and approve or recommend changes to the templates.
- D. Once the fleetmap and templates are approved and completed, the SELECTED VENDOR shall use these for installation of subscribers and for further configuration of the system. The contractor shall submit these with the final as-built documentation.

### **11.6 Coverage Testing**

- A. RESPONDENT shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the Proposal. The final CATP shall be submitted during the Final Design stage of the project.
- B. CATP:



1. The CATP shall be consistent with the procedures and guidelines outlined in TSB-88C 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 County's discretion.
3. The SELECTED VENDOR shall perform two types of coverage testing:
  - a. Automated objective mobile drive testing
  - b. Non-automated subjective DAQ testing (intelligibility testing)

Automated and intelligibility testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally.

4. 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. Automated Objective Mobile Drive Testing:
    - 1) The SELECTED VENDOR shall test both the signal level and Bit Error Rate (BER), as applicable, at a statistically significant number of test locations throughout the County utilizing automated test equipment such as an STI-9400 or equivalent.
    - 2) Inaccessible grids shall not count as either a pass or fail in the statistical analysis.
  - c. Non-Automated Subjective DAQ Testing:
    - 1) Non-Automated subjective DAQ coverage testing shall be conducted using typical portable radios supplied with the system.
    - 2) Talk-out and talk-in performance shall be documented.
    - 3) The SELECTED VENDOR shall provide a standardized test form for testing.



- d. The SELECTED VENDOR shall coordinate with the County to establish pass/fail criteria as well as correlation between the subjective and objective test results. Coverage tests shall be completed in full foliage.

### **11.7 30-Day Operational Test**

- A. The contractor shall perform a 30 calendar day operational test of the system to ensure that all hardware and software defects have been corrected prior to entering final proof of performance testing. The fully integrated operation of the system, including all individual subsystems, shall be demonstrated during these tests. The tests shall be designed to demonstrate the reliability, long-term stability, and maintainability of the systems. A failure of any component of the system during this test will cause the test to restart after the repair is completed. The SELECTED VENDOR and the County will agree on what constitutes a critical failure prior to commencing this test.
- B. The SELECTED VENDOR shall provide a 30-day operational test plan during the preliminary design phase.

### **11.8 Final 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 County shall be given two weeks written notice that the system is ready for final acceptance testing. The Final Acceptance Test Plan shall test all items described in the detailed design documents.
- B. Final Acceptance Test Plan (FATP):
  1. The SELECTED VENDOR shall use the completed and County approved Final Acceptance Test Plan (FATP). It is expected that the FATP has been performed and all tests have been successful before the County witnesses the official FATP. The FATP shall be signed and dated by the SELECTED VENDOR and County representatives following completion of all tests. All tests in the FATP shall be marked as either pass, fail, or pass qualify.
  2. The SELECTED VENDOR shall provide all necessary technical personnel and test equipment to conduct FATP tests. All deviations, anomalies, and test failures shall be resolved at the Vendor's expense.



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

### ***11.9 As-Built Documentation***

At the completion of the installation phase, the SELECTED VENDOR shall provide complete as-built documentation as outlined below:

- A. Equipment provided
- B. Plan and elevation drawings of all equipment including antennas on towers
- C. Cabling and terminations
- D. Block and level diagrams
- E. Fleet mapping and programming
- F. Setup and alignment information
- G. Successfully completed, signed, and dated acceptance test plans

### ***11.10 System Acceptance***

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

- A. Final Design submittals
- B. Staging Acceptance Test Plan (SATP)
- C. System installation
- D. Final inspection and punch list resolution
- E. As-built documentation



- F. Final Acceptance Test Plan (FATP), including Coverage Acceptance Test Plan (CATP)
- G. 30 day operational test completion
- H. Training



## Glossary of Terms and Acronyms

AC	Alternating Current
agency	Term that applies generically to any local, state, federal entity or organization, such as; a department, division, city/town, or bureau. Includes: government, quasi-government and private groups.
ALI	Automatic Location Identification
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communications Officials International
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
AWG	American Wire Gauge
b	bit
backhaul	The transporting of radio communications traffic between distributed sites (typically access points) and more centralized points of presence.
bandwidth (BW)	The capacity of a channel to carry signals. The amount of spectrum required to transmit a signal without distortion or loss of information.
BER	Bit Error Rate
bit	Binary digit
BR	Bit rate
BTU	British Thermal Unit; a measure of energy equivalent to the amount of energy required to heat one pound of water one degree Fahrenheit
CAI	Common Air Interfaces
CATP	Coverage Acceptance Test Plan



channel	The route through which a message is sent. A connection between initiating and terminating nodes of a circuit. A single path provided by a transmission medium via an electrical separation, such as by frequency or frequency pairs.
communications	Information transfer among or between users. In public safety communications, the ability of public safety agencies to talk across agencies.
connectivity	The complete path between two terminals.
conventional	A radio system with dedicated, single-purpose channels (can be shared between several users with different operational needs; e.g., fire and police). A user must select the specific channel to be used.
coverage	The geographic area included within the range of a wireless radio system.
CSSI	Console Subsystem Interface
DAQ	Delivered Audio Quality
dB	Decibel
DC	Direct Current
digital	Radio transmission method that replaces analog systems and transmits its signal in binary 1's and 0's the same as a computer. One major difference is that digital signals do not degrade gradually the way analog does as the distance between the transmitter and receiver increases.
DTMF	Dual Tone Multi-Frequency
EIA	Electronic Industries Alliance (publisher of standards)
EMI	Electromagnetic Interface
encryption	The reversible transformation of data from the original (plain text) format to a difficult to interpret format as a mechanism for protecting its confidentiality, integrity and sometimes its authenticity. Encryption uses an encryption algorithm and one or more encryption keys.
ERP	Effective Radiated Power



FAA	Federal Aviation Administration
FAT	Factory Acceptance Test
FATP	Factory Acceptance Test Plan
FCC	Federal Communications Commission
first responders	The first professionals called to an incident or emergency that provides immediate support services during prevention, response, and recovery operations.
frequency	The number of cycles or events of a periodic process in a unit of time.
frequency bands	The spectrum of transmission space where mobile radio systems operate in the United States. They are (from low to high):  High HF 25-29.99 MHz  Low VHF 30-50 MHz  High VHF 150-174 MHz  Low UHF 450-470 MHz  UHF TV Sharing 470-512 MHz  700 MHz 764-776 & 794-806 MHz  800 MHz 806-869 MHz  2.4 GHz  4.9 GHz
FRU	Field Replaceable Units
GFI	Ground Fault Interrupt
GUI	Graphical User Interface
HVAC	Heating Ventilation and Air Conditioning
Hz	Hertz (same as cycles per second)
IEEE	Institute of Electrical and Electronic Engineers



