



**DRAFT**  
**REQUEST FOR PROPOSAL**  
**No. 200823**

**PUBLIC SAFETY RADIO NETWORK**

Scope of Services  
Contract Documents  
Specifications

December 2011

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# SECTION 1

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## PROPOSAL DOCUMENTS

**REQUEST FOR PROPOSAL  
December 2011**

**Public Safety Radio Network**

**RFP #200823**

The City of Winchester is submitting this Request for Proposal to establish a contract with a qualified Contractor to furnish all labor, equipment, materials, transportation, quality controls and testing necessary for the development of a radio network consistent with the goals of City Council and in the best interest of the City.

The City has authorized this RFP as part of ongoing efforts to upgrade and enhance two-way radio communications throughout the City for the benefit of all public safety and local government users and the citizens that they serve.

The City currently operates a single site VHF conventional radio system. This system has become obsolete, and the City desires to upgrade this system with the most beneficial solution that the City deems necessary. The City anticipates four main proposal types.

Proposal options and general scope of work is the following:

Option A - Full 800 MHz System – This solution will create an 800 MHz Project 25 (P25) digital, trunked radio system whereby every city department would be connected to the 800 MHz system creating full internal interoperability that may be utilized during day to day operations and emergent operations/disasters. Additionally, this system will provide external interoperability to insure communications with outside agencies as required for operations.

Option B - 800 MHz/VHF Hybrid System – This solution will create an 800 MHz system for utilization by the traditional Public Safety Agencies (Police, City Sheriff, Fire & Rescue and Emergency Management) and provide a narrowband compliance solution for the current VHF frequencies/channels that will be assigned to the non-public safety radio agencies/users. This system will also create internal interoperability and external interoperability for utilization on a day to day and emergent/disaster operations as required.

Option C - VHF Compliance System – This solution will utilize the current radio frequencies/channels utilizing them in similar nature to the current frequency/channel assignment. This solution will replace certain specified hardware and retrofit that hardware which can technically be modified. This system will provide somewhat limited interoperability both internally and externally very much consistent with the current radio system.

Option D - Alternate Solutions – Respondents are invited to introduce other technologies that exist in the market place as an alternative to the technologies cited in the previously identified solutions. These solutions will be considered as alternatives and must meet the necessary elements of the communications system as identified in this RFP under Section 1, 2, and any combination of 3, 4, and 5. Information shall be provided in the proposal as outlined in the Part 1 – Submittal Content Request for Proposal

above.

A **mandatory pre-proposal conference** will be at 10:00A.M. (local time) on January 10, 2012 at the Timbrook Public Safety Center (TPSC), 231 E. Piccadilly Street, Winchester, VA 22601. The purpose of this conference is to allow potential Respondents an opportunity to present questions and obtain clarification relative to any facet of this solicitation.

Due to the importance of all respondents having a clear understanding of the specifications/scope of work and requirements of this solicitation, attendance at this conference will be a prerequisite for submitting a proposal. Proposals will only be accepted from those respondents who are represented at this pre-proposal conference. Attendance at the conference will be evidenced by the representative's signature on the attendance roster. No one will be admitted after 10:05 A.M. (local time).

Bring a copy of the solicitation with you. Site visits shall also be conducted immediately following the pre-bid meeting, first at the Timbrook Public Safety Building, then at the Jefferson Water Tank. Respondents shall be responsible for their own transportation. Information regarding the site locations are located in Appendix C. Any changes resulting from this conference will be issued in a written addendum to the solicitation.

Contract Specifications may be obtained from the office of:

City of Winchester, Virginia  
Finance Department - Purchasing Division  
Rouss City Hall, 1<sup>st</sup> Floor  
15 North Cameron Street  
Winchester, Virginia 22601  
Telephone (540) 667-1815, EXT. 1477

The documents and drawings can also be downloaded at no cost from the City's website at:  
<http://www.winchesterva.gov/purchasing/itbrfp.php>

Any questions regarding the contract documents or drawings shall be sent **in writing via e-mail** to:

Lynn Miller: [lmiller@ci.winchester.va.us](mailto:lmiller@ci.winchester.va.us)  
Steve Corbit: [scorbit@ci.winchester.va.us](mailto:scorbit@ci.winchester.va.us)  
Chris Kelly: [chris.kelly@LRKimball.com](mailto:chris.kelly@LRKimball.com)

Proposal prices shall be made on the blank Proposal Form provided herein with completed "Detailed Pricing Submittal Forms". Proposals shall be delivered to the above address on or before **2:00 p.m. on February 15, 2012**, at which time the proposals shall be publicly read aloud.

Proposals will be received only from contractors who are registered in the Commonwealth of Virginia. **Respondents shall indicate on the outside of the envelope containing the Proposal their current Virginia Contractor's Registration Number.**

Performance and Payment Bonds will be required of the successful respondent, each in an amount equal to one hundred (100) percent of the amount of the Contract, conditioned upon the faithful performance of the Contract and to the payment in full to all persons furnishing labor, materials, Request for Proposal

equipment, etc., for and in connection with the work to be performed under the contract.

The City of Winchester reserves the right to reject any proposal for failure to comply with all requirements of this notice or any of the Contract Documents; however, it may waive any minor defects or informalities at its discretion. The City further reserves the right to reject any and all proposals or to award a contract that in its judgment is in the best interest of the City.

MBE/WBE firms are encouraged to submit proposals. Respondents must comply with the following: the Presidents's Executive Order # 11246 prohibiting discrimination in employment regarding race, color, creed, sex, or national origin; the President's Executive Orders # 12138 and 11625 regarding utilization of MBE/WBE firms; and the Civil Rights Act of 1964. Respondents must certify that they do not or will not maintain or provide for their employees any facilities that are segregated on the basis of race, color, creed, or national origin.

CITY OF WINCHESTER, VIRGINIA

BY: Steve Corbit, Purchasing Agent

## Public Safety Radio Network

### SECTION 1.b – INSTRUCTIONS TO RESPONDENTS

1. **OWNER AND ENGINEER:**

The Owner is the City of Winchester, Virginia, which shall be represented by the Emergency Management Coordinator and the Engineer is L.R. Kimball.

2. **COPIES OF CONTRACT DOCUMENTS:**

- 2.01 Complete sets of Request for Proposal (RFP) Documents may be obtained at the following location for a non-refundable fee of \$50.00 per set. Delivery by Federal Express or other similar service will be at the requesting firm's expense. All checks shall be made payable to the City of Winchester. RFP Documents may be examined and downloaded from the City's website at <http://www.winchesterva.gov/purchasing/itbrfp.php> at no charge.

City of Winchester, Virginia  
 Finance Department  
 Purchasing Division  
 Rouss City Hall, 1<sup>st</sup> Floor  
 15 North Cameron Street  
 Winchester, Virginia 22601  
 Telephone: (540) 667-2378

- 2.02 Complete set of RFP Documents shall be used in preparing bids; neither the Owner nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of RFP Documents. Owner and Engineer in making copies of RFP Documents available on the above terms do so only for the purpose of obtaining bids on the Work and do not confer a license or grant for any other use.

3. **EXAMINATION OF CONTRACT DOCUMENTS AND SITE:**

- 3.01 Offerors should carefully examine the specifications and fully inform themselves as to all conditions and matters, which would in any way affect the equipment/materials/service of cost thereof. Should an offeror find discrepancies in or omissions from the specification or request for proposal, he/she should notify the Purchasing Agent and obtain clarification prior to submitting the proposal. Only questions answered by formal Addenda will be binding; oral and other interpretations or classifications will be without legal effect.
- 3.02 Before submitting a bid, each Respondent must examine the Contract Documents thoroughly, visit the site to familiarize himself with local conditions that may in any manner affect cost, progress, or performance of the work, familiarize himself with

federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the work; and study and carefully correlate Respondent's observations with the Contract Documents. Respondent's may amend the City's Terms and Conditions or submit their own documents for the City to review.

- 3.03 Before submitting his bid, each Respondent will, at his own expense, make such additional investigations and tests as the Respondent may deem necessary to determine his bid for performance of the work in accordance with time and other terms and conditions of the Contract Documents. The Contractor shall be responsible for taking his own borings or making any investigations he requires to establish subsurface conditions in the area of this Contract. The City does not assume any responsibility for the subsurface conditions which may be encountered. On request, Owner will provide each Respondent access to the site to conduct such investigations.
- 3.04 The submission of a bid will constitute an incontrovertible representation by the Respondent that he has examined the site and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions of the Work.
- 3.05 It is understood and agreed by the Respondent that the estimate of quantities (if provided) are approximate, and are presented in order to obtain unit prices and approximate amount of the Contract. The Contractor shall make no claim against the City because of any estimate, tests or representations made by any officer or agent of the City, which may prove to be in any respect erroneous.
- 3.06 Scope of the work is as specified herein. The Owner, however, reserves the right to make adjustments to the scope of the work. Such adjustments shall be accomplished by appropriate Change Orders.
4. **SELECTION PROCEDURE:** This Request for Proposals is divided into two parts:

Part I - Written submission of Firm Experience and Qualifications; and  
 Part II - Interviews and presentations from Part I short-listed firms, only.

In general, the selection of a firm will be conducted by the following process:

**PART I**

1. Statements of firms' experience and qualifications must be submitted in the form defined under Submittal Requirement (5.03d).
2. A Selection Committee composed of City officials will evaluate and rank all firms.
3. Firms will be evaluated and ranked in accordance with the Part I – Evaluation Criteria detailed in Section 6.

4. This ranking list shall be forwarded to Common Council who shall review and consider the list, and make a final determination by vote in an open meeting.

## PART II

1. The Selection Committee may conduct formal interviews with the short-listed firms.
2. The Selection Committee will complete the final evaluation and rank the firms as set forth in herein, in order to identify up to two (2) firms whose professional qualifications and proposed services are deemed most meritorious per Virginia Code §2.2-4301.

## 5. SUBMITTAL REQUIREMENT

### 5.01 GENERAL INSTRUCTIONS:

5.01.a RFP Response: In order to be considered for selection, offerors must submit a complete response to this RFP. One (1) original hardcopy, one (1) original electronic copy on CD in .pdf format and eight (8) copies of the original hardcopy are to be submitted in a sealed envelope bearing the company name, mailing address, the RFP name, the RFP number, the date and the time due mailed or delivered to: City of Winchester, Finance Department - Purchasing Division, 15 North Cameron Street, 1st Floor-Rouss City Hall, Winchester, Virginia 22601. No other distribution of the proposal shall be made by the offeror. Offerors must clearly label the original with the word "ORIGINAL" on the cover and must clearly label all copies with the word "COPY" on the cover.

5.01b Late Proposals: It is the responsibility of the firm to insure the Purchasing Agent receives the submittal by the proposal due date and time. Late Proposals will be returned to offeror unopened, if the container is properly identified with the firm's return address.

### 5.02 PROPOSAL PREPARATION:

5.02a Proposals shall be signed by an authorized representative of the offeror. All information requested should be submitted. Failure to submit all information requested may result in the Purchasing Agent requiring prompt submission of missing information and/or giving a lowered evaluation of the proposal. Proposals which are substantially incomplete or lack key information may be rejected by the Purchasing Agent. Mandatory requirements are those required by law or regulation or are such that they cannot be waived and are not subject to negotiation.

5.02b Proposals shall be prepared simply and economically, providing a straightforward, concise description of capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content. Avoid excessive content and

unrelated work samples.

5.02c Proposal Submissions

A. Proposal Content

1. The following information shall be submitted as part of the Proposal:
  - a. A detailed description of the proposed system(s) and services to be provided.
  - b. Preliminary detailed project schedule indicating project duration and critical path items.
  - c. Preliminary transition plan for replacing/upgrading communications consoles, including control, administration and related equipment from existing system(s) to the new City wide system architecture. Project organization chart including personnel assigned and responsibilities.
  - d. System design including complete description, block diagrams, equipment layouts, and equipment lists shall be included to provide a complete and comprehensive description.
  - e. Complete product descriptions including all standard and optional hardware and software available, descriptive literature, and cut sheets.
  - f. Preliminary testing methodology and procedures to assure complete and fully operable system at project completion.
  - g. Warranties: General and Extended warranties specified in this Section.
  - h. Training descriptions for each type of training.

5.02d Each copy of the proposal should be bound or contained in a single volume where practical. All documentation submitted with the proposal should be contained in that single volume.

5.02f Ownership of all data, materials and documentation originated and prepared for the City pursuant to the RFP shall belong exclusively to the City and be subjected to public inspection in accordance with the Virginia Freedom of Information Act. Trade secrets or proprietary information submitted by an offeror shall not be subject to the public disclosure under the Virginia Freedom of Information Act; however, the offeror must invoke the protections of §2.24342F of the Code of Virginia, in writing, either before or at the time the data or other material is submitted. The written notice must specifically identify the data or materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secrets or proprietary information. The classification of an entire proposal document, line item prices, and/or total proposal prices as proprietary or trade secrets is not acceptable and will

result in rejection of the proposal.

5.03 PART I - SUBMITTAL CONTENT: Proposal Submittal shall contain the following information presented in the following order according to SECTION numbers:

5.03a SECTION 1: TRANSMITTAL LETTER AND EXECUTIVE SUMMARY

- a. Responses shall contain a transmittal letter that must be typed on the Vendor's 8 ½" x 11" stationary and include the following:
  - 1) The identification of the vendor submitting the proposal
  - 2) The name, title and phone and fax numbers of the person or persons authorized to contractually obligate the vendor with this proposal and in future negotiations.
  - 3) The names, titles and phone numbers of the persons to be contacted for clarifications.
  - 4) An indication of acceptance of the general requirements and contract terms as described within this request for proposal.
  - 5) An acknowledgment of receipt of all amendments to this request.
  - 6) The letter must be signed by a person who is authorized to obligate the vendor in a contract offer.
- b. Enclose an Executive Summary overview of the system(s), equipment, and services proposed.

5.03b SECTION 2: TABLE OF CONTENTS

- a. The proposal shall contain a complete table of contents for the proposal.

5.03c SECTION 3: MANDATORY SUBMITTALS

- a. The proposal document shall contain all mandatory submittals including, Bid Bond, Non-Collusion Affidavit, and the Proposal Form.
  - 1) In a separate sealed envelope in the original proposal **ONLY**, please complete and enclose Section 1.c Proposal Form for each Optional or Alternate system offered. Extra charges or fees will not be allowed. All additional fees that are not listed and may be applicable during the term of the contract shall be outlined, i.e. mileage, programming, archiving, security fees, etc.

5.03d. SECTION 4: RESPONDENT'S QUALIFICATIONS

- a. The proposal shall summarize qualifications of key individuals to be assigned to the work. Information and/or resumes must exhibit qualifications and experience of the individual in the type of work to be conducted with emphasis on services similar in nature to those expected.
- b. City will investigate, as it deems necessary, to determine the ability of Respondent to furnish the required equipment and services. All Respondents shall furnish City information and data outlining their qualifications as requested within this RFP, or as may become required later by City.

- c. Installer Qualifications Respondent shall employ experienced installers who are authorized representative/subcontractor of the radio equipment manufacturer for both installation and maintenance of units required for this Project. The City prefers a single installation/maintenance contractor for the entire system.
- d. Respondent shall provide a short description or brochure explaining your organization's history, structure and culture.
- e. List of References: List of the five (5) most relevant references within the last five (5) years, including: short descriptions, dates and client references (include client contact person, address and phone number), preferably government agencies.
  - (1) Respondents shall provide a reference (including same requirements above) that will permit a demonstration provided at a completed and accepted installation using the same technology as proposed for Winchester. The Respondent is responsible for supporting the test demonstration with the host site owner as required. Winchester designees will provide the turnout gear and mask, rotary saw, metal, wood, and other ancillary equipment necessary to conduct the test. The vendor will provide the radios and arrange clearance with the host site to use the dispatch console. The City shall reserve the right to request this test during or after the Respondent selection process. Additional information on this demonstration is found in Section 3.b, 2.6 and Section 4.b, 2.6.
- f. List the outside services to be used. Describe the anticipated scope of services by sub-contractors and how they will be coordinated. Specific names, references and qualifications of sub-contractors are preferred at this time. The intent of this section is to ascertain what outside services the firm will require.
- g. Provide a summary listing of all designations, licensures, or certifications your firm has received within the past three (3) years regarding proposed services within the information technology industry. In addition, please provide a summary listing of all licensures, certifications and trainings for key personnel to be assigned to the City within the past three (3) years.
- h. Provide documentation that the firm is licensed under the applicable laws of the Commonwealth of Virginia and the City of Winchester. Foreign (out of state) corporations desiring to transact business in the Commonwealth of Virginia must register with the State Corporation Commission in accordance with Title 13.1 of the Code of Virginia. Proof of registration, or proof of application for such registration, should be provided with the proposal.

- 5.03e TECHNICAL RESPONSE – OPTION A (Full 800 MHz System): Respondents proposing this Option shall provide a detailed explanation and outline of the firm’s work plan and methodology that meets the requirements of Section 1, 2 and 3 of the RFP. Information shall be provided in the proposal as outlined below:

#### SECTION 5: COMPLIANCE

- a. Section 5 of the proposal shall contain compliance statements on both a general and on a specific item basis. Respondents shall explicitly state in the proposal that their offering is fully compliant with the requirements except as specifically and otherwise noted. Compliance is assumed unless specifically identified by section number, and identified as follows:
- 1) COMPLY – shall be used to indicate that the proposed solution fully complies with the requirement as written.
  - 2) COMPLY WITH CLARIFICATION - shall be used if most, but not all of the specified requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception.
  - 3) EXCEPTION - shall be used if the proposal does not substantially meet the specified requirements. Failure to indicate any exceptions shall be interpreted that the Respondent intends to fully comply with all RFP requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The City reserves the right to give consideration or waivers for these exceptions. Additional explanation, description, or clarification may be supplied to amplify the Compliance Matrix responses. However, the statement of COMPLY, COMPLY WITH CLARIFICATION, or EXCEPTION will control.
- b. Statements can be provided in a checkbox format that designates a column for the paragraph number, three columns for the replies above (check only one for that paragraph), and a last column describing the explanation required for Comply with Clarification and Exception.

#### SECTION 6: DESCRIPTION OF SYSTEM AND SERVICES

- a. The proposal shall contain a detailed description of the proposed system and services to be provided.
- b. Project Management and engineering plans shall be included in this section
- c. System design including complete description, block diagrams, equipment layouts, and equipment lists shall be included so as to provide a complete and comprehensive description.
- d. Preliminary Staging Acceptance Test Plan (SATP), Coverage Acceptance Test Plan (CATP) and Final System Acceptance Test Plan (FATP), testing methodology, and procedures to assure complete and fully operable system at Project completion.

**SECTION 7: DESCRIPTION OF PROPOSED EQUIPMENT AND SOFTWARE**

- a. The proposal shall contain the detailed description of the elements comprising the installed system, including cut sheets, specifications, manuals, diagrams, and other pertinent data.
- b. The following information shall be submitted as part of the initial proposal:
  - 1) Product Data Sheets and specifications and other description literature for radio network equipment, microwave equipment, subscriber equipment, antennas and other critical infrastructure components.
  - 2) Complete equipment lists for all systems.
  - 3) Warranties: general and extended warranties.
  - 4) Point of Manufacture: Statement of location where the proposed equipment is manufactured.

**SECTION 8: PROJECT IMPLEMENTATION**

- a. The proposal shall provide information on project implementation, the project team, a detailed description of work to be performed, a preliminary project schedule, a list of project risks and mitigation plans for these risks.
- b. Respondents shall submit a preliminary project schedule including the delivery schedule and installation of equipment from award of contract to final acceptance.
- c. Preliminary Test Plans, testing methodology, and procedures to assure complete and fully operable system at project completion.
- d. Training plan description.

5.03f **TECHNICAL RESPONSE – OPTION B (800 MHz / VHF Hybrid System):** Respondents proposing this Option shall provide a detailed explanation and outline of the firm’s work plan and methodology that meets the requirements of Sections 1, 2 and 4 of the RFP. Information shall be provided in the proposal as outlined below:

**SECTION 5: COMPLIANCE**

- a. Section 5 of the proposal shall contain compliance statements on both a general and on a specific item basis. Respondents shall explicitly state in the proposal that their offering is fully compliant with the requirements except as specifically and otherwise noted. Compliance is assumed unless specifically identified by section number, and identified as follows:
  - 1) **COMPLY** – shall be used to indicate that the proposed solution fully complies with the requirement as written.
  - 2) **COMPLY WITH CLARIFICATION** - shall be used if most, but not all of the specified requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception.
  - 3) **EXCEPTION** - shall be used if the proposal does not substantially meet

the specified requirements. Failure to indicate any exceptions shall be interpreted that the Respondent intends to fully comply with all RFB requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The City reserves the right to give consideration or waivers for these exceptions. Additional explanation, description, or clarification may be supplied to amplify the Compliance Matrix responses. However, the statement of COMPLY, COMPLY WITH CLARIFICATION, or EXCEPTION will control.

- b. Statements can be provided in a checkbox format that designates a column for the paragraph number, three columns for the replies above (check only one for that paragraph), and a last column describing the explanation required for Comply with Clarification and Exception.

#### SECTION 6: DESCRIPTION OF SYSTEM AND SERVICES

- a. The proposal shall contain a detailed description of the proposed system and services to be provided.
- b. Project Management and engineering plans shall be included in this section
- c. System design including complete description, block diagrams, equipment layouts, and equipment lists shall be included so as to provide a complete and comprehensive description.
- d. Preliminary Staging Acceptance Test Plan (SATP), Coverage Acceptance Test Plan (CATP) and Final System Acceptance Test Plan (FATP), testing methodology, and procedures to assure complete and fully operable system at Project completion.

#### SECTION 7: DESCRIPTION OF PROPOSED EQUIPMENT AND SOFTWARE

- a. The proposal shall contain the detailed description of the elements comprising the installed system, including cut sheets, specifications, manuals, diagrams, and other pertinent data.
- b. The following information shall be submitted as part of the initial proposal:
  - 1) Product Data Sheets and specifications and other description literature for radio network equipment, microwave equipment, subscriber equipment, antennas and other critical infrastructure components.
  - 2) Complete equipment lists for all systems.
  - 3) Warranties: general and extended warranties.
  - 4) Point of Manufacture: Statement of location where the proposed equipment is manufactured.

#### SECTION 8: PROJECT IMPLEMENTATION

- a. The proposal shall provide information on project implementation, the project team, a detailed description of work to be performed, a preliminary project schedule, a list of project risks and mitigation plans for these risks.

- b. Respondents shall submit a preliminary project schedule including the delivery schedule and installation of equipment from award of contract to final acceptance.
- c. Preliminary Test Plans, testing methodology, and procedures to assure complete and fully operable system at project completion.
- d. Training plan description.

5.03g TECHNICAL RESPONSE – OPTION C (VHF Compliance System): Respondents proposing this Option shall provide a detailed explanation and outline of the firm’s work plan and methodology that meets the requirements of Sections 1, 2 and 5 of the RFP. Information shall be provided in the proposal as outlined below:

#### SECTION 5: COMPLIANCE

- a. Section 5 of the proposal shall contain compliance statements on both a general and on a specific item basis. Respondents shall explicitly state in the proposal that their offering is fully compliant with the requirements except as specifically and otherwise noted. Compliance is assumed unless specifically identified by section number, and identified as follows:
  - 1) COMPLY – shall be used to indicate that the proposed solution fully complies with the requirement as written.
  - 2) COMPLY WITH CLARIFICATION - shall be used if most, but not all of the specified requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception.
  - 3) EXCEPTION - shall be used if the proposal does not substantially meet the specified requirements. Failure to indicate any exceptions shall be interpreted that the Respondent intends to fully comply with all RFB requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The City reserves the right to give consideration or waivers for these exceptions. Additional explanation, description, or clarification may be supplied to amplify the Compliance Matrix responses. However, the statement of COMPLY, COMPLY WITH CLARIFICATION, or EXCEPTION will control.
- b. Statements can be provided in a checkbox format that designates a column for the paragraph number, three columns for the replies above (check only one for that paragraph), and a last column describing the explanation required for Comply with Clarification and Exception.

#### SECTION 6: DESCRIPTION OF SYSTEM AND SERVICES

- a. The proposal shall contain a detailed description of the proposed system and services to be provided.
- b. Project Management and engineering plans shall be included in this section

- c. System design including complete description, block diagrams, equipment layouts, and equipment lists shall be included so as to provide a complete and comprehensive description.
- d. Coverage Acceptance Test Plan (CATP) and Final System Acceptance Test Plan (FATP), testing methodology, and procedures to assure complete and fully operable system at Project completion.

#### SECTION 7: DESCRIPTION OF PROPOSED EQUIPMENT AND SOFTWARE

- a. The proposal shall contain the detailed description of the elements comprising the installed system, including cut sheets, specifications, manuals, diagrams, and other pertinent data.
- b. The following information shall be submitted as part of the initial proposal:
  - 1) Product Data Sheets and specifications and other description literature for radio network equipment, microwave equipment, subscriber equipment, antennas and other critical infrastructure components.
  - 2) Complete equipment lists for all systems.
  - 3) Warranties: general and extended warranties.
  - 4) Point of Manufacture: Statement of location where the proposed equipment is manufactured.

#### SECTION 8: PROJECT IMPLEMENTATION

- a. The proposal shall provide information on project implementation, the project team, a detailed description of work to be performed, a preliminary project schedule, a list of project risks and mitigation plans for these risks.
- b. Respondents shall submit a preliminary project schedule including the delivery schedule and installation of equipment from award of contract to final acceptance.
- c. Preliminary Test Plans, testing methodology, and procedures to assure complete and fully operable system at project completion.
- d. Training plan description.

5.03h **TECHNICAL RESPONSE – OPTION D (ALTERNATE SOLUTIONS):** Respondents are invited to introduce other technologies that exist in the market place as an alternative to the technologies cited in the previously identified solutions. These solutions will be considered as alternatives and must meet the necessary elements of the communications system as identified in this RFP under Section 1, 2, and any combination of 3, 4, and 5. Section 6.a project overview shall require compliance responses as well as any sections (3, 4, or 5) that the Respondent intends to comply with in their proposal. Information shall be provided in the proposal as outlined in the Part 1 – Submittal Content above.

#### SECTION 5: COMPLIANCE

- a. Section 5 of the proposal shall contain compliance statements on both a

general and on a specific item basis. Respondents shall explicitly state in the proposal that their offering is fully compliant with the requirements except as specifically and otherwise noted. Compliance is assumed unless specifically identified by section number, and identified as follows:

- 1) COMPLY – shall be used to indicate that the proposed solution fully complies with the requirement as written.
  - 2) COMPLY WITH CLARIFICATION - shall be used if most, but not all of the specified requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception.
  - 3) EXCEPTION - shall be used if the proposal does not substantially meet the specified requirements. Failure to indicate any exceptions shall be interpreted that the Respondent intends to fully comply with all RFB requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The City reserves the right to give consideration or waivers for these exceptions. Additional explanation, description, or clarification may be supplied to amplify the Compliance Matrix responses. However, the statement of COMPLY, COMPLY WITH CLARIFICATION, or EXCEPTION will control.
- b. Statements can be provided in a checkbox format that designates a column for the paragraph number, three columns for the replies above (check only one for that paragraph), and a last column describing the explanation required for Comply with Clarification and Exception.

#### SECTION 6: DESCRIPTION OF SYSTEM AND SERVICES

- a. The proposal shall contain a detailed description of the proposed system and services to be provided.
- b. Project Management and engineering plans shall be included in this section

#### SECTION 7: DESCRIPTION OF PROPOSED EQUIPMENT AND SOFTWARE

- a. The proposal shall contain the detailed description of the elements comprising the installed system, including cut sheets, specifications, manuals, diagrams, and other pertinent data.
- b. The following information shall be submitted as part of the initial proposal:
  - 1) Product Data Sheets and specifications and other description literature for radio network equipment, microwave equipment, subscriber equipment, antennas and other critical infrastructure components.
  - 2) Complete equipment lists for all systems.
  - 3) Warranties: general and extended warranties.
  - 4) Point of Manufacture: Statement of location where the proposed equipment is manufactured.

## SECTION 8: PROJECT IMPLEMENTATION

- a. The proposal shall provide information on project implementation, the project team, a detailed description of work to be performed, a preliminary project schedule, a list of project risks and mitigation plans for these risks.
  - b. Respondents shall submit a preliminary project schedule including the delivery schedule and installation of equipment from award of contract to final acceptance.
  - c. Preliminary Test Plans, testing methodology, and procedures to assure complete and fully operable system at project completion.
  - d. Training plan description.
- 5.03i Verify that required insurance coverage is available (*insurance certificates need not be submitted until the award stage*).
- 5.04 PART II - SUBMITTAL CONTENT: Part II will consist of two (2) sections:
- 5.04a Presentation by Firms and Formal Interview (Optional). Summarize the capabilities of the firm to meet the needs of the City. Presentation should depict how staff will be organized to accomplish the work and where they will be located. Demonstrate the availability of resources for the successful completion of the services. Question and Answer period.
- 5.04b Identify any requested Amendments to the Standard Agreement.
6. EVALUATION CRITERIA: Proposals received will be evaluated by a Selection Committee consisting of end users and/or the requesting department who will review and rank offers. Each criterion is of equal importance and the criteria to be used to evaluate proposals are listed below. The evaluation will be based upon the information provided in the proposal; additional information that may be requested for clarification, or during negotiation, as well as information obtained from references and independent sources. The evaluation of proposals will be based on the offer's response to the list of criteria. The Purchasing Agent will then develop a composite ranking of each firm for each Option proposed. A proposal may be rejected if it is conditional or incomplete in the judgment of the City of Winchester.
- Rating and Scoring Method: Proposal will be rated and scored using the Adjectival Rating method. With the Adjectival Rating method, adjectives such as Exceptional, Acceptable, Marginal and Unacceptable will be used to indicate the degree to which the proposals have met the evaluation criteria. After the Selection Committee makes their individual ratings, price will be ranked by the Purchasing Agent from lowest to highest of each firm for each Option proposed as it is an important criterion that will be considered in the best interests of the City.
- a. Example of Adjective Rating Method:

- 1.) Exceptional “E” – Proposal exceeds requirements and demonstrates an exceptional understanding of goals and objectives of the procurement. One or more major strengths exist. No significant weaknesses exist.
- 2.) Acceptable “A” – Offeror’s proposal demonstrates an acceptable understanding of goals and objectives of the procurement. There may be strengths and weaknesses however the strengths outweigh the weaknesses.
- 3.) Marginal “M” – Offeror’s proposal demonstrates a fair understanding of the goals and objectives of the procurement. Weaknesses have been found that exceed any strengths that exist. Weaknesses will be difficult to correct.
- 4.) Unacceptable “U” – Offeror’s proposal fails to meet an understanding of the goals and objectives of the procurement. The proposal has one or more significant weaknesses that will be very difficult to correct or are not correctable.

#### PART I - Evaluation Criteria

- Experience and qualifications of key individuals to be assigned to the work.
- Qualifications and experience of the firm in performing requested services.
- Proposal: Overall system design, responsiveness to customer requirements, soundness of technical approach, and feasibility of design.
- Equipment: Compliance with specifications, equipment reliability and performance, quality of workmanship and materials.
- Firm’s pricing schedule and cost of services (Purchasing Agent will rank).
- Degree of firm's capability to perform tasks in-house.
- Overall quality and completeness of proposal.

#### PART II - Evaluation Criteria

- Final adjustments to Part I criteria may be made by each member of the Selection Committee upon conclusion of the interview.
  - References: Three (3) references may be reviewed before the Selection Committee selects up to two (2) firms to begin negotiations.
- Compensation:** Offeror will not be compensated for the cost of proposal preparation whether or not an award is consummated.
- Investigations:** The Selection Committee may make such reasonable investigations, as it deems proper and necessary to determine the ability of the firm to perform the work. The Selection Committee and/or its representative(s) reserve the right to inspect the firm’s physical premises prior to award to satisfy questions regarding the firm’s capabilities.

7. AWARD: Selection shall be made of two or more offerors deemed to be fully qualified and best suited among those submitting proposals on the basis of the City’s best interests and evaluation factors included in the Request for Proposals, including price, if so stated in the Request for Proposals. Negotiations shall be conducted with

the offerors so selected. Price shall be considered, but need not be the sole determining factor. After negotiations have been conducted with each offeror so selected, the City shall select the offeror which, in its opinion, has made the best proposal, and shall award the contract to that offeror. The City of Winchester may cancel this Request for Proposals or reject proposals at any time prior to an award, and is not required to furnish a statement of the reasons why a particular proposal was not deemed to be the most advantageous (*Code of Virginia*, § 2.2-4359D). Should the City of Winchester determine in writing and in its sole discretion that only one offeror is fully qualified, or that one offeror is clearly more highly qualified than the others under consideration, a contract may be negotiated and awarded to that offeror. The award document will be a contract incorporating by reference all the requirements, terms and conditions of the solicitation and the contractor's proposal as negotiated.