infrastructure	Dedicated telecommunications networks; the hardware and software needed to complete and maintain a public safety communications system
interference	Extraneous energy, from natural or man-made sources, that impedes the reception of desired RF signals.
interoperability	The ability of diverse systems and organizations to work together (interoperate). In public safety, the ability of personnel to exchange voice and data communications with staff from other agencies, on demand and in real time.
intranet	A private computer network that uses Internet technologies to share an organization's information or operational systems with its employees in a secure manner.
IP	Internet Protocol
kHz	kilo Hertz (1000 Hertz)
kW	Kilowatts
LAN	Local Area Network
LED	Light emitting diode
LMR	Land Mobile Radio
MHSB	Monitored Hot Standby
MHz	Megahertz (1,000,000 Hz)
modem	An acronym for modulator/demodulator, which is a device that translates digital signals coming from a computer into analog signals that can be transmitted over standard telephone lines. The modem also translates the analog signals back into digital signals that a computer can understand.
MPE	Maximum Permissible Exposure
mutual aid	Generally describes a situation where a major emergency or incident requires a large number of agencies, including agencies from remote locations, working together to mitigate the crisis.



mutual aid channel	A radio channel specifically allocated for use during emergency mutual aid situations.
NAS device	Network attached storage device
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NiMH	Nickel-Metal Hydride
NMS	Network Management System
NMT	Network Management Terminal
NTIA	National Telecommunications and Information Administration (part of Department of Commerce - coordinates use of the federal government frequency spectrum).
OET	Office of Engineering Technology (FCC)
OSHA	Occupational Safety and Health Administration
Project 25 (P25) or APCO-25	A suite of standards for digital radio communications for use by federal, state/province and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in emergencies.
PTT	Push-to-Talk



Public Safety spectrum	Specific bands of frequencies set aside by the FCC for use by public safety agencies. They are:  Low Band (25-50 MHz)  VHF High Band (150-174 MHz)  220 Band (220-222 MHz)  UHF Band (450-470 MHz)  700 Band (764-776 and 794-806 MHz)  800 Band (806-824 and 851-869 MHz)  4.9 GHz Band
QA/QC	Quality Assurance/Quality Control
R56	Motorola Installation Standards and Guidelines for Communication Systems
RAID	Redundant Array of Independent Discs
receiver	The component(s) of a radio device that converts the radio waves into audible signals.
repeater	A special receiver/transmitter combination that receives a signal on one frequency and retransmits a new signal on another frequency, usually within the same frequency band, sometimes referred to as a relay station.
RESPONDENT	Any individual or entity bidding on the right to supply products and services in response to this RFP.
RF	Radio Frequency
RFI	Radio Frequency Interference
RFP	Request For Proposal
RPC	Regional Planning Committee
SATP	Staging Acceptance Test Plan



SELECTED VENDOR	Any individual or entity selected from among all RESPONDENTS to supply products and services in response to this RFP.
SoR	Statement of Requirements
spectrum	The range of electromagnetic radio frequencies that can be decomposed into frequency components, used in the transmission of sound, data and television.
subscriber	User, customer on a network.
subscriber unit	User's equipment (usually a mobile or portable radio).
talkgroup	Radio system users assigned to a specific group of users who regularly communicate with each other.
TCP	Transmission Control Protocol – a component of Internet Protocol (IP)
TDMM	Telecommunications Distribution Methods Manual
TIA	Telecommunications Industry Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
trunked	A radio system with a group of channels available and assigned as needed to specific "groups" or operations. The channels are programmed for automatic system assignment while in-use, and then released for other users. A trunked system maximizes channel utilization.
TSB	Telecommunications System Bulletin
turnkey	Entire system with hardware and software assembled and installed by a vendor and sold as a package.
TVSS	Transient Voltage Surge Suppression
UL	Underwriters Laboratory
VAC	Volts Alternating Current
VDC	Volts Direct Current



VSWR	Voltage Standing Wave Ratio
WBS	Work Breakdown Structure



## Appendix A: Mandatory Submittals

### CONTRACTOR ELIGIBILITY CERTIFICATION

This is to certify that this person/firm/corporation has not been barred from bidding on contracts by any agency of the Commonwealth of Virginia, nor is this person/firm/corporation a part of any firm/corporation that has been barred from bidding on contracts by any agency of the Commonwealth of Virginia.

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Name of Official

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Title

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Firm or Corporation



**Appendix B: Mandatory Proposal Pricing Format**

**Table B.1 – Proposal Pricing Summary Sheet (Total Cost)**

<b>RESPONDENTS Shall complete all forms</b>	
<b>System Components (Table B-2)</b>	<b>Total</b>
System Control Equipment	
Remote Site Equipment	
Dispatch Console Equipment	
Microwave Network	
Spare Equipment	
Other	
<b>Total Infrastructure</b>	
<b>Services –(Table B-3)</b>	<b>Total</b>
Installation	
Project Management	
System Engineering	
System Staging	
Coverage and Acceptance Testing	
Documentation	
Training	
Warranty & Maintenance	
Other	
<b>Total Services</b>	
<b>Infrastructure Development Cost (Table B-4)</b>	
<b>Phase II Upgrade (to 6.25 kHz Bandwidth)</b>	
<b>Total Proposal Cost</b>	



**Table B.2 – Proposal Pricing Sheet (System Components Cost)**

<b>Item</b>	<b>Description</b>	<b>Site Name</b>	<b>Qty</b>	<b>Unit Cost</b>	<b>Extended Cost</b>
	<b>System Control Equipment</b>				
	List all system control equipment; Controllers				
	Software, networking equipment, GPS, servers				
	Simulcast equipment, voting equipment, etc.				
	<b>Remote Site Equipment</b>				
	Base Stations, Antenna Networks, networking				
	Equipment, Software, GPS, etc.				
	<b>Dispatch Console Equipment</b>				
	Workstations, networking equipment,				
	Gooseneck Microphones, Logging Recorder,				
	software, etc.				
	<b>Microwave Network</b>				
	Microwave radios, multiplexing equipment,				
	dishes, etc.				



Item	Description	Site Name	Qty	Unit Cost	Extended Cost
	<b>Spare Equipment</b>				
	Suggest spares for system repairs				

**Table B.3 – Proposal Pricing Sheet (Services Cost)**

Item	Description	Site Name	Qty	Unit Cost	Extended Cost
	<b>Installation</b>				
	<b>Project Management</b>				



Item	Description	Site Name	Qty	Unit Cost	Extended Cost
	<b>System Engineering</b>				
	<b>System Staging</b>				
	<b>Coverage and Acceptance Testing</b>				
	<b>Documentation</b>				



Item	Description	Site Name	Qty	Unit Cost	Extended Cost
	<b>Training</b>				
	<b>Warranty and Maintenance (3 year Warranty)</b>				
	<b>Other</b>				



**Table B.4 – Proposal Pricing Sheet (Infrastructure Development)**

<b>Item</b>	<b>Description</b>	<b>Site Name</b>	<b>Qty</b>	<b>Unit Cost</b>	<b>Extended Cost</b>
	<b>Towers</b>				
	<b>Shelters</b>				
	<b>Generator, Propane Tanks &amp; ATS</b>				
	<b>PM, Engineering &amp; Installation cost</b>				
<b>Infrastructure Development Total Cost</b>					



**Table B.5 – Proposal Pricing Sheet (Subscriber Cost)**

Item	Description	Option	Qty	Unit Cost	Extended Cost
	<b>Portables (Limited Keypad &amp; Display)</b>				
	<b>Mobiles (Remote Mount)</b>				
	<b>Mobile Installs</b>				



Item	Description	Option	Qty	Unit Cost	Extended Cost
	<b>Control Station</b>				

**Table B.6 – Proposal Pricing Sheet (Subscriber Options Cost)**

Item	Description	Option	Qty	Unit Cost	Extended Cost
	<b>Portables</b>				
	<b>Low Tier</b>				
	<b>Mid Tier</b>				
	<b>High Tier</b>				
	<b>Software Options(operating modes)</b>				



Item	Description	Option	Qty	Unit Cost	Extended Cost
	<b>Battery Options</b>				
	<b>Accessories</b>				
	<b>Multiband Portable</b>				
	<b>Mobiles</b>				
	Low Tier Remote Mount				
	Low Tier Dash Mount				
	Mid Tier Remote Mount				
	Mid Tier Dash Mount				
	High Tier Remote Mount				
	High Tier Dash Mount				
	<b>Software Options(operating modes)</b>				
	<b>Accessories</b>				



Item	Description	Option	Qty	Unit Cost	Extended Cost
	<b>Multiband Mobile</b>				
	<b>VHF Pagers</b>				
	<b>Pager Accessories</b>				



**Table B.7 – Pricing Sheet (Post-Warranty Options Cost)**

Item	Description	Qty	Unit Cost	Extended Cost
	<b>Post-Warranty Maintenance (List each service separately)</b>			
	<b>Phase II Upgrade</b>			



**Appendix C: Point-by-Point Compliance**

<b>RFP Section</b>	<b>Description</b>	<b>Respondent's Statement of Compliance</b>	<b>Respondent's Clarifications and Comments</b>
<b>1</b>	<b>PROJECT OVERVIEW</b>		
<b>1.1</b>	<b>Introduction</b>		
<b>1.2</b>	<b>Overview of this Document</b>		
<b>1.3</b>	<b>Project Summary</b>		
<b>1.4</b>	<b>Proposals Desired</b>		
<b>1.5</b>	<b>Quality Assurance and Coordination</b>		
<b>1.5.1</b>	<b>Standards and Guidelines</b>		
<b>1.5.2</b>	<b>Frequency Coordination and Licensing</b>		
<b>1.5.3</b>	<b>Federal Aviation Administration</b>		
<b>1.5.4</b>	<b>Project Management</b>		
<b>1.5.5</b>	<b>QA/QC Program</b>		
<b>1.6</b>	<b>Project Submittals</b>		
<b>1.6.1</b>	<b>General Requirements</b>		
<b>1.6.2</b>	<b>Proposal</b>		
<b>1.6.3</b>	<b>Preliminary Design</b>		
<b>1.6.4</b>	<b>Final Design</b>		
<b>2</b>	<b>INSTRUCTIONS TO PROPOSER</b>		
<b>2.1</b>	<b>Overview</b>		
<b>2.2</b>	<b>Mandatory Pre-Proposal Conference</b>		
<b>2.3</b>	<b>Proposal Format</b>		
<b>2.4</b>	<b>Evaluation</b>		
<b>2.5</b>	<b>Addenda to RFP</b>		
<b>2.6</b>	<b>Award of Contract</b>		



<b>RFP Section</b>	<b>Description</b>	<b>Respondent's Statement of Compliance</b>	<b>Respondent's Clarifications and Comments</b>
<b>3</b>	<b>RADIO COMMUNICATIONS SYSTEM REQUIREMENTS</b>		
<b>3.1</b>	<b>Project 25 Radio Communications Network Requirements</b>		
<b>3.1.1</b>	<b>Redundancy and Survivability</b>		
<b>3.1.2</b>	<b>Coverage</b>		
<b>3.1.3</b>	<b>Site Locations</b>		
<b>3.1.4</b>	<b>Site Equipment</b>		
<b>3.2</b>	<b>System Options</b>		
<b>3.3</b>	<b>Option 1, 700 MHz P25 Phase 2 System</b>		
<b>3.3.1</b>	<b>Spectrum</b>		
<b>3.3.2</b>	<b>Project 25 Phase 2</b>		
<b>3.4</b>	<b>Option 2, UHF P25 system</b>		
<b>3.5</b>	<b>VHF Paging and Interoperability Network</b>		
<b>3.5.1</b>	<b>Spectrum</b>		
<b>3.5.2</b>	<b>Site Locations</b>		
<b>3.6</b>	<b>Coverage Maps</b>		
<b>4</b>	<b>BACKHAUL NETWORK</b>		
<b>4.1</b>	<b>Digital Microwave Network</b>		
<b>5</b>	<b>DISPATCH CONSOLE</b>		
<b>5.1</b>	<b>General Requirements and Features</b>		
<b>5.2</b>	<b>Trunked Requirements</b>		
<b>5.3</b>	<b>Conventional Requirements</b>		
<b>5.4</b>	<b>Paging Requirements</b>		
<b>5.5</b>	<b>Logging Recorder</b>		
<b>5.6</b>	<b>Operator Position Equipment</b>		
<b>5.7</b>	<b>Common Electronics Equipment</b>		



<b>RFP Section</b>	<b>Description</b>	<b>Respondent's Statement of Compliance</b>	<b>Respondent's Clarifications and Comments</b>
<b>6</b>	<b>INFRASTRUCTURE DEVELOPMENT</b>		
<b>6.1</b>	<b>General Requirements</b>		
<b>6.2</b>	<b>Communications Towers</b>		
<b>6.3</b>	<b>Shelters</b>		
<b>6.4</b>	<b>Generator and Automatic Transfer Switch</b>		
<b>6.4.1</b>	<b>Propane Generator</b>		
<b>6.4.2</b>	<b>Automatic Transfer Switch</b>		
<b>6.4.3</b>	<b>Propane Fuel System</b>		
<b>6.5</b>	<b>Site Power</b>		
<b>6.5.1</b>	<b>Uninterruptable Power Supply (UPS)</b>		
<b>6.5.2</b>	<b>DC Power</b>		
<b>7</b>	<b>NETWORK MANAGEMENT SYSTEM</b>		
<b>7.1</b>	<b>General</b>		
<b>7.2</b>	<b>Network Management Terminals</b>		
<b>8</b>	<b>SUBSCRIBER EQUIPMENT</b>		
<b>8.1</b>	<b>Overview</b>		
<b>8.2</b>	<b>General Requirements</b>		
<b>8.2.1</b>	<b>Portable Radios</b>		
<b>8.2.2</b>	<b>Mobile Radios/Control Stations</b>		
<b>8.2.3</b>	<b>VHF Pagers</b>		
<b>9</b>	<b>TRAINING</b>		
<b>9.1</b>	<b>General</b>		
<b>10</b>	<b>WARRANTY, MAINTENANCE AND SUPPORT</b>		
<b>10.1</b>	<b>Warranty</b>		
<b>10.2</b>	<b>Maintenance</b>		
<b>10.2.1</b>	<b>General Requirements</b>		