8. **INTERPRETATIONS:**

All questions about the discrepancies or ambiguities in the Contract Documents prior to the bid opening shall be submitted in writing via e-mail to **all** of the following:

Chris Kelly: [Chris.Kelly@LRKimball.com](mailto:Chris.Kelly@LRKimball.com)

Steve Corbit: [scorbit@ci.winchester.va.us](mailto:scorbit@ci.winchester.va.us)

Lynn Miller: [LMiller@ci.winchester.va.us](mailto:LMiller@ci.winchester.va.us)

Replies to questions will be issued by Addenda to all parties recorded by the Purchasing Agent as having received the RFP Documents, or by posting on a Question and Answer Bulletin Board posted at the following location:

<http://www.winchesterva.gov/purchasing/itbrfp.php>

Questions received less than five (5) calendar days prior to the date for opening of bids may not be answered. Only questions answered by formal written Addenda or in writing on the Question and Answer Bulletin Board will be binding.

9. **Intentionally Left Blank**

10. **REQUIRED BONDS:**

Performance and Payment Bonds will be required of the Successful Respondent, each in an amount equal to one hundred percent (100%) of the amount of the Contract, conditioned upon the faithful performance of the Contract and to the payment in full to all persons furnishing labor, materials, equipment, etc., for and in connection with the work to be performed under the Contract.

11. **CONTRACT TIME:**

Contractor agrees that all work shall be completed prior to December 31, 2012 with Work beginning upon an executed Notice to Proceed (NTP). Owner and Contractor

recognize that the time is of essence in this Contract, and if the work is not completed within the specified time, plus any extensions allowed, then the Contractor shall pay, as liquidated damages, \$2,500.00 for each calendar day that expires after the specified completion date.

12. **PAYMENT PROCEDURE:**

12.01 The basis for payment shall be on milestones of actual work completed, as negotiated prior to the Notice to Proceed.

12.02 An amount equal to five percent (5%) of each milestone payment shall be held from each payment as retainage.

13. **SUBCONTRACTORS:**

13.01 The apparent successful Respondent and any other Respondent so requested, will within seven (7) days after the day of bid opening submit to Owner a list of all subcontractors and other persons and organizations, including those who are to furnish the principal items of material and equipment, proposed for the work. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such subcontractor, person, and organization. If Owner or Engineer, after due investigation has reasonable objection to any proposed subcontractor, other person or organization, either may before giving the Notice of Award request the apparent successful Respondent to submit an acceptable substitute without an increase in Bid price. If the apparent successful Respondent declines to make any such substitution, the Contract shall not be awarded to such Respondent, but his declining to make any such substitution will not constitute grounds for sacrificing his Bid Bond. Any subcontractor, other person, or organization so listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer.

13.02 No Contractor shall be required to employ any subcontractor, other person, or organization against whom he has reasonable objection.

14. **SUBSTITUTE MATERIAL AND EQUIPMENT**

14.01 Whenever it is indicated in the Contract Documents that a substitute or "or equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered until after the Effective Date of the Contract Agreement. The procedure for submittal of any such application by Contractor and consideration by Engineer is set forth in the General Conditions.

**SECTION 1.c – PROPOSAL FORM**  
**Public Safety Radio Network**  
**RFP# 200823**

This Proposal is submitted to:

City of Winchester, Virginia  
Finance Department - Purchasing Division  
Rouss City Hall, 1<sup>st</sup> Floor  
15 North Cameron Street  
Winchester, Virginia 22601

In submitting this Proposal, Respondent acknowledges that the Respondent has examined copies of the following Contract Documents:

**SECTION 1 – Proposal Documents**

- a. Request for Proposal
- b. Instructions to Respondents
- c. Proposal Form
- d. Bid Bond
- e. Non-Collusion Affidavit
- f. Contract
- g. Performance Bond
- h. Labor and Material Payment Bond
- i. Notice of Award
- j. Notice to Proceed
- k. City of Winchester Required General Terms and Conditions
- l. General Conditions

**SECTION 2 – General Scope of Work**

- a. Project Overview
- b. Radio Network
- c. Point-to-Point Digital Microwave Radio
- d. Self-Supporting Communications Tower
- e. Pre-Fabricated Radio Equipment Shelter
- f. Chain Link Fencing and Gates
- g. Propane Generator and Transfer Switch

**SECTION 3 – Option A – Full 800 MHz Trunking Radio Network**

- a. Option A – Project Overview
- b. Option A – Radio Network
- c. Option A – Radio Dispatch Console System
- d. Option A – Non-Fixed User Radio Equipment

**SECTION 4 – Option B – 800 MHz / VHF Hybrid System**

- a. Option B – Project Overview
- b. Option B – Radio Network
- c. Option B – Radio Dispatch Console System
- d. Option B – Non-Fixed User Radio Equipment

**SECTION 5 – Option C –VHF Compliance System**

- a. Option C – Project Overview
- b. Option C – Radio Network
- c. Option C – Non-Fixed User Radio Equipment

**SECTION 6 – Option D –Alternate Solutions**

- a. Option D – Project Overview

**APPENDICES**

- A. Glossary
- B. FCC License Information
- C. Candidate Radio Sites
- D. Critical Buildings
- E. Subscriber Counts
- F. Jefferson Water Tower Drawing

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>DATE</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Receipt of all of above is hereby acknowledged.

CONTRACTOR: \_\_\_\_\_

BY (SIGNATURE): \_\_\_\_\_

NAME AND TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

**PROPOSAL ITEMS/QUANTITIES**

- (a) The Contractor will supply to the City prices for all known work items at the time of proposal submission on supplied forms. The proposal forms designate which prices are for *Install* only work, complete and in place, (i.e. assumes equipment and/ or materials will be supplied by the City). All other proposal prices are for Furnish and Install work, complete and in place.
- (b) The quantities shown for unit proposal items are based upon the best information available at time of preparation of these proposal documents, and are established for the purpose of obtaining a proposal price. No adjustments to the proposal prices based on changes to quantities will be considered. All proposal prices will be held throughout the duration of the contract regardless of any increase or decrease in proposal quantity.
- (c) Emergency work shall be negotiated with a maximum allowable amount of 50% over the proposal price by item. This excludes all lump sum proposal items.
- (d) All other proposal items not listed or described in the Contract Documents will be negotiated between the City and the Contractor before the time of need. Once a negotiated price is established, it will be used for the remainder of the contract.

The undersigned Respondent proposes to complete all work in accordance with the Contract Documents for the pricing breakdown located at the end of this Proposal Form title "Detailed Pricing Submittal Forms"

TOTAL BASE AMOUNT: \$ \_\_\_\_\_

IN WORDS:

\_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

BY: (SIGNATURE) \_\_\_\_\_

NAME AND TITLE: \_\_\_\_\_

\_\_\_\_\_

DATE: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TELEPHONE: \_\_\_\_\_

CURRENT VIRGINIA CONTRACTOR REGISTRATION NUMBER: \_\_\_\_\_

**NOTE: REQUIRED BID GUARANTEE MUST BE ENCLOSED WITH THIS PROPOSAL.**

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# DETAILED PRICING SUBMITTAL FORMS

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## City of Winchester, Virginia Public Safety Radio Network

Summary - BASE PRICING

	A	B	C	D	E
	Equipment Total	Discounted Equipment Total	Installation Total	Discounted Installation Total	Equipment and Installation Total
Radio Infrastructure Equipment	_____	_____	_____	_____	_____
Radio Infrastructure Warr. & Maint.	_____	_____	_____	_____	_____
Digital Microwave Equipment	_____	_____	_____	_____	_____
Digital Microwave Warr. & Maint.	_____	_____	_____	_____	_____
Site Facilities	_____	_____	_____	_____	_____
Site Facilities Warr. & Maint.	_____	_____	_____	_____	_____
Subscriber Equipment	_____	_____	_____	_____	_____
Subscriber Equipment Warr. & Maint.	_____	_____	_____	_____	_____

**TOTAL:** \_\_\_\_\_

This value to be shown on official proposal form as

"TOTAL BASE AMOUNT"

## City of Winchester, Virginia Public Safety Radio Network

### Radio Infrastructure Equipment - BASE PRICING

Note: Separate sheet(s) shall be provided for each site or location

System/Site Name/Location: \_\_\_\_\_

Item #	Qty	Equipment		Discount Price	Installation		Discount Price	Discounted Equipment and Installation
		Unit	Total	Total	Unit	Total	Total	Total
<b><u>System Control and Monitoring Equipment</u></b>								
SC-B 1	1	Trunking System Controller	AD	_____	_____	_____	_____	_____
SC-B 2	2	Simulcast Controller	AD	_____	_____	_____	_____	_____
SC-B 3	3	Receiver Voting Equipment	AD	_____	_____	_____	_____	_____
SC-B 4	4	System status monitor sub-system	AD	_____	_____	_____	_____	_____
SC-B 5	5	Digital Voice Logging Recorder Upgrade	AD	_____	_____	_____	_____	_____
SC-B 6	6	Spare equipment (list separately)	AD	_____	_____	_____	_____	_____
SC-B 7	7	Alarm and Monitoring Equipment	AD	_____	_____	_____	_____	_____
SC-B 8	8	Software	AD	_____	_____	_____	_____	_____
SC-B 9	9	Gateways	AD	_____	_____	_____	_____	_____
SC-B 10	10	Other (list)	AD	_____	_____	_____	_____	_____
<b><u>Alarm and control</u></b>								
A&C 1	1	Master Station Equipment	EA	_____	_____	_____	_____	_____
A&C 2	2	Remote Terminal Units	EA	_____	_____	_____	_____	_____
A&C 3	3	Workstation position (local)	EA	_____	_____	_____	_____	_____
A&C 4	4	Workstation position (remote)	EA	_____	_____	_____	_____	_____
A&C 5	5	Spare equipment (list separately)	EA	_____	_____	_____	_____	_____
A&C 6	6	Training	EA	_____	_____	_____	_____	_____
A&C 7	7	Other (list)	EA	_____	_____	_____	_____	_____

## City of Winchester, Virginia Public Safety Radio Network

**Radio Infrastructure Equipment - BASE PRICING**

Note: Separate sheet(s) shall be provided for each site or location

System/Site Name/Location: \_\_\_\_\_

Item #	Qty	Equipment		Discount	Installation		Discount	Discounted
		Unit	Total	Price	Unit	Total	Price	Equipment and Installation
				Total		Total	Total	Total
<b><u>Engineering &amp; Services</u></b>								
ES-B 1	1	System engineering	AD					
	2	Project management	AD					
ES-B 3	3	System staging	AD					
ES-B 4	4	Coverage and Acceptance Testing	AD					
ES-B 5	5	High Noise Environment Testing	AD					
ES-B 6	6	Documentation	AD					
ES-B 7	7	Other services (list)	AD					
<b><u>Training</u></b>								
T-B 1	1	Operational training	EA					
T-B 2	2	User training	EA					
T-B 3	3	System manager training	EA					
T-B 4	4	Maintenance training	EA					
T-B 5	5	Other (list)	EA					
<b><u>Warranty / Maintenance</u></b>								
WM-B 1	1	1 year total system warranty/maintenance after acceptance INCLUDES Remote Network Monitoring						
		AD = As Determined by Proposer		TOTAL		TOTAL		TOTAL

## City of Winchester, Virginia Public Safety Radio Network

**Remote Site Equipment - BASE PRICING**

Note: Separate sheet(s) shall be provided for each site or location

System/Site Name/Location: \_\_\_\_\_

Item #	Qty	Equipment		Discount	Installation		Discount	Discounted Equipment and Installation Total
		Unit	Total	Price Total	Unit	Total	Price Total	
<b><u>Base Station Equipment</u></b>								
RS-B 1	1	800 MHz Base Stations	AD	_____	_____	_____	_____	_____
RS-B 2	2	800 MHz Antenna System	AD	_____	_____	_____	_____	_____
RS-B 3	3	VHF Base Stations	AD	_____	_____	_____	_____	_____
RS-B 4	4	VHF Antenna System	AD	_____	_____	_____	_____	_____
RS-B 5	5	Routing Equipment	AD	_____	_____	_____	_____	_____
RS-B 6	6	Software	AD	_____	_____	_____	_____	_____
RS-B 7	7	Spare equipment (list separately)	AD	_____	_____	_____	_____	_____
RS-B 8	8	Gateways	AD	_____	_____	_____	_____	_____
RS-B 9	9	Base Station Alarm and Monitoring Equipment	AD	_____	_____	_____	_____	_____
RS-B 10	10	Spare equipment (list separately)	AD	_____	_____	_____	_____	_____
RS-B 11	11	Other (list)	AD	_____	_____	_____	_____	_____
				TOTAL _____	_____	TOTAL _____	_____	TOTAL _____

AD = As Determined by Proposer

## City of Winchester, Virginia Public Safety Radio Network

**Digital Radio Console - BASE**

Note: Separate sheet(s) shall be provided for each dispatch locator

System/Site Name/Location: \_\_\_\_\_

Item #	Qty	Equipment		Discount Price	Installation		Discount Price	Equip & Installation Total
		Unit	Total	Total	Unit	Total	Total	
<u>Radio Dispatch Console System</u>								
DC-B 1	1	Console Operator Position (local)	AD	_____	_____	_____	_____	_____
DC-B 2	2	Console Operator Position (remote)	AD	_____	_____	_____	_____	_____
DC-B 3	3	Console System Controller	AD	_____	_____	_____	_____	_____
DC-B 4	4	Logging recorder interface	AD	_____	_____	_____	_____	_____
DC-B 5	5	Spare equipment (list separately)	AD	_____	_____	_____	_____	_____
DC-B 6	6	Microphone-cardiod gooseneck	AD	_____	_____	_____	_____	_____
DC-B 7	7	Microphone-desktop	AD	_____	_____	_____	_____	_____
DC-B 8	8	Microphone-condenser	AD	_____	_____	_____	_____	_____
DC-B 9	9	Audio speaker	AD	_____	_____	_____	_____	_____
DC-B 10	10	Other (list)	AD	_____	_____	_____	_____	_____
AD = As Determined by Proposer		TOTAL		_____		TOTAL	_____	TOTAL _____

## City of Winchester, Virginia Public Safety Radio Network

### Radio Infrastructure Equipment - BASE PRICING

Note: Separate sheet(s) shall be provided for each site or location

SYSTEM

Item #	Qty	Equipment		Discount Price Total	Installation		Discount Price Total	Discounted Equipment and Installation Total	
		Unit	Total		Unit	Total			
<b>Warranty / Maintenance Year 2</b>									
WHMO 2	1								
WSMO 2	1								
WNMO 2	1								
WLMO 2	1								
<b>Warranty / Maintenance Year 3</b>									
WHMO 3	1								
WSMO 3	1								
WNMO 3	1								
WLMO 3	1								
<b>Warranty / Maintenance Year 4</b>									
WHMO 4	1								
WSMO 4	1								
WNMO 4	1								
WLMO 4	1								
<b>Warranty / Maintenance Year 5</b>									
WHMO 5	1								
WSMO 5	1								
WNMO 5	1								
WLMO 5	1								
AD = As Determined by Proposer		TOTAL			TOTAL			TOTAL	

## City of Winchester, Virginia Public Safety Radio Network

### Digital Microwave Equipment - BASE PRICING

Note: Separate sheet(s) shall be provided for each site or location

System/Site Name/Location: \_\_\_\_\_

Item #	Digital Microwave	Qty	Equipment		Discount Price	Installation		Discount Price	Equip & Installation
			Unit	Total	Total	Unit	Total	Total	Total
	HSB or Loop Configured Radio (please indicate)								
MWT-B 1		AD							
MWT-B 2	Multiplex Equipment	AD							
MWT-B 3	Loop switch (if applicable)	AD							
MWT-B 4	Power supply and battery	AD							
MWT-B 5	Antenna system	AD							
MWT-B 6	Programming	AD							
MWT-B 7	Spare equipment (list separately)	AD							
MWT-B 8	Other (list)	AD							
MWT-B 9	Other (list)	AD							
	<u>Engineering &amp; Services</u>								
MWES-B 1	System engineering	1							
MWES-B 2	Project management	1							
MWES-B 3	System staging	1							
MWES-B 4	Documentation	AD							
MWES-B 5	Other services (list)	AD							
	<u>Warranty Maintenance</u>								
MWW-B 1	1 year total system warranty after acceptance	1							
	AD = As Determined by Proposer								
			TOTAL			TOTAL			TOTAL

## City of Winchester, Virginia Public Safety Radio Network

**Digital Microwave Equipment - BASE PRICING**

Note: Separate sheet(s) shall be provided for each site or locator

Item #	Digital Microwave	Qty	Equipment			SYSTEM				Equip & Installation Total
			Unit	Total	Discount Price Total	Unit	Installation Total	Discount Price Total		
<b>Warranty / Maintenance Year 2</b>										
MWHMO	2 1 year system hardware warranty / maintenance (year 2)	1								
MWSMO	2 1 year system software warranty / maintenance (year 2)	1								
MWLMO	2 1 year system labor warranty / maintenance (year 2)	1								
<b>Warranty / Maintenance Year 3</b>										
MWHMO	3 1 year system hardware warranty / maintenance (year 3)	1								
MWSMO	3 1 year system software warranty / maintenance (year 3)	1								
MWLMO	3 1 year system labor warranty / maintenance (year 3)	1								
<b>Warranty / Maintenance Year 4</b>										
MWHMO	4 1 year system hardware warranty / maintenance (year 4)	1								
MWSMO	4 1 year system software warranty / maintenance (year 4)	1								
MWLMO	4 1 year system labor warranty / maintenance (year 4)	1								
<b>Warranty / Maintenance Year 5</b>										
MWHMO	5 1 year system hardware warranty / maintenance (year 5)	1								
MWSMO	5 1 year system software warranty / maintenance (year 5)	1								
MWLMO	5 1 year system labor warranty / maintenance (year 5)	1								
AD = As Determined by Proposer			TOTAL _____			TOTAL _____				TOTAL _____

## City of Winchester, Virginia Public Safety Radio Network

**Remote Site Facilities - BASE PRICING**

Note: Separate sheet(s) shall be provided for each site or location

Site Name/Location: \_\_\_\_\_

Item #	Site Facilities	Qty	Equipment		Discount Price Total	Installation		Discount Price Total	Equip & Installation Total
			Unit	Total		Unit	Total		
RS-B 1	Site preparation and finishing	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 2	Tower ( ____-foot)	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 3	Fencing	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 4	Grounding and surge protection	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 5	Prefabricated shelter		_____	_____	_____	_____	_____	_____	_____
RS-B 6	Emergency Generator and fuel system	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 7	Transfer switch	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 8	UPS and batteries	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 9	Site alarm, security and monitoring system	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 10	FAA Study / FCC ASR Reg	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 11	Structural Analysis - If needed	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 12	Soil Resistivity Testing	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 13	Permitting	AD	_____	_____	_____	_____	_____	_____	_____
RS-B 14	Other (list)	AD	_____	_____	_____	_____	_____	_____	_____
			TOTAL	_____	_____	TOTAL	_____	_____	TOTAL

AD = As Determined by Proposer

## City of Winchester, Virginia Public Safety Radio Network

### Radio Subscriber Equipment

Item #		Qty	Equipment		Discount Price	Installation		Discount Price	Discounted	
			Unit	Total	Total	Unit	Total	Total	Equipment and Installation Total	
<u>Portable Radios</u>										
PB 1	D1 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 2	D2 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 3	D3 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 4	A1 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 5	A2 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 6	A3 Portable	AD	_____	_____	_____	_____	_____	_____	_____	
PB 7	Reprogramming Portable	AD	_____	_____	_____	_____	_____	_____	_____	
<u>Mobile Radios</u>										
MB 1	D1 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 2	D2 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 3	D3 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 4	A1 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 5	A2 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 6	A3 Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
MB 7	Control Stations	AD	_____	_____	_____	_____	_____	_____	_____	
MB 8	Reprogramming Mobile	AD	_____	_____	_____	_____	_____	_____	_____	
<u>Pagers</u>										
PB 1	Individual Pager	AD	_____	_____	_____	_____	_____	_____	_____	
PB 2	Desktop Pager	AD	_____	_____	_____	_____	_____	_____	_____	
AD = As Determined by Proposer			TOTAL	_____	_____	TOTAL	_____	_____	TOTAL	_____

## City of Winchester, Virginia Public Safety Radio Network

### Radio Subscriber Equipment

Item #		Qty	Equipment		Discount Price	Installation		Discount Price	Discounted
			Unit	Total	Total	Unit	Total	Total	Equipment and Installation Total
<u>Portable Radios</u>									
PO 1	Speaker microphone	EA	_____	_____	_____	_____	_____	_____	_____
PO 2	Speaker Microphone w/ antenna	EA	_____	_____	_____	_____	_____	_____	_____
PO 3	Headset	EA	_____	_____	_____	_____	_____	_____	_____
PO 4	Spare battery	EA	_____	_____	_____	_____	_____	_____	_____
PO 5	Intrinsically safe battery	EA	_____	_____	_____	_____	_____	_____	_____
PO 6	High capacity battery	EA	_____	_____	_____	_____	_____	_____	_____
PO 7	Extra high capacity battery	EA	_____	_____	_____	_____	_____	_____	_____
PO 8	1/4 Wave stub antenna	EA	_____	_____	_____	_____	_____	_____	_____
PO 9	Rapid charger	EA	_____	_____	_____	_____	_____	_____	_____
PO 10	Vehicular charger	EA	_____	_____	_____	_____	_____	_____	_____
PO 11	12V DC charger.	EA	_____	_____	_____	_____	_____	_____	_____
PO 12	120 V Multi-unit/gang bank charger	EA	_____	_____	_____	_____	_____	_____	_____
PO 13	120 V Multi-unit/gang bank charger/battery	EA	_____	_____	_____	_____	_____	_____	_____
PO 14	Leather carrying case	EA	_____	_____	_____	_____	_____	_____	_____
PO 15	Leather carrying case with swivel belt clip and shoulder	EA	_____	_____	_____	_____	_____	_____	_____
PO 16	Extra long leather shoulder strap	EA	_____	_____	_____	_____	_____	_____	_____
PO 17	Spare equipment (list separately)	EA	_____	_____	_____	_____	_____	_____	_____
PO 18	Other (list)	EA	_____	_____	_____	_____	_____	_____	_____
<u>Mobile Radios</u>									
MO 1	Dual control head	EA	_____	_____	_____	_____	_____	_____	_____
MO 2	Siren and light control	EA	_____	_____	_____	_____	_____	_____	_____
MO 3	Public address	EA	_____	_____	_____	_____	_____	_____	_____
MO 4	DTMF Microphone	EA	_____	_____	_____	_____	_____	_____	_____
MO 5	Reprogramming	EA	_____	_____	_____	_____	_____	_____	_____
MO 6	Motorcycle mounting kit	EA	_____	_____	_____	_____	_____	_____	_____
MO 7	Spare equipment (list separately)	EA	_____	_____	_____	_____	_____	_____	_____
MO 8	Other (list)	EA	_____	_____	_____	_____	_____	_____	_____

## City of Winchester, Virginia Public Safety Radio Network

### Radio Subscriber Equipment

Item #	Qty	Equipment		Discount Price	Installation		Discount Price	Discounted
		Unit	Total	Total	Unit	Total	Total	Equipment and Installation Total
<b><u>Warranty Maintenance</u></b>								
PHM-B	1	1 year warranty and maintenance after acceptance	1					
<b><u>Warranty / Maintenance Year 2</u></b>								
PHPM-2	1	1 year hardware warranty / maintenance (year 2)	1					
PSPM-2	2	1 year software warranty / maintenance (year 2)	1					
PLPM-2	3	1 year labor warranty / maintenance (year 2)	1					
<b><u>Warranty / Maintenance Year 3</u></b>								
PHPM-3	1	1 year hardware warranty / maintenance (year 3)	1					
PSPM-3	2	1 year software warranty / maintenance (year 3)	1					
PLPM-3	3	1 year labor warranty / maintenance (year 3)	1					
<b><u>Warranty / Maintenance Year 4</u></b>								
PHPM-4	1	1 year hardware warranty / maintenance (year 4)	1					
PSPM-4	2	1 year software warranty / maintenance (year 4)	1					
PLPM-4	3	1 year labor warranty / maintenance (year 4)	1					
<b><u>Warranty / Maintenance Year 5</u></b>								
PHPM-5	1	1 year hardware warranty / maintenance (year 5)	1					
PSPM-5	2	1 year software warranty / maintenance (year 5)	1					
PLPM-5	3	1 year labor warranty / maintenance (year 5)	1					

**SECTION 1.d. BID BOND**

KNOW ALL MEN BY THESE PRESENTS THAT \_\_\_\_\_

\_\_\_\_\_  
(Here insert the name & address or legal title of the Contractor)

as Principal, hereinafter called the Contractor and \_\_\_\_\_

\_\_\_\_\_  
(Here insert the legal title of the Surety)

as Surety, hereinafter called the Surety, are held and firmly bound unto the City of Winchester, Virginia, as obligee, hereinafter called the Owner, in the amount of

\_\_\_\_\_  
(Dollars)

(\$ \_\_\_\_\_) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a Bid for:

**Public Safety Radio Network**

in accordance with Drawing and Specifications prepared by the Owner and Engineer.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Obligee shall accept the Bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with terms of such Bid, and give such bonds as specified in the Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bonds, if the Principal shall pay the Obligee the difference not to exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said Bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

SIGNED AND SEALED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_ A.D., 2012.

\_\_\_\_\_  
PRINCIPAL

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
WITNESS

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
WITNESS

**SECTION 1. e – NON-COLLUSION AFFIDAVIT**

STATE OF VIRGINIA

Ss: **Public Safety Radio Network**

CITY OF WINCHESTER, COUNTY of FREDERICK

I, \_\_\_\_\_ of the City of \_\_\_\_\_

In the County of \_\_\_\_\_ and the State of \_\_\_\_\_

Of full age, being duly sworn according to law or my oath depose and say that:

I am \_\_\_\_\_ of the firm of \_\_\_\_\_

\_\_\_\_\_, of the Company making the Proposal for the above named project, and that I executed the said Proposal with full authority to do so; that the Company has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive proposal preparation in connection with the above named project; and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge that the City of Winchester relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the Contract for said Project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by:

\_\_\_\_\_  
(Name of Contractor)

Subscribed and sworn to \_\_\_\_\_  
(Type or print name of applicant under signature)

before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
(Notary Public)

of \_\_\_\_\_

My commission expires: \_\_\_\_\_, 20\_\_\_\_.

**Public Safety Radio Network  
RFP # 200823**

**SECTION 1.f – CONTRACT**

THIS CONTRACT, made and entered into in triplicate originals this \_\_\_\_ day of \_\_\_\_\_, 2012, by and between the **City of Winchester, Virginia**, Party of the First Part, hereinafter referred to as the "**Owner**" and \_\_\_\_\_, Party of the Second Part, hereinafter referred to as the "**Contractor**".

WITNESSETH, That the Contractor and the City for the consideration stated herein agree as follows:

ARTICLE I, SCOPE OF WORK - The Contractor shall perform everything required to be performed and shall provide and furnish all of the labor, materials, necessary tools, expendable equipment and all utility and transportation services required to perform and complete in a workmanlike manner all the work required in connection with:

**Public Safety Radio Network**

all in strict accordance with the Contract Documents prepared by the Owner and Engineer. The Contractor shall do everything required by this Contract and other Documents constituting a part thereof.

ARTICLE II, CONTRACT PRICE - The City shall pay to the Contractor for the performance of this Contract, subject to any additions or deductions provided therein, in current funds, the Contract Price computed as follows:

**TOTAL CONTRACT PRICE=** \_\_\_\_\_

ARTICLE III. PAYMENTS - Payments are to be made to the Contractor in accordance with and subject to provisions embodied in the Documents made a part of this Contract.

ARTICLE IV. CONTRACT TIME - Work under this Contract shall commence no later than the date to begin work set forth in a written Notice to Proceed from the City or its authorized representative, to the Contractor. The Contractor shall complete **all** work under this Contract **prior to December 31, 2012** following the date specified in the Notice to Proceed.

The Work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed by and between the Contractor and the City that the time for the completion of the Work described herein is a reasonable time for the completion of the

same, taking into consideration average climatic range and usual industrial conditions prevailing in this locality.

ARTICLE V. ENGINEER – The project has been designed by L. R. Kimball, who is hereinafter called ENGINEER and who is to act in conjunction with the OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE VI. HOLD HARMLESS CLAUSE - Bids shall provide that during the term of the Contract, including warranty period, for the successful bidder indemnifying, defending, and holding harmless the City, its officers, employees, agent and representatives thereof from all suits, actions, claims of any kind, including attorney's fees, brought on account of any personal injuries, damages, or violation of rights sustained by any person or property in consequence of any neglect in safeguarding contract work, or on account of any act or omission by the Contractor or his employees, or from any claims or amounts arising from violation of any law, bylaw, ordinance, regulation or decree. The Contractor agrees that this clause shall include claims involving infringement of patent or copyrights.

ARTICLE VII. LIQUIDATED DAMAGES - It is hereby fully understood and agreed that the time is of essence in the performance of this Contract. For each and every calendar day that elapses between the Contract Completion Date and the date on which the work covered by such Contract is actually completed, the Contractor shall pay to the City as liquidated damages and not as a penalty, the sum of TWO THOUSAND FIVE HUNDRED DOLLARS PER CALENDAR DAY (\$2,500.00). The total amount so payable by the Contractor as liquidated damages either may be deducted from any moneys due or payable to the Contractor by the City or so much thereof as is not so deducted shall be chargeable to and will be payable promptly by such Contractor and his Surety, or either of them, to the City. Such liquidated damages shall be payable to reimburse or compensate, at least in part, the City for (1) the administration of the work covered by such Contract and any other contract or contracts beyond the Contract Completion Date, including the additional expense to the City for supervision, inspection, and superintendence; (2) expenditures resulting from the inability of the City (and the general public) to use the improvement being constructed from and after such Contract Completion Date until the actual date of completion; (3) other miscellaneous obligations and expenditures incurred by the City directly as a result of the failure to complete the Work covered by such Contract on or before the Contract Completion Date.

ARTICLE VIII. COMPONENT PARTS OF THIS CONTRACT - That this Contract consists of the following component parts which are made a part of this agreement and Contract as fully and absolutely as if they were set out in detail in this Contract:

**SECTION 1 – Proposal Documents**

- Request for Proposal
- Instructions to Respondents
- Proposal Form
- Bid Bond
- Non-Collusion Affidavit
- Contract
- Performance Bond
- Labor and Material Payment Bond
- Notice of Award
- Notice to Proceed
- City of Winchester Required General Terms and Conditions
- General Conditions

**SECTION 2 – General Scope of Work**

- a. Project Overview
- b. Radio Network
- c. Point-to-Point Digital Microwave Radio
- d. Self-Supporting Communications Tower
- e. Pre-Fabricated Radio Equipment Shelter
- f. Chain Link Fencing and Gates
- g. Propane Generator and Transfer Switch

**SECTION 3 – Option A – Full 800 MHz Trunking Radio Network**

- a. Option A – Project Overview
- b. Option A – Radio Network
- c. Option A – Radio Dispatch Console System
- d. Option A – Non-Fixed User Radio Equipment

**SECTION 4 – Option B – 800 MHz / VHF Hybrid System**

- a. Option B – Project Overview
- b. Option B – Radio Network
- c. Option B – Radio Dispatch Console System
- d. Option B – Non-Fixed User Radio Equipment

**SECTION 5 – Option C – VHF Compliance System**

- a. Option C – Project Overview
- b. Option C – Radio Network
- c. Option C – Non-Fixed User Radio Equipment

**SECTION 6 – Option D – Alternate Solutions**

- a. Option D – Project Overview

**APPENDICES**

- A. Glossary

- B. FCC License Information
- C. Candidate Radio Sites
- D. Critical Buildings
- E. Subscriber Counts
- F. Jefferson Water Tower Drawing

All of the following Addenda:

Above components are complimentary and what is called for by one shall be binding as if called by all.

IN WITNESS WHEREOF, the parties hereto have hereunto set their hands and seals the date first written above.

CONTRACTOR:

CITY OF WINCHESTER, VIRGINIA:

\_\_\_\_\_

\_\_\_\_\_

CITY MANAGER

NAME AND TITLE

ATTEST

ATTEST

**SECTION 1.g – PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_

\_\_\_\_\_ as Principal, hereinafter

called Contractor, and \_\_\_\_\_

Surety Company, with General Offices in \_\_\_\_\_

\_\_\_\_\_, a corporation organized under the laws of the State of \_\_\_\_\_ and authorized to transact business in the State of Virginia as Surety, hereinafter called Surety, are held and firmly bound onto the City of Winchester, Virginia, the Virginia Resources Authority, and U.S. Bank National Association as Trustee, as Obligees, hereinafter called Owner, in the penal sum \_\_\_\_\_

(\_\_\_\_\_)Dollars, lawful money of the United States, for the payment of which sum, will and truly be made, the Said Contractor and Surety bind themselves, their successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and delivered this \_\_\_\_ day of \_\_\_\_\_, 2012.

WHEREAS, the above named and bounded Contractor has entered into a written contract with the Owner, dated \_\_\_\_\_, 2012 for:

**Public Safety Radio Network**

in accordance with the Drawings and Specifications prepared by the Owner and Engineer, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or

2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of contract price," as used in this paragraph, shall mean the total amount payable by the Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 2012.

\_\_\_\_\_  
PRINCIPAL

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
WITNESS

\_\_\_\_\_  
WITNESS

**SECTION 1.h – LABOR AND MATERIAL PAYMENT BOND**

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_

\_\_\_\_\_ as Principal, hereinafter

called Contractor, and \_\_\_\_\_

Surety Company, with General Offices in \_\_\_\_\_

\_\_\_\_\_, a corporation organized under the laws of the State of \_\_\_\_\_ and authorized to transact business in the State of Virginia as Surety, hereinafter called Surety, are held and firmly bound unto the City of Winchester, Virginia, the Virginia Resources Authority, and U.S. Bank National Association as Trustee, as Obligees, hereinafter called Owner, in the penal sum \_\_\_\_\_ (\_\_\_\_\_)Dollars, lawful money of the United States, for the payment of which sum, will and truly be made, the Said Contractor and Surety bind themselves, their successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and delivered this \_\_\_\_\_ day of \_\_\_\_\_ 2012.

WHEREAS, the above named and bounded Contractor has entered into a written contract with the Owner, dated \_\_\_\_\_, 2012 for:

**Public Safety Radio Network**

in accordance with the Drawings and Specifications prepared by the Owner and Engineer, Virginia, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named Principal and Surety hereby jointly and severally agree with

the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgement for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:
  - a) Unless claimant, other than the one having a direct Contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage paid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
  - b) After the expiration of one (1) year following the date on which Principal ceased work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
  - c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanic's liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 2012.

\_\_\_\_\_  
PRINCIPAL

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
WITNESS

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
WITNESS

**SECTION 1.i – NOTICE OF AWARD**

**DATE:**

**TO:**

**PROJECT TITLE: Public Safety Radio Network**

Gentlemen:

Your Bid, dated \_\_\_\_\_, for the above Project has been considered and you are the apparent successful bidder. You are hereby notified that you have been awarded a Contract for RFP No. 200823.

The Contract Price of your contract is \$\_\_\_\_\_.

Three copies each of the proposed Contract between Owner and Contractor and the Contract Documents accompany this Notice of Award.

You must comply with the following conditions precedent within fifteen days of the date of this Notice of Award, that is by \_\_\_\_\_.

1. You must deliver to the Owner three (3) fully executed counterparts of the Contract between Owner and Contractor including all the Contract Documents. This includes the sets of Plans and Specifications. Each of the Contract Documents must bear your signature on the Index page of the Plans and on the Specification Table of Contents page.
2. You must deliver with the executed Contract, Payment and Performance Bonds, and required Certificates of Insurance. The Certificate of Insurance must identify the above referenced project as the project for which insurance is being provided. *Additionally, it must indicate the City of Winchester as the Certificate Holder, and name the City of Winchester as an additional insured.*

Failure to comply with these conditions within the time specified will entitle Owner to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

After you comply with those conditions, and upon approval of the Contract Security by the Owner, the Owner will return to you one fully signed counterpart of the Contract with the Contract Documents.

City of Winchester, Virginia

By: \_\_\_\_\_  
City Manager

**SECTION 1.j – NOTICE TO PROCEED**

**DATE:**

**TO:**

**PROJECT TITLE: Public Safety Radio Network**

Gentlemen:

In accordance with the Contract between Owner and Contractor, you are notified that the Time for Completion under the above Contract will commence to run on \_\_\_\_\_ . By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Contract between Owner and Contractor, the Work shall be substantially completed **prior to December 31, 2012.**

City of Winchester, Virginia

By: \_\_\_\_\_  
City Manager

## CITY OF WINCHESTER

### SECTION 1.k – REQUIRED GENERAL TERMS AND CONDITIONS

- A. APPLICABLE LAWS AND COURTS
- B. ANTI-DISCRIMINATION
- C. ETHICS IN PUBLIC CONTRACTING
- E. IMMIGRATION REFORM AND CONTROL ACT OF 1986
- F. DEBARMENT STATUS
- G. ANTITRUST
- H. MANDATORY USE OF CITY FORM AND TERMS AND CONDITIONS
- I. CLARIFICATION OF TERMS
- J. PAYMENT
- K. PRECEDENCE OF TERMS
- L. QUALIFICATIONS OF BIDDERS OR OFFERORS
- M. TESTING AND INSPECTION
- N. ASSIGNMENT OF CONTRACT
- O. SEVERABILITY
- P. CHANGES TO THE CONTRACT
- Q. DEFAULT
- R. TAXES
- S. USE OF BRAND NAMES
- T. TRANSPORTATION AND PACKAGING
- U. INSURANCE
- V. ANNOUNCEMENT OF AWARD
- W. DRUG-FREE WORKPLACE
- X. NONDISCRIMINATION OF CONTRACTORS
- Y. AVAILABILITY OF FUNDS
- Z. LICENSES AND PERMITS
- AZ. TERMINATION
- BZ. HOLD HARMLESS

These General Terms and Conditions are required for all sealed and unsealed written solicitations issued by the City of Winchester for procurements that are subject to the Winchester City Code unless changed, deleted or revised by the City Attorney.

- A. **APPLICABLE LAWS AND COURTS:** This solicitation and any resulting contract shall be governed by the laws of the Commonwealth of Virginia. Any dispute arising from the performance or non-performance of this Agreement shall be resolved or otherwise litigated in the Circuit Court for the City of Winchester, Virginia or the Fourth Circuit Federal District Court in Harrisonburg, Virginia. The agency and the contractor are encouraged to resolve any issues in controversy arising from the award of the contract or any contractual dispute following the Winchester City Code, Chapter 21-61. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.
- B. **ANTI-DISCRIMINATION:** By submitting their (bids/proposals), (bidders/offerors) certify to the City of Winchester that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and § 2.2-4311 of the *Virginia Public Procurement Act (VPPA)*. If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (*Code of Virginia, § 2.2-4343.1E*).

In every contract over \$10,000 the provisions in 1. and 2. below apply:

1. During the performance of this contract, the contractor agrees as follows:

- a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
  - b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.
  - c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting these requirements.
2. The contractor will include the provisions of 1. above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.
- C. **ETHICS IN PUBLIC CONTRACTING:** By submitting their (bids/proposals), (bidders/offerors) certify that their (bids/proposals) are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other (bidder/offeror), supplier, manufacturer or subcontractor in connection with their (bid/proposal), and that they have not conferred on any public employee having official responsibility for this 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 was exchanged.
- D. **IMMIGRATION REFORM AND CONTROL ACT OF 1986:** By submitting their (bids/proposals), (bidders/offerors) certify that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the federal Immigration Reform and Control Act of 1986.
- E. **DEBARMENT STATUS:** By submitting their (bids/proposals), (bidders/offerors) certify that they are not currently debarred by the Federal Government, Commonwealth of Virginia, or by any City, Town or County from submitting bids or proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.
- F. **ANTITRUST:** By entering into a contract, the contractor conveys, sells, assigns, and transfers to the City of Winchester all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the City of Winchester under said contract.
- H. **MANDATORY USE OF CITY FORM AND TERMS AND CONDITIONS:** Failure to submit a bid/proposal on the official City form provided for that purpose may be a cause for rejection of the bid/proposal. Modification of or additions to the General Terms and Conditions of the solicitation may be cause for rejection of the bid/proposal; however, the City of Winchester reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a bid/proposal.
- I. **CLARIFICATION OF TERMS:** If any prospective (bidder/offeror) has questions about the specifications or other solicitation documents, the prospective (bidder/offeror) should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the Purchasing Agent, or designee.
- J. **PAYMENT:**
1. **To Prime Contractor:**
    - a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations).
    - b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however.
    - c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which department is being billed.

- d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail.
- e. **Unreasonable Charges.** Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon determining that invoiced charges are not reasonable, the City of Winchester shall promptly notify the contractor, in writing, as to those charges which it considers unreasonable and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification. The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges which are not in dispute (*Code of Virginia, § 2.2-4363*).

2. To Subcontractors:

- a. A contractor awarded a contract under this solicitation is hereby obligated:
  - (1) To pay the subcontractor(s) within seven (7) days of the contractor's receipt of payment from the City of Winchester for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or
  - (2) To notify the agency and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason.
- b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the City of Winchester, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the City of Winchester.

K. **PRECEDENCE OF TERMS:** The following General Terms and Conditions APPLICABLE LAWS AND COURTS, ANTI-DISCRIMINATION, ETHICS IN PUBLIC CONTRACTING, IMMIGRATION REFORM AND CONTROL ACT OF 1986, DEBARMENT STATUS, ANTITRUST, MANDATORY USE OF CITY FORM AND TERMS AND CONDITIONS, CLARIFICATION OF TERMS, PAYMENT shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

L. **QUALIFICATIONS OF (BIDDERS/OFFERORS):** The City of Winchester may make such reasonable investigations as deemed proper and necessary to determine the ability of the (bidder/offeror) to perform the services/furnish the goods and the (bidder/offeror) shall furnish to the City of Winchester all such information and data for this purpose as may be requested. The City of Winchester reserves the right to inspect (bidder's/offeror's) physical facilities prior to award to satisfy questions regarding the (bidder's/offeror's) capabilities. The City of Winchester further reserves the right to reject any (bid/proposal) if the evidence submitted by, or investigations of, such (bidder/offeror) fails to satisfy the City of Winchester that such (bidder/offeror) is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

M. **TESTING AND INSPECTION:** The City of Winchester reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

N. **ASSIGNMENT OF CONTRACT:** A contract shall not be assignable by the contractor in whole or in part without the written consent of the City of Winchester.

O. **SEVERABILITY OF CONTRACT:** In the event that any provision shall be adjudged or decreed to be invalid, such ruling shall not invalidate the entire Agreement but shall pertain only to the provision in question and the remaining provisions shall continue to be valid, binding and in full force and effect.

P. **CHANGES TO THE CONTRACT:**

1. A public contract may include provisions for modification of the contract during performance, but no fixed-price contract may be increased by more than twenty-five percent of the amount of the contract or ten thousand dollars (\$10,000), whichever is greater, without the advance written approval of the City Council. In no event may the amount of any contract, without adequate consideration, be increased for any purpose, including, but not limited to, relief of an offeror from the consequences of an error in its bid or offer (Winchester City Code 21-44).
  2. Changes can be made to the contract in any of the following ways:
    - a. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.
    - b. The City of Winchester may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt. The contractor shall be compensated for any additional costs incurred as the result of such order and shall give the City of Winchester a credit for any savings. Said compensation shall be determined by one of the following methods:
      1. By mutual agreement between the parties in writing; or
      2. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the City of Winchester's right to audit the contractor's records and/or to determine the correct number of units independently; or
      3. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the City of Winchester with all vouchers and records of expenses incurred and savings realized. The City of Winchester shall have the right to audit the records of the contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the City of Winchester within thirty (30) days from the date of receipt of the written order from the City of Winchester. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the City of Winchester Code. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the City of Winchester or with the performance of the contract generally.
- Q. **DEFAULT:** In case of failure to deliver goods or services in accordance with the contract terms and conditions, the City of Winchester, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the City of Winchester may have.
- R. **TAXES:** Sales to the City of Winchester are normally exempt from State sales tax. State sales and use tax certificates of exemption, Form ST-12, will be issued upon request.
- S. **USE OF BRAND NAMES:** Unless otherwise provided in this solicitation, the name of a certain brand, make or manufacturer does not restrict (bidders/offerors) to the specific brand, make or manufacturer named, but conveys the general style, type, character, and quality of the article desired. Any article which the public body, in its sole discretion, determines to be the equal of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The (bidder/offeror) is responsible to clearly and specifically identify the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the City of Winchester to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding only the information furnished with the bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the (bidder/offeror) clearly indicates in its (bid/proposal) that the product offered is an equal product, such (bid/proposal) will be considered to offer the brand name product referenced in the solicitation.

- T. **TRANSPORTATION AND PACKAGING:** By submitting their (bids/proposals), all (bidders/offerors) certify and warrant that the price offered for FOB destination includes only the actual freight rate costs at the lowest and best rate and is based upon the actual weight of the goods to be shipped. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order number, commodity description, and quantity.
- U. **INSURANCE:** By signing and submitting a bid or proposal under this solicitation, the bidder or offeror certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §§ 2.2-4332 and 65.2-800 et seq. of the *Code of Virginia*. The bidder or offeror further certifies that the contractor and any subcontractors will maintain these insurance coverage during the entire term of the contract and that all insurance coverage will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.

**MINIMUM INSURANCE COVERAGES AND LIMITS REQUIRED FOR MOST CONTRACTS:**

1. Workers' Compensation - Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the City of Winchester of increases in the number of employees that change their workers' compensation requirements under the *Code of Virginia* during the course of the contract shall be in noncompliance with the contract.
2. Employer's Liability - \$100,000.
3. Commercial General Liability - \$1,000,000 per occurrence. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The City of Winchester must be named as an additional insured and so endorsed on the policy.
4. Automobile Liability - \$1,000,000 per occurrence. (Only used if motor vehicle is to be used in the contract.)

**NOTE: In addition, various Professional Liability/Errors and Omissions coverages are required when soliciting those services as follows:**

<b><u>Profession/Service</u></b>	<b><u>Limits</u></b>
Accounting	\$1,000,000 per occurrence, \$3,000,000 aggregate
Architecture	\$2,000,000 per occurrence, \$6,000,000 aggregate
Asbestos Design, Inspection or Abatement Contractors	\$1,000,000 per occurrence, \$3,000,000 aggregate
Health Care Practitioner (to include Dentists, Licensed Dental Hygienists, Optometrists, Registered or Licensed Practical Nurses, Pharmacists, Physicians, Podiatrists, Chiropractors, Physical Therapists, Physical Therapist Assistants, Clinical Psychologists, Clinical Social Workers, Professional Counselors, Hospitals, or Health Maintenance Organizations.)	\$1,925,000 per occurrence, \$3,000,000 aggregate
(Limits increase each July 1 through fiscal year 2008, as follows: July 1, 2008 - \$2,000,000. This complies with §8.01-581.15 of the <i>Code of Virginia</i> .)	
Insurance/Risk Management	\$1,000,000 per occurrence, \$3,000,000 aggregate
Landscape/Architecture	\$1,000,000 per occurrence, \$1,000,000 aggregate
Legal	\$1,000,000 per occurrence, \$5,000,000 aggregate
Professional Engineer	\$2,000,000 per occurrence, \$6,000,000 aggregate
Surveying	\$1,000,000 per occurrence, \$1,000,000 aggregate

- V. **ANNOUNCEMENT OF AWARD:** Upon the award or the announcement of the decision to award a contract over \$50,000, as a result of this solicitation, the Purchasing Agent will publicly post such notice on the City of Winchester's web site ([www.winchesterva.gov/purchasing](http://www.winchesterva.gov/purchasing)) for a minimum of 10 days.
- W. **DRUG-FREE WORKPLACE:** During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) 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 the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "*drug-free workplace*" means a site for the performance of work done in connection with a specific contract awarded to a contractor, 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 contract.

- X. **NONDISCRIMINATION OF CONTRACTORS:** A bidder, offeror, or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the bidder or offeror employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.
- Y. **AVAILABILITY OF FUNDS:** In the event that funds are not appropriated for this Contract for any City fiscal year, following the City's current year, the Contract shall terminate automatically as of the last day for which funds were appropriated without the City providing written notice to the Contractor prior to the date of termination. The City shall not consider termination of the Contract pursuant to this section default. Upon such termination, the City shall be released from any obligation to make future payments and shall not be liable for cancellation or termination charges.
- Z. **LICENSES AND PERMITS:** Contractors will be responsible for all licenses and permits, if required. Any person, firm, or corporation responding to this invitation to bid which is required to have a current and valid City of Winchester business license and, in fact, does not, will not be considered a "responsive bidder" as such term is defined by the Code of Virginia §2.2-4301, as amended. Any bid received from such an entity may be rejected, at the City's sole option, for that reason alone. In addition, the successful bidder or offeror will be required to produce affirmative evidence, satisfactory to the Purchasing Agent, or designee that it has such a license, or is not required to have such a license, prior to approval and execution of any contract to perform the work herein described.
- AZ **TERMINATION:**
- a. Termination for Convenience: The City of Winchester may terminate a contract, in whole or in part, whenever the City OF Winchester determines that such termination is in the best interest of the City of Winchester, without showing cause, upon giving ten (10) days written notice to the vendor.
  - b. Termination for Default: When the vendor has not performed or has unsatisfactorily performed the contract, the City of Winchester may terminate the contract for default. Upon termination for default, payment may be withheld at the discretion of the City of Winchester. The Vendor will be paid for work satisfactorily performed prior to termination.
- BZ **HOLD HARMLESS:** Bids/Proposal shall provide that during the term of the contract, including warranty period, for the successful bidder/offeror indemnifying, defending, and holding harmless the City, its officers, employees, agent and representatives thereof from all suits, actions, claims of any kind, including attorney's fees, brought on account of any personal injuries, damages, or violation of rights sustained by any person or property in consequence of any neglect in safeguarding contract work, or on account of any act or omission by the contractor or his employees, or from any claims or amounts arising from violation of any law, bylaw, ordinance, regulation or decree. The vendor agrees that this clause shall include claims involving infringement of patent or copyrights.
- CZ **CONFLICT OF PROVISIONS:** If there is a conflict between the City of Winchester Required General Terms and Conditions and the Standard General Conditions of the Construction Contract, the City of Winchester Required General Terms and Conditions shall govern. If there is a conflict between the City of Winchester Required General Terms and Conditions and the Special Terms and Conditions, the Special Terms and Conditions shall govern. If there is a conflict between any Federal provisions with any other part of the Contract, the Federal provisions shall govern.

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## SECTION 2

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### GENERAL SCOPE OF WORK

## SECTION 2.a - PROJECT OVERVIEW AND GENERAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 BACKGROUND

- A. The City of Winchester Virginia (the "City") has authorized this Request For Proposals (RFP) as part of ongoing efforts to upgrade and enhance two-way radio communications throughout the City for the benefit of all public safety and local government users and the citizens that they serve.
- B. The City currently operates a single site VHF conventional radio system. This system has become obsolete, and the City desires to upgrade this system with the most beneficial solution that the City deems necessary. The City anticipates four main proposal types.
1. Option A - Full 800 MHz System – This solution will create an 800 MHz Project 25 (P25) digital, trunked radio system whereby every city department would be connected to the 800 MHz system creating full internal interoperability that may be utilized during day to day operations and emergent operations/disasters. Additionally, this system will provide external interoperability to insure communications with outside agencies as required for operations.
  2. Option B - 800 MHz/VHF Hybrid System – This solution will create an 800 MHz system for utilization by the traditional Public Safety Agencies (Police, City Sheriff, Fire & Rescue and Emergency Management) and provide a narrowband compliance solution for the current VHF frequencies/channels that will be assigned to the non-public safety radio agencies/users. This system will also create internal interoperability and external interoperability for utilization on a day to day and emergent/disaster operations as required.
  3. Option C - VHF Narrowband Compliance System – This solution will utilize the current radio frequencies/channels utilizing them in similar nature to the current frequency/channel assignment. This solution will replace certain specified hardware and retrofit that hardware which can technically be modified. This system will provide somewhat limited interoperability both internally and externally very much consistent with the current radio system.
  4. Option D - Alternate Solutions – This solution will invite vendors to introduce other technologies that exist in the market place as an alternative to the technologies cited in the previously identified solutions. These solutions will be considered as alternatives and should meet the necessary elements of the communications system as identified in this RFP.
- C. The City currently uses a Motorola Gold Elite radio dispatch console system (RDACS). Respondents are to provide a proposal to replace that system to fully support any new trunked or Hybrid radio system (Option A and B). A new RDACS is not required for the VHF Narrowband Compliance System (Option C).
- D. The legacy VHF systems to be replaced are impacted by the FCC Narrowbanding mandate. Therefore the replacement system must be in place, fully tested, accepted and operational no later than December 31, 2012.

- E. Any products and services that are not specifically addressed in this RFP, but are necessary to provide functional capabilities proposed by the Respondent, must be included in the proposal.
- F. Throughout this document, the singular use of the words vendor, contractor, proposer or Respondent shall apply to the responders to this request for proposals.

## 1.2 SUMMARY

- A. The City is requesting proposals for the design, construction, and optimization of a radio communications network consisting of one of the four previously described systems.
  - 1. Option A - Full 800 MHz System
  - 2. Option B - 800 MHz/VHF Hybrid System
  - 3. Option C - VHF Narrowband Compliance System
  - 4. Option D - Alternate Solutions
- B. This system will be capable of providing portable radio coverage to federal, state, City and local government public safety agencies, and certain non-governmental public service entities throughout the entire City.
- C. In order to conform to the current "Narrowbanding" deadlines, the proposed system must be constructed, tested, and operational by December 31, 2012.
  - 1. Respondent shall provide support required for the preparation and filing of any necessary documents with the FCC should the installation extend beyond December 31, 2012.
  - 2. Support may include
    - a. Preparation and filing of waiver requests
    - b. Preparation and filing of Special Temporary Authority (STA) requests
    - c. Preparation and filing of FCC license forms and any associated waivers that may be required.
  - 3. Respondent shall detail the support that they will provide and indicate any limitations in that support (number of filings, number of documents etc.)
  - 4. City will pay all costs and fees associated with the filing of these forms.
- D. The proposed system is to be a "Turnkey" project under the proposed System A, B, or C with one prime contractor taking full responsibility for
  - 1. all equipment needed,
  - 2. installation,
  - 3. testing,
  - 4. engineering,
  - 5. project management,
  - 6. performance and warranty of the system.
- E. General requirements for Microwave network

1. For all options, the City requires the provision of an IP-based microwave network to carry all traffic from remote sites to the dispatch center.
2. The City prefers that a loop configuration be provided wherever possible.
3. Where a looped configuration is not possible, spurs shall use monitored hot standby connections.
4. All links will be designed for a minimum of 99.999% reliability.
5. Minimum requirements for Option C includes a microwave link connecting the existing Jefferson Water Tank site to the existing Timbrook Public Safety Building.
6. The microwave site connectivity network shall include the following:
  - a. Complete system design
  - b. Network infrastructure including RF and all control
  - c. Channel banks
  - d. DC power supply
  - e. Project management
  - f. Installation and programming
  - g. Testing
  - h. Documentation

#### F. Self-Supporting Tower

1. This Section defines the requirements for a complete, self-supporting, steel communications tower if required for the radio network.
  - a. The scope includes:
    - 1) Foundation and tower design
    - 2) Procurement and delivery to location
    - 3) Grounding and bonding
    - 4) Construction, erection and inspection
2. During site visits, the Respondent shall review existing conditions at the Jefferson WT for additional structural capabilities to place new antennas on the water tower. The City's preference is to save cost on the tower infrastructure and reuse the water tower if possible. Existing water tower information is provided in Appendix F.

#### G. Pre-Fabricated Equipment Shelter

1. This section provides specifications and requirements for pre-fabricated radio equipment shelter if required for the radio network options.

- a. This Section includes the following:
    - 1) Materials
    - 2) Structural Specifications
    - 3) AC Power/Distribution
    - 4) Wiring
    - 5) Ground Perimeter System
    - 6) Air Conditioner / Heater
    - 7) Code Compliance
    - 8) Execution
  2. All sites requiring a new shelter (based on the radio network design) shall meet the requirements set forth within this specification.
- H. Chain Link Fencing and Gates
1. This section will be used for any new raw land site development, as well as any required site expansions for the proposed shelters, generators and propane tanks as determined by Respondent and the radio network.
  2. For any existing site expansions, fence fabric, posts, and barbed wire shall be matched to the existing material and installed in a like manner, to include post foundations, in lieu of the listed requirements in this section.
  3. This Section includes
    - a. Fence framework, fabric and accessories.
    - b. Gates and related hardware.
    - c. Posts foundations.
    - d. Barbed wire security strands at top.
    - e. Installation.
- I. Propane Generator and Transfer Switch
1. Provide a standby power systems to supply electrical power in 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 in Section 2.f.
  2. The specification is for a single phase 120/240 VAC propane generating set. Respondent shall provide units meeting these general specifications, and appropriately sized to supply anticipated loads within the equipment building or shelter.
  3. A generator and transfer switch are only required if necessary based on the Respondents' radio network proposal.
  4. As an Option, Respondents may include interfacing with an existing generator where the additional load can be supported by the existing generator. Respondent's have the option to upgrade/replace the existing generator to support the combined existing and projected loads.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Respondent shall be responsible for, and bear the costs of, the delivery, storage, and handling of all equipment prior to system acceptance.

1.4 COORDINATION

A. General:

1. Respondent shall be responsible for execution of all work and shall coordinate installation of all work with the City and other Contractors and/or sub-contractors, if used.
2. Respondent shall be responsible for all permits and approvals.

B. FCC Licenses

1. New and modified FCC licenses will be needed for this project.
2. Respondent shall be responsible to identify any new or modified licenses needed for the proposed system. Respondent shall indicate required emissions for immediate and future use.
3. Respondent shall research and prepare any FCC forms and submittals needed for existing and/or new sites or channels and provide to City for signature and submittal.
4. City shall be responsible for coordination and licensing fees.
5. Respondent shall be responsible for regularly updating license status as system construction progresses.
6. Respondent shall be responsible for FCC tower registration and posting as required.
7. Existing license information is included in Appendix B. This includes existing VHF licenses requiring narrowbanding and 800 MHz channels identified as potential trunking channels.

C. FAA

1. FAA tower studies may be needed for this project.
2. Respondent shall be responsible to identify any new or modified registrations needed for the proposed system.
3. Respondent shall research and prepare any FAA forms and submittals needed for existing and new towers and provide to City for signature and submittal.
4. The City shall be responsible for coordination and licensing fees.

**END OF SECTION**

## SECTION 2.b - POINT-TO-POINT DIGITAL MICROWAVE RADIO

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section provides specifications and requirements for point-to-point digital microwave radio links required for all radio network options.
- B. The City requires that the microwave network be designed using hot standby or loop topology. It is the intention of this topology to ensure that the physical loss of a single site will not cause other sites to be isolated and inaccessible.
- C. Where connectivity to specific sites is determined to require a non-loop solution, Respondent shall design any such links for monitored / hot standby operation and specifically explain the inability to integrate these links into the loop.
- D. The scope includes:
  - 1. Point to point digital microwave radios
  - 2. Microwave antennas
  - 3. Antenna feeder systems
  - 4. Multiplexer or Router equipment
  - 5. Interfaces
  - 6. Alarms

#### 1.2 SUBMITTALS

- A. The following information shall be submitted within 40 working days of contract award:
  - 1. Channelization Plan Diagrams
- B. Final Design: The following information shall be submitted within 90 working days of contract award:
  - 1. Path Survey Report
    - a. Shall include graphical path profiles with recommended antenna centerline heights
    - b. Shall include profile drawings of applicable towers and indicating existing space utilizations as well as recommended antenna mounting locations.
    - c. Shall include pictures of applicable towers, which include sufficient detail for subsequent review and contingency planning.
    - d. Shall include written evaluation of path suitability and indication of potential problems (e.g., terrain, weather, and possible obstructions).
  - 2. Path Data Sheets for each link, including:
    - a. Site names
    - b. Geodetic Coordinates (NAD 83)
    - c. Ground Elevation

- d. Antenna sizes
  - e. Antenna mounting heights
  - f. Transmission line type
  - g. Transmission line lengths
  - h. Fade margin calculations
  - i. Reliability predictions
- C. System Acceptance and Commission: The following information shall be submitted upon completion of installation and prior to final acceptance and commissioning:
1. As-Built System Block and Level Diagrams
  2. As-Built DS1 and DS0 Channelization Plan Diagrams
  3. Field test reports including thermal fade margin (TFM) and external interference fade margin (EIFM)
  4. Path Performance predictions based on composite fade margin (CFM) as derived from TFM and EIFM test results
- 1.3 QUALITY ASSURANCE
- A. Comply with References and Applicable Standards
1. The radio shall meet the applicable requirements and standards of the following:
    - a. Federal Communications Commission (FCC)
      - 1) Rules, Part 15 Subpart B, Class A
      - 2) Rules, Part 101.
    - b. Conducted Emissions
      - 1) TR-TSY-000752, Microwave Digital Radio System Criteria, 14.5.2, 10/89
      - 2) ETS 300 826
    - c. Electronics Industry Association/Telecommunications Industry Association
      - 1) Standard RS-232C.
      - 2) 603 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
      - 3) 569 Commercial Building Standard for Telecom Pathways and Spaces
      - 4) 568-A Commercial Building Wiring Standard
    - d. National Fire Protection Association (NFPA)
    - e. Mil. Std. 217B
    - f. National Electrical Manufacturers' Association (NEMA).
    - g. National Electrical Code (NEC).
    - h. Uniform Building Code (UBC).

- i. American National Standards Institute (ANSI).
    - 1) C95.1 – 1982 Radiation Hazards
    - 2) Y14.5M – 1982
  - j. Institute of Electrical and Electronic Engineers (IEEE).
  - k. International Consultative Committee on Radio (CCIR).
  - l. International Consultative Committee on Telephone and Telegraphy (CCITT).
- B. Inspection and Test Reports
- 1. During the course of the Project the Respondent shall maintain an adequate inspection system and shall perform such inspections to insure that the materials supplied and the work performed conform to Contract requirements.
  - 2. The Respondent shall also provide printed test result documentation, directly from the test equipment used, indicating that all testing was completed and that all irregularities were corrected and re-tested, prior to installation acceptance, for City Project Manager analysis.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Components shall be supplied and installed in accordance with the associated project drawings and meet equipment specifications of the manufacturers listed below or approved equal. Only systems and equipment that meet or exceed the level of quality and capabilities stated within this document will be considered for acceptance.
- B. Microwave System components include:
  - 1. Transmitter/Receiver
  - 2. Antenna System
  - 3. Cabling
  - 4. Multiplex
  - 5. DC Power supply and batteries

### 2.2 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that meet the requirements of this section shall be acceptable.

### 2.3 MATERIALS

- A. All products shall be new, of the same revision level and brought to the job site in original manufacturer's packaging.
- B. All pertinent electrical components/devices shall bear the Underwriter's Laboratories label.

### 2.4 SYSTEM REQUIREMENTS

- A. Proposed equipment specifications should comply with the stated requirements. However, if there is any disparity, the Respondent shall explain how the equipment satisfies the intent of the particular requirement and how the end objective will be met.
- B. General
  - 1. Microwave links shall be digital in architecture, point to point, with capability to provide sufficient DS1 capacity as required by the network design. End-to-end performance requirement is  $10^{-6}$  BER or better, with a 2-Way availability of 99.999 percent of the time (Five Nines) for any and all desired digital (DS1) circuits.
  - 2. The digital microwave radio and all other components shall be designed to meet the requirements for needed system capacities plus 50%. The intention of this requirement is to permit the City to ensure that there is expansion for growth available in the system proposed.
  - 3. The radio shall be suitable for two-frequency, full-duplex operation in various combinations of non-protected, hot standby and space diversity configurations.
  - 4. The radio shall include transmitter, receiver, power supply, automatic switching device, multiplexer, and all associated interconnections
- C. Link Design:
  - 1. The Respondent shall conduct physical path surveys to assure that all paths meet proper clearance criteria.

2. The Respondent shall conduct site visits at all sites and quote any tower or building modification necessary to mount related microwave and antenna equipment.
  3. The Respondent shall provide antenna centerline mounting height recommendations, based upon the information gathered during the physical path surveys and site visits.
  4. The Respondent shall include fade margin calculations with the bid, showing the antenna sizes, system gains, and system losses.
  5. Solid dish antennas shall be used.
  6. Radomes shall be provided for each microwave antenna.
  7. The equipment shall be self-accepted for licensing under Part 101 of the FCC Rules and Regulations.
- D. Frequency Bands:
1. It is requested that all links employ the 6 GHz frequency band (L6 or U6), unless distance limitations preclude use according to FCC Rules part 101.
  2. The Respondent shall include all required frequency coordination and licensing services and fees.
- E. Unfaded Bit Error Rate
1. In the absence of fading, the BER will not be greater than  $10^{-12}$  per HOP or link at room temperature
- F. System Gain
1. The Radio shall have a guaranteed system gain, measured at the antenna port top of rack provided in Respondent's proposal.
- G. Jitter Requirements
1. Radio terminals and multiplex shall meet the requirements outlined in the following specifications:
    - a. Jitter transfer conforms to AT&T Standard TR-62411.
    - b. Jitter tolerance conforms to Bellcore Standard GR-499, Section 7.3.2.
    - c. Jitter generation conforms to Bellcore Standard GR-499, Section 7.3.3.
    - d. The DS1 interface meets the jitter transfer and jitter acceptance requirements of ITU-T G.958 and Bellcore GR-253.
    - e. Overall jitter requirements shall be met based on the radio system requirements.
- H. Severely Errored Seconds (SES)
1. A one-way, one-hop system, not subject to the effects of radio fading, will produce no more than one SES in a 24-hour period, measured at the DS1 level, during the first year of service. A severely errored second is defined as a one-second interval within which at least 1544 bit errors occur at the DS1 level or 2500 bit errors occur at the 155 Mb/s level.
- I. Protection and Recovery

1. In a hot standby radio the modules shall be protected at RF, IF, High Level Mux and Low Speed Mux levels.
2. Radio receivers shall provide both manual and fade initiated automatic errorless switching to the protection unit.
3. Recovery of a system from prolonged (greater than 1 min) RF signal loss will take place within 250 milliseconds after a valid signal is restored.
4. The average recovery time for switching caused by hardware failures in a protected system will be 60 milliseconds or less.
5. The Radio shall be designed so that protection circuits and units not in service or operation can be tested and repaired without affecting on-line system operation.
6. Partial or complete failure of protection control or switching equipment will not render the microwave link inoperable.
7. The time delay between the onset of the BER reaching  $10E-6$  and the completion of the protection switching will be less than 25 milliseconds 10 consecutive measurements.
8. The recovery time of valid DS1 signals will take place within 10 milliseconds after the removal of a short transmit system disturbance which interrupts only the radio system framing signals without loss of the basic line signals.
9. The protection switching threshold has a hysteresis with at least a factor of 10, in the sense that if the protection switch threshold is  $10E-6$ , the switch from the protection channel back to working channel requires the BER of the working channel to be better than  $10E-7$ .
10. The average recovery time of the radio from an out-of-frame and out-of-synchronization condition will be 0.25 seconds or less. Not more than 5 percent of the recovery times will exceed 0.5 seconds. The maximum recovery time will not exceed two seconds.