<b>RFP Section</b>	<b>Description</b>	<b>Respondent's Statement of Compliance</b>	<b>Respondent's Clarifications and Comments</b>
10.2.2	Maintenance Standards		
10.3	Parts Availability		
10.4	Spare Equipment		
10.5	Post-Warranty Maintenance		
<b>11</b>	<b>SYSTEM IMPLEMENTATION, TEST AND ACCEPTANCE</b>		
11.1	General		
11.2	Cutover Plan		
11.3	Staging		
11.4	System Installation		
11.5	Fleet Mapping		
11.6	Coverage Testing		
11.7	30 Day Operational Test		
11.8	Final Acceptance Testing		
11.9	As-Built Documentation		
11.10	System Acceptance		
<b>12</b>	<b>TERMS AND CONDITIONS</b>		
Appendix A	Mandatory Submittals		
Appendix B	Mandatory Pricing		



## Appendix D: Site List

Table D.1 – Site List

Owner	Site Name	Location	Type	FCC #	Latitude	Longitude	AGL	G.E.
American Tower - Spectrasite	Antioch Fork	Rt. 301 West & South of Rt. 628	Guyed	1016470	38°00'43.1"	77°20'20.3"	300'	204'
VA Electric & Power Co.	Ladysmith VEPCO A	2 miles W of Rt. 1 on SR 604	Guyed	1016983	38°02'51.0"	77°33'04.0"	330'	280'
American Tower - Spectrasite	Cedon - Summer Brook Farm	SR 633-Summer Brook Farm (SR 632 & I95)	Guyed	1016472	38°04'50.2"	77°30'41.1"	335'	241'
Caroline County	Sheriff's Office (911 Dispatch)	Behind Sheriff's Office complex, Bowling Green	SS	N/A	38°03'01.6"	77°20'47.4"	160'	223'
Crown Castle (Global Signal)	Center Drive	17473 Center Drive, Ladysmith, VA	SS	1041254	38°01'13"	77°30'39.1"	250'	241'
Crown Castle	Port Royal	7458 Edmont Rd, Port Royal – Rt. 301 SW of Rt. 17	Guyed	1024279	38°09'24.7"	77°12'35.8"	285'	169'
Crown Castle	Golansville	22090 Jefferson Davis Highway, Ruther Glen	Guyed	1009063	37°57'40.1"	77°30'17.7"	286'	218'
American Tower	Boulwares	Boulwares & Rt. 207, off Rt. 704, Ruther Glen	Mono	1226951	37°59'33.1"	77°25'15.8"	200'	232'
Crown Castle (Global Signal)	Frog Level	17503 Frog Level Road, Ruther Glen	SS	1208755	37°51'28.5"	77°20'17.7"	250'	197'
Crown (Pinnacle Tower)	Clinger	25031 Ruther Glen Road	SS	1044194	37°55'31.4"	77°26'59.4"	250'	230'
Telecom Consulting Group	TCG - Bowing Green	Rt. 619 & 301, Bowling Green	Guyed	1221777	38°03'02.4"	77°20'38.8"	140'	211'
American Tower	Ruthers Glen B	11455 Railroad Lane, Ruthers Glen	Guyed	1008442	37°55'42.1"	77°27'18.5"	300'	214'
Fire Department	Fire Dept	Behind FD Bowling Green	Guyed	N/A	38°01'01.6"	77°22'19.0"	210'	120'
Alliance Fertilizer Corp.	Alliance Fertilizer	Rt. 722 (15500)	Guyed	N/A	38°01'15.0"	77°22'18.6"	140'	120'
American Tower	Pepmeier Hill (Corbin)	16341 Pepmeier Hill Road	SS	1023977	38°12'43.7"	77°21'24.8"	312'	216'
Crown Castle	Crown - 22092 Jeff Davis	22092 Jefferson Davis Hwy, Ruther Glen	SS	N/A	37°57'41.1"	77°30'13.8"	200'	220'
Crown (Pinnacle Tower )	Stephen's Mill	21764 Coolwater Drive, Ruther Glen	SS	1041253	37°57'34.9"	77°28'54.7"	250'	194'
Crown Castle	Crown - Mt. Gideon	Rt. 651 / 32412 Mt. Gideon Road, Hanover	SS	1016607	37°48'52.2"	77°22'16.1"	285'	194'
Crown Castle	Crown- 26389 Jeff Davis	26389 Jefferson Davis Hwy, Ruther Glen	SS	1007852	37°54'00.0"	77°27'57"	280'	183'
American Tower	Amer.-Bowling Green	Rt. 631 off Rt. 2, Bowling Green	SS	1016912	38°04'36.4"	77°21'59.9"	225'	222'
Crown (Pinnacle Tower)	Woodford	13362 Nancy Wrights Drive, Woodford	SS	1041252	38°04'07.7"	77°30'20.1"	250'	227'
DukeNet Comm. Svs. (AAA)	Dry Bridge	14100 Dry Bridge Rd., McBryant Corner	SS	N/A	37°55'53.0"	77°24'26.2"	110'	260'
Crown Castle	Cadawood	15093 Cadawood Drive, Bowling Green	SS	1016776	38°03'12.0"	77°22'07"	285'	172'