J. Electromagnetic Interference

1. The radio should be operationally compatible with the following types of analog and digital equipment located in the same shelter, and/or on the same site:
  - a. AMPS Cellular Base Stations
  - b. Digital Cellular/PCS Base Stations
  - c. FDM-FM Microwave
  - d. VHF Mobile Base Stations
  - e. UHF Mobile Base Stations
  - f. 700/800 Mobile Base Stations
  - g. VHF/UHF/ 700/800 Hand-held Radios
  - h. Paging/Short Messaging Transmitters
2. The radio shall not emit Radio Frequency Interference (RFI) to any of the types of equipment listed above at any level above that permitted under FCC Part 15, Subpart B for Class A devices.

3. The equipment offered will be capable of meeting full specifications when operating in the general vicinity of FM and TV transmitters and vehicular mobile UHF/VHF transmitters where their emitted RFI does not exceed the level specified in Bellcore TR-EOP-000063.

K. Environmental

1. All equipment rooms are air-conditioned; however, the Respondent must provide the guaranteed operating temperature range and the BTU's of heat generated for each primary piece of equipment in the proposed system.

L. Physical

1. Equipment Mounting

- a. All equipment shall be installed in 7-foot high, 19-inches wide, aluminum phosphate-coated relay racks.
- b. Each 19-inch Digital Radio rack shall be equipped with:
  - 1) Fuse, Alarm and Distribution Panel capable of distributing two independent -48 VDC power circuits to the A and B radios, multiplex and service channel.
  - 2) Frame Ground Lug.
- c. With the exception of coaxial connections, connector blocks or jacks and plugs will be provided for all external connections.

2. Equipment Arrangement

- a. The equipment in each rack will be arranged to permit ease of operation and maintenance. Service channel and control panel placement will be at a convenient operating height, when seated, such that there is no interference to the maintenance and operation of the equipment.
- b. The addition of modules and equipment in order to bring the system to full capacity shall be considered in the rack layout.

3. Grounding/Lightning

- a. The positive (+) DC connection (return) will be isolated from the equipment rack to eliminate ground loops.
- b. All equipment shall provide for proper grounding either by direct connection via chassis and/or a separate ground strap connection.
- c. All external and internal/external transmission cables (including RF and data) shall be properly grounded (chassis, tower, earth) at both ends to eliminate ground loops and minimize potential lightning damage.
- d. All external and internal/external transmission cables (including RF and data) shall provide for surge suppression optimized for lightning strike frequencies

## 2.5 TRANSMITTER SUB-SYSTEM REQUIREMENTS

A. Transmitter Output Power

1. The guaranteed minimum transmitter output power referenced to the antenna port shall be provided by the Respondent for each radio.

- B. Adjustable Output Power
    - 1. Automatic Transmitter Power Control (ATPC) shall be available for a 10 dB range to ease frequency coordination in congested areas and reduce interference levels without the use of pads or high performance antennas. It shall be possible to disable this feature.
    - 2. The transmitter output power shall be software adjustable using a keypad/display, or PC emulator to reduce the need for attenuators on short paths.
  - C. Frequency Source
    - 1. The frequency source shall be synthesized. Frequency stability shall be at least  $\pm 3$  ppm over the temperature range of 0° to +50° C.
  - D. RF Monitor Port
    - 1. Calibrated RF monitor test points should be provided on the radio transmitter to measure output power and frequency on an in-service basis.
  - E. Power Amplifier
    - 1. Each hot standby radio shall have redundant, separately switched power amplifiers.
    - 2. Failure of a redundant amplifier shall not reduce the power output of the radio.
    - 3. Replacement of a failed power amplifier shall not require system outage.
  - F. Reverse Path Protection
    - 1. Reverse path protection software will enable a hot-standby radio to automatically switch from the on-line Transmitter to the standby Transmitter when the Receiver has a sync loss alarm.
    - 2. Reverse path protection must be accomplished in less than 60 milliseconds.
  - G. Error Correction
    - 1. Forward Error correction shall be employed to ensure low intrinsic error rate and improved threshold.
- 2.6 RECEIVER SUB-SYSTEM REQUIREMENTS
- A. Threshold
    - 1. The Radio shall have a guaranteed receiver threshold provided by the Respondent for each radio.
  - B. Equalization:
    - 1. Each radio shall be equipped, as standard equipment, with a digital transversal equalizer (DTE) for aligning information packets to compensate for the effects of dispersive fading, and to provide automatic alignment of the equipment.
  - C. Receiver Diversity Switching:
    - 1. The receiver shall be designed so as to ensure that the receiver with the better performance is operational at any given moment.

2. The receiver shall monitor the incoming RF/IF signal for signal degradation (including but not limited to eye-quality monitor alarm, RSL threshold alarm, and uncorrected BER alarm) and initiate a receiver switch before errors occur.
3. The transfer to the alternate receiver shall be without errors.

D. Dispersive Fade Margin

1. The Dispersive fade margin for the Radio at  $10^{-3}$  BER with multipath delay of  $\tau = 6.3$  ns shall be provided by the Respondent in the proposal.

## 2.7 ANTENNA SUB-SYSTEM REQUIREMENTS

- A. The Digital Microwave Radio shall operate on an antenna system equal or exceeding a peak return loss of -20 dB without degrading the specified performance.
- B. The radio shall be provided with a CMR or CPR waveguide flange for connection of external waveguide runs. Connection to the waveguide shall be by use of semi-rigid cables. Use of low loss coaxial cable in the antenna branching network shall not be allowed.
- C. The microwave antennas shall be compatible with the radio frequency bands used and conform to applicable FCC requirements. They shall be of the solid parabolic type designed to minimize tower loading. They shall also include radomes.
- D. High-performance antennas with low VSWR shall be used where required to meet the total system end-to-end performance requirements.
- E. Transmission lines shall be semi-flexible continuous extruded low-loss runs with low VSWR. Pressurized elliptical waveguide shall be used for all frequency bands 6 GHz and above. Connectors shall be standard, premium type, and compatible with the antenna and radio EIA interfaces.
- F. Minimum antenna system requirements shall be as listed below:
  1. Antennas shall meet or exceed performance standard Category A in accordance with Part 101.115
  2. VSWR: 1.05
  3. Wind Load Operating (MPH): 100
  4. Wind Load Survival (MPH) Including 1-inch ice: 125
  5. Max Line loss (dB/100'): 1.5
  6. Pressure Limit (psi): 10
- G. All mounting brackets, connectors and other hardware shall be supplied as necessary for a complete installation.
- H. An automatic dehydrator/pressurization system, Andrew Model 1930 or equal, shall maintain at least 5-psig positive pressure of conditioned air in the elliptical waveguide and antenna feed unit. Individual pressure gauges on a distribution manifold shall be provided for each line.
- I. The pressurization system shall operate from 120 VAC, 60 Hz, single phase; and it shall include built-in sensing for local and remote indication of pressure loss and high humidity.

- J. All installed antenna/transmission lines shall be purged, pressure-tested, and tested for low VSWR using return loss measurements over the specified frequency band. 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.

## 2.8 CHANNEL BANK SUB-SYSTEM REQUIREMENTS

- A. Digital channel bank equipment shall be provided where necessary, to process the voice and data signals between required circuits and the microwave radio equipment.
- B. If the radio system has TCP/IP-based architecture, and T1 capacity is not necessary, then 1xT1 of capacity is the only requirement per remote site, and corresponding T1 capacity.
- C. The equipment shall be complete, mounted and wired in racks, ready for operation.
  - 1. Accessories shall include specialized test fixtures, test cords, and adapters.
  - 2. All equipment shall be completely factory-tested and documented in the final configuration.
- D. The equipment shall be completely solid-state, employing the latest technology, and shall be convection-cooled.
- E. All necessary standby switching, alarm sensing, and control shall ensure fully automatic operation, and it shall have remote alarm/control capability for any equipment failure common to 24 or more channels.
- F. Test points and facilities shall enable alignment and testing of all signal levels, including DS1 signals to and from the microwave radio, levels, clock frequency, BER levels, framing, power supplies, and all interface signals, all with no interruption of service. Built-in alarms shall be provided for major, minor, power failure, BER, and loss of clock or framing.

## 2.9 NETWORK MANAGEMENT SUB-SYSTEM REQUIREMENTS

- A. General
  - 1. The Radio shall have sufficient alarm, control and metering capabilities so that qualified technicians can detect and repair defective links.
  - 2. All radio settings, adjustments, etc., shall be made without the use of straps, switches, or mechanical adjustments.
  - 3. The network management system is not required to be a completely separate system than the alarm and monitoring system for the radio network. The intent of the network management / alarm and monitoring is to notify when a link has failed to dispatch the appropriate personnel to resolve the problem.
- B. Alarm Indications
  - 1. The status and alarm indications should be arranged so that a notification of the failure is known.
- C. Control Inputs
  - 1. The radio keypad, display or laptop emulator shall provide a means to control the following functions:
    - a. Manual switch of on-line transmitters and receivers, locally and remotely, from all sites in a contiguous network.

- b. Adjustment of local transmitter power output
  - c. Local IF electronic loopback
  - d. Local and remote DS 1 loopback
  - e. Initiation of integral BERT for DS1 line testing.
  - f. Assignment of network element addresses
  - g. Programming of individual DS1 line codes and ability to enable/disable equipped lines.
  - h. Select version of on-line software.
- D. External Controls
1. Each radio assembly shall have eight, customer configurable, as alarm or control, relay outputs.
  2. Two of the relays are normally factory configured as Local Major and Local Minor Alarm relays.
- E. RSL Test Points
1. Test points for each receiver shall be available for attaching a multi-meter for voltage readings to approximate measuring of RSL for antenna alignment.
- F. Automatic Provisioning
1. A replacement module shall be automatically configured/provisioned identical to the removed module.
  2. No straps, switches, or adjustments are to be required.
  3. If a CPU is replaced, the radio shall have all settings for all units stored elsewhere in the radio so that the replacement CPU is automatically provisioned.
    - a. Transmitter turn on procedure is followed to ensure that the Transmitter Assembly and power level comply with the license requirements. (Example: FCC Title 47, Part 101.107, 101.111, 101.113, and 101.217.) It also ensures that the residual BER floor and acquisition time remain within specification.
    - b. Radio automatically records part number, manufacture date, serial number and revision number of Transmitter.
    - c. Receiver turn on procedure is followed to ensure that the Receiver is operating on the correct frequency.
- G. SNMP Network Management
1. The radio shall have an embedded SNMP capability for connections to an open NMS system such as HP Open View.
  2. Any channel banks shall have an embedded SNMP capability for connections to an open NMS system such as HP Open View.
- 2.10 DC POWER SUB-SYSTEM REQUIREMENTS
- A. Operating Range
1. The equipment shall operate over the range of  $\pm 22$  to  $\pm 60$  VDC at Top of Rack.

- B. The Digital Microwave Radio and associated channel bank equipment shall be provided with and powered by a -48 VDC (nominal) battery system.
    - 1. Batteries supplied shall be sized for eight hours minimum operation at full load.
  - C. Terminal power consumption on a per link basis shall not exceed 500 watts.
  - D. Polarity
    - 1. The radio shall operate without damage with reversed polarity battery connections.
  - E. Power Feeds
    - 1. In a protected radio, each transmitter/receiver pair shall have its own power supply and regulator.
    - 2. A power supply failure will not cause the alarm and control circuits to fail.
  - F. Ripple
    - 1. The radio shall meet all specifications in the presence of externally-produced battery ripple not exceeding 200 mV RMS, with voltage spikes up to 60 volts peak-to-peak, 125 microseconds rise time.
  - G. Noise
    - 1. The radio shall meet the requirements for Noise Allocation (bus loading) as presented in Bellcore Technical Advisory TR-TSY-00752.
  - H. Fuses
    - 1. All fuses and circuit breakers associated with DC distribution or the microwave terminal are of the indicating type and provide alarm contact closure upon open-circuit operation.
  - I. Ground Loops
    - 1. The battery DC connection (return) will be isolated from the equipment rack to eliminate ground loops.
- 2.11 ALARM, CONTROL AND METERING SUB-SYSTEMS REQUIREMENTS
- A. Each of the alarm, control and metered points on the local display panel shall meet the following requirements:
    - 1. Control Inputs: The Digital Microwave Radio shall have a control and display panel providing a means to switch transmitters and receivers on and off line either automatically or manually, both locally and remotely from all sites in a contiguous network. The display panel also shall provide a visual indication of control actions.
  - B. Alarm, control and metering points for each site shall be provided to remotely monitor and control the radios through an external alarm and control system.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. All work shall be coordinated with the City.

**END OF SECTION**

## SECTION 2.c – SELF-SUPPORTING COMMUNICATION TOWERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section defines the requirements for a complete, self-supporting, steel communications tower if required for the radio network.
- B. The scope includes:
  - 1. Foundation and tower design
  - 2. Procurement and delivery to location
  - 3. Grounding and bonding
  - 4. Construction, erection and inspection

#### 1.2 SUBMITTALS

- A. The following information shall be submitted within 60 working days of contract award: Complete and detailed drawings of the structure and its foundation sealed by a Professional Engineer, registered in the State of Virginia and competent in civil and structural design. Submittal and seal will attest that the Respondent's design is in full compliance with the mechanical, structural, and electrical parameters established by these specifications.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch, if fewer than five are used.
  - 3. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 4. Air Content: ASTM C231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture
  - 5. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each composite sample

6. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture
  7. Compression Test Specimens: ASTM C31/C31M
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  8. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- C. Upon completion of the work, the Respondent shall provide to the Owner:
1. Two complete sets of all final design and as-built drawings, ANSI C size or larger
  2. CD-ROM with all design and as-built drawing files in Adobe Acrobat (.pdf) format
  3. Final inspection and testing report

### 1.3 QUALITY INSURANCE

- A. Source Limitations: Obtain all tower components from the same manufacturer.
- B. Comply with standards (including, but not limited to:)
  1. ANSI/EIA Standard 222 latest revision and/or related state, City, local government ordinances or specifications as detailed in this document
  2. Federal Aviation Administration (FAA), Advisory Circular; AC 70/7460-1K or latest revision, if necessary
  3. Comply with all federal, state and local codes and regulations, including but not limited to: (National Environmental Protection Act (NEPA), State Historical Preservation Office (SHPO), Tribal Historical Preservation Office (THPO), MPE, etc.)
- C. The Respondent shall assume total responsibility for project design, work, licenses and liability insurance of any required items for himself and any required subcontractors. This is to include all shipping, receiving and all site work required to install the tower.
- D. In the event of conflicting guidance in published standards, the Respondent will be expected to meet the requirements of the standard with the more stringent requirement.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Tower sections and components will be covered with a tarp during winter transportation. This is to prevent road salt and chemical spray from damaging tower steel surface finish.

1.5 COORDINATION

- A. Should the Selected Respondent, in the process of excavation for the foundation, find a condition that makes use of the proposed foundation unsuitable, the Selected Respondent shall take the following action within 24 hours:
  - 1. Notify the Owner Representative.
  - 2. Provide drawings and specifications for a revised foundation as designed by the Selected Respondent's certified engineer.
  - 3. Provide a written quotation of the cost for the revised foundation.
- B. The Selected Respondent shall also coordinate with other contractors, through the Owner Representative, working at the sites, to ensure all requirements of this procurement are met in a manner acceptable to the Owner.
- C. Prior to erecting steel on the foundation, the Selected Respondent will provide the Owner with a sample of each truckload of concrete that has been tested for compliance with the foundation specifications set forth by the tower engineer. Written reports certifying the strength of the concrete are to accompany each test cylinder.
- D. If any concrete used in the foundation does not meet specifications, the Selected Respondent shall remove the foundation and pour a new one using compliant materials, at no expense to the owner.
- E. Selected Respondent shall be responsible for the following coordination:
  - 1. FAA 7460 Determination of No Hazard to Air Navigation
  - 2. FCC Antenna Structure Registration
  - 3. File for all necessary paperwork for State Historical Preservation Offices (SHPO), Tribal Historical Preservation Offices (THPO), and any other local codes required during site acquisition
  - 4. Tower structural analyses at existing sites
  - 5. Soil resistivity tests

1.6 WARRANTY

- A. Manufacturer shall guarantee structural integrity of the tower for a period of no less than 10 years from the date of acceptance.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that meet these specifications shall be accepted.

### 2.2 TOWER REQUIREMENTS

#### A. General

1. The towers shall be suitable for general communications use including two way radio antennas, panel antennas, microwave dishes, etc.
2. Towers of the following types can be proposed to meet the network design proposed:
  - a. Self-Supporting Towers;
3. Towers shall be designed to provide at least 50% additional loading added for future capacity

#### B. Materials

1. Tower structural steel work shall be governed by the American Institute of Steel Construction (AISC) Specifications, the AISC Code, and the EIA Standard. Where applicable, the EIA Standard shall supersede AISC requirements.
2. All concrete used in the foundation shall meet or exceed tower manufacturer foundation design requirements.
3. The towers should be new, unused, and shall meet the latest design and fabrications standards.

#### C. Construction

1. The tower structures shall be designed and installed in accordance with the latest ANSI/EIA Standard 222 and meet other state, City, or local government ordinances or specifications as detailed in this document.
2. All tower sections shall be attached to each other by use of flange plates.
3. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.
4. The towers should be constructed of high-strength steel. All components and hardware shall be hot dip galvanized with zinc coating in accordance with 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.
5. Prior to galvanizing, each and every piece of steel and every weld is to be deburred and smooth-finished.
6. All welding must be done in the factory prior to the galvanizing process. Field welding is not acceptable.

#### D. Foundation Design

1. Foundation designs shall be provided by tower manufacturer based on Selected Respondent supplied borings and any other site information required by the tower manufacturer. The foundation design shall be stamped by a professional engineer licensed in the State of Virginia.

#### E. Grounding

1. Towers shall be properly grounded in accordance with manufacturer's recommendations and current industry best practices.
2. Tower Ground Bars
  - a. Shall be the single termination point for all transmission lines or exterior grounding conductors located on the towers.
  - b. Shall be bonded to the external ground electrode system with a #2 AWG or larger stranded (preferred) or solid tinned copper grounding conductor.
  - c. Construction
    - 1) Shall carry the UL listing
    - 2) Minimum dimensions: 2 inches high by 12 inches wide by 1/4-inch thick
    - 3) Bare solid, Alloy 110 (99.9 percent) copper bus bar or plate of one piece construction
    - 4) May be electro-tin plated
    - 5) Mounting brackets must be suitable for the application
    - 6) Polyester fiberglass insulators, 15 kV minimum dielectric strength flame resistant per UL 94 VO classification
    - 7) Holes 7/16-inch on 3/4-inch centers to permit the use of two-hole lugs
    - 8) A 2/0, solid, bare copper, grounding electrode conductor shall be exothermically welded to the master ground bus
  - d. Location
    - 1) Base of the towers adjacent to ice bridge

#### F. Tower Loading

1. The structures shall be designed and installed to withstand winds and ice based on the requirements in the applicable ANSI/EIA Standard 222 for public safety towers and any state or local requirements.
2. All antenna requirements shall be based on the proposed radio network and microwave connectivity requirements.

#### G. Transmission Line Support

1. Cable ladders and/or internal cable support system
  - a. A vertical transmission line support system shall be provided to attach the antenna transmission lines.

- b. Holes shall be provided in the tower support members, tower hanger adapter plates or separate ladder structures to allow installation of snap-in cable hangers and bolt-in cable hangers at maximum three-foot intervals. The mounting holes shall be precision punched or drilled and sufficiently separated to accommodate the snap-in or bolt-in hangers.
- c. This transmission line support system shall run to the highest mounted antenna and allow for two times the identified cable requirements for loading requirements listed above.

## 2. Ice bridge

- a. A horizontal transmission line ice bridge, approximately eight feet above ground, extending from the tower cable support to the equipment building/shelter entry port shall be provided.
- b. The ice bridge shall be installed such that it is self-supporting with its own foundations and not attached to either the tower or equipment building.
- c. The ice bridge shall be bonded to the external ground bus bar and grounded at all posts in accordance with best practices.. Multiple sections of Ice Bridge shall be bonded together using two-hole lugs and stainless steel hardware, or other suitable method.

## H. Climbing Access

1. A ladder, or in the case of monopoles, climbing rungs, 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.
2. The tower shall be equipped with an OSHA-approved, anti-fall safety device in accordance with EIA-222. This device must not interfere with the climber's ease of reach by hand or foot from one rung of the ladder to the next, going up or coming down. Two safety-climbing belts with each new tower shall be supplied.

## I. Lighting

1. Tower lighting shall be supplied as required by the applicable determination as issued by the FAA for this project and fully compliant with FAA AC 70/7460-1K or latest revision.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

#### A. Erection

1. The tower steel shall be installed and erected in accordance with all manufacturer requirements, instructions, and specifications.
2. Any deviation from manufacturer requirements, instructions, and specifications shall be immediately identified and brought to Owner's attention.

### 3.2 SPECIFIC INSTALLATION REQUIREMENTS

#### A. Tower Safety

1. When any work on an antenna support structure is being performed above ground level, there must be at least two certified competent tower climbers on the site at all times.
2. All Tower Climbers and their supervisors must have completed an OSHA approved Tower Climbing Safety and Rescue course within the last 5 years. At least one person within the Respondent's company must have completed the course within the last year, so as to bring others in the company up to date with any new changes in safety regulations, requirements and procedures. The Selected Respondent must submit certification cards of their personnel with the response.
3. All climbers must wear a full body safety harness with the appropriate approved shock absorbing safety lanyard attached to a single D ring at the top of the back of the climber at all times when on a tower. Each climber must be issued, equipped and use fall protection equipment must insure a 100 percent tie off while climbing. All fall protection and safety equipment must meet ANSI and OSHA standards and maybe inspected by the City at any time during the project.
4. The City may perform unannounced safety inspections at any time during the project but this in no way infers that the City has accepted any liability for any safety procedure, equipment condition, safety condition or work action taken by the Respondent whether the City was aware or not of this procedure, condition or work action. The City has a right to, as solely determined by the City, to inform the Respondent of any actions, procedures, conditions or equipment that it deems to be unsafe or potentially hazardous, to halt work on the site until such time as the City agrees that the action, procedure, condition or equipment has been returned to a safe condition. No additional charges will be incurred by the City for the above work stoppage.

5. All standard, best safety practices must be followed at all times when working on City communications site. The Respondent shall be solely and completely responsible for the safety and supervision of its employees and any other persons engaged by the Respondent for this upgrade.

- B. When performing any work on an antenna support structure, or near any RF emitters, such as antenna's, microwave dishes or other, the Selected Respondent must comply with the Federal Communications Commission's (FCC) OET Bulletin 65, Edition 97-01 and Supplement A - titled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields."
- C. The Selected Respondent shall be solely and completely responsible for the RF exposure compliance and safety and supervision of its employees and any other persons engaged by the Selected Respondent for this upgrade.

### 3.3 LABELING AND IDENTIFICATION

- A. Make, model and serial number plates shall be clearly labeled near the base of the tower.
- B. The tower height in feet shall be clearly labeled near the base of the tower.
- C. FAA and FCC identification numbers, if applicable, shall be clearly labeled near the base of the tower.
- D. All labeling shall be weatherproof and durable. A stamped, metal plate or equivalent. Labeling can be attached to a leg or cross brace.

### 3.4 FINAL ACCEPTANCE

- A. During installation, and upon completion, the tower installation shall be inspected and tested to verify compliance with manufacturer requirements.
- B. Upon completion of the work, documentation detailing final inspection and testing shall be submitted, addressing the following:
  - 1. Steel structure
    - a. Vertical alignment and plumb
    - b. Bolts tight and torqued to specification
    - c. No damaged or missing structural members
    - d. No signs of stress or vibration
    - e. All climbing ladders and other devices installed correctly
    - f. Labels and tags
  - 2. Foundation
    - a. Concrete finish/lack of cracks/blemishes
    - b. Backfilling and grading

3. Grounding
  - a. Verify lugs and cadwelds
  - b. Ground resistance test and record
  - c. Shelter to Tower bonding requirement
4. Ice Bridge
  - a. Installed according to specification
5. Lighting and controls (if necessary)
  - a. Inspect conduit and wiring installation
  - b. Verify proper lamp operation
  - c. Verify alarm contact operation
  - d. Verify labeling
6. Photographs
  - a. Overall structure—from North, East, South, West
  - b. Footers
  - c. Grounding

**END OF SECTION**

## **SECTION 2.d – PRE-FABRICATED RADIO EQUIPMENT SHELTER**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This section provides specifications and requirements for pre-fabricated radio equipment shelter if required for the radio network options.
- B. This Section includes the following:
  - 1. Manufacturers
  - 2. Materials
  - 3. Structural Specifications
  - 4. AC Power/Distribution
  - 5. Wiring
  - 6. Ground Perimeter System
  - 7. Air Conditioner / Heater
  - 8. Code Compliance
  - 9. Execution
- C. All sites requiring a new shelter (based on the radio network design) shall meet the requirements set forth within this specification.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, this section is open to all trunked radio equipment manufacturers and integrators offering products that meet or exceed these specifications.

### 2.2 MATERIALS

A. Concrete:

1. Compressive strength shall be 3000 PSI at 28 days.
2. Mix design shall be 114-118 lb./cu. ft. structural lightweight concrete using expanded shale or expanded clay aggregate. Mix shall be homogeneous.

B. Other:

1. Cement used in concrete shall be standard Portland cement conforming to the requirements of the "Standard Specifications for Portland Cement," ASTM Designation C150.
2. Concrete aggregates shall conform to one of the following specifications:
  - a. "Specifications for Concrete Aggregates," ASTM Designation: C33.
  - b. "Specifications for Lightweight Aggregates for Structural Concrete," ASTM Designation C330.
3. Water shall be free from injurious quantities of oil, alkali, vegetable matter, and salt. Non-potable water shall not be used in mixing concrete.
4. Reinforcement bars shall be deformed steel bars conforming to the requirements of the "Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," ASTM Designation: A615.
5. Welded smooth wire fabric shall be steel wire fabric conforming to the requirements of the "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement," ASTM Designation: A185.
6. Admixtures to be used in concrete shall be subject to prior approval by the quality control supervisor and shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing the concrete proportions in the mix design.
  - a. Air-entraining admixtures shall conform to "Specifications for Air-entraining Admixtures for Concrete," ASTM Designation: C260.
  - b. Water reducing admixtures, retarding admixtures, accelerating admixtures, and water reducing and accelerating admixtures shall conform to "Specifications for Chemical Admixtures for Concrete," ASTM Designation: C494.

- c. Fly ash or other pozzolans used as admixtures shall conform to "Specifications for Fly Ash and Raw or Calcined Natural Pozzolans for Use in Portland Cement Concrete," ASTM Designation: C618.

C. Skid Assembly

1. If a skid assembly is used, the complete skid assembly shall be painted with a rust preventative paint after fabrication or acceptable method of rust prevention and secured to the finished sub-floor with high strength bolts.

## 2.3 STRUCTURAL SPECIFICATIONS

A. Shelter Type:

1. The shelter shall be a pre-fabricated, pre-assembled shelter. The shelter can be constructed from concrete, fiberglass and/or aggregate materials. Manufacturer shall provide all specifications including design drawings for the shelter.
2. Manufacturing of the pre-fabricated shelters shall occur inside an enclosed plant building in a controlled environment.
3. The shelter shall be designed and provided with suitable attachment points for lifting and moving the shelter so that the shelter can be hoisted up using overhead equipment such as cranes, boom trucks and hoists. The manufacturer shall provide a description and drawings detailing the attachment points and proper lifting procedures.

B. Size:

1. Shelter dimensions shall be determined by the Respondent dependent upon final design.
2. It is anticipated that the minimum shelter size required will be 12' x 16' but may be larger to support necessary equipment.

C. Foundation:

1. The foundation shall consist of concrete piers or a poured concrete slab constructed by the Respondent to properly support and secure to the shelter.
2. Foundation drawings recommended by the shelter manufacturer shall be the criteria by which the foundation is constructed.

D. Flooring

1. Respondents are to propose a structure whose floor or solid foundation features a minimum uniform live load rating of 200 pounds per square foot with no more than 3000 pounds over any four-square-foot area. This rating shall be increased in sections as necessary to support heavy weight equipment. If delivered assembled with floor, the floor shall exhibit a minimum 90 pounds per square foot uniform live load capacity while the building is being lifted.
2. Floors shall be insulated to a minimum R-11 rating. Insulation shall be secured in place to prevent shifting during construction and transportation.

3. Exterior covering of the floor shall be included to prevent small rodent penetration.
4. The floor shall be covered by a high quality, industrial/commercial grade asphalt or vinyl, white or marble colored tile. All edges shall be covered by wall molding.
5. A door sill shall protect the edges at the entry area.

E. Walls

1. Walls shall be constructed to a minimum 120 MPH wind loading, including overturning moments.
2. Bullet Proof: 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. Any damage to the exterior of the shelter, even if left unrepaired for a period of ten years, shall in no way effect the integrity or performance of the shelter.
3. The outside walls shall be finished concrete or an aggregate composition.
4. A wall feed-through 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. The wall feed-through shall be grounded to the building ground on the outside of the shelter.
5. The inside walls shall be finished with minimum 5/8-inch plywood (or equivalent) trimmed with coordinated molding to allow mounting of panels, blocks, etc.
6. High performance insulation shall provide a minimum insulation factor of R-11.
7. Respondents shall detail their proposed construction methods, materials, and insulation factors on pages attached to their proposal. Such pages shall be clearly referenced to these sections to which they apply.

F. Roof:

1. The building roof shall support a minimum 100 pounds per square foot uniform live load.
2. The roof is to be sloped to facilitate run-off of water and snow.
3. It shall withstand the impact of ice falling from the adjacent tower without suffering any damage or shall otherwise be protected from such damage. Respondents are to describe in their proposal how this requirement will be met.
4. High performance insulation shall provide a minimum insulation factor of R-19.
5. The roof is to be constructed of fire resistant materials.

G. Door:

1. The exterior door shall be of aluminum or steel (stainless or galvanized) construction with a finish matching the building finish, and a minimum of 36 inches wide.
2. An insulating inner core shall separate interior and exterior panels of this door.

3. Bullet Proof: 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. With the exception of door hardware, any damage to the exterior of the door, even if left unrepaired for a period of ten years shall in no way effect the integrity or performance of the door.
4. The door shall be mounted with three stainless steel, tamper proof hinges. A mortise type dead bolt lock secured in the door frame shall provide tamper proof security. Two locks, one in-keyed passage and a keyed deadbolt, shall be provided.
5. Locks are to be constructed of non-corroding materials and all shelter locks shall be keyed alike for all shelters.
6. A wind stay chain and rain drip cap is to be included.
7. The door frame is to be bonded to the ground perimeter. The door is to be bonded to the frame by no less than two grounding braids (stranded wire is not acceptable) each equal to 1/0 bare copper wire.

## 2.4 FINISHING

- A. The finishes shall be described by the Respondent. Color and finishes shall be selected by the Owner from samples provided by the Respondent.
- B. Exterior color and finish shall be coordinated with Owner to match surrounding buildings.
- C. The interior shall be smooth finished in all cases. Color to be selected by the Owner from samples provided by the Respondent.
- D. Openings for air flow, doorways, cable entry, etc. shall be designed and sealed to preclude penetration of moisture, insects, and rodents into the interior of the structure or between the exterior and interior of any wall, roof or flooring.
- E. All air intake and exhaust openings shall be fitted with hoods to prevent the entrance of rain, snow, etc.
  1. Intake hoods shall be fitted with permanent air filters.
  2. Exhaust hoods are to be fitted with insect screens.
  3. All such hoods shall be designed with bars or grilles to prevent forcible entry by even the smallest person.
  4. Each hood, frame, etc. shall be bonded to the perimeter ground system.
- F. Joints:
  1. All joints shall be sealed with a compressible, resilient sealant.
  2. There shall be no exposed roof-to-wall or wall-to-floor joints.
- G. Exterior wall and roof surfaces shall be sealed to insure a watertight barrier.

- H. The shelter shall be dust proof, air tight and watertight.

## 2.5 WIRING METHODS

### A. General:

1. All wiring noted on the site drawings or otherwise included by this Respondent 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 mounted and supported by approved clamps, brackets, or straps as applicable and held in place with properly selected screws.
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. Conduit shall not be used as a ground of any kind. Separate ground wires shall be used for all grounding functions. More specific grounding requirements are stated elsewhere within this specification.

## 2.6 MINIMUM WIRING

- A. Unless otherwise approved, all power wiring shall be a minimum size 12 AWG solid copper conductors with insulation rated for 600 Volts alternating current (AC).

## 2.7 AC POWER SYSTEM

### A. Capacity:

1. The Respondent shall deliver the building complete with a 200 ampere capacity, 240 volts, single phase electrical panel box with a ground bar.
2. This panel shall be equipped with a 200 ampere capacity main circuit breaker used to supply power for all electrical functions related to the site.
3. Overall panel size shall be determined by the need to provide the number of individual breakers determined plus a reserve of at least six 240 Volt slots.
4. Building construction and panel installation shall allow additions or changes to be easily made at any time.
5. The Owner will provide electrical power to the meter panel on the exterior of the shelter. The meter panel and all wiring from that point is the responsibility of the Respondent, along with mast and weather head.

### B. Power Distribution:

1. Power shall be distributed from the electrical panel, through the raceways and conduits to the indicated fixture or other termination.

2. For each equipment unit receptacle and service receptacle group, No. 12 AWG insulated copper conductors shall be run by this Respondent through appropriately sized conduit.
3. Each radio equipment unit receptacle shall be mounted to the side of the cable tray.
4. Service receptacles shall be specification grade, 120 Volt or 240 Volt rated as appropriate for the purpose, with ground.
5. Each equipment 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 for ease of servicing power problems.

C. 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 model CP2365 manufactured by Transtector Corporation. An alternate unit must meet or exceed all of the capabilities of this model unit.
3. Minimum surge protector requirements are:
  - a. Built-in redundancy of dual stages per phase with filtering
  - b. Surge energy shunted to ground, not to neutral.
  - c. Front panel indicator lamps.
  - d. Remote/local status contacts.
  - e. Fusible link protected so as not to interrupt power.
  - f. Field replacement protection blocks, fuses, if needed.
  - g. UL listed components.
  - h. 45 KA per phase ANSI C62.1 8/20 waveform.
  - i. EMI/RFI filtering per Mil-STD-220.
4. The unit shall be capable of handling the full 240 Volt, 200 Amp capacity of the electrical system.

## 2.8 EQUIPMENT, FEATURES TO BE INCLUDED

A. Outlets:

1. Quad (double duplex) outlets shall be provided every six feet. One weatherproof GFI exterior power receptacle shall be provided with each shelter.
2. Each duplex outlet shall be on a separate 20 amp circuit.

B. Light Fixtures:

1. 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. These shall be fed as a gang from a common breaker and controlled by an on/off switch for each room.

3. Fixtures shall be Lithonia Series AF-10 or approved equal.
- C. Electric Heater:
1. A 240 Volt AC wall mounted heater shall be supplied and installed in each shelter. (4000 watt minimum)
  2. The heater shall be sized to provide 100 percent of the required building heating capacity, including equipment heat.
  3. The heater shall be fed from separate circuit and controlled by wall mounted thermostat.
  4. The thermostat shall turn the heater on when the temperature inside the shelter drops to 65 degrees F and off when it rises to 68 degrees F. It shall be adjustable to turn on and off within the range of 45 to 80 degrees F.
  5. The heating and cooling equipment will be capable of maintaining an inside ambient temperature range between 65 and 85 degrees F.
- D. Outdoor Lighting:
1. An exterior wall mounted floodlight shall be mounted on the front entrance of the shelter.
  2. The exterior lighting system shall be fed from a separate, appropriately rated breaker.
  3. Fixtures shall be Halophane Series Wallpack II or approved equal.
- E. Antenna Cable Conduit Entry:
1. All conduit openings in the shelter walls shall align properly with the antenna entrance cables.
  2. A solid copper bulkhead panel shall be supplied to accommodate coaxial transmission lines between 1/2-inch and 1 5/8-inch diameter elliptical waveguides. A minimum of 12 transmission lines shall be accommodated.
  3. The building Respondent shall seal the conduits into the wall to assure that they are watertight.
- F. Cable Tray:
1. The Respondent shall install an 18-inch wide cable tray system above the equipment and below the ceiling. All new shelters will be equipped with the cable trays.
  2. The Respondent shall ground all cable ladder sections to the interior perimeter ground system as per specifications.
  3. The shelter manufacturer's standard cable tray will be considered an acceptable alternative.
- G. Perimeter Ground System:
1. A 2/0, bare copper solid conductor perimeter loop shall be installed around the interior walls at ceiling level.

2. This ground shall be stood off from the wall itself by approved insulators, such as "clic's" manufactured by Litchfield International or equivalent. Types with encircling metal bands or clamps are not acceptable.
3. The shelter perimeter ground system shall then be interconnected to the tower ground and thus the driven earth ground.
4. All electrical grounding must be connected to this earth ground system, including the electrical panel ground bar.
5. Where the building and/or roof are of steel construction, such steel components must be bonded to the earth ground system.
6. Each panel shall be bonded to the next adjacent panel by a 1/0 bare copper solid conductor secured by methods approved by the Project Director.
7. The cable ladder is to be bonded to the ground perimeter. All sections of the ladder are to be bonded together.
8. A Master Ground Bus Bar shall be installed at the antenna entry port. The Master Ground Bus Bar shall have a cad welded connection directly to the exterior building counterpoise.

## 2.9 AIR CONDITIONER

### A. Capacity:

1. The shelters shall be provided with a single, wall mounted, 240 Volt powered air conditioner.
2. Dual units supplied in a lead lag configuration shall be proposed as an option.
3. Each air conditioner shall be sized to provide 100 percent of the required building cooling capacity, including equipment heat.

### B. Size:

1. Each air conditioner shall be sized to maintain temperatures inside the shelter at 70 degrees F when exterior temperatures go as high as 100 degrees F.
2. The heating and cooling equipment will be capable of maintaining an inside ambient temperature range between 65 and 85 degrees F.

### C. BTU Ratings:

1. Respondents are to include in their proposal a detail of how they determined the BTU rating of the air conditioner.

### D. Thermostat Control:

1. A wall mounted thermostat, part of the air conditioner, will control the operation. It will turn on the air conditioner when the interior temperature reaches 78 degrees F and off when the temperature drops below 75 degrees F.

### E. Time Delay:

1. A time delay relay will be included with the air conditioner to prevent compressor damage from an attempt to restart the unit too soon after power has been turned off or interrupted. The delay time shall be five minutes.

#### 2.10 CODE COMPLIANCE

- A. 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.
- B. All electrical equipment shall be listed or approved by Underwriters Laboratories (UL).
- C. All local codes shall likewise be complied with.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Shelter shall be transported by Respondent to the radio site; this building shall be assembled and secured on a solid foundation or supporting piers constructed by this Respondent.

**END OF SECTION**

## SECTION 2.e – CHAIN LINK FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 Summary

- A. This section will be used for any new raw land site development, as well as any required site expansions for the proposed shelters, generators and propane tanks as determined by Respondent and the radio network.
- B. For any existing site expansions, fence fabric, posts, and barbed wire shall be matched to the existing material and installed in a like manner, to include post foundations, in lieu of the listed requirements in this section.
- C. This Section includes
  - 1. Fence framework, fabric and accessories.
  - 2. Gates and related hardware.
  - 3. Posts foundations.
  - 4. Barbed wire security strands at top.
  - 5. Installation.

#### 1.2 REFERENCES

- A. ASTM A392 - Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
- B. ASTM A428 - Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles.
- C. ASTM A491 - Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
- D. ASTM A569 - Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
- E. ASTM A824 - Specification for Metallic-Coated Steel Marcellled Tension Wire for use with Chain Link Fence.
- F. ASTM B117- Test Methods of Salt Spray (Fog) Testing.
- G. ASTM C94 - Ready-mixed Concrete.
- H. ASTM E8 - Test Methods of Tension Testing of Metallic Materials.
- I. ASTM F552 - Definitions of Terms Relating to Chain-Link Fencing.
- J. ASTM F567 - Practice for Installation of Chain-Link Fence.
- K. ASTM F626 - Specification for Fence Fittings.

- L. ASTM F1083 - Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- M. ASTM F1234 - Specification for Protective Coatings on Steel Framework for Fences.

1.3 SHOP DRAWING AND PRODUCT DATA

- A. Submit Shop Drawings and/or product data.
- B. Clearly indicate plan layout, grid, spacing of components, accessories, fittings, and anchorage.
- C. Submit manufacturer's installation instructions and procedures, including Standard Details of fence and gate installation.

1.4 WARRANTY

- A. Manufacturer's standard form in which Contractor agrees to repair or replace components of high-security chain-link fences and gates that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of gate operators and controls.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - c. Deflection of fence fabric beyond design limits.
- B. Warranty Period: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 Available Manufacturers: Subject to compliance with requirements, this section is open to all trunked radio equipment manufacturers and integrators offering products that meet or exceed these specifications.

2.2 MATERIALS

A. Framework: Type I or Type II Steel Pipe.

1. Type I - Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM F-1083; or,
2. Type II - Pipe manufactured from steel conforming to ASTM A569, cold-formed, high frequency or induction welded and having a minimum yield strength of 50,000 PSI. External surface triple coated per ASTM F-1234, Type B and Type D with 1. ounce +/-0.1 ounce of zinc per square foot, 30 +/-15 micrograms of chromate per square inch and high performance polymer and shall demonstrate the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5 percent red rust in a test conducted in accordance with ASTM B-117. Internal surface coated, after welding, with a zinc-rich based organic coating having a 91 percent zinc powder loading capable of providing the ability to withstand 650 hours of exposure to salt fog with a maximum of 5 percent red rust, when conducted in accordance with ASTM B-117.
3. All coatings to be applied inside and out after welding.
4. Unless otherwise noted on the drawings, Type II framework shall be provided.
5. Pipe shall be straight, true to section and conform to the following weights:

<u>Pipe Size</u> <u>Outside Diameter</u>	<u>Type I</u> <u>Weight Lbs./Ft.</u>	<u>Type II</u> <u>Weight Lbs./Ft.</u>
1 5/8-inches	2.27	1.84
2 inches	2.72	2.28
2 1/2-inches	3.65	3.12
3 inches	5.79	4.64
3 1/2-inches	7.58	5.71
4 inches	9.11	6.56
6 5/8-inches	18.97	

B. Fabric:

1. Zinc-coated fabric shall be galvanized after weaving with a minimum 1.2 ounces of zinc per square foot of surface area and conform to ASTM A-392, Class I. Fabric to be 9 gauge wire woven in a 2-inch diamond mesh. Top selvage to be twisted and barbed. Bottom selvage to be knuckled or twisted and barbed.

C. Barbed Wire

1. Security strands shall be galvanized, 3 runs of 12 1/2 gauge, double strand, twisted wire, with 4 point barbs on 5 inch centers.
2. Barbed Wire Arms shall be pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire. Arms shall be set outward on a 45 degree angle and be capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

2.3 CONCRETE MIX

- A. ASTM C94 Portland Cement concrete with maximum 3/4-inch aggregate having a minimum compressive strength of 3,000 PSI at 28 days. Place concrete with between a 2-inch and 3-inch slump.

2.4 COMPONENTS

A. Fence Posts:

TYPE I - II

<u>Fabric Height</u>	<u>Line Post O.D.</u>	<u>Terminal Post O.D.</u>
Under 6 feet	2 inches	2 1/2-inches
6 to 9 feet	2 1/2-inches	3 inches
9 to 12 feet	3 inches	4 inches

B. Gate Posts:

<u>Single Gate Width</u>	<u>Double Gate Width</u>	<u>Post O.D. Type II</u>
Up to 6 feet	Up to 12 feet	3 inches
7 to 12 feet	13 to 25 feet	4 inches

C. Rails and Braces: 1 5/8-inches O.D.

D. Fittings:

1. Post Caps - Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts. All fittings shall conform to ASTM F-626.

2. Rail and Brace Ends - Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
  3. Top Rail Sleeves - Tubular steel, 0.051 thickness x 7 inches long, expansion type.
  4. Tension Bars - Steel strip, 5/8-inch wide x 3/16-inch thick.
  5. Tension Bands - Pressed steel, 14 gauge thickness x 3/4-inch wide.
  6. Brace Bands - Pressed steel, 12 gauge thickness x 3/4-inch wide.
  7. Truss Rods - Steel rod, minimum 3/8-inch diameter merchant quality with turnbuckle.
- E. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 1.2 ounces of zinc per square foot of wire surface and conforming to ASTM A-824.
- F. Tie Wires: Aluminum, 9 gauge, alloy 1100-H4 or equal, spaced a maximum of 24 inches.
- G. Hog Rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.
- H. Vegetation Stop: Shall be 12 inches in width and constructed with weed barrier geotextile and 3-inch depth of AASHTO#10 coarse aggregate centered with centerline of fence.

## 2.5 SWING GATES

- A. Frame assembly of 2 inches O.D. pipe Type I or Type II with welded joints. Weld areas repaired with zinc-rich coating applied per manufacturer's directions. Fabric shall match fence.
- B. Gate accessories, hinges, latches, center stops, keepers and necessary hardware of quality required for industrial and commercial application. Latches shall permit padlocking.
- C. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame **12 inches** as required to attach barbed wire assemblies

## 2.6 CHAINS AND LOCKS

- A. Provide one heavy duty weather resistant combination padlock Master Lock Model M176XDLH for each site.
1. All padlocks shall be configured with the same combination and shall be keyed alike.
  2. City shall be able to change the padlock combination when required.
  3. Provide five additional locks to the City
  4. Provide all backup and combination keys to the City

- B. Provide thirty six inches of high tensile strength chain for each gate at any raw land sites.
  - 1. Chain links shall be of sufficient size to permit locking with Master Lock Model M176XDLH padlock referenced above

## 2.7 SIGNAGE

- A. Provide an 24" x 24" Reflective metal sign for each communications site
- B. For City owned sites:
  - 1. Sign will be mounted on the compound fence
  - 2. Sign will contain at a minimum the following information
    - a. Site Name
    - b. Antenna Structure Registration Number
    - c. Winchester Emergency Contact Phone Number
- C. For leased or collocated sites
  - 1. Sign will be mounted on the shelter door
  - 2. Sign will contain at a minimum the following information
    - a. Site Name
    - b. Winchester Emergency Contact Phone Number
- D. Final content of all signs to be coordinated with the City Project Manager.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Shall be for the installation of
  - 1. A compound with an 8 ft. high fence and 1 ft. barbed wire at the top for all raw land sites.
  - 2. For collocated or existing City sites, shall be for the installation of "like" material to existing fencing.
  - 3. For sites not specifically covered above. where applicable, fence location and compound size shall be approved by the City.
- B. Compound shall include one double swing vehicle gate a minimum of 14' 6" in width.
- C. All corner posts and gate posts shall be grounded directly to the tower grounding ring, and all non-corner posts shall be grounded to the corner posts through a broken halo. All posts shall be bonded to the fence fabric and top mounted barbed wire in accordance with grounding and bonding best practices.
- D. All grounding connections shall be made with exothermic (CAD) welds. Compression fastening is not acceptable.
- E. General: Installation to conform to ASTM F-567. Where more rigid standards are described herein, they shall govern.
- F. Height: Fence height shall be 8 feet high plus 1-ft. for barbwire.
- G. Post Spacing: Space line posts uniformly between angle points at intervals not exceeding ten feet.
- H. Post Setting: Set terminal, gate, and line posts plumb in 12-inch diameter concrete footings 42 inches deep. Gate post footings to be 48 inches deep. Top of footing to be approximately 2 inches above finished grade and sloped to direct water away from posts.
- I. Bracing: Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.
- J. Top Rail: Install through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
- K. Bottom Tension Wire: Stretch between terminal posts 6-inches above grade interwoven through the fabric and fasten to outside of line posts with tie wires.
- L. Fabric: Pull fabric taut with bottom selvage 2-inches above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15-inch intervals. Tie to line posts and top rails with tie wires spaced at

maximum 12-inch on posts and 24-inch on rails. Attach to bottom tension wire with top rings at maximum 24-inch intervals.

- M. Barbed Wire Security Strands: Anchor to terminal extension arms, pull taut and firmly install in slots of line post extension arms. 3 strands shall be provided.
- N. Gates: Install gates plumb, level, true to fence line and grade and secure for full opening without interference. Anchor center stops and keepers in concrete.
- O. Fasteners: Install nuts or fittings, bands and hardware bolts on inside of fence.
- P. Valleys: Should fence cross a ditch or drainage swale, 3/8-inch diameter aluminum alloy rods shall be driven vertically 18-inches into the ground on 4-inch centers, woven through the fence fabric and provide security for these areas.

### 3.2 COMPLETION

- A. The area of installation shall be left free of debris caused by the installation of the fence.
- B. Excess material from the post hole excavation shall be removed to the designated spoil area.
- C. Provide vegetation stop (plastic) and gravel under fence, as detailed, to facilitate lawn mowing and maintenance.

**END OF SECTION**

## SECTION 2.f - GENERATOR AND TRANSFER SWITCH

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section provides specifications and requirements for standby power systems to supply electrical power in 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 hereinafter.
- B. This specification is for a single phase 120/240 VAC propane generating set. Respondent shall provide units meeting these general specifications, and appropriately sized to supply anticipated loads within the equipment building or shelter.
- C. A generator and transfer switch are only required if necessary based on the Respondents' radio network proposal.

#### 1.2 SUBMITTALS

- A. Shop Drawings and Product Data shall include, but not be limited to, the following information:
  - 1. Detailed dimensioned drawings of the engine generator set showing all system components and location of electrical and fuel connections.
  - 2. Specification describing the engine generator set and all components.
  - 3. Drawings and/or specifications describing auxiliary equipment.
  - 4. The following data in tabulated form:
    - a. Make type and rated capacity of engine.
    - b. Number of cylinders.
    - c. Bore, liters (inches).
    - d. Stroke, liters (inches).
    - e. Piston displacement, liters (cubic inches).
    - f. Piston speed, liters per minute (feet/min.), at rated RPM.
    - g. BMEP at rated KW output.
    - h. Make and type of generator.
    - i. Generator electrical rating, KVA and KW at 0.8 power factor.
    - j. Number and type of bearings.
    - k. Exciter type.
    - l. Generator insulation class and temperature rise.
    - m. Parts and service support.

- n. Engine manufacturer's certified engine BHP curve and certified engine generator set fuel consumption curve.
5. This data shall be accompanied by the manufacturer's published specifications for each article of equipment or specialty and shall give dimensions, rated capacity, kind of materials, finish, guarantee, and all other detailed information required to indicate compliance with the specifications.

### 1.3 QUALITY ASSURANCE

#### A. Manufacturer Requirements

1. The system shall be supplied by a firm experienced in manufacturing generator and transfer switch equipment similar to that indicated for use in this project and with a record of successful in-service performance.
2. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.

#### B. Regulatory Requirements

1. An electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.
2. The generator set must conform to applicable National Electrical Code and applicable inspection authorities.
3. The generator set must be available with the Underwriters Laboratories listing as a stationary engine generator assembly.
4. Any included transfer switch(es) must be UL listed for use in emergency systems.

#### C. Comply with:

1. NFPA 37 Flammable and Combustible Liquids Code
2. NFPA 54 National Fuel Gas Code
3. NFPA 55 Standard for the Storage and Handling of Compressed gasses
4. NFPA 70 with particular attention to Article 700, "Emergency Systems"
5. NFPA 110 Requirements for Level 1 Emergency Power Supply System
6. NFPA 101 - Code for Safety to Life From Fire in Buildings and Structures
7. ANSI/NEMA MG 1 - Motor and Generators
8. ANSI/NEMA AB 1 - Molded Case Circuit Breakers
9. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 volts maximum)
10. CSI Division 2 Section 02010 Subsurface Investigation
11. CSI Division 2 Section 02210 Site Grading
12. CSI Division 2 Section 03300 Concrete Work

1.4 WARRANTY

- A. The standby electric generating system components, complete engine-generator and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel.
- B. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

1.5 MAINTENANCE SERVICES

- A. In-Warranty Maintenance:
  - 1. The local facility shall provide a telephone number that answers 24 hours a day for service requests.
  - 2. In-Warranty Maintenance Services shall be provided 24 x 7 x 365.
  - 3. The local facility shall provide prompt repair service during the warranty period should a failure occur, providing parts support as needed.
  - 4. The Respondent shall provide for City/Engineer written documentation indicating that all testing was completed and that all irregularities were corrected once the unit is repaired.
  - 5. The manufacturer shall offer engineering and technical support to the user and/or its service agency to help resolve any operational or service problems that may occur. The manufacturer shall provide a 24-hour hotline telephone number for emergency technical support.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, this section is open to all trunked radio equipment manufacturers and integrators offering products that meet or exceed these specifications.

### 2.2 ENGINE

- A. The prime mover shall be a liquid-cooled, propane, naturally aspirated engine of 4-cycle design.
- B. Engine shall be a design with sufficient horse power rating to drive the generator to full output power without a gear box between the engine and generator. The unit requires a minimum rated output based on each sites power requirements.
- C. The engine is to be cooled with a unit mounted radiator, fan to be installed on the engine side of the radiator, water pump, and closed coolant recovery system.
- D. Engine temperature to be controlled by a self contained, thermostatic controlled valve that modulates the coolant flow to maintain a constant coolant temperature as recommended by the engine manufacturer.
- E. Coolant to have a visual expansion tank to provide a diagnostic means to determine if the system is operating with a normal engine coolant level. The expansion tank will be mounted to allow additional coolant to be added without removal of container from its mounting position.
- F. Coolant should be a solution of 60% Propylene Glycol based antifreeze and 40% water with anticorrosion additives as recommended by engine manufacturer.
- G. Radiator will be marked "Propylene Glycol Used; Do Not Add Ethylene Glycol."
- H. The radiator shall be designed for operation in 110 degrees F, 43 degrees C ambient temperature.
- I. The air intake filter(s), with replaceable element, must be mounted on the unit.
- J. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).
- K. Engine coolant and oil drain extensions, equipped with pipe plugs and drain valves, must be provided to the outside of the mounting base for cleaner and more convenient engine servicing.
- L. A fan guard must be installed for personnel safety.

- M. The engine shall have a factory mounted battery charging DC alternator with a solid state voltage regulator. Minimum output to be 35 amps at nominal 14 volts continuous rating.
- N. Remote 2-wire starting shall be by a solenoid shift, electric starter.
- O. Engine speed shall be controlled by isochronous governor to maintain alternator frequency within 0.5% from no load to full load alternator output. Steady state regulation is to be 0.25%.
- P. The engine fuel system shall be designed for primary operation on propane gas having a BTU content of 2500 BTU per cubic foot delivered to the unit in a gaseous state.
- Q. A carburetor, secondary regulator/vaporizer, fuel lock-off solenoid and all piping must be installed at the point of manufacturing, terminating at a single pipe opening external to the mounting base.
- R. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer. The Respondent shall provide a proper electrical branch circuit feed from a normal 120 volt utility power source.
- S. The engine shall have (a) unit mounted, thermostatically controlled oil heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer. The Respondent shall provide a separate proper electrical branch circuit feed from a normal 120 volt utility power source. This circuit is not to be shared with the block heater or battery charger.
- T. Sensing elements to be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over-speed shutdown and over-crank shutdown. These sensors are to be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion, and all wiring to be run in flexible conduit for protection from the environment and any moving objects.
- U. Provide the following items installed at the factory:
  - 1. The manufacturer shall supply its recommended stainless steel, flexible pipe to couple the engine exhaust manifold to the exhaust system.
- V. Provide a suitable automatic rain cap at the exhaust outlet to prevent water from entering the exhaust system when the engine is not operating.
- W. Flexible fuel lines are to be provided and shipped loose with the unit.
- X. Engine Exhaust System Requirements
  - 1. Muffler: Critical type, by Kittel, Maxim, Nelson, or approved equal, sized as recommended by engine manufacturer. Measured sound level at a distance of 10 feet from exhaust discharge, is 85 dBA or less.

2. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.
3. Connections from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.
4. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liners.
5. Supports for Muffler and Exhaust Piping: Spring hangers and all-thread rods and vibration hangers as specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints"; attached to building structure.
6. Exhaust Piping External to Engine: ASTM A 53, Schedule 40, welded, black steel, with welded joints and fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation and joint construction. Refer to Division 15 Section "Hydronic Piping" for materials and installation requirements for piping.
7. Provide suitable wall thimble, rain cap at the exhaust outlet, expansion and contraction fittings, etc., as required for the exhaust pipe installation and termination and to protect the building construction.
8. Insulation: All exhaust piping in the building and at openings through building walls, and exterior piping shall be covered with a two-inch thickness of molded hydrous calcium silicate pipe insulation, suitable for 1,200° F. operating temperature. Insulate fittings with mitered segments of pipe insulation. Cover insulation with a smooth surface aluminum jacket. All joints, ends and fittings shall be covered and sealed with 0.16" thickness aluminum covering.
9. Type and Manufacturer: High temperature exhaust piping and muffler insulation shall be similar to the "Thermo-12" system as manufactured by Manville, Denver, CO, or equal as approved by A/E.
10. Type and Manufacturer: Aluminum pre-jacket for exhaust piping and muffler shall be standard product as manufactured by Johns-Manville, Denver, CO, or equal as approved by A/E.
11. Type and Manufacturer: Aluminum jacket for exhaust piping and muffler shall be standard product as manufactured by Chilswea Mfg., or equal as approved by A/E.

### 2.3 STARTING SYSTEM REQUIREMENTS

- A. Description: 12 VDC electric, with negative ground with solenoid actuated pinion and over-running clutch, and including the following items:
  1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article above.
  2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
  3. Cranking Cycle: 30 seconds, and start within five seconds.

4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article above to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by generator set manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater is arranged to maintain battery above 10° C regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article above. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-amp minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit complies with UL 1236 and includes the following features:
  - a. Operation: Equalizing-charging rate of 10 amps is initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit then automatically switches to a lower float-charging mode and continues operating in that mode until battery is discharged again.
  - b. Automatic Temperature Compensation: Adjusts float and equalizes voltages for variations in ambient temperature from minus 40° C to plus 60° C to prevent overcharging at high temperatures and undercharging at low temperatures.
  - c. Automatic Voltage Regulation: Maintains output voltage constant regardless of input voltage variations up to plus or minus 10 percent.
  - d. Ammeter and Voltmeter: Flush mounted in door. Meters indicate charging rates.
  - e. Safety Functions: Include sensing of abnormally low battery voltage arranged to close contacts providing low battery voltage indication on control and monitoring panel. Also include sensing of high battery voltage and loss of ac input or dc output of battery charger. Either condition closes contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
  - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

## 2.4 ALTERNATOR

- A. The alternator shall be a four pole revolving field type, 12 lead, re-connectable, with extended stacks for full rated single phase output, wired for 240/120 VAC 1 phase, 60 Hz, rated at 50 KW with a brushless design.
  1. Photosensitive components will not be permitted in the rotating exciter.
  2. The rotor shall be direct connected to the engine to insure permanent alignment.
  3. Exciter is rotated integrally with alternator rotor.

4. Excitation uses no slip or collector rings or brushes and is arranged to sustain alternator output under a short-circuit condition as specified.
  5. The Alternator shall be designed for operation in 110 degrees F, 43 degrees C ambient temperature.
  6. The alternator shall meet temperature rise standards for Class "H" insulation, operating within Class "F" standards for extended life. Both the stator and rotor shall be further protected with a 100% epoxy impregnation and an overcoat of resilient insulating material to reduce possible fungus and abrasion deterioration.
  7. All re-connectable leads must be extended into an AC connection panel.
  8. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.
  9. Stator windings will have two-thirds pitch and have fully linked amortisseur winding.
  10. Subtransient Reactance: 12 percent, maximum.
  11. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 40.
- B. One step load acceptance shall be 100% of engine-generator set nameplate rating and meet the requirements of NFPA 110 paragraph 5-13.2.6.
1. The generator set and voltage regulator must sustain at least 90% of rated voltage for 10 seconds with 250% of rated load at near zero power factor connected to its terminals when equipped with direct or brushless excitation.
  2. 300% short circuit current must be selectable on units equipped with permanent magnet exciters.
  3. Generators equipped with permanent magnet exciters not allowing the selection of the short circuit current ratings are not allowed.
- C. A solid state voltage regulator designed and built by the alternator manufacturer must be used to control output voltage to provide + or - 0.25% regulation in less than or equal to one cycle of the AC voltage.
1. Should an extremely heavy load drop the output frequency, the regulator shall have a voltage droop of 4 Volts/Hertz to maximize motor starting capability.
  2. The frequency at which this droop operation begins must be adjustable, allowing the generator set to be properly matched to the load characteristics insuring optimum system performance.
  3. Additional rheostats for matching generator voltage, droop, and stability characteristics to the specific load conditions must be available.
  4. The solid state regulator module shall be shock mounted and epoxy encapsulated or coated for protection against vibration and atmospheric deterioration.
  5. Voltage regulator shall be SCR load application tolerant.

- D. A NEMA 1 panel that is an integral part of the generator set must be provided to allow the installer a convenient location in which to make electrical output connections.
- E. A fully rated, isolated neutral must be included by the generator set manufacturer to insure proper sizing.
- F. The generator system 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, shunt trip circuit breaker carrying the UL mark shall be factory installed.
  - 1. The breaker shall be rated per the manufacturer's recommendations unless specified below and mounted in the genset connection box.
  - 2. The line side connections are to be made at the factory.
  - 3. Output lugs shall be provided for load side connections.
  - 4. Form C auxiliary contacts rated at 250 VAC/10 amps shall be provided to allow remote sensing of breaker status.
  - 5. A system utilizing manual reset field circuit breakers and current transformers is unacceptable.
- H. An alternator strip heater shall be installed to prevent moisture condensation from forming on the alternator windings.

## 2.5 GENSET CONTROLS

- A. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock mounted in a NEMA 1 enclosure mounted to the engine-generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/-5% voltage adjusting control. This panel must be able to be rotated 90 degrees in either direction for correct installation.
- B. The engine-generator set shall contain a complete 2 wire automatic engine start-stop control which starts the engine on closing contacts and stop the engine on opening contacts.
- C. A programmable cyclic cranking limiter shall be provided to open the starting circuit after four attempts if the engine has not started within the programmed time. Engine control modules must be solid state plug-in type for high reliability and easy service.
- D. The panel shall include;
  - 1. Analog meters to monitor
    - a. AC voltage
    - b. AC current
    - c. AC frequency
  - 2. A phase selector switch
  - 3. Emergency stop switch

4. Audible alarm
  5. Battery charger fuse
  6. Programmable engine start control
  7. Monitoring module
  8. Panel illumination lights and switch
  9. Voltage level adjustment rheostat as specified elsewhere
  10. Control for automatic/stop/manual as specified elsewhere
  11. Individual fault indicators to visually indicate alarms and status
  12. One auxiliary alarm relay with a set of form C contacts rated at 10 amps
  13. One red mushroom type emergency stop push button with indicator
- E. The programmable module shall include:
1. Auto/OFF/Manual switch
  2. Four LED's to indicate
    - a. Not In Auto
    - b. Alarm Active
    - c. Generator Running
    - d. Generator Ready
- F. The control panel shall display all pertinent unit parameters including:
1. Generator Status – not in AUTO
  2. Instrumentation - Real time readouts of the following engine and alternator analog values:
    - a. Oil pressure
    - b. Coolant temperature
    - c. Fuel level (where applicable)
    - d. DC battery voltage
    - e. Run time hours
  3. Alarm Status - Current alarm(s) condition of:
    - a. High or low AC voltage
    - b. High or low battery voltage
    - c. High or low frequency
    - d. Low or pre-low oil pressure
    - e. Low water level
    - f. Low water temperature
    - g. High and pre-high engine temperature
    - h. High, low and critical low fuel levels (where applicable)
    - i. Overcrank
    - j. Overspeed

k. Unit not in "Automatic Mode"

- G. The following control equipment is to be installed at the engine-generator set manufacturer's facility:
1. A DPDT relay shall be socket mounted in the generator control panel and operate on engine start and run for City connection.
  2. The control panel shall contain a frequency meter reading from 40Hz to 70Hz.
  3. The panel mounted 5% voltage adjusting control shall have a positive locking mechanism to prevent the accidental movement of the control.