Owner	Site Name	Location	Type	FCC #	Latitude	Longitude	AGL	G.E.
Crown Castle	Crown - 26145 Jeff Davis	26145 Jefferson Davis Hwy, Ruther Glen	SS	1059024	37° 54' 22.2"	77° 28' 17.3"	200'	192'
Crown Castle	Beland Texaco	8415 Ladysmith Rd, Ruther Glen - Exit 110 off I-95	SS	N/A	38° 01' 14.6"	77° 29' 53.2"	190'	240'
Crown Castle	Nancy Wright	5721 Jefferson Davis Hwy, US Rt. 1 & SR 603	Guyed	1016787	38° 06' 00.3"	77° 31' 09.2"	285'	257'
Rapp. Comm. Group	WWUZ 96.9FM	Rt. 601, Penola, VA	Guyed	1057531	37 57' 56.0"	77 22' 18.0"	497'	145'
Crown Castle (Global Signal)	Cedar Fork (Golansville)	7177 Ladysmith Road, Golansville, VA	SS	1208507	37 58' 05.4"	77 32' 31.2"	250'	244'
VZW - CANCELLED	Beaverdam - Lewis	22371 Horseshoe Bend Road, Ruther Glen	SS	Cancelled	37 57' 7.31"	77 36' 48.6"	300'	194'
Rapp. Electric Cooperative	Rapp. Electric	Rt. 2, Bowling Green	SS	1209237	38 03' 48.4"	77 21' 18.9"	190'	215'
National Comm. Towers	Doggett's Fork	17009 Dry Bridge Road, Ruther Glen	SS	1244387	37 54' 25.7"	77 21' 35.3"	195'	218'
Crown (Global Signal)	AP Hill - RT 301	21425 AP Hill Boulevard, Bowling Green	SS	1228656	38 06' 09.6"	77 16' 18.6"	250'	200'
Crown (Global Signal)	AP Hill - RT 2 West	8080 Fredericksburg TNPK, Bowling Green -FT AP Hill Rt. 2	SS	1228659	38 09' 15.3"	77 23' 22.2"	250'	214'
Crown (Global Signal)	AP Hill - RT 17 North	21800 Tidewater Trail, Port Royal - Route 17 AP Hill	SS	1228658	38 10' 52.0"	77 16' 40.8"	250'	189'
Dominion VA Power	Power Line - RT 17 North	RT 17 North	SS	N/A	38 14' 19.6"	77 21' 52.1"	150'	120'
National Comm. Towers	Fairgrounds	14339 Concord Road, Doswell 23047	Mono	1257092	37 51' 35.2"	77 23' 47.9"	195'	206'
VZW-NOT CONSTRUCTED	Sparta	23707 Maracossic Dr. (SR 640), Bowling Green	SS		37 59' 36.9"	77 14' 16.7"	250'	104'
Rappahannock Electric Coop.	Dawn	31081 Old Dawn Road, Hanover	SS	1265722	37 50' 13.2"	77 21' 45.4"	250'	207'
* PREVIOUS TOWER OWNER SHOWN IN PARENTHESIS								
* EXISTING COUNTY RADIO SITES ARE HIGHLIGHTED IN BLUE								
VDOT	95 Rest Area	I-95 N, North	Tank	N/A	37°58'48.6"	77°29'31.5"	100'	270'
Caroline County	Butler Tank	Chase & Butler, Bowling Green	Tank	N/A	38°03'01.2"	77°20'42.4"	150'	230'
Caroline County	High School Tank	Caroline County High School, Rt. 207 & 676	Tank	N/A	38°00'02.7"	77°24'48.9"	170'	260'
Caroline County	Exit 104 Truck Stop	Rt. 207 & I-95, behind Truck Stop	Tank	N/A	37°56'26.0"	77°28'09.9"	120'	250'
Caroline County	VDOT Water Tank	Rt. 2N, Bowling Green	Tank	N/A	38°04'46.2"	77°21'45.4"	150'	230'
VA State Police	VSP Stars	Next to CAR-105 Water Tank	SS	1247811	38 04' 47.8"	77 21' 50.0"	300'	216'



## Appendix E: DAQ Values

Table E.1 – DAQ Values

<b>DAQ</b>	<b>SUBJECTIVE PERFORMANCE DESCRIPTION</b>
<b>1</b>	<b>Unusable, Speech Present, but unreadable</b>
<b>2</b>	<b>Understandable with considerable effort. Frequent repetition due to noise/distortion</b>
<b>3</b>	<b>Speech understandable with slight effort. Occasional repetition required due to noise/distortion</b>
<b>3.4</b>	<b>Speech understandable with repetition only rarely required. Some noise/distortion</b>
<b>4</b>	<b>Speech easily understood. Occasional noise/distortion</b>
<b>4.5</b>	<b>Speech easily understood. Infrequent noise/distortion</b>
<b>5</b>	<b>Speech easily understood.</b>



**Appendix F: Critical Infrastructure Locations**

Name	Address
Caroline High School	19155 Rodgers Clark Blvd., Milford, VA 22514
Caroline Middle School	13325 Devils Three Jump Rd., Milford, VA 22514
Bowling Green Primary School	17176 Richmond Turnpike, Milford, VA 22514
Bowling Green Elementary School	16261 Richmond Turnpike, Bowling Green, VA 22427
Madison Elementary	9075 Chance Place, Ruther Glen, VA 22546
Lewis and Clark Elementary	18101 Clark & York Blvd., Ruther Glen, VA 22546
Caroline Diversified Learning Center	7278 Ladysmith Rd., Ruther Glen, VA 22546
Caroline School Board Office	16221 Richmond Turnpike, Bowling Green, VA 22427
Caroline Sheriff's Office	118 Courthouse Rd., Bowling Green, VA 22427
Caroline Courthouse	112 Courthouse Lane, Bowling Green, VA 22427
Caroline Courthouse Annex	111 Ennis St., Bowling Green, VA 22427
Caroline Community Services Center	17202 Richmond Turnpike, Bowling Green, VA 22427
Caroline Wastewater Treatment Plant - Upper Polecat Creek	22101 Rogers Clark Blvd., Ruther Glen, VA 22546
Caroline Public Utilities	233 W Broaddus Ave. Bowling Green, VA 22427
Caroline Planning and Community Development	233 W Broaddus Ave., Bowling Green, VA 22427
Bowling Green Rescue Squad	132 Courthouse Lane, Bowling Green, VA 22427
Bowling Green Fire Department	130 Courthouse Lane, Bowling Green, VA 22427



Name	Address
Ladysmith Rescue Squad	18287 Jefferson Davis Hwy., Ladysmith, VA 22501
Ladysmith Fire Department	17410 Jefferson Davis Hwy., Ladysmith, VA 22501
Port Royal Fire Department	435 King Street, Port Royal, VA 22535
Sparta Fire Department	23280 Sparta Rd., Milford, VA 22514
Frog Level Rescue Squad	29415 Richmond Turnpike, Ruther Glen, VA 22546
Frog Level Fire Department	30240 Richmond Turnpike Ruther Glen, VA 22546
Upper Caroline Fire Department	12563 Stonewall Jackson Rd., Woodford, VA 22580
Meadow Event Park Complex (all buildings on complex)	13111 Dawn Blvd., Doswell, VA 23047
The Carmel School	9020 Jericho Rd., Ruther Glen ,VA 22546
Caroline County Bus Garage / Transportation	13487 Devils Three Jump Rd., Milford, VA 22514
Caroline County Govt. Administration Building	212 North Main St., Bowling Green, VA 22427
Caroline County Animal Shelter	14080 Devils Three Jump Rd., Milford, VA 22514
Dawn Library	16315-C Dawn Blvd., Hanover, VA 23069
Ladysmith Library	7199 Clara Smith Dr., Ruther Glen, VA 22546
Remuda Ranch	20500 Easter Seal Dr., Milford, VA 22514
Bowling Green Nursing Home	120 Anderson Ave., Bowling Green, VA 22427
Caroline Visitors Center	23724 Rogers Clark Blvd., Ruther Glen, VA 22546
Peumansend Creek Regional Jail	11093 S W Lewis Memorial Dr., Bowling Green, VA 22427
Virginia Corrections Camp #2	31275 Camp Rd., Hanover, VA 23069