## 2.6 PROPANE FUEL SYSTEM

### A. General

1. Provide complete fuel system including tank(s) and all associated piping, valves, controls, etc.
2. Tank and fuel system components shall be sized to provide a minimum of 7 days of run time at full load.
3. Fuel tank shall be located a minimum of 10 feet from generator and building.
4. Clear access shall be provided for re-fueling.
5. Above ground tanks shall be protected by bollards as shown.

### B. Tanks

1. Steel and polyurethane construction.
2. UL labeled in accordance with UL 644 and stamped in accordance with ASME Section VIII Division 1.
3. Rated for a minimum of 250 psig.
4. Tanks to be secured to pad to prevent floatation in areas prone to flooding. This may require a larger mounting pad in some locations, screw anchors and cable or chain tie downs.

### C. Fuel System Construction

1. Provide riser tube with bolted lid.
2. Provide excess flow and multi-valve.
3. Install high pressure gas regulator at tank under the cover.
4. Install low pressure gas regulator near the generator.
5. Install fuel shut off valve within 24 inches of generator.
6. All pressure regulator vents will be protected from collecting water.
7. Install galvanized pipe union between generator and fuel shut off valve.
8. Install stainless steel flex fuel line entering generator.
9. No copper pipe will be allowed for any part of the underground fuel line system.

10. No bare black iron pipe will be used for any part of fuel system.
11. Any underground steel pipe will be epoxy coated and all joints wrapped to prevent corrosion.
12. Polyethylene tubing and fittings can be used if it complies with ASTM D2513 and is recommended by the manufacturer for use with LP gas. See NFPA 58.
13. All underground fuel pipes will be at least 18 inches below the surface.
14. Fuel lines will be protected with a concrete filled sleeve both entering and leaving the ground for at least 12 inches into the ground and 6 inches above the ground.
15. Fuel lines crossing a driveway will be protected from damage by being installed in a larger pipe sleeve or covered with a concrete barrier of sufficient strength.
16. All above ground pipe will be supported at least every 36 inches.

D. Concrete Pad

1. Provide concrete pad 9" thick minimum and 12" larger on all sides of tank
2. Pad shall be sized to provide sufficient ballast to secure empty tank from floatation due to ground water or flooding. Larger tanks may require screw anchors added to pad to provide sufficient up lift restraint on tank in flood prone areas.

E. Controls and Monitoring Equipment

1. Gas capacity gauge with low fuel level alarm contact closure.
2. Multi-valve for filling, pressure relief and gauging.

## 2.7 UNIT ACCESSORIES

A. The following unit accessory equipment is to be installed at the engine-generator set manufacturer's facility:

1. Weather protective enclosure:
  - a. The engine-generator set shall be factory enclosed in a heavy gauge steel enclosure constructed with a minimum of 14 gauge corner posts, uprights and headers.
  - b. The roof shall aid in the runoff of water and include a drip edge.
  - c. The enclosure shall be coated with electrostatically applied powder paint, baked and finished to manufacturer's specifications.
  - d. The color will be factory standard or coordinated with City requirements.
  - e. The enclosure is to have large, hinged doors to allow easy access to the engine, alternator and control panel.
  - f. The doors must lift off without the use of tools. Each door will have lockable hardware with identical keys. Padlocks do not meet this specification.
2. The exhaust silencer(s) shall be provided of the size as recommended by the manufacturer and shall be of critical grade.

- a. The silencer(s) shall be mounted within the weather protective enclosure for reduced exhaust noise and provide a clean, smooth exterior design.
  - b. It shall be connected to the engine with a flexible, seamless, stainless steel exhaust connection.
  - c. A rain cap will terminate the exhaust pipe.
  - d. All components must be properly sized to assure operation without excessive back pressure when installed.
3. Provide an automatic dual rate maintenance battery charger manufactured by the engine-generator set supplier. Input voltage to be 120 volts AC.
- a. The automatic equalizer system shall monitor and limit the charge current to 10 amps.
  - b. Low charge rate to be of the battery maintenance level.
  - c. The output voltage is to be determined by the charge current rate.
  - d. The charger must be protected against a reverse polarity connection.
  - e. The battery charger is to be factory installed on the generator set.
  - f. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.
- B. The following unit accessory equipment is to be provided by the engine-generator set manufacturer and shipped loose with the unit:
1. Spring-type vibration isolators of the type, size and number recommended by the manufacturer shall be supplied to support the engine generator set to reduce transmitted vibration. Isolators to be painted or otherwise protected to prevent rusting in an outdoor environment.
  2. A heavy duty, lead acid 12 VDC battery shall be provided by the generator set manufacturer. There shall be a frame suitable for securely mounting the battery and include all connecting battery cables.

## 2.8 AUTOMATIC TRANSFER SWITCH (ATS)

### A. General

1. The automatic transfer switch shall be compatible with the engine-generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system.
2. ATS shall be listed by Underwriter's Laboratory, Standard 1008.
3. The ATS shall be in a NEMA 4 enclosure with the manufacturer's standard finish for outdoor installations, or a NEMA 1 cabinet for indoor installations.
4. 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 the electrically operated transfer from normal to emergency and back to normal.
5. 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.

6. Adjustable time delays will be provided for the following:
  - a. Momentary normal source power outages to delay start
  - b. Transfer to emergency power
  - c. Transfer from emergency to normal power
  - d. Cool down engine run
7. Built in engine exerciser to automatically test generator on a weekly basis with testing with or without load.

#### B. Rating and Performance

1. The automatic transfer switch shall be a three pole design rated for minimum of 200 amps continuous operation in ambient temperatures of -20 degrees Fahrenheit (-30 degrees Celsius) to +140 degrees Fahrenheit (+60 degrees Celsius).
2. Main power switch contacts shall be rated for 600 V AC minimum.
3. The transfer switch supplied shall have a minimum withstand and closing rating when fuse protected of 200,000 amperes. Where the line side overcurrent protection is provided by circuit breakers, the short circuit withstand and closing ratings shall be 35,000 amperes RMS. These RMS symmetrical fault current ratings shall be the rating listed in the UL listing or component recognition procedures for the transfer switch.
4. All withstand tests shall be performed with the overcurrent protective devices located external to the transfer switch.
5. The operating mechanism will be a single operating coil design, electrically operated and mechanically held in position.
6. A provision will be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

#### C. Construction

1. The transfer switch shall be double throw construction, positively electrically and mechanically interlocked to prevent simultaneous closing and mechanically held in both normal and emergency positions.
  - a. Independent break before make action shall be used to positively prevent dangerous source to source connections.
  - b. The transfer switch shall be approved for manual operation.
  - c. The electrical operating means shall be by electric solenoid.
  - d. Every portion of the contactor is to be positively mechanically connected. No clutch or friction drive mechanism is allowed, and parts are to be kept to a minimum.
2. This transfer switch shall not contain integral overcurrent devices in the main power circuit, including molded case circuit breakers or fuses.
3. The transfer switch electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching.
  - a. Maximum electrical transfer time in either direction shall be 160 milliseconds, exclusive of time delays.

- b. Main switch contacts shall be high pressure silver alloy with arc chutes to resist burning and pitting for long life operation.
4. There shall be a SPDT (form C), 10 ampere, 250 volt auxiliary contact operated by the switch mechanism for monitoring switch position. Full rated neutral bar (or contacts on switched neutral applications) with lugs for normal, emergency and load conductors shall be provided inside the cabinet.

D. ATS Control

1. All control equipment shall be mounted on the inside of the cabinet door in an enclosure with transparent safety shield to protect all solid state circuit boards. This will allow for ease of service access when main cabinet lockable door is open, but to prevent access by unauthorized personnel.
  - a. Control boards shall have installed cover plates to avoid shock hazard while making control adjustments.
  - b. The solid state voltage sensors and time delay modules shall be plug-in circuit boards with silver or gold contacts for ease of service.
2. 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.
3. Controls shall signal the engine-generator set to start in the event of a power interruption.
  - a. A set of contacts shall close to start the engine and open for engine shutdown.
  - b. A solid state time delay start, adjustable, 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
4. Controls shall transfer the load to the engine-generator set after it reaches proper voltage.
  - a. Adjustable from 70-90% of system voltage, and frequency.
  - b. Adjustable from 80-90% of system frequency.
  - c. A solid state time delay, adjustable from 5 seconds to 3 minutes, shall delay this transfer to allow the engine-generator to warm-up before application of load.
  - d. There shall be a switch to bypass this warm-up timer when immediate transfer is required.
5. 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.
6. The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.

- a. Controls shall provide an automatic retransfer of the load from emergency to normal if the emergency source fails with the normal source available.
7. Controls shall signal the engine-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.
8. Provide an engine minimum run timer, adjustable from 5-30 minutes, to ensure an adequate engine run period.
9. 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.
  - a. 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. A switch must be provided to bypass this feature if not required.
11. If the in-phase monitor will not allow such a transfer, the control must default to time delay neutral operation.
  - a. Switches with in-phase monitors which do not default to time delay neutral operation are not acceptable.
12. Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode which bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.
13. Provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from utility or the engine-generator set.
14. Provide manual operating handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure so accessible only by authorized personnel.
15. Provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.
16. Provide LED status lights to give a visual readout of the operating sequence including:
  - a. Utility on
  - b. Engine warm-up
  - c. Standby ready

- d. Transfer to standby
  - e. In-phase monitor
  - f. Time delay neutral
  - g. Return to utility
  - h. Engine cool down
  - i. Engine minimum run.
17. A "signal before transfer" lamp shall be supplied to operate from external circuitry.

E. Miscellaneous Transfer Switch Equipment

- 1. An isolated Neutral bus will be provided in the transfer switch cabinet. All power Neutral conductors will be connected to the isolated bus. The isolated bus will not be connected to the cabinet ground or an electrical ground.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate ventilation, fuel supply and exhaust, to provide an efficient and well coordinated layout.
- B. All underground wiring will be installed with conduit for the wires sized as required by the NEC.
- C. All underground wiring will be with wet area rated insulation such as THW, THHW, THWN or TW. This includes the generator output, control, alarms and 120 volt feed for battery charger and block heater. All wiring will be stranded, no solid wire is allowed.

### 3.2 SPECIFIC INSTALLATION REQUIREMENTS

- A. Install engine-generator set and make operational as follows:
  - 1. Install engine at sufficient height above base to permit dropping oil pan without removing unit.
  - 2. All connections to the engine generator shall be flexible.
  - 3. Provide conduit, wiring and connections required and recommended by unit supplier.
  - 4. Install all control and alarm wiring in conduit. Coordinate sizes and locations of concrete bases. Verify structural requirements with structural engineer.
  - 5. Provide concrete pad 6" thick minimum and 24" larger on all sides of generator. Pad thickness size will depend on total weight of generator. Generator base to be mounted at least 18 inches higher than surrounding yard. Open ended I beam rails is not allowed. The intent of this elevation is to prevent normal surface blowing snow from filling up the inside of the generator.
  - 6. Control start/stop wiring will be in a separate conduit run with minimum No. 14 AWG stranded wire.
  - 7. AC 120 volt power for the engine block heater and battery charger will be on a single circuit breaker feed from the main power distribution panel and labeled as such. No other use will be allowed for this breaker. A different circuit will be supplied for the oil heater.
  - 8. Frame of the generator will be grounded to the building earth counterpoise in at least two places with double-hole exothermic welded or non-reusable compression wire lugs. At a minimum, the generator weather proof cabinet will be grounded in opposite corners. The paint will be removed at the connection point and a thin coating of an anti-oxide compound will be applied to the surfaces. Only stainless steel hardware will be used to attach the grounding lugs to the cabinet.

9. The generator neutral bus will not be grounded to the generator frame or with an external ground wire. The generator neutral bus will only be wired back to the automatic transfer switch neutral bus.
10. The propane fuel tank will be grounded to the earth counterpoise in two places. Double hole non-reusable compression lugs or exothermically welded lugs will be used with No. 2 AWG solid tinned copper wire. The paint will be removed at the point of attachment and a thin coat of an anti-oxide compound will be applied. Only stainless steel hardware will be used to attach the lugs to the fuel tank supporting legs.
11. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

### 3.3 LABELING AND IDENTIFICATION

- A. All wiring harnesses and connectors shall be clearly identified by number and function according to the associated schematic diagrams and documentation provided by the Respondent.

### 3.4 FIELD QUALITY CONTROL

- A. Inspection: The Respondent shall have in place an inspection schedule that will insure that the components of the systems and workmanship are of the highest quality and meet the contractual agreements.

#### B. STARTUP AND CHECKOUT

1. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout 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. Verification of engine parameters within specification.
  - c. Verify no load frequency and voltage, adjusting if required.
  - d. Test all automatic shutdowns of the engine-generator.
  - e. Perform a simulation of power failure to test generator start up and ATS to pick up building load correctly.
  - f. Return commercial power and test generator and ATS to correctly cycle 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 to be run for a minimum of one hour.
  - h. Test and verify all remote indicators and controls.
2. Provide complete report(s) of all testing performed.

**END OF SECTION**

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## SECTION 3

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### FULL 800 MHz TRUNKED RADIO NETWORK

### SECTION 3.a – OPTION A – PROJECT OVERVIEW

#### PART 1 - GENERAL

##### 1.1 OPTION A – FULL 800 MHZ SYSTEM PROJECT SUMMARY

- A. The Project includes several related networks and Project components.
  - 1. A 800 MHz Project 25 Phase 1 Trunked radio system,
  - 2. Radio Dispatch Console System
    - a. Respondent shall provide pricing for provision of a new four position Radio Dispatch Console System
    - b. The Radio Dispatch Console System must interface with existing legacy conventional equipment.
  - 3. VHF conventional, narrowband channels for mutual aid with adjacent agencies coming into the City and provides paging tones to City agencies.
    - a. Conventional, analog, narrowband VHF Interoperability channels
  - 4. Internet Protocol (IP) based microwave network linking transmitter sites, dispatch consoles, master controller, and all other system components.
  - 5. New tower sites that may include the provision of towers, shelters, and other site equipment.
  - 6. New subscriber equipment and/or upgrade of existing subscriber equipment for use by first responders.
- B. IP network connectivity has emerged as the standard for Project 25 system interconnect and backhaul, replacing tone and circuit switched system control and backhaul. It is desired that the respondents propose IP-based system control and backhaul.
- C. It is desired that all equipment locations and sites be secure and have adequate uninterruptible power and backup power systems. In choosing sites for this system, respondents must ensure that the facilities provide secure equipment rooms have adequate environmental control systems for the equipment proposed, have adequate uninterruptible power supply (UPS) systems for the equipment proposed, and meet all of the grounding and installation requirements for communications facilities as published in Harris (M/ACOM 4618/1 R3A) or Motorola R56, or MIL 188-124B standards.
- D. Because of the high recurring costs to use commercially owned tower sites, the City provided a list of current properties that may be considered in Appendix C and may be considered for the provision of “green field” sites.
- E. System Configuration
  - 1. This system specification describes a City-wide radio system providing “public safety grade” performance in general, and to the specific requirements as described herein.

2. The radio infrastructure shall be capable of operation in Project 25 digital trunked simulcast mode, and must be compliant with the then-current, applicable TIA-102 PROJECT 25 Phase 1 standards.
3. Multiple Sites:
  - a. Multiple sites will be needed to provide City-wide coverage. This wide-area, multi-site network should consist of the number of simulcast radio sites required to provide the desired coverage.
  - b. The system must seamlessly integrate all multiple sites such that field users can freely roam throughout the service area without the need to manually select sites.
  - c. Respondent shall determine the number and location of sites needed to provide the required coverage.
    - 1) A list of candidate sites is included in Appendix C, which includes the existing Jefferson Water Tank (WT) and Timbrook Public Safety Building as the prime candidates.
  - d. Respondents are urged to investigate all available sites in the City, including commercial sites, to obtain optimum performance with the smallest number of sites, and lowest recurring cost.
- F. General requirements for all components of this project include:
  1. Robust and fault tolerant network infrastructure with sufficient capability to support all users on a common platform.
  2. Interface with conventional channels.
  3. Provide complete services including design, project management, permitting, installation, testing, documentation, training, and warranty maintenance.
- G. General requirements for 800 MHz Project 25 Digital Trunked Radio Network
  1. Project 25 Phase I equipped compliant network. Compliance with the TIA-102 suite of Project 25 published standards is required.
  2. City-wide mobile and portable in-street and 20 dB in-building radio coverage with detailed areas of in-building coverage as specified in maps provided in Appendix D.
  3. The City desires a robust system design to minimize the chance of system downtime due to the loss of any critical component or path.
  4. Provide interfaces to support operations on conventional radio channels.
- H. General Requirements for Radio Dispatch Console System
  1. IP Based console system, which replicates and improves the functionality and features of the currently installed console sub system.
  2. Console must be able to perform tone alerting.
- I. General Requirements for VHF Conventional Channels
  1. At proposed 800 MHz trunking sites, additional VHF channels shall be implemented to provide mutual aid to adjacent VHF narrowband agencies. The City anticipates only one site of the trunking sites for VHF channels. The

- Respondent shall assign this site based on the site that provides the best coverage based on existing licensing information provided in Appendix B.
2. The City anticipates a separate antenna system to support these channels.
  3. The City requires the ability to provide VHF-800 MHz communications between the City and Frederick County (County).
  4. Any communications that supports fire/rescue operations needs to be available concurrently on both 800 MHz and on VHF. These are referred to as the VHF-800 Interop channels. The reason is that any fire/rescue incident in the city is subject to requiring assistance from Frederick County. A fire/rescue mutual aid response with Frederick County is a frequent event.
  5. Respondents shall provide a five-channel solution.
  6. All necessary gateway type devices shall be provided to connect the VHF and 800 MHz channels together either via permanent gateway patch or via a console patch that does not require dispatcher intervention.
- J. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, speaker microphones, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment, in either or both analog and digital voice alternatives.
- K. Voice RF Coverage Requirements
1. The City requires Respondents to propose a system design that provides for talk-out and talk back coverage to a portable radio used on the street, with portable and antenna on the hip. Coverage is to be provided with 95% reliability in 95% of the geographic area of the City.
  2. In addition, the City requires coverage to penetrate the denser buildings found in the city. Respondents shall provide for coverage to/from a portable radio inside a 20 dB building in the geographical area of the city with 95% reliability with the same radio configuration noted in 1.1.K.1.
- L. Interoperability With Legacy Systems
1. The proposed system shall interface with existing City radio systems in a way that enables seamless dispatch and field communications to support incident communications during system transition.
- M. Standards Conformance
1. The proposed radio network and related equipment and installation shall meet applicable portions of the following codes, standards, regulations and recommendations of the following entities, except as limited by herein.
    - a. APCO Project 25 TIA-102
    - b. TIA TSB-88-C or latest revision
    - c. TIA/EIA -603
    - d. Building Industry Consultant Services International(BICSI)

- e. American National Standards Institute (ANSI)
  - f. National Electrical Manufacturers Association (NEMA)
  - g. Telecommunications Distribution Methods Manual (TDMM)
  - h. National Electrical Code (NEC)
  - i. Institute of Electrical & Electronics Engineers (IEEE)
  - j. Underwriters Laboratories (UL)
  - k. National Fire Protection Association (NFPA)
  - l. American Standards Association (ASA)
  - m. Federal Communications Commission (FCC)
  - n. Occupational Safety and Health Administration (OSHA)
  - o. American Society of Testing Materials (ASTM)
2. Governing Codes and Conflicts: If the requirements of this specification section conflict with those of the governing codes and regulations, then the more stringent of the two shall become applicable.

N. Site Use, Acquisition And Development

1. The City prefers that current City-owned and currently leased sites be considered first in any system design, but otherwise has no preference as to sites to be utilized, as long as the requirements in this RFP are met. The City's intent is to allow Respondents to use any set of sites that will result in an efficient and cost effective design.
2. Regardless of the sites proposed, Respondents shall retain complete responsibility for system performance and coverage. In support of the design, Respondents will submit documentation that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
3. Respondent shall be responsible for identifying the optimum sites and contacting the site owner to determine feasibility of lease of the site and sufficient space for the system equipment. Sites should be selected to provide best performance and optimize the respondent's system design.
4. The City prefers to use new raw land sites rather than new commercial/leased sites. The City encourages respondents to consider the use of government owned properties for new sites.
5. A list of existing tower sites that may be used in engineering the specified coverage is summarized in Appendix C.
6. Negotiation of site purchase or lease shall be the responsibility of the City.
7. Site Development
  - a. Respondent shall be responsible for site development of new radio sites and/or upgrade of existing sites. Site development work will be listed as a separate cost line item on a site-by-site basis.
  - b. Site development services include:

- 1) Final site layout and design per network requirements design
- 2) Preparation and submission of NEPA/SHPO studies
- 3) Site preparation
- 4) Grounding
- 5) Shelters
- 6) Towers
- 7) Fencing
- 8) Project management
- 9) Installation
- 10) Testing & Commissioning
- 11) Training
- 12) Documentation

O. Provision Of New Equipment

1. All equipment shall be provided in new condition, and be covered by a full factory and/or manufacturer's warranty.
2. All equipment proposed shall be current production equipment with a minimum of two years continued production anticipated before end of life.
3. Lifecycle roadmaps for all equipment and system components shall be provided.
4. Used, refurbished, or previously installed equipment may not be proposed.
5. All equipment supplied as part of the system(s) shall be subject to system warranty.

1.2 WORK INCLUDED

- A. The intent of this RFP is to obtain an end-to-end, turnkey solutions meeting the functional requirements of the City for any of the Options but does not require Respondents to provide solutions for all Options.
- B. Turnkey Respondent Responsibility
1. Provide a total system design including any and all subsystem components.
  2. Provide all systems necessary to meet the specification and as outlined in Respondent's proposal, regardless of manufacturer.
  3. Provide full turnkey installation and optimization services for all systems, subsystems and components, as outlined in Respondents response, regardless of manufacturer.
  4. All respondent, contractor, and/or sub-contractor labor, travel, lodging, delivery, and other expenses shall be provided as part of the project. No additional charges for expenses shall be paid by the City unless expressly agreed to in writing.

- C. The Contractor shall be responsible for providing all products and services for a complete working system, whether or not specifically required and proposed, unless specifically excluded from the project.
1. Radio Network, consoles, control points, and user equipment
    - a. Complete system design
    - b. Network infrastructure including RF and control
    - c. Dispatch console equipment
    - d. User equipment including mobile, portable, and control station radios
    - e. Project management
    - f. Installation and programming
    - g. Testing
    - h. Training
    - i. Documentation
  2. Site Development
    - a. Project management
    - b. Site construction
    - c. Site commissioning
    - d. Documentation
  3. Grounding and Bonding
    - a. As part of the work to be performed all RF equipment, antenna systems, transmission lines, and the design of the antenna support structures (towers), shelters, electrical and generator systems must be designed, and installed in compliance with grounding and Installation standards such as
      - 1) Harris (Formerly M/A-COM) 4618/1 R3A or
      - 2) MIL 188-124B.
      - 3) Motorola R-56,
    - b. Respondent shall detail which grounding and installation standard(s) are to be used in the construction of the City's system.
  4. RF Interference
    - a. Respondent shall demonstrate good engineering practice in design and installation such that all proposed equipment is configured and installed to minimize RF interference to, from, or with co-located equipment.
    - b. Respondent shall be responsible to identify and analyze potential interference sources during system design activities.
    - c. Respondent shall conduct and provide suitable inter-modulation calculations as part of final system design.
    - d. Suitable filtering, isolation, and other means shall be proposed to correct any identified interference between the proposed and existing systems.

- e. Respondent shall be responsible to correct mutual interference between proposed and existing systems.
- f. Construction of new towers shall not interfere with existing broadcast systems per FCC rules Section 22.371. Pattern mitigation shall be respondent responsibility.
- g. Interference caused by the proposed systems or equipment shall be corrected by the Respondent at no additional cost to the City.

D. City Responsibilities

- 1. Provide reasonable access to City facilities where equipment is to be installed including a designated work area with adequate heat, light and a secure storage area for equipment delivered for installation to the City designated location.
- 2. Assist Contractor in obtaining building permits required in conjunction with this project, where practical.
- 3. Secure additional sites and/or facilities recommended by the selected Respondent, and agreed upon by the City.

1.3 PROJECT SUBMITTALS

A. The following information shall be submitted within twenty (30) working days of contract award:

- 1. Firm detailed Project schedule indicating all Project milestones and specific dates relating to the installation of the system.
- 2. The schedule shall include the following milestones:
  - a. Procurement
  - b. Pre-Shipment Integration Testing
  - c. Start and Finish of Equipment Installation
  - d. Start and Finish of Antenna System Installation
  - e. Start and Finish of System Equipment Testing
  - f. Operator Training
  - g. End User Training
  - h. Network Administration Training
  - i. Start and Finish of Coverage Testing
  - j. Final Inspection
  - k. Delivery of final documentation.

- I. System Certification
- m. Final System Acceptance
- B. The following information shall be submitted within forty (45) working days of Contract award:
  1. System block level diagrams
  2. Patching schedules and termination details for all horizontal cables necessary for a complete record of the installation.
  3. Radio and microwave channel plans
  4. Site Drawings including:
    - a. Site Plan Drawings which indicate scale, orientation and locations of proposed and existing features including towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - b. Equipment Shelter/Room Plan drawings which indicate scale, orientation, termination and proposed and existing hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - d. Tower Profile Drawings indicating current and planned antenna mounting locations of all new, existing, and modified sites
  5. Detailed list of materials for each site, including size and quantity, required to achieve calculated availability (i.e., antennas, waveguide, connectors, and hardware).
  6. Detailed configuration information for each site, including link and launch delay settings, signal level settings, antenna manufacturer, model number, tilt, orientation, and mounting height required to achieve specified design coverage performance.
- C. Final Design: The following information shall be submitted within sixty (90) working days of contract award:
  1. Any updates to previously submitted design information
  2. System operation and maintenance manuals for all equipment including, but not limited to:

- a. Instructions for installation, alignment procedures, testing, commissioning
  - b. Information, procedures, and recommendations for maintenance and troubleshooting of the equipment.
3. Installation Site Drawings: Drawings shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the architectural and electrical power plans. Installation Site Drawings shall include:
- a. Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
  - b. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
  - c. Tower Profile Drawings indicating antenna mounting locations
  - d. Respondent is responsible for coordination of final site drawings with the site construction contractor selected by the City.
- D. System Staging, Delivery and Installation: The following information shall be submitted as equipment is staged, delivered and installed:
1. Detailed Staging Acceptance Test Plan (SATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for shipment. The SATP shall include but not be limited to tests demonstrating:
    - a. Radio Console Features
      - 1) Instant Transmit
      - 2) Talkgroup selection and calling
      - 3) Talkgroup patching (Trunking and conventional)
      - 4) Multi-Select
      - 5) Multi Talkgroup calls
      - 6) Private calls
      - 7) Emergency Notification
      - 8) Alert Tone Generation
    - b. Radio Network Features
      - 1) Emergency Call
      - 2) Emergency Call with System Busy
      - 3) Transmit Grant Tone
      - 4) System Busy Tone
      - 5) Out of Range Tone
      - 6) System Busy Queuing and Call back
      - 7) Reaction to failed base station(s)
      - 8) Reaction to failed backhaul link(s)
      - 9) Recovery from failed base station

- 10) Recovery from failed backhaul link(s)
  - 11) Reaction to Failed Controller/Server
  - 12) Recovery from Failed Controller / Server
- c. System Network Management Features
- 1) Display current system activity
  - 2) Display individual site status
  - 3) Display individual base station status
  - 4) Start/Stop individual base station
  - 5) Radio Enable / Disable
  - 6) Fault Management / Alarm Indications
  - 7) Reporting Capabilities
2. Detailed SATP shall be submitted no later than ninety (90) days before the testing starts.
  3. Final SATP shall be approved no later than thirty (30) days before the testing starts.
  4. User manual – one (1) copy per unit, to be kept at the installation site, plus five file copies delivered to the City
  5. Installation manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
  6. Maintenance manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
  7. Bill of Materials – one (1) copy per shipment plus five (5) file copies delivered to the City
  8. Installation documentation shall include complete system and site drawings.
- E. System Acceptance and Commission: The following information shall be submitted upon completion of installation and prior to Final System Acceptance and commissioning:
1. Detailed Final System Acceptance Test Plan (FATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for Final System Acceptance by City.
  2. Detailed FATP shall be submitted no later than 90 days before the testing starts.
  3. FATP shall be approved no later than 30 days before the testing starts.
  4. Five final and complete sets of as-built documentation, bound and containing all previous submitted manuals and materials including:
    - a. Documentation index

- b. List of deliverables
- c. Field Test reports
- d. Coverage testing reports
- e. Maintenance Data
- f. As-Built System Block and Level Diagrams
- g. As-Built Site Drawings including:
  - 1) Site Plan Drawings which indicate scale, orientation and locations of towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
  - 2) Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
  - 3) Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
  - 4) Tower Profile Drawings indicating antenna mounting locations

#### 1.4 TRAINING

- A. The successful Respondent shall develop and conduct professionally prepared training programs to allow City operating personnel to become knowledgeable with the system and the operation of their individual equipment.
- B. Respondent shall describe in detail end-user, system administrator, and maintenance training programs.
  - 1. Model specific end-user equipment training shall be proposed.
  - 2. Hands-on System Administrator training shall be proposed.
  - 3. Hands-on Radio Console training shall be proposed.
- C. End User Equipment Training
  - 1. A large number of users from a wide variety of agencies will need to be trained, this training should be designed as a “train the trainer” course to permit agencies to have their designees trained.
  - 2. Respondent shall be prepared to train, and provide retraining materials to approximately forty to fifty agency trainers from various agencies during each

session. Approximately 8-10 sessions to be conducted during days, evenings, and weekends will be needed.

3. The training should be oriented to optimum use of the equipment, proper non-technical care and operation, and characteristics of faulty operation.
4. Training shall include the function and operation of all controls.
5. The instructor shall give operational demonstrations of all Respondent supplied equipment and shall permit "hands-on" operation of equipment by trainees.

D. System Administrator Training

1. The System Administrator Training shall be oriented to optimum use of the equipment, proper non-technical operation and care, and the characteristics of faulty operation.
2. Training shall be oriented to permit City personnel to effectively manage and administer the operation of the radio network
3. Training should provide basic knowledge of the overall System Management functions, their purposes, and an introduction to basic navigation and use of the Radio System Management applications.
4. Training shall provide information regarding the use of system reports and real-time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.

E. Console System Training

1. The Respondent will be required to train approximately fifteen Console Operators, and two (2) System Administrators.
  - a. The training shall be scheduled to allow sufficient time for all participants from all shifts to be trained. The Respondent shall provide a preliminary training schedule for review and approval by the City for each type of training to be provided.
  - b. City trainers shall receive both standard operations training and "train the trainer" specific training.

F. Training Materials

1. Training materials shall be provided for all students covering all aspects of the training. Students will retain all such training materials.
2. Illustrations and photographs, where provided, shall be specific to the Winchester City installation. Color photos must be provided where detail or clarity is supported by use of color. Black and white photocopying of color materials is unacceptable.
3. Respondent shall provide fully editable (softcopy) versions of all training materials so that the City trainers can update the course materials over time.

- G. The Respondent shall provide unit pricing for all media (CDs, DVDs, Manuals, etc.) used for training to allow the City to purchase additional training materials if necessary. The pricing provided shall be valid for a period of three (3) years following system acceptance.

## 1.5 WARRANTY

### A. Warranty- One (1) Year After Final System Acceptance

1. The system described herein shall be the total responsibility of the Respondent prior to final system acceptance, and for one (1) year following final system acceptance, at no additional cost to the City.
2. Respondent agrees that any hardware or software warranties whose term exceeds one year after Final System Acceptance will be passed through to the City and will remain in effect for the full term of that warranty.
3. The warranty period shall begin on the date of Final System Acceptance.
4. System performance, and all hardware, parts and materials shall be warranted, including all related equipment labor, installation, handling, inspection, return and delivery charges and fees.
5. All software and firmware associated with system features, functions, and capacity as required by this RFP shall be warranted.
6. During the installation and warranty periods, the Respondent shall provide, at no additional cost, commercially available upgrades of any and all software and firmware sold to the City as part of the installation. The frequency and timing of installation of upgrades during this period will be at the sole discretion of the City based on availability by the Respondent.
  - a. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:
    - 1) Patches for defective software;
    - 2) New releases that are corrective revisions for earlier versions and/or no-cost enhancements to earlier releases.
  - b. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
  - c. The Respondent should make every effort to separate corrective revisions from enhancements. If the Respondent is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.
7. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions. If deemed necessary

by the City, software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City.

8. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the warranty period.
9. Any notices either generated and circulated internally by the Respondent or received by the Respondent from the original Software Provider, alerting the Respondent to software problems found elsewhere, shall be passed onto the City within 30 days of receipt of such material.
10. All conditions above also apply to all firmware installed in any products included as part of this system.
11. Respondent shall fully describe all other terms and conditions of warranty in the Proposal.
12. Respondent shall provide updates for documentation of all system components (hardware, software etc.) at the completion of the system warranty period.