## **Appendix G: Regional Interoperability**

Caroline County desires public safety interoperability with the following mutual aid localities and regional channels:

- Essex County - VHF
- Hanover County 800 P25 trunking
- King and Queen County - UHF P25 conventional
- King George County VHF
- King William County - VHF (RFP for 700/800 has been released)
- Spotsylvania County -800 MHz EDACS
- Virginia EMS Statewide – 155.205 MHz
- Virginia Fire Statewide – 154.295 MHz
- Hospital HEAR – 155.340 MHz
- NWS Wakefield Weather – 162.475 MHz
- STARS – Virginia Statewide Agencies Radio System – VHF P25 trunking



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## Appendix H: General Terms and Conditions

### CAROLINE COUNTY GENERAL TERMS AND CONDITIONS

#### 1. General Provisions

These General Terms and Conditions are attached to and a part of that certain Caroline County, Virginia, Request for Proposals, Project 25, Radio Communications System and will be made a part of any purchase contract or agreement resulting from such RFP for the goods and services described therein (the "Agreement"). In the event of any conflict between any provision of these General Terms and Conditions and the Agreement, the Agreement shall take precedence and control. Nothing in the Agreement or any document executed in connection therewith shall be construed as authority for either party to make commitments which will bind the other party beyond the scope of service contained therein. Unless defined herein, capitalized terms shall have the meaning defined and used in the Agreement. Contractor shall refer to all parties to the Agreement other than the County.

#### 2. Laws of the Commonwealth

- A. The Agreement shall be governed in all respects whether as to validity, construction, performance, or otherwise by the laws of the Commonwealth of Virginia. The Contractor providing goods or services to the County under this Agreement represents and warrants to the County that it is:
1. Conforming to the provisions of the Civil Rights Act of 1964, as amended, the Virginia Fair Employment Contracting Act of 1975, as amended, and the Virginia Human Rights Act, as amended, where applicable;
  2. Not employing illegal alien workers or otherwise violating the provisions of the Immigration Reform and Control Act of 1986;
  3. Complying with federal, state and local laws and regulations applicable to the performance of the services procured; and
  4. In full compliance with the Virginia Conflict of Interest Act.
- B. In every contract of over \$10,000, the Contractor agrees during the performance of the Agreement that:
1. the Contractor (1) will not discriminate against any employee or applicant for employment because of race, religion, color, sex, disability, or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of



the Contractor, (2) will post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause, and (3) will state that the Contractor is an equal opportunity employer in all solicitations or advertisements for employees placed by or on behalf of the Contractor under this Agreement. All notices, advertisements, and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section;

2. the Contractor will include the provisions of the foregoing subparagraph 2.(B)(1) in every subcontract or purchase order under the Agreement of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor; and

- C. In every contract of over \$10,000, the Contractor agrees during the performance of the Agreement that:

the Contractor shall A) provide a drug-free workplace for its employees; B) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in its workplace and specify the actions which will be taken against any employee for a violation; C) state in all of its solicitations or advertisements for employees that it maintains a drug-free workplace; and D) include the provisions of this sub-paragraph in every subcontract or purchase order of over \$10,000, so that said provisions shall be binding upon each subcontractor or vendor.

For purposes of this sub-paragraph, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a the Contractor in accordance with the provisions of the Virginia Public Procurement Act, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the Agreement.

- D. In addition to the provisions contained in sub-paragraph C pertaining to drug-free workplaces, the Contractor shall comply with the federal Drug Free Workplace Act.
- E. Pursuant to Section 2.2-4343.1 of the Code of Virginia of 1950, in all invitations to bid, requests for proposals, contracts, and purchase orders, the County does not discriminate against faith-based organizations.

"Faith-based Organization" means a religious organization that is or applies to be a contractor to provide goods or services for programs funded by the block grant



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provided pursuant to the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, P.L. 104-193.

### **3. Certifications.**

The Contractor certifies that:

1. Its bid or offer (1) was made without prior participation, understanding, agreement, or connection with any corporation, firm or person submitting a bid/offer for the same materials, supplies, equipment, or services with respect to the allocation of the business afforded by or resulting from this Agreement, (2) was in all respects fair and without collusion or fraud, and (3) was and or is intended to be competitive and free from any collusion with any person, firm or corporation;
2. the Contractor has not offered or received any kickback from any other bidder or the Contractor, supplier, manufacturer, or subcontractor in connection with the bid/offer that resulted in this Agreement. A kickback is defined as an inducement for the award of a contract, subcontracts or order, in the form of any payment, loan, subscription, advance, deposit of money, services or anything, present or promised, unless consideration of substantially equal or greater value is exchanged. Further, no person shall demand or receive any payment, loan, subscription, advance, and deposit of money, services or anything of value in return for an agreement not to compete on a public contract;
3. the Contractor is not a party to nor has it participated in nor is obligated or otherwise bound by agreement, arrangement or other understanding with any person, firm or corporation relating to the exchange of information concerning bids, prices, terms or condition upon which this Agreement is to be performed;
4. the Contractor understands that collusive bidding is a violation of the Virginia Governmental Frauds Act and federal Law, and can result in fines, prison sentences, and civil damage awards and agrees to abide by all conditions of this proposal; and
5. the Contractor has not and will not confer on any public employee having official responsibility for a procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value is exchanged.

### **4. Warranties**

The Contractor represents and warrants that it has the requisite experience, skills, capabilities and manpower to perform the Services as provided for in the Contract Documents in



a good and workmanlike fashion, that it is a corporation chartered or authorized to do business in Virginia having all necessary licenses required by law, that the person signing the Agreement has been fully authorized to do so, and his signature will legally bind the Contractor to the Agreement. Any goods or services furnished by the Contractor under the Agreement shall be new and covered by the most favorable warranties provided by the Contractor to any customer; the rights and remedies hereby provided are in addition to any and do not limit those otherwise available to the County. The Contractor agrees that if such warranties are in any respect breached, the Contractor will pay to the County the full contract price agreed to by the County to be paid for the supplies, materials, equipment or services furnished under the bid or proposal.