B. Latent Defects:

1. The Respondent, at no cost to the City, shall correct latent design defects or recurring problems relating to software, hardware or overall system design, even if such latent defects are discovered after final system acceptance.
2. Nothing contained in this RFP shall be deemed to have caused any applicable statute of limitations to commence to run or any alleged cause of action to have accrued in the event of any latent defect not discovered until after final system acceptance and final payment. The statute of limitations shall commence to run on any alleged latent cause of action only upon actual discovery of such latent defect.
3. System malfunctions due to software shall be corrected at no cost to the City.

C. OPTIONAL Extended Warranty Beyond First Year

1. Respondent shall propose extended warranty services AS AN OPTION on an annual basis for years two through five.
2. The extended warranty specified shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Respondent under requirements of the Contract Documents.
3. Respondent shall provide repair/return services for a period of ten (10) years from date of Final System Acceptance.
4. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten (10) years from date of Final System Acceptance.

5. Notification shall be given at least one (1) year in advance of any change of status from products available from regular production to maintenance only.
6. Respondent shall fully describe all other terms and conditions of the extended warranty in the Proposal.
7. Respondent may also propose other optional extended warranties as part of the Proposal.

D. OPTIONAL End-User Equipment

1. End User equipment warranties may have terms of longer than one year, respondent is expected to provide warranty service throughout the term of the warranty for all end-user equipment.
2. During the full term of the warranty period malfunctioning mobile and portable non-fixed equipment units will be replaced by the Respondent.
3. Respondent personnel will remove and re-install equipment at the customer location. City or other agency personnel will not be required to travel to Respondent service shop for repair.
4. During the full term of the warranty period cost of unit removal and re-installation shall be borne by the Respondent.
5. The Respondent shall state the method for handling and the turn-around-time for the repair of mobile and portable radios during the warranty period.

1.6 MAINTENANCE SERVICE

A. General Requirements:

1. The approach to maintenance of this system shall be preventive maintenance.
2. Comprehensive maintenance services shall be proposed for each network.
3. The Respondent shall include in the Proposal the terms and conditions of the warranty / maintenance contract covering the equipment. The Respondent shall state in the Proposal the name, address, and capabilities of the service station(s) providing warranty / maintenance service.
4. Maintenance for all items in the system shall be quoted on a standard maintenance contract basis for two (2)-hour response time, seven (7) days a week, unless otherwise specified
5. Provide twenty-four (24) hour system alarm monitoring capability where users can dial one toll free number to report problems.
  - a. Respondent staff will then dispatch the proper technician in the allotted response time to resolve problem.

- b. Respondent staff must generate a trouble report detailing who called, what the problem was, how it was resolved, response turn time and how much it cost to repair.
    - c. Trouble report must be deliverable in softcopy format by email to addresses specified by the City.
  6. Provide a list of maintenance plans available. These shall include:
    - a. Radio unit drive-in service;
    - b. Radio unit on-site service;
    - c. Fixed equipment on-site service;
      - 1) 2-hour response time
      - 2) 8-hour response time
      - 3) Next day response time
      - 4) Stocking of replacement units at shop
    - d. Fixed equipment mail in board repair;
      - 1) Normal response - 7 day
      - 2) Emergency response - Next day
      - 3) Full time on-site technician availability.
- B. Maintenance Standards:
  1. Replacement parts shall be equal in quality and ratings as the original parts, rebuilt parts are not permitted.
  2. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
  3. 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 that this has been done.
  4. Records shall be available for the City's inspection upon request. Records shall be maintained by the Respondent's radio maintenance shop throughout the warranty period (and any subsequent maintenance contract period), and shall revert to the City upon termination of the warranty (or maintenance contract).
  5. Respondent shall provide only factory trained and authorized maintenance personnel.
  6. The service organization(s) shall maintain comprehensive installation and instruction manuals for all systems equipment. These manuals shall be the property of the City, and shall revert to the City at such time as the City assumes the maintenance responsibility for the system.

7. Maintenance of non-fixed equipment shall be on a unit replacement basis, at no cost to the City or the subscriber agency, such that the amount of time users spend in the maintenance shop shall be minimized.
8. If a fixed equipment module or a non-fixed unit (or control head if applicable) fails twice during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that the equipment is potentially prone to continuing failures, the Respondent shall replace it at no cost to the City.
  - a. If the same fixed equipment module fails twice at a separate location during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that this specific model of device is potentially prone to continuing failures, the Respondent shall provide an equivalent equipment line for complete replacement at no cost to the City.

C. Preventive and Routine Maintenance

1. Routine maintenance procedures recommended by the equipment manufacturer shall be followed.

D. Response Times

1. Catastrophic Failures

- a. Catastrophic failures are defined as those failures which severely impact the overall performance some examples include but are not limited to:
  - 1) System down, communications unavailable
  - 2) Site down, communications severely impacted
  - 3) Radio console system down
  - 4) Microwave system failure
- b. Declaration of a catastrophic failure will be at the sole discretion of the City of Winchester.
- c. The Respondent shall have a qualified technician respond to the location of catastrophic failures within 1 hour during normal working hours (8 AM to 5 PM weekdays), and within 2 hours at other times.
- d. Catastrophic failures not caused by outside effects such as Acts of God will be expected to be resolved within 2 hours after arrival of the technician.

2. Non-catastrophic Failures

- a. Declaration of a non-catastrophic failure will be at the sole discretion of the City of Winchester.
- b. Non-catastrophic failures require the following responses:
  - 1) 0000- 1600 Same working day -- overtime if needed
  - 2) 1601- 2400 Next working day -- start job in AM

3. Response times shall be the same as above during the acceptance test period.

E. Escalation Procedures

1. Respondent shall describe escalation procedures and equipment priority levels in their proposal to be used if the trouble is not resolved within required times.
2. The City reserves the right to approve the proposed escalation procedures or to recommend alternative methods of escalation and problem resolution

F. Hardware Maintenance Contract:

1. As an OPTION, the Respondent shall offer separate one-year hardware maintenance contracts for each non-radio component contained in the proposal. Maintenance contracts shall commence immediately following the expiration of the warranty period. It is the intent of this paragraph to obtain maintenance quotations on those items, which are not directly related to the normal radio shop maintenance articles.
2. As an OPTION, the Respondent shall offer a maintenance contract for the system fixed equipment and non-fixed equipment, that maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis. This system maintenance contract shall be based on the initial system configuration for fixed equipment and on a per unit basis for non-fixed equipment.

G. Software Maintenance Contract:

1. As an OPTION, the Respondent shall offer a software maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis.
2. During the software maintenance contract period, the Respondent shall provide at no additional cost, periodic upgrades of any and all system operational software. The frequency and timing of these upgrades during this period will be at the sole discretion of the City. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:
  - a. Patches for defective software;
  - b. New releases that are corrective revisions for earlier versions and/or;
  - c. No-cost enhancements to earlier releases.
3. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
4. The software provider should make every effort to separate corrective revisions from enhancements. If the software provider is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.

5. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions.
6. Software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City, if so directed by the City.
7. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the maintenance period. All system definition parameters and other unique information (data sets) used to operate the mobile radio system or any associated sub-system included shall be backed-up onto movable media on a quarterly basis during the maintenance period by the Respondent at no cost to the City. These media shall be turned over to the City for safe, off-site storage.
8. All conditions above also apply to all firmware installed in any products included as part of this system or in any spare parts in possession of the City at the end of the warranty period.
9. Any annual software license fees or software maintenance fees should be clearly identified in the Respondent's response and should either be rolled into this software maintenance contract fee or paid in full as part of the initial system price.

#### 1.7 SPARE PARTS

- A. Appropriate and sufficient spare parts shall be provided to the City by the Contractor.
- B. Respondent shall provide a comprehensive list of all proposed spare parts and equipment, which lists each recommended component and a description of its function.
- C. All spare parts and equipment shall be packaged with protective covering for storage and identified with conspicuous labels describing contents.
- D. The Respondent may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing those used on an as-used and timely basis. The spares complement shall include sufficient non-fixed units to enable maintenance on a unit replacement basis.
- E. At the end of the warranty/maintenance period, the full complement of spares shall be delivered to the City.
- F. Spare parts shall be available for shipment on an expedited basis twenty-four (24) hours a day, 365 days a year including weekends and holidays. The manufacturer shall provide a 24-hour hotline telephone number for the handling of such orders.
- G. Notification shall be given at least one (1) year in advance of any change of status for products available from regular production to maintenance only (MO). The specific statement shall be provided with the bid response.

## PART 2 - SYSTEM REQUIREMENTS

### 2.1 GENERAL REQUIREMENTS

- A. Systems proposed shall meet the requirements here and in other sections of this RFP for Option A.
- B. New system minimum requirements. The following items reflect the basic objectives for minimum system performance as identified by City users. Proposed systems shall meet these requirements to the greatest extent practical.
  - 1. APCO Project 25 compliant trunked radio network.
  - 2. RF coverage for the trunked radio network shall assume any belt-mounted portable radio indicated by the manufacturer as providing guaranteed service in the system design. Radios will be used w/swivel carry case antenna on hip for talk-out and talk back to a standard of 95/95 percent (area defined by City borders) in street coverage, 20 dB heavy in-building coverage and those buildings identified in Appendix D.
  - 3. Unit ID displayed at dispatcher positions and for subscriber units with unit ID-capable displays and alias display.
  - 4. "Emergency/Man Down" button on subscriber units
  - 5. Subscriber priority administratively selectable
  - 6. Subscriber unit "talk-around" capability for localized use and system redundancy.
  - 7. Regrouping, re-fleeting of subscriber units administratively selectable.
  - 8. Intra-operability within the system.
  - 9. Inter-operability with surrounding mutual aid jurisdictions.
  - 10. Continued use of existing VHF High band, tone and voice paging
  - 11. 99.999 percent system reliability
  - 12. All user equipment built to Mil. Spec
  - 13. As an Option, Respondents shall provide a network and user equipment equipped of providing secure, encrypted communications to selected users.
    - a. AES Encryption Protocol, compliant with the P25 standards in general and TIA/EIA/IS-102-AAAA Rev A (or latest revision), shall be provided.
    - b. Other protocols shall be considered as an option.

14. As an Option, Respondents shall provide a network equipped with Global Positioning System (GPS) mapping system. The GPS system shall support a select number of upgraded subscriber units and Respondent provided mapping program located at the dispatch facility. All network and server components shall be included console interface, dispatch display, and management.
- C. Primary site selection shall be driven by the 800 MHz Project 25 Digital Trunked voice network.
- D. Infrastructure includes the radios, combiners, antenna systems, controllers, switching equipment, dispatching console systems, and alarm and monitoring sub-systems and all related equipment.
- E. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment.

## 2.2 800 MHZ PUBLIC SAFETY VOICE RADIO NETWORK

- A. The 800 MHz Project 25 Digital Trunked voice radio network shall include the following:
  1. Complete system design
  2. Network infrastructure including RF and all control
  3. Dispatch console equipment
  4. User equipment including mobile, portable, and control station radios
  5. Alarm and control system
  6. Project management
  7. FCC licensing
  8. Installation and programming
  9. Testing
  10. Training
  11. Documentation
- B. Coverage
  1. The basic requirement for the Project 25 Trunked Radio System is for

- a. 95% City-wide in street, 20 dB in-building portable coverage measured on the hip and in-building coverage per locations found in Appendix D.
- C. Analog and digital equipment
1. Project 25 Trunked radio system infrastructure shall support digital trunked user equipment.
  2. VHF / 800 Conventional Base/Repeater Mutual Aid radio system infrastructure shall support analog user equipment.
  3. User equipment, fully compatible with the infrastructure shall be provided.
- D. Anticipated acceptable system configurations include:
1. Simulcast network
- E. 800 MHz FCC Licenses
1. The City has conducted a preliminary frequency analysis, which contains a list of channels in Appendix A for potential use in the system.
- F. Dispatch Consoles
1. Dispatch consoles shall be provided that integrate the following functions, to the greatest extent possible:
    - a. Radio dispatch – conventional and trunked
  2. Fully integrated, graphic based dispatch consoles shall be provided at the following locations:
    - a. Timbrook Public Safety Building
      - 1) 4 positions
  3. The console controller and/or switch and related equipment shall be designed to fully support expansion by fifty percent (50%).
  4. Current dispatch consoles will need to be kept operational during the transition period.
  5. The City requires that dispatch personnel be able to use ONE headset to interface with the existing 9-1-1 and administrative telephone systems AND with the new radio dispatch console system.
- G. Alarm and Control
1. An integrated alarm and control system shall be provided for network management.
- H. User Equipment:

1. Estimated equipment counts for mobile radios, portable radios, and control stations are provided in Section 3.d. The information provided is estimates only. Individual agencies may have more or less radios currently in use, and agencies may opt to deploy more or less radios on the new radio system.
2. As part of the evaluation process, the City will require respondents to provide fully programmed functional samples of all subscriber equipment and accessories proposed. Radios shall be programmed to operate on common interop channels so that evaluators can adequately assess the equipment's functionality.

## 2.3 SITE SELECTION AND ACQUISITION

- A. The City has provided a list of tower sites that may be used in engineering the specified coverage. These sites are summarized in Appendix C.
- B. Respondents shall use tower sites that best optimize the design of the proposed system and offering alternatives for sites critical to the design.
- C. The City's intent is to allow Respondents to use any set of sites that will result in an efficient and cost effective design.
- D. Regardless of the sites proposed, Respondents shall retain complete responsibility for system performance and coverage. In support of the design, Respondents will submit documentation ensuring that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
- E. Sufficient data shall be presented to permit adequate cost/ benefit analysis of lifecycle costs to aid trade-off decision processes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION PLANNING

- A. The Respondent Project Manager shall convene a Project planning session with the City within twenty (20) days of contract award, and together they will jointly develop a Project plan. The Project plan shall include:
1. Project description statement.
  2. A work statement that includes the Project deliverables and Project objectives.
  3. A Work Breakdown Structure (WBS) to the level at which control will be exercised.
  4. Updated Cost estimates, scheduled start dates, and responsibility assignments that support the WBS.
  5. Performance measurement baselines for schedule and cost.
  6. Major milestones and target dates for each.
  7. Key and required staff.
  8. Key risks, including constraints and assumptions, and planned responses for each.
  9. Subsidiary (supporting) management plans including scope management plan, schedule management plan, Project budget(s), change control process, acceptance testing, Project closure process, etc.
  10. Project communications plan or strategy, including periodic reporting requirements and milestone achievement determination.
  11. A written list of open issues and pending decisions.
  12. Supporting detail for all the above.
- B. The Project plan shall be presented to the City not more than fifteen (15) days after the Planning Session meeting.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Installation of equipment shall not begin prior to the City's approval of Shop Drawings and other required submittals.
- B. Installation shall include a complete, tested, system to include placement of associated cabling, appropriate system layout and terminal connections. Respondent shall provide

associated power supplies and any other hardware, adapters and or connections to deliver a complete operable system to the City at the time of acceptance.

- C. All installations shall be performed by factory authorized or Respondent affiliated service shops. Other shops or installers may be used upon mutual agreement between the customer and Respondent. Qualified, adequately trained personnel familiar with this type of work shall perform all installations.
- D. Prior to the start of the system installation the Respondent shall participate in a mandatory Project site survey with the City or City's representative to confirm actual equipment location within each space. At that time the exact equipment locations will be determined and documented by the Respondent.
- E. The installation Respondent shall coordinate with others, as appropriate, to confirm that any prep work, such as tower work, coring, bracing, conduit, electrical, etc that affects the installation of any equipment is complete before final inspection.
- F. During site visits, the Respondent shall review existing conditions at the Jefferson WT for additional structural capabilities to place new antennas on the water tower.

### 3.3 FACTORY TESTING AND STAGING

#### A. Products and Equipment:

- 1. Each individual assembly or equipment shall undergo factory testing prior to shipment.
- 2. Standard factory test documentation, indicating successful completion of testing, and fully documenting the tests performed, shall be submitted to the City to demonstrate compliance.

#### B. System Staging:

- 1. The complete system shall be staged and tested at the factory to the greatest extent practical.
- 2. The Respondent shall provide all necessary technical personnel, and test equipment to conduct staging tests. The Respondent shall remedy all deviations, anomalies, and test or specification failures in a timely manner and at the Respondent's sole expense.
- 3. Staging tests will be conducted using final, approved Staging Acceptance Test Plan (SATP).
- 4. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation. Therefore, the Respondent is expected to execute the SATP and correct all deficiencies before the City is on-site.

5. The City Project Manager or designee shall conduct and/or witness staging tests. The City's cost of travel and expenses associated with staging will be borne by the City.
6. Each section of the SATP, will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
7. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
8. Retest of the failed SATP section or the entire plan shall be at the City's sole discretion,
9. The fully executed and completed SATP document shall be provided to the City.

### 3.4 LABELING AND IDENTIFICATION

- A. All equipment, cables, connections, etc shall be clearly and permanently labeled per the Project drawings, manufacturer's requirements, and TIA/EIA-606A.
  1. Any other signage or labeling as required by law shall be provided.

### 3.5 FIELD QUALITY CONTROL

- A. Installation monitoring and meetings
  1. The Respondent shall attend monthly Project and construction meetings to discuss status, problems, and schedule with individuals deemed necessary by the City prior to and during installation. More frequent meetings may be held at the request of the City.
  2. Respondent shall maintain the written Project schedule on a monthly basis or more frequently if necessary to properly reflect Project activities.
- B. Inspection:
  1. When installation is substantially complete, Respondent shall schedule with the City an inspection of the work.
  2. The City Project Manager or designee will conduct an inspection of the work. Any deficiencies will be documented in a punch list format and delivered to Respondent for resolution.
- C. Pre-final testing

1. Before final testing, Respondent shall completely execute the final approved FATP to verify proper installation and operation of all equipment before presentation to the City.

D. Meeting Minutes and Reports:

1. Respondent shall provide written minutes of all meetings no later than the earlier of five days after the meeting or two (2) days prior to a subsequent meeting relating to the same issue(s).
2. Respondent shall submit a written status report at the end of each week noting progress to date, meetings held, schedule adherence, and variances.
3. Respondent shall provide written reports of corrected punch list items.

E. As-Built Documentation:

1. Respondent shall provide two (2) copies of all as-built documentation
2. All submittals shall be provided in hard copy, paper format, and in electronic format on CD-ROM or USB "thumb drives."
3. Documentation shall be professionally produced, and provided in heavy duty three ring "D ring" style locking binders. Loose leaf materials are not permitted. Paper shall be shall be 8 ½ x 11" whenever possible. If larger paper is utilized it must be professionally incorporated into the document. Minimum paper quality permissible shall be 24# bond and ISO brightness of 90. Binders shall be color coded where it will provide an organizational benefit.
4. Respondent shall provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for the installation including detailed documentation for City review and detailed documentation of as-built conditions.
5. Respondent shall provide complete as built documentation detailing all aspects of the installation including but not limited to:
  - a. Equipment provided
  - b. Plan and elevation drawings of all equipment including antennas on tower
  - c. Cabling and terminations
  - d. Installed location
  - e. Block and level diagrams
  - f. Termination panels
  - g. Programming

h. Set-up and alignment information

6. Equipment/Terminal Elevations: Furnish details showing equipment racks, terminal block and backboard elevations, including all cable terminals, spaces for equipment, equipment racks, and station cable routing. Communications equipment distribution frames shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the Contract Documents and shall show additional detail as indicated herein.

3.6 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.
  1. Worksites shall be left neat and broom swept upon completion of work. All trash shall be removed weekly.

3.7 FINAL INSPECTION

- A. Upon notification of completion of all installation and resolution of all punch list items, City Project Manager or designee will conduct final inspection of the installation.
- B. Any deficiencies will be noted on the punch list and provided to the Respondent for resolution.
- C. Final System Acceptance testing will not commence until all punch list items are resolved.

3.8 TRAINING

- A. The Respondent shall complete all training prior to Final System Acceptance.

3.9 FINAL SYSTEM ACCEPTANCE TESTING

- A. Respondent shall verify and document that all equipment, assemblies, hardware, software, and firmware are upgraded to the latest factory revision before the start of Final System Acceptance testing. Multiple revision levels among similar equipment are unacceptable.
- B. City shall be given two (2) weeks written notice that the system is ready for Final System Acceptance testing.
- C. The Respondent shall provide all necessary technical personnel, and test equipment to conduct final testing.

- D. The Respondent shall remedy all variances or deficiencies in a timely manner and at the Respondent's sole expense.
- E. Final tests will be conducted using the complete and approved Final System Acceptance Test Plan (FATP).
- F. The intent of the Final System Acceptance tests is to demonstrate to the City that the system is complete and ready for commissioning and operation. Therefore, the Respondent is expected to perform preliminary execution of the FATP prior to final execution with the City.
- G. The City or Engineer shall conduct and/or witness execution of the FATP.
- H. Each section of the FATP will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
- I. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
- J. Retest of the failed FATP section or the entire plan shall be at the City's sole discretion,
- K. The fully executed and completed FATP document shall be provided to the City.

### 3.10 FINAL SYSTEM ACCEPTANCE

- A. "Final System Acceptance" shall mean the date on which the Respondent delivers all required documentation to the City and completes all of the work on the Project as required by the Contract Documents, including, without limitation, the date on which the Respondent completes all of the following requirements and demonstrates that the Project is complete in all respects, as determined by the City in its sole discretion, as evidenced by written notice from the City to the Respondent:
  - 1. Receipt and approval of the Staging Acceptance Test Plan (SATP)
  - 2. Satisfactory completion of the Staging Acceptance Test and resolution of punchlist items
  - 3. Completion of System installation
  - 4. Final inspection and resolution of installation punch list items
  - 5. Receipt and approval of the as-built documentation
  - 6. Receipt and approval of the Coverage Acceptance Test Plan (CATP)
  - 7. Satisfactory completion of the Coverage Acceptance Test and resolution of punchlist items

8. Satisfactory completion of installation of subscriber equipment
9. Completion of all training required by the Contract Documents
10. Receipt and approval of the Final System Acceptance Test Plan (FATP) and related test;
11. Satisfactory completion of the Final System Acceptance Test and resolution of punchlist items

**END OF SECTION**

### **SECTION 3.b – OPTION A – RADIO NETWORK**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This section provides specifications and requirements for an 800 MHz P25-compliant digital trunked simulcast radio system for voice communications. The system is comprised of several main subsystems or components.
- B. The scope includes:
  - 1. Basic system configuration criteria
  - 2. Coverage requirements
  - 3. RF infrastructure
    - a. Repeaters
    - b. Combiners
    - c. Antenna systems
    - d. Controllers and switch equipment
    - e. System Configuration and Control
    - f. VHF Conventional Channels

## PART 2 - PRODUCTS AND SYSTEMS

### 2.1 MANUFACTURERS

- A. Available Respondents. Subject to compliance with requirements, this section is open to all manufacturers of trunked radio equipment and/or systems integrators offering products that meet or exceed specifications indicated in Option A.

### 2.2 SYSTEM CONFIGURATION

- A. Respondents shall propose six (6) P25 Phase I compliant base stations (one control channel and five voice paths)
- B. This system specification describes a Citywide radio system providing “public safety grade” performance in general, and to the specific requirements as described herein.
- C. The Respondent’s offering must be compliant to the P25 standard.
- D. Any feature required in the system specification must function with all TIA102 P25 compliant subscriber units regardless of manufacturer in order to be considered compliant.
- E. No manufacturer specific feature will be permitted if it limits, disables or defeats multi-Respondent interoperability unless the Respondent fully describes in their response the functionality provided by the feature and how subscriber hardware from vendors other than the Respondent will function/integrate.
- F. The respondents’ proposed system shall provide a balanced system design where talkback performance is the same or better than talk out performance.
- G. The new system shall comply with the standard features and functions defined in the following documents.
- H. Environmental
  - 1. All equipment rooms are air-conditioned; however, the Respondent must provide the guaranteed operating temperature range and the BTU's of heat generated for each primary piece of equipment in the proposed system.
- I. Multiple Sites
  - 1. Multiple sites will be needed to provide City-wide coverage. This wide-area, multiple-site network will consist of simulcast radio sites.
  - 2. The system must seamlessly integrate all multiple sites and any cells or zones such that field users can freely roam throughout the service area without the need to manually select sites.
  - 3. Respondent shall determine the number and location of sites needed to efficiently provide the required coverage.
  - 4. Candidate sites which are known to be available for City use are described in Appendix C. While the City desires the use of these sites final site selection to provide the required coverage is at the discretion of the Respondent.

### 2.3 INTEROPERABILITY

- A. The proposed system shall interface with conventional radio systems in a way that enables seamless dispatch and field communications to support incident communications.

**B. Conventional Interoperability Requirements**

1. Respondent shall provide conventional interoperable base stations to provide portable radio coverage for mutual aid responders.
2. To decrease the overall cost of the interoperability overlay, these base stations shall be located only at one of the proposed sites that provides the best level of VHF coverage based on the final licensing potential for existing channels already provided.
3. Respondent will provide five VHF High Band, narrowband, conventional base stations/repeaters.
4. Respondent shall provide interoperability gateway(s) to interface the interoperability channels to the trunked system.
5. The Interoperability channels will be mapped to trunked talk groups by the system and at the dispatch consoles.
6. A live demonstration of the Respondent's ability to provide an acceptable mutual aid solution shall be part of the acceptance test plan. The following shall apply:
  - a. The exhibit must demonstrate the interoperability between a narrowband VHF analog conventional radio and a P25 digital trunked radio system that meets the operational requirements of the City. The P25 vocoder used in the demonstration shall be the same as that provided by the Respondent

**2.4 VOICE RF COVERAGE REQUIREMENTS****A. Channel Performance Criteria (CPC)**

1. RF coverage is defined as the digital bit-error-rate (BER) that provides a minimum delivered audio quality (DAQ) 3.4 audio signal to the operator as defined in TIA TSB-88-C (OR LATEST REVISION) for both talk-out and talk back to portable radios on hip used outdoors (in street), in 20 dB buildings throughout the City, and in-building coverage for locations identified in Appendix D.
2. The DAQ 3.4 performance level shall provide 95 percent reliability throughout 95 percent of the geographical area of the City.

**B. Minimum Radio System Coverage Requirements (MRSCR)**

1. The City seeks to implement a system design that best meets its operational coverage needs. Therefore, the MRSCR must be based on a geographic area basis using grid sizes providing enough grids to achieve the associated confidence factor as described later in this section.
2. The system shall provide a minimum service area reliability of 95 percent voice radio coverage, by area, for the City for portable radios carried on the hip in 20 dB buildings and locations identified in Appendix D.

**C. Coverage Maps**

1. Respondents shall submit both talk-out and talk-back, or system composite coverage maps for the proposed configuration, showing system gain calculations, for
  - a. P25 mobile radios
  - b. P25 portable radios in the street

- c. P25 portable radios in 20 dB buildings
  - d. VHF analog portable radios in the street
  - e. VHF analog paging coverage in the street with pager worn on hip.
2. Map Criteria
- a. The operating parameters and factors pertaining to the coverage commitment for a specific map must be shown for that map (preferably on the map). If a Respondent chooses to show the operating parameters and factors on a separate page, the Respondent is responsible to clearly identify the correct information for each map. Each and every map must have this information.
  - b. The following minimum information must be clearly defined, relating to each map and each site:
    - 1) The base/repeater RF power output
    - 2) The base/repeater antenna gain and directivity (if applicable)
    - 3) The "down tilt" angle (in degrees) of the base/repeater antenna
    - 4) The transmit ERP
    - 5) The effective receiver sensitivity
    - 6) Receiver tower top amplifier gain
    - 7) The base/repeater antenna height above ground
    - 8) The base/repeater antenna height above average terrain
    - 9) The mobile or portable antenna type
    - 10) The mobile or portable antenna height above ground for transmitting position and for receiving position, if different
    - 11) The mobile or portable RF output power
    - 12) Any areas within the coverage contours shown on a map that are predicted to have a reliability of less than 95 percent for the conditions and operating parameters applicable to that map must be clearly marked on the map.
  - c. If backup or standby sites are proposed, appropriate maps showing system coverage utilizing these sites must be included in the proposal.
  - d. Coverage should not be limited to the City boundaries and shall show coverage provided outside the City limits based on the proposed sites for informational purposes.
- D. Coverage Model
- 1. A description of how the Respondent calculated the coverage must be included in each proposal. List the coverage model(s) used (for example–Okumura, etc.)
- E. Guarantee of Proposed Coverage
- 1. The City has identified minimum coverage requirements in this RFP.

2. The City anticipates that the proposed coverage will not exactly match the required coverage on a grid-by-grid basis. In each sub-area, some required grids may not be covered and other non-required grids may be covered.
  3. The City will evaluate proposals based on overall coverage value to the City.
  4. The selected Respondent will be required to guarantee the proposed system coverage based on the submitted grid maps and the testing methodology of this RFP.
  5. Any subsequent design changes based on mutual agreement between the City and selected Respondent that impact coverage will require revision of the coverage grid maps and guarantee based on the grid maps.
- F. TIA TSB-88-C– User Choices
1. [E.1] User Choices
    - a. Coverage predictions, design and proof of performance testing must be conducted in accordance with TIA TSB-88-C, or latest revision to the greatest extent possible. The following criterion is provided in accordance with TIA TSB-88-C.
  2. [E.2] Service Area
    - a. The service area is defined as the City of Winchester, Virginia.
    - b. Coverage testing shall be performed within the Winchester City boundaries.
    - c. The target device, usage and location are:
      - 1) Mobile radios—standard dash or trunk mount with antenna mounted in the center of the roof
      - 2) Portable radios—standard portable radio (for in-building applications):
        - a) Talk-out and talk-back to portable radio on hip with swivel belt clip
      - 3) Basic network coverage shall be designed to accommodate vehicles traveling at speeds up to 85 MPH
      - 4) Basic network coverage shall be designed to accommodate supplemental 20 dB in-building coverage.
      - 5) Basic network coverage shall be designed to accommodate supplemental in-building coverage as identified in the locations included as Appendix D.
  3. [E.3] Channel Performance Criterion (CPC)
    - a. Minimum CPC shall be DAQ 3.4 for digital channels.
  4. [E.4] Reliability Design Targets
    - a. The CPC reliability design target is a service area probability of 95 percent.
  5. [E.5] Terrain Profile Extraction Method
    - a. Either the bilinear interpolation or the snap to grid method of terrain profile extraction is acceptable.

6. [E.6] Interference Calculation Method
  - a. Either the equivalent interferer or the Monte Carlo Simulation Method of interference calculation is acceptable.
7. [E.7] Metaphors to Describe the Plane of the Service Area
  - a. The tiled method is preferred
  - b. Grid mapped from radial method is also acceptable
8. [E.8] Required Service Area Reliability
  - a. The CPC is required for 95 percent of the service area.
9. [E.9] Willingness to Accept a Lower Area Reliability in Order to Obtain a Frequency
  - a. The City is not willing to accept a lower area reliability in order to obtain a frequency.
10. [E.10] Adjacent Channel Drift Confidence Factor
  - a. Adjacent channel drift confidence factor shall be 95 percent.
11. [E.11] Conformance Test Confidence Level
  - a. A conformance test confidence level of 99 percent is required.
12. [E.12] Sampling Error Allowance
  - a. A sampling error allowance of  $\pm 1$  percent is required.
13. [E.13] Pass/Fail Criterion
  - a. The "greater than" test is required.
14. [E.14] Treatment of Inaccessible Grids
  - a. All inaccessible grids will be eliminated from the calculation.

## 2.5 RF COVERAGE TESTING

### A. General:

1. RF coverage testing is critical to verifying that the proposed system design meets the City's requirements.
2. The intent of RF coverage testing is to verify proposed coverage based on TSB-88-C, or latest revision. Any deviations from TSB-88-C shall be noted by the Respondent otherwise they are assumed to meet the recommendations of the standard document.
3. Respondent shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the proposal meeting the requirements of this Section.
4. Both the City and the selected Respondent shall agree upon the final CATP and method to be used no later than 90 days after award of contract.
5. Respondents may propose alternative test methods as an Option for consideration, consistent with the requirements, TSB-88-C, and achieving the same results however, the City shall make the final determination as to whether the proposed alternative is acceptable.

- a. Roundtrip BER testing will be accepted as a valid test method if:
    - 1) Must include talk-out BER and talk-in BER measurements for each tile.
    - 2) Must contain a sufficient number of BER samples per tile to be statistically valid.
    - 3) Must include an acceptable methodology for combining the talk-out and the talk-in BER data into a composite round trip BER mean value for each tile.
    - 4) A BER of 2 percent or less for 95 percent of the tested tiles is the pass criterion.
    - 5) Accompanied by subjective voice quality tests that validate a DAQ 3.4, 95 percent pass criterion. Voice quality tests may be conducted while moving.
  6. Coverage testing shall be conducted after the system is fully tested and aligned.
  7. Significant changes to system alignment will require re-testing of coverage.
- B. Types of Testing
1. Two types of coverage testing will be conducted in all areas:
    - a. Automated mobile drive testing for overall grid acceptance testing purposes
    - b. Non-automated intelligibility testing to verify DAQ and base-lining purposes for portable radio configurations in-street and in buildings located in Appendix D.
  2. Automated and intelligibility testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally.
  3. Automated testing shall be objective and quantitative in nature and used to:
    - a. Verify that system coverage meets signal level and BER threshold requirements on a grid basis.
    - b. Automated testing results may also be used as a baseline of system performance such that system alignment and coverage performance can be re-tested at a later date to determine if degradation has occurred.
  4. Intelligibility testing shall be subjective and qualitative in nature and used to:
    - a. Verify that system DAQ meets requirements in selected grids tested as covered.
    - b. Respondent shall provide audio samples to permit City personnel to grade audio quality.
    - c. City personnel will evaluate audio quality based on Respondent provided audio samples.
    - d. Conduct in-building testing for locations in Appendix D for both intelligibility and measure signal strength at all testing locations.
- C. Test Configurations

1. Testing configurations for automated and intelligibility testing shall correspond as closely as possible to anticipated typical operating configurations.
2. Testing configurations shall use typical mobile and portable radios delivered with the system. Selected Respondent and City shall mutually agree on a testing plan utilizing a selection of Respondent's multi-featured low and high-tiered mobile and portable radios.
3. If test configuration does not use delivered mobile or portable radios, Respondent shall fully describe and demonstrate correlation between test measurements obtained with test equipment used and the performance of actual operational equipment.
4. City personnel or representatives will participate in and witness all coverage testing at City option.