#### **5. Modifications, Additions or Changes**

Modifications, additions or changes to these terms and conditions may not be made except in writing and agreed to by the County; however, no fixed priced contract may be increased by more than twenty-five (25) percent of the amount of the agreement or \$50,000, whichever is greater, without the express approval of the Caroline County Board of Supervisors. The amount of this Agreement may not be increased for any purpose without adequate consideration provided to the County.

#### **6. Hold Harmless**

The Contractor and all its subcontractors shall bear all loss, expense (including reasonable attorney's fees) and damage in connection with, and shall indemnify the County, its Board of Supervisors members, officers, employees and agents against and save them harmless from all claims, demands, and judgments made or recovered against them because of bodily injuries, including death at any time resulting there from, and/or because of damage to property, from any cause whatsoever, arising out of, incidental to, or in connection with the Services, whether or not due to any act of his or their employees, servants or agents and whether or not due to any act of omission or commission including negligence, except sole negligence, of Caroline County, its Board of Supervisors members, officers, employees, and/or agents. Compliance by the Contractor with the insurance provisions hereof shall not relieve the Contractor from liability under this provision.

#### **7. Assignment**

The Agreement may not be assigned, sublet, or transferred without the written consent of the County.



**8. Default**

In the case of default or breach by the Contractor or the failure of the Contractor to perform the Services in conformance with the specifications in the Agreement, the County shall give written notice to the Contractor specifying the manner in which the Agreement has been breached. If the County gives such notice of breach and the Contractor has not corrected the breach within seven (7) days of receipt of the written notice, the County shall have the right to immediately rescind, revoke or terminate the Agreement and in addition to any other remedies available at law to procure such services from other sources and hold the Contractor responsible for any and all excess cost occasioned thereby.

**9. Audit**

The Contractor hereby agrees to retain all books, records, and other documents relative to this Agreement for five (5) years after final payment or after all other pending matters are closed, whichever is longer. The County and its authorized agents, state auditors, the grantor of the funds to the County, the Comptroller of Virginia or of the United States, or any of their duly authorized representatives shall have access to any books, documents, papers and records of the Contractor which are directly pertinent to the Agreement for the purpose of making audits, examinations, excerpts or transcriptions.

**10. Ownership of Documents**

Any reports, studies, photographs, negatives, or other documents prepared by the Contractor in the performance of its obligations under this Agreement shall be remitted to the County by the Contractor upon completion, termination or cancellation of this Agreement. The Contractor shall not use, willingly allow or cause to have such materials used for any purpose other than performance of the Contractor' obligations under this Agreement without the prior written consent of the County. The County shall own the intellectual property rights to all materials produced under this Agreement.

**11. Payment and Performance Bond**

If required by law, the Contractor shall furnish to the County performance and payment bonds in the amount of the Contract Sum, regardless of its amount, pursuant to Sections 2.2-4336 and 2.2-4337 of the *Code of Virginia*, 1950, as amended (the "Code") and shall otherwise fully comply with the requirements of such sections of the Code.

**12. Required Payment**

Pursuant to Section 2.2-4354 of the Code, the Contractor covenants and agrees to:

- a. within seven (7) days after receipt of any amounts paid to the Contractor under the Agreement, (i) pay any subcontractor for its proportionate share of the total payment received from the County attributable to the Services under the



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Agreement performed by such subcontractor, or (ii) notify the County and the subcontractor, in writing, of its intention to withhold all or a part of the subcontractor's payment and the reason therefor;

- b. provide its federal employer identification number or social security number, as applicable, before any payment is made to the Contractor under the Agreement; and
- c. pay interest at the legal rate or such other rate as may be agreed to in writing by the subcontractor and the Contractor on all amounts owed by the Contractor that remain unpaid after seven (7) days following receipt by the Contractor of payment from the County for Services performed by the subcontractor under the Agreement, except for amounts withheld pursuant to subparagraph 12a. above.
- d. include in its contracts with any and all subcontractors the requirements of a, b, and, c above.

**13. Liability Coverage.**

The Contractor shall take out and maintain during the life of the Agreement such bodily injury, liability and property damage liability insurance as shall protect it and the County from claims for damages for personal injury, including death, as well as from claims for property damage, which may arise from its activities under this Agreement. Such insurance shall at least have the coverages and be in the amounts set forth in Section 16 "Insurance and Bond Requirements" set forth below and shall name Caroline County and the Caroline County Board of Supervisors as Additional Insureds. Such insurance must be issued by a company admitted within the Commonwealth of Virginia and with at least a Best's Key Rating of A:V1. the Contractor shall provide the County with a certificate of insurance showing such insurance to be in force and providing that the insurer shall give the County at least 30 days' notice prior to cancellation or other termination of such insurance.

**14. Loss or Damage in Transit.**

Delivery by the Contractor to a common carrier does not constitute delivery to County. Any claim for loss or damage incurred during delivery shall be between the Contractor and the carrier. The County accepts title only when goods are received regardless of the F.O.B. point. The County will note all apparent damages in transit on the freight bill and notify the Contractor. Discovery of concealed damages or loss will be reported by the County to the carrier and the Contractor within seven days of receipt and prior to removal from the point of delivery if possible. the Contractor shall make immediate replacement of the damaged or lost merchandise or be in default of the Agreement. It shall be the Contractor' responsibility to file a claim against the carrier. If damage is to a small quantity, with the approval of the County, the Contractor may deduct the amount of damage or loss from his or her invoice to the County in lieu of replacement.



**15. Termination for Default.**

In case of default by the Contractor for failure to deliver or perform in accordance with the Agreement's specifications or terms and conditions, the County may procure the articles or services from other sources and hold the defaulting the Contractor responsible for any resulting additional purchase and administrative costs. The County will normally repurchase from the next low bidder or purchase competitively by resolicitation. If the repurchase results in increased costs to the County, a letter will be sent to the defaulted the Contractor requiring payment for additional costs. When repayment is requested, the Contractor will be removed from future bidding until the repayment has occurred. the Contractor shall not be liable for any excess cost if the failure to perform arises out of any act of war, order of legal authority, strikes, act of God, or other unavoidable causes not attributed to their fault or negligence. Failure of a Contractor' source to deliver is generally not considered to be an unavoidable cause. The burden of proof rests with the Contractor.

**16. Insurance and Bond Requirements**

The Contractor shall maintain the following insurance to protect it from claims under the Workmen's Compensation Act, and from any other claims for personal injury, including death, and for damage to property that may arise from operations under this Agreement, whether such operations be by itself or by any subcontractor, or anyone directly or indirectly employed by either of them.

<b><u>TYPE OF COVERAGE</u></b>	<b><u>LIMITS</u></b>
Workers' Compensation and Employer's Liability including coverage under United States Longshoremen's and Harbor Worker's Act where applicable	Statutory, including Employer's Liability of \$100,000.00 Each Accident \$500,000.00 Disease-Policy Limit \$100,000.00 Disease-Each Employee
Comprehensive General Liability endorsement coverages.	Including the Broad Form C.G.L.
Premises – Operations Bodily Injury Liability and Property Damage Liability Combined	\$500,000 Each Occurrence \$1,000,000 Aggregate
Including: Underground Hazard (U) Explosion and Collapse Hazard (XC)	



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Independent Contractors – Owner’s Protective Bodily Injury Liability and Property Damage Liability Combined	\$500,000 Each Occurrence \$1,000,000 Aggregate
Completed Operations - Products Liability Bodily Injury Liability and Property Damage Liability Combined for five (5) years after payment	\$500,000 Each Occurrence \$1,000,000 Aggregate
Contractual Bodily Injury Liability and Property Damage Liability Combined in accordance with Agreement between Owner and Contractor	\$500,000 Each Occurrence \$1,000,000 Aggregate
Personal Injury with Employee’s Exclusion C deleted	\$1,000,000 Aggregate
Automobile Bodily Injury Liability and Property Damage Liability Combined covering all automobiles, trucks, tractors, trailers, or other automobile equipment, whether owned, non-owned, or hired by the Contractor	\$500,000 Per Accident
Umbrella/Excess Liability	\$1,000,000 Each Occurrence \$1,000,000 Aggregate
Professional Liability Insurance	\$1,000,000 Limit of Liability

1. The Contractor shall purchase and maintain insurance coverage on his tools, equipment and machinery and shall waive subrogation to the County for damage thereto.
2. The County reserves the right to require insurance of any Contractor in greater amounts provided notice of such requirements is stated in the Solicitation.

**17. No Waiver**

Any failure of the County to demand rigid adherence to one or more of the terms and provisions of the Agreement, including these General Terms and Conditions, on one or more occasions, shall not be construed as a waiver nor deprive the County of the right to insist upon strict compliance with the terms of this Agreement. Any waiver of a term of this Agreement, in whole or in part, must be in writing and signed by the party granting the waiver to be effective.

**18. Termination**



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The County may terminate the Agreement for its convenience at any time upon written notice to the Contractor. the Contractor shall not be paid for any service rendered or expense incurred after receipt of such notice except such fees and expenses incurred prior to the effective date of termination that are necessary for curtailment of the Contractor' Services under this Agreement.

**19. Choice of Law**

To ensure uniformity of the enforcement of this Agreement, and irrespective of the fact that either of the parties now is, or may become, a resident of a different state, this Agreement is made and is intended to be performed in the Commonwealth of Virginia, and shall be governed by and construed in accordance with the laws of that state without regard to principles of conflicts of law.

**20. Severability**

If any provision of the Agreement, including this Appendix, is held to be illegal, invalid, or unenforceable, or is found to be against public policy for any reasons, such provision shall be fully severable and the Agreement shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never been part of the Agreement, and the remaining provisions of the Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision, or by its severance from the Agreement.

**21. Contractual Claims Procedure**

- A. Contractual claims or disputes by the Contractor, whether for money or other relief, except for claims or disputes exempted by law from the procedure set forth herein, shall be submitted in writing no later than sixty (60) days after final payment; provided, however, that the Contractor shall give the County written notice of its intention to file a claim or dispute within fifteen (15) days after the occurrence upon which the claim or dispute shall be based. Any written notice of the Contractor' intention to file such a claim or dispute need not detail the amount of the claim, but shall state the facts and/or issues relating to the claim in sufficient detail to identify the claim, together with its character and scope. Whether or not the Contractor files such written notice, the Contractor shall proceed with the Services as directed. If the Contractor fails to make its claim or dispute, or fails to give notice of its intention to do so as provided herein, then such claim or dispute shall be deemed forfeited.
- B. The County, upon receipt of a detailed claim, may at any time render its decision and shall render such decision within one hundred twenty (120) days of final payment. Each such decision rendered shall be forwarded to the Contractor by written notice.
- C. If the Contractor disagrees with the decision of the County concerning any pending claim, the Contractor shall promptly notify the County by written notice



that the Contractor is proceeding with the Services under protest. Any claim not resolved, whether by failure of the Contractor to accept the decision of the County or under a written notice of the Contractor' intention to file a claim or a detailed claim not acted upon by the governing body of the County, shall be specifically exempt by the Contractor from payment request, whether progress or final. Pendency of claims shall not delay payment of amounts agreed due in the final payment.

- D. The decision on contractual claims by the governing body of the County shall be final and conclusive unless the Contractor appeals within six months of the date of the final decision on the claim by instituting legal action in the appropriate circuit court.

## **22. Subject to Annual Appropriation**

The Agreement is subject to annual appropriation by the Board of Supervisors of the Caroline County. Neither the Agreement nor any amount due or to become due under the Agreement shall be deemed to constitute a debt or pledge of the faith and credit of the Commonwealth of Virginia or any political subdivision thereof, including the County. Neither the Commonwealth of Virginia nor any political subdivision thereof, including the County, shall be obligated to pay any amount due or to become due under this Agreement except from funds annually appropriated by the Board of Supervisors of Caroline County for such purpose.

In the event of non-appropriation of funds for the items under this Agreement, the County may terminate this Agreement as to the Services for which funds have not been appropriated. Written notice will be provided to the Contractor as soon as possible after such action is taken.

## **23. Forum Selection**

The parties hereby submit to the personal jurisdiction and venue of any state or federal court located within the Commonwealth of Virginia for resolution of any and all claims, causes of action or disputes arising out of or related to this Agreement and agree that service by certified mail to the addresses set forth in the Agreement or this Appendix shall constitute sufficient service of process for any such action. The parties further agree that any claims, causes of action or disputes arising out of, relating to or concerning this Agreement shall have jurisdiction and venue in the Circuit Court of Caroline County, and shall be brought only in such Court.

## **24. Notices**

All requests, notices and other communications required or permitted to be given under the Agreement shall be in writing and delivery thereof shall be deemed to have been made three (3) business days after such notice shall have been duly mailed by certified first-class mail, postage prepaid, return receipt requested, one (1) business day after being deposited with any nationally recognized overnight courier service, or when delivered if delivered by hand delivery, to the party entitled to receive the same at the address indicated below or at such other address as such party shall have specified by written notice to the other party. Notices to the Contractor



shall be sent to the address on the first page of the Agreement, and notices to the County shall be sent to:

County Administrator  
Caroline County  
212 N. Main Street  
P.O. Box 447  
Bowling Green, VA 22427; with a copy to:

Benjamin W. Emerson, Esquire  
Sands Anderson PC  
1111 E. Main Street, Suite 2300  
Richmond, VA 23219