D. Automated Mobile Drive Testing

1. To verify coverage for final system acceptance, the selected Respondent must, to the satisfaction of the City, measure the signal level and/or BER, as applicable, at a statistically significant number of test locations randomly and homogeneously distributed throughout the City, for each coverage sub-area.
2. The intent of this procedure is to define a coverage testing method that is consistent with TSB-88-C.
3. The City is approximately 9.3 square miles in area. Respondents are required to create the appropriate grid size for testing purposes to achieve the confidence level noted previously.
4. Selected Respondent may evenly subdivide grids, if necessary, to provide a statistically significant number of grids in a sub-area as is acceptable to the City.
5. Using automated drive testing equipment, the signal level or BER shall be measured in each accessible bin.
6. Inaccessible bins will not be counted for any calculations.
7. The automated test equipment shall be capable of making and recording multiple measurements within each bin per TSB-88-C (OR LATEST REVISION) and averaging the readings to produce the final test result for that bin. All samples and the final average value shall be stored and retained as part of the test data.
8. A PASS shall be scored for each average bin measurement that exceeds the threshold determined to correspond with each bin as shown in proposed/contracted coverage map.
9. Ninety-five percent of the bins tested, in each sub-area, must PASS the corresponding threshold or the test will be graded as "FAILED."
10. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

E. Non-automated Intelligibility Testing

1. Non-automated intelligibility coverage testing will be conducted using Respondent and City mutually-agreed on and Respondent-supplied mobile and portable radios

2. Digital audio quality coverage will be tested at each location and in all critical buildings identified in Appendix D.
3. Both talk-out and talk-back will be recorded
4. Testing shall be performed using typically configured portable radios.
5. Testing will be done in teams with one part of the team in the field and the other at a dispatch console.
  - a. Field personnel will document talk out testing
  - b. Dispatch personnel will document talk back testing
6. A standard test result form shall be used to document test information for each test location including:
  - a. Date
  - b. Time
  - c. Personnel
  - d. Digital
  - e. Talk-out or talkback
  - f. Equipment
  - g. Location
  - h. Received signal level for in-building tests
  - i. Pass or fail status
7. Individual Building Tests
  - a. The following number of test locations shall be used based on the type of building.
    - 1) Residential building (single/2 story family) – Single test in center of ground floor.
    - 2) Small commercial building (single story, open floor plan) – Five test locations, one in each corner and one in center.
    - 3) Medium building (small school, light industrial, medical office) – 20 test locations, uniformly distributed on the ground floor.
    - 4) Large buildings (shopping malls, factories, buildings over 5 stories) – Multiple test points (minimum 20) uniformly distributed on the ground floor.
  - b. The final standard deviation of test locations confirmation shall be agreed to by both the City and Respondent with a minimum 50% of test locations passing.
  - c. Physical in-building test shall be conducted by walking in a circle, approximately 1 meter in diameter, while conducting a subjective test.
    - 1) In addition, received signal level shall be recorded at each test location.

8. Data from the testing forms will be analyzed to determine the percentage of tested locations that passed.
9. At least 95 percent of the test locations in each sub-area must PASS or the test will be graded as "FAILED."
10. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

F. Test Unit Configuration

1. Mobile units operating in this system may be traveling on any street, road (paved or unpaved), or highway at any time within the coverage area.
2. Vehicular antennas are to be center mounted on each vehicle unless specifically noted elsewhere in this specification for any particular vehicle or class of vehicles.
3. Respondent shall fully describe vehicular antenna to be used, including:
  - a. Make
  - b. Model
  - c. Frequency range
  - d. Gain

2.6 HIGH NOISE AMBIENT ENVIRONMENT TESTING

A. General

1. The City's fire and rescue users shall frequently operate in high noise environments with and without masks.
2. Respondent shall propose a detailed plan how high ambient noise acceptance testing shall be done.
3. The proposed test plan the City is attempting to replicate is based on the NTIA Technical Report TR-08-453 "Intelligibility of Selected Radio Systems in the presence of Fireground Noise: Test Plan and Results"

B. Testing Configurations

1. Respondents' detail plan may include any combination of the below environmental noise conditions or alternates to validate operation in these situations.
  - a. No background noise, no mask (or the Clean condition)
  - b. Fire truck pump panel, no mask
  - c. Mask with no background noise
  - d. Two personal alert safety system (PASS) alarms, with mask
  - e. In-mask low air alarm
  - f. Rotary saw cutting metal garage door, with mask
  - g. Chainsaw cutting wood, with mask
  - h. 2 ½ inch hose with fog nozzle, with mask

- i. Rotary saw cutting metal garage door, with amplified mask
2. Respondents shall detail any requirements for the City to provide the necessary equipment to proceed with the testing.
3. The intent of the high noise ambient environment testing is for both subscriber and network.
  - a. Subscriber – Demonstrate the audio intelligibility performance in an all P25 environment of a subscriber operating in a high noise ambient environment test.
  - b. Network Interoperability – Demonstrate the audio intelligibility performance of the proposed VHF-800 patch/gateway. The VHF analog radio will transmit in a high noise ambient environment with a noise-cancelling microphone under the conditions defined. The audio to be evaluated is received by an 800 MHz P25 subscriber through the VHF-800 interoperability gateway/patch.

C. References

1. Respondents shall provide a reference that will permit a demonstration provided at a completed and accepted installation using the same technology as proposed for Winchester. The Respondent is responsible for coordinating the test demonstration with the host site owner including access to the console. Winchester designees will provide the turnout gear and mask, rotary saw, metal, wood, and other ancillary equipment necessary to conduct the test. The vendor will provide the radios and arrange clearance with the host site to use the dispatch console. The City shall reserve the right to request this test during or after the Respondent selection process.

2.7 TRUNKED RADIO SYSTEM FEATURES

A. General

1. The system shall provide the following general features:
  - a. Compliance with P25 features.
  - b. Digital talk group and voice call operation
  - c. Network management
2. Required features are grouped and described in the following paragraphs.

B. Trunking Modes

1. Digital P25-compliant voice calls
2. Digital talk group calls
3. Message or transmission trunked

C. Dispatch Consoles

1. The City plans to purchase digital radio consoles as part of this procurement.
2. The network system shall support cross muting of radio consoles.
3. Any console position must be able to communicate with any talkgroup it is equipped for in the system regardless of the site or sites involved in the call.

4. The connection of the multiple site network system to the console network must be completely digital end-to-end.
- D. Non-fixed User Equipment
1. System shall support the following:
    - a. P25-compliant mobile radios
    - b. P25-compliant portable radios
    - c. P25-compliant control station radios
  2. Field units shall be capable (via programming) of accessing or being denied access to any and all sites within the system.
- E. Network Site Capacity
1. The network switch and associated control equipment must be capable of fully interconnecting all sites in the system.
  2. Spare capacity, sufficient to integrate additional sites equal to 50 percent of the initial proposed sites, shall be supported.
  3. Site Configuration
    - a. The network shall be capable of the following site configurations:
      - 1) Single site trunking
      - 2) Multiple site simulcast cells
      - 3) Satellite receiver sites
    - b. A simulcast cell consisting of several physical sites shall count as one site and not as a total of the simulcast sites.
    - c. The number of channels supported must also range from a standard single channel conventional repeater to a 24-channel trunking system.
      - 1) Initial design is for a 6-channel trunking system.
    - d. Respondent shall fully describe all site/repeater configurations proposed.
- F. Control Data
1. The trunked system shall operate using the P25-compliant control channel protocol as defined in TIA-102. All working and control channels will function on frequencies licensed for this system.
  2. Broadcast of talkgroup assignments, emergency assignments, individual signaling calls, and special signal calls shall occur on the control channel.
- G. Channel Assignment
1. A system control computer shall allocate all RF channels or timeslots such that any and all system users (field units and console dispatchers) will have access to all voice channels via a system priority protocol.
  2. Channel access time, assuming a channel is available, shall be less than 850 milliseconds. Access time is defined as the time period from the radio Push-to-Talk until the receiving unit speaker is un-muted and audio is emitted from that speaker.

## H. Talkgroups

1. The system shall have initial capability to support at least 300 talkgroups.
2. Respondent shall state maximum number of talkgroups the system can support and what is required to achieve this expansion.
3. Each talkgroup must be capable of consisting of any and all individual unit ID's.
  - a. Respondents shall list any restrictions/limitations of their fleet map.
  - b. This will include any restrictions or reprogramming required if additional talkgroups are created later.
4. Any field unit or console dispatcher can be programmed to be a member of any talkgroup either at initial implementation or at any time in the future. Respondents shall describe how this process takes place and what restrictions there would be when adding any units to any talkgroups.
5. All field units (mobiles, portables, and RF control stations) and console dispatch positions will be capable of being assigned talkgroup address designators that shall permit communications between groups of field units or groups of field units and individual dispatch positions.
6. All units operating within the same talkgroup must receive both sides of every conversation addressed to or from the talkgroup.

## I. Number of Individual Discrete Addresses

1. The signaling protocol will permit the system to assign not less than 16,256 discrete field unit addresses (unit ID). Respondent shall state maximum number of unit ID's the proposed system can support, and what is required to achieve this expansion.
2. All discrete addresses must have the capability of being a member of any or all talkgroups. Regardless of the talkgroup affiliation, the discrete unit address for a unit will not change. Each unit will have a unique discrete unit address.

## J. Call Management

1. Call types supported:
  - a. Talk group calls
  - b. Individual calls
2. Call processing:
  - a. All call types must be maintained across the network.
  - b. Talkgroup calls and management commands such as unit-to-unit calls, console operator calls, individual unit disable commands, remote radio assignments, data messages, etc., must follow a user or group throughout the area of operation.
  - c. Call processing shall be highly channel efficient and not unnecessarily tie up multiple channels at multiple sites for the same user. The system shall optimize the number of channels used in any given conversational scenario.
3. Call Routing Management

- a. Site Registration
    - 1) For multi-site networks, the system shall automatically perform site registration and de-registration on a talkgroup and radio unit basis.
    - 2) The system controller shall maintain the site registration status of all units active on the network.
    - 3) Real-time and logged status of units and talk groups shall be available via the system management subsystem.
    - 4) All unassigned units that are turned on within, or move into, the RF coverage area will initiate a registration process with the network in a manner that is consistent with the trunking protocol in use.
  - b. Site Hand-off and Roaming
    - 1) System shall automatically detect loss of signal and control roaming from one site to another.
    - 2) Audio loss during site hand-off shall not exceed one second.
  - c. Default Site
    - 1) Any or all sites within the multiple-site network shall be capable of being designated as a default site. These sites must always be included in a talkgroup call before the call can proceed.
  - d. Preferred Site
    - 1) In areas of overlapping coverage from two or more sites, one site may be designated as a preferred site.
    - 2) Designation shall be on a talkgroup or unit basis.
  - e. Call Busy
    - 1) System shall issue a busy status for a talkgroup call if a channel is not available at all sites where talk group units are registered.
    - 2) Busy calls shall be placed in queue on a priority basis.
    - 3) System shall allow programmable override of call busy on a site, talkgroup, or unit basis.
4. Priority Levels
- a. A minimum of eight levels of operational talkgroup priority will be incorporated into the system.
  - b. The network manager terminal shall allow authorized personnel to assign individual and/or talkgroup priority levels to all field units.
  - c. The signaling protocol shall be structured so that access to the system will be in accordance with the level of priority involved.
  - d. Dispatch consoles shall be capable of temporarily elevating the operational priority of a talkgroup to facilitate channel assignments in critical situations.
  - e. Respondents shall provide information in their proposal explaining how the voice and emergency call features have priority over data-messaging traffic.

- f. Emergency Priority
  - 1) All public safety and other identified subscriber units in the system will have a preemptive “emergency” capability.
    - a) Within 500 milliseconds of activation of the emergency button, the field unit's ID must be displayed at the dispatch terminal and other talkgroup units and an audible alert shall also be activated.
    - b) A channel shall be immediately assigned to handle the emergency communications regardless of system loading condition.
    - c) Respondents shall detail the exact method of obtaining an emergency channel during system busy times and explain how queuing of an emergency message is averted.
    - d) Respondents shall describe in detail the function of the emergency button when a subscriber unit is using a talkaround or fireground channel.
- 5. Queuing of Request for Voice Channel
  - a. When all available talking channels are assigned, the second and lower precedence level requests for a talking channel will be placed in a queue according to the priority levels involved. The queue will cause the system to assign talking channels (as they become available) on a priority level basis. If multiple talkgroups with the same priority are in the queue, they will be assigned a channel on a first-in, first-out (FIFO) basis.
  - b. The queuing protocol shall process and assign channels to requesting units that have been involved in recent conversations before processing and assigning channels to units not involved in any recent conversations (assuming both talkgroups have equal priorities). The desired result is to keep current conversations from becoming fragmented by any delays that might be caused by a new user request for a channel.
- 6. Busy Queuing Callback
  - a. The system shall provide a callback feature when any unit is placed into a system busy queue. The unit requesting the channel must be notified automatically by the system when the system assigns the unit a channel. The system will cause the field unit to emit an audible alert, specific for callback, and the unit shall automatically access the assigned channel.
  - b. The channel shall be reserved for a short period of time to allow the requesting unit's user to activate the PTT switch and broadcast the message. The selected talkgroup members will automatically be assigned to the talking channel so they will hear the voice message and can reply as necessary.
- K. Unit ID
  - 1. Each unit will send its unique discrete address identification to the system each time the unit transmits regardless of whether the system is operating in the message trunking mode or transmission trunking mode.
- L. Selective Alerting

1. The system shall provide a means for selectively alerting one unit from another unit or from a dispatch location (for field units equipped with the selective alerting feature).
  2. Selected field units shall be capable of viewing the sending party's unit ID or alias during this mode of communication.
- M. System Database Update:
1. Whenever a field unit is turned on (with this system selected), and the unit is within range of the system, the unit's discrete address and talkgroup affiliation shall be transmitted to and recorded into the system database.
  2. Whenever a field unit is on, this trunked system is selected, and is in range of the system, any change of talkgroup affiliation for the field unit will automatically update the system database with the unit's ID (discrete data signaling address) and current talkgroup affiliation. This will allow authorized personnel to have up-to-date information on which talkgroup any radio is currently selected.
- N. Continuous Talkgroup Affiliation Notification
1. The system shall provide for continuous talkgroup affiliation updates. The system shall broadcast a continuous update of the talkgroup channel assignments to field units. The field units shall monitor this signaling. Those units that become activated during a conversation, or those which leave the system coverage and return, will use this process to immediately affiliate with their proper talkgroup conversation.
- O. Out of Range Indication:
1. Whenever a field unit leaves the coverage area of the signaling channel or is otherwise unable to receive the signaling channel a unique audible alert shall be sounded when it attempts to access the system (PTT).
  2. This alert shall have a different "sound" than any other audible alert capable of being generated by the field unit.
- P. Individual Unit Disable
1. Hardware and software must be included in the system that allows a dispatcher, using a system management terminal, to selectively disable any field unit(s) currently operational on the system. The disabling of a field unit must prevent the unit from monitoring any voice communications on any channel or talkgroup in the system. A disabled unit must not be able to transmit or otherwise join into any voice conversation on the system. The disabling function must occur while the field unit is on the system anywhere within RF coverage.
  2. The system must have the capability to automatically search multiple times for the unit to be disabled if so requested by the dispatcher. The terminal must indicate to the dispatcher when the unit is disabled. The field unit and system must "handshake" so that the system will have a positive indication of success. This process must be able to take place even if the dispatch console or network manager terminal is inoperative.
  3. The enable/disable control operation should not require the use of any talking channel. All Respondents shall describe what resources (i.e., control channel, working channel, etc.) are required for the unit disable feature to be implemented.

4. A disabled unit can only be re-enabled by authorized personnel. If for any reason the trunked system is shutdown or disabled, any disabled units must stay disabled. If the unit is not on the system at the time the disabling function is initially invoked, the system must have the ability to capture the unit when it comes into the system. When the target unit accesses the system, the system must have the capability to automatically disable the unit. Respondents are to describe this process in detail.
5. The system must have the ability to enable a disabled unit by request of the dispatcher using an appropriately configured console. The system must have the ability to search for a turned on, disabled unit in the system. When the system finds the unit, it will re-enable the unit, give an indication to the dispatchers, and log the reactivation.

Q. Wide Area Talkgroup Scan

1. A multiple site network talkgroup scan feature must be available in specified radios. This scan feature must allow the user to listen to any talkgroup that is using the same site as the user, and is in the user's scan list.
2. It is not required to allow a user to listen to talkgroups that are not assigned at the site in question due to traffic loading considerations.
3. The ability to become a member of an active talkgroup, even though a user is listening to another talkgroup, shall be supported. This switching is to be made to predetermined higher priority talkgroups only. Each radio shall be capable of handling a higher priority talkgroup, not including the talkgroup the user has selected.

## 2.8 PROPRIETARY FEATURES

- A. The City is interested in using features described in this section when available under P25 standards. It is understood Respondents may not currently offer these features because they are not standardized. Respondents should provide their best estimates when/if these features shall be supported in the future on their proposed system. If the features below are available now using only that Respondent's user equipment (that is they are proprietary to the Respondent and their equipment), the Respondent's may propose those features and provide information (including budgetary costs and schedule for implementation) on policies in place for meeting the P25 standards for their current proprietary features.
- B. Other Features - OPTIONAL
  1. Respondents may provide full details of any other specific features that are offered in their systems which the City may desire to take advantage. Where such options are provided at additional cost, Respondents shall provide these costs as optional additions to their response.
  2. Two optional features include AES encryption and GPS mapping integration.

## 2.9 TRUNKED RADIO SITE REQUIREMENTS

- A. Basic Trunked Network Configuration
  1. The City is seeking to secure licensing for six 800 MHz channels.
  2. Each transmitter and receiver will be capable of operating independently of, and simultaneously with, any or all of the others assigned to the system.

3. Repeaters shall be of modular design and consist of a transmitter, receiver, power supply, and all related control and signaling circuitry.
  4. Repeaters shall employ frequency-synthesized transmitters and receivers such that any repeater can be programmed for any channel. Base stations using crystal controlled or discrete channel elements are not acceptable.
  5. Repeaters shall be under the control of the system controller. All interface circuitry and cables will be provided.
  6. The quantity of base stations required will depend upon the coverage design and number of sites required.
  7. Final system layout will be coordinated with the City.
- B. The equipment offered will be capable of meeting full specifications when operating in the general vicinity of FM and TV transmitters and vehicular mobile UHF/VHF/800 transmitters.

## 2.10 SYSTEM RELIABILITY, AVAILABILITY, AND BACKUP

- A. The network system will support a large number of users based on the subscriber counts in Section 3.d. The system being proposed shall have adequate reliability mechanisms included in its design and shall be very reliable.
- B. No Single Point of Failure. The system must continue to operate with all specified features if any single system controller device fails.
1. The City requires that for any design requiring central controller equipment, main equipment shall be redundant to avoid any single point of failure.
  2. The network control processor must be of a fault-tolerant design. This shall prevent a single point failure from reducing the call processing capabilities of the system.
- C. Cold standby, redundant multiple-site network processors are unacceptable.
- D. When a hardware failure occurs, backup hardware must be automatically and instantaneously activated to prevent loss of any call processing capability or feature.
- E. The failure of a critical sub-system shall trigger software and/or contact closure notification to a system administrator.
- F. Voice communication channels between the network system central site and the remote radio sites are required. Such communications transport can be achieved by various means. The multiple site network must be able to accommodate these different transport methods.
- G. Proposed system's network control processor shall have the capability to "down" a failed site and allow the remaining sites to operate in a multiple-site network environment.
- H. Proposed system's network control processor shall be capable of supporting alternate end-to-end path configurations.
- I. The remote radio site controller shall allow continued trunking operation in the event of a link failure. In dual controller, [a redundant (standby) configuration], equipped sites, a failure of the first controller must not stop trunking at the site. In the event of a failure in the second controller, the remote radio site shall operate in a reduced-capability mode.

## 2.11 CONVENTIONAL REQUIREMENTS

- A. One 800 MHz repeater site shall also include conventional base stations to provide the best VHF portable radio coverage for mutual aid responders.
- B. The City anticipates each of these conventional channels to be prone to high noise environments. The Respondent shall detail how their proposed system will alleviate any concerns with outside agencies using analog conventional channels as the City's agencies will be listening to those channels on assigned talkgroups on the digital system.
- C. Respondent will provide VHF High Band conventional base stations operating on the following frequencies
  - 1. VHF High Band (5 bases)
    - a. VHF FD-1 – Fire and Tone & Voice Paging
      - 1) TX 158.9250 MHz, RX 156.0000 MHz
    - b. VHF FD-2 – Fire Simplex Tactical
      - 1) TX/RX 154.4150 MHz
    - c. VHF FD-3 – Fire Simplex Tactical
      - 1) TX/RX 154.2500 MHz
    - d. VHF PD-1 – Police Simplex Tactical
      - 1) TX 159.2100 MHz, RX 155.9100 MHz
    - e. City TAC – City wide Tactical
      - 1) TX/RX Not Defined Yet
- D. Respondent shall provide interoperability gateways to interface the interoperability channels to the trunked system.
- E. The Interoperability channels will be mapped to trunked talk groups by the system and at the dispatch consoles.

## 2.12 FIXED END TRUNKED RADIO SYSTEM EQUIPMENT

- A. System and Site Controllers
  - 1. General Requirements
    - a. The Respondent shall describe in the response to this RFP the manner in which the proposed system and site controller functions and operates.
    - b. The system and site controller shall perform all functions and control activities necessary to completely control the trunked radio system. The Respondent shall provide a redundant or distributed processing system and site controllers.
    - c. The City plans that system control equipment be located at the Timbrook Public Safety Building.
      - 1) Successful respondent shall assess the existing equipment room HVAC capacity and shall provide additional HVAC capacity to provide sufficient cooling for the equipment room and the adjacent server room.

- 2) Successful respondent shall assess the existing equipment room power capacities and shall provide additional power capacity to for the equipment
  - 3) Services provided in sections one and two above will require coordination with the City who is a willing and cooperative participant.
- d. This shall include all of the necessary hardware and software for overall monitoring and control of the trunked radio system. The controllers shall fully support all functions described in the functional requirements section of this RFP; including automatic RF channel assignment in accordance with priorities, call queuing, late entry assignment, recent user priority option, and logging system activity.
  - e. The controllers shall be capable of controlling all voice and control channels in a trunked, multi-site system. The controllers shall have sufficient processing capacity and memory to fully support these functions during system overload conditions. The controllers shall fully support P25 features, and performance objectives, including the common air interface (CAI), and trunking procedures.
  - f. Voice signals from the dispatch console shall be processed and routed via the backbone transmission system to the selected repeaters. All dispatch consoles shall be based on a decentralized architecture to assure minimal points of failure. The controllers shall process and execute requests for service from field radio units, RF control stations and dispatch positions. Channel assignment shall be automatic and user-transparent. The controllers shall recognize group, subgroup, and unit ID, organization, and shall direct messages accordingly.
  - g. The system controller and other elements of the trunked radio system shall correctly assign an RF channel within 500 milliseconds of the receipt of the initial request for service, assuming an available RF channel and loading at full-system design capacity.
  - h. The system controller shall interface with the system manager, console system, logging recorders, and site controllers to monitor system and equipment parameters.
  - i. The controllers shall be capable of detecting the failure of any repeater or other system element and taking the appropriate corrective action to maintain system trunking. The site controllers shall be capable of supporting successive fallback modes to maintain trunking to the extent practical before reverting to conventional repeater operation.
  - j. The controllers shall be capable of removing a single site from a multi-site system, upon failure of the site, without the effected site reverting to a fallback operation. Any equipment failure or out-of-tolerance condition must immediately be reported to the system manager terminal for subsequent analysis and resolution.
2. Simulcast Equipment
    - a. The entire 800 MHz system is of simulcast design.

- b. The Respondent shall provide all necessary simulcast components and signal processing elements that are required to optimize transmission quality in coverage overlap areas. The system design shall minimize the potential for simulcast distortion by using a GPS-disciplined, high-stability, precision frequency source at each transmitter location to assure that each of the simulcast transmitters operate at precisely the correct frequency. Intelligent digital channel bank equipment, in conjunction with GPS-directed digital audio delay buffers, shall be used to automatically maintain the modulating signal amplitude and phase at each simulcast transmitter site. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.
- c. The simulcast trunked system shall not require constant manual alignment to maintain the specified system level performance. The simulcast equipment, including the transmitters, timing elements, intelligent channel banks, and other system components shall be designed to support long-term stability and maintainability. The trunked simulcast system shall operate without the need for frequent manual optimization. All alignment and adjustments shall be automated where possible, (i.e. signal conditioning adjustments for channel banks, signal launch times at sites, etc).

### 3. RECEIVER VOTING

- a. The receiver voting equipment shall monitor all receivers in a simulcast cell or multiple sites and select the best signal for processing and re-broadcast through the network.
- b. Receiver voting equipment shall meet the following minimum requirements:
  - 1) Voter shall have audio processing capability for digital signals for all configurations of conventional, trunking, multiple sites and simulcast configurations.

### 2.13 TRUNKED LOGGING RECORDER

- A. The Respondent shall propose an upgrade to the existing NICE digital voice logging recorder capable of capturing radio voice conversations as they occur without requiring recombination of the individual voice segments.

### 2.14 NETWORK MANAGEMENT SUBSYSTEM

#### A. Network Management Subsystem Requirements

- 1. Provide at least two levels of administrative access for managing functions and features.
  - a. The first level is the multiple site network administrators who assure the system stays operational and sets the parameters for the system's operation.
  - b. The second level is the multiple site network dispatcher or radio user supervisors.
- 2. Provide secured access via a multiple level password scheme.

3. Respondents shall provide descriptions of the full capability of the multiple-site network management packages and indicate which are included in the base price.
4. Networking interfaces shall use TCP/IP (or Ethernet) protocols.
5. The network management sub-system must support at least one computer terminal with the capability to expand without modification to the computer network.
6. This system shall include printers to print alarms and customizable reports.

B. Network Manager Features

1. The network manager subsystem shall allow authorized operators to perform the following radio network configuration and control tasks:
  - a. Add/delete field units permitted to access the system
  - b. Assign alias names to augment numeric ID of units
  - c. On/off control of individual repeater channel
  - d. Adjust system-timing parameters
  - e. Report channel activity/status
  - f. On/off control of individual telephone interconnect
  - g. Report airtime and telephone interconnect usage by unit, talkgroup, or organization
  - h. Display alarm status
  - i. Configure emergency call parameters
  - j. Modify priority level assignments of units, talkgroups or both
  - k. Query and report dispatch interconnect call-loading information for each 15-minute period, for the previous seven days (minimum) of operation
  - l. Display in real-time the unit ID and talkgroup affiliation
  - m. Display unit ID and annunciate "emergency" activation.
  - n. Disable an individual unit
  - o. Selectively call one or more field units
  - p. Provide status/message displays
  - q. Backup the radio subscriber databases

C. Report Requirements

1. Provide the following traffic reports:
  - a. Airtime summary report that lists, by talkgroup or unit ID, the number of calls and the amount of airtime used
  - b. Transaction summary that lists, by call type, the talkgroup or unit id
2. Provide the following system configuration reports:

- a. User Access Control Report. List by user identification number, the types of calls the user can initiate and which sites they may use. A desired feature is the ability to record affiliations of radios even though they might be denied service at the specific site.
  - b. Talkgroup/fleet map report
  3. Database reports that are customizable through a report writer package
  4. Ability to print standard summation reports on system usage
  5. Display of status of a particular radio, including unit ID, last talkgroup selected. Whether it was disabled or regrouped.
  6. Provide customizable system usage reports for the City's immediate use.
  7. Provide data export of report information in a format for use in Excel, Access or other standard PC applications.
- D. Network Manager Equipment
1. Local and remote terminals shall be supported. The City anticipates the need for one network management terminal located at the Timbrook Public Safety Building.
- 2.15 SYSTEM ALARMS AND CONTROL
- A. An alarm subsystem shall be provided.
  - B. A remote alarm indication subsystem must be provided to capture diagnostic and alarm reports as well as summarizing traffic operations.
  - C. 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. Digital Microwave System
    3. Local and remote site facilities
    4. Primary and backup power systems
  - D. All components shall be properly grounded and installed with surge protection per standard industry practice and manufacturer's standards.
  - E. The alarm and control shall meet the following general requirements:
    1. Hardware and software platform shall be PC based using current versions of hardware and software.
    2. Provide instantaneous and comprehensive network status information on both graphic and tabular displays
    3. Provide full archiving and control functions
    4. Mediate multiple alarm protocols for higher lever network management systems
    5. Designed to monitor a large cross section of equipment so that it can consolidate multiple alarm systems rather than just poll alarms manufacturer's RTUs.
    6. Report alarms to managers and other interrogators
    7. Perform full management functions with a local terminal

8. Provide email notification of alarms
  9. Provide alarm filtration and consolidation
- F. Work Stations provided:
1. Local work station(s)
    - a. One local workstation shall be provided and installed at the Timbrook Public Safety Building.
    - b. If the alarm and control workstation can be combined into the network management work station it shall be permitted.
- G. Standard Features:
1. Tabular Screen Based Monitoring Operation- shall provide 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 Screen Operation- shall provide for the 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. 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
  4. Control Points- the following relay control types shall be supported:
    - a. Direct control
    - b. Select before operate
    - c. Batch – control multiple relay with a single operation
  5. Analog points - display the value of a telemetered quantity such as temperature, fuel level, VSWR, etc
  6. Time stamp indicating date and time of message within 0.5 seconds
  7. Alarm qualification- on a point basis, programmable delay before alarm is issued
  8. Alarm de-activation – on a point basis, the ability for the operator to de-activate an alarm to inhibit additional annunciation.
  9. Alarm history
  10. Email support- text message of alarm sent to email lists

11. Ping interrogator – to confirm that servers, routers, and IP based equipment are physically present on the network.
12. Editor providing point configuration utilities to create and edit point databases.
13. Security – Multiple levels of user name and password protection to all for flexible system management
14. Provide primary dedicated and dial-up back-up master to remote communication channels.
15. Provide detection of loss of connectivity with the alarm sensor.

2.16 SITE ACQUISITION

- A. Respondent shall be responsible for identifying any additional sites needed, contacting site owner and working with the City to determine feasibility of purchase or lease of site or sufficient space.
- B. Negotiation of site purchase or lease shall be the responsibility of the City.
- C. Leased or private City-owned and non-City-owned remote sites will be considered.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Respondent shall provide the following:
1. Materials and Labor
    - a. The Respondent 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 the specifications and drawings. Workmanship and materials shall be of good quality suitable for the purpose of the new system. The Respondent shall, if required, furnish satisfactory evidence as to the kind and quality of materials. All work not conforming shall be considered defective.
    - b. All materials furnished and work completed shall be subject to inspection by the City's engineer. Such inspection shall not relieve the selected Respondent from supplying the best materials and laboring strict accordance with the specification. Notwithstanding such inspection, the selected Respondent will be held responsible for the acceptability of the work and furnished materials.
    - c. The City requires that installation occur in a timely fashion and in accordance with the project schedule mutually agreed between the City and selected Respondent.
    - d. The work will be performed by qualified individuals specifically trained on the systems they are implementing. All work will be done in a workmanship-like manner. The assurance of the quality of the work is the responsibility of the selected Respondent. The selected Respondent shall, if requested by the City, remove from the project any worker who the City determines to be incompetent or undesirable.
    - e. Respondent shall provide implementing procedures written in layman's terms for infrequently used features or procedures.
  2. Project Management
  3. System Design
  4. Equipment Engineering
  5. Factory Assembly and Test
  6. Equipment (Radio and Ancillary Equipment)
- B. Installation and testing (field radio equipment) in accordance with manufacturer's installation best practices and procedures.
- C. Installation and testing (field antennas) in accordance with manufacturer's installation best practices and procedures.

D. Training

1. The selected Respondent shall develop and conduct professionally prepared training programs to allow City's operating personnel to become knowledgeable with the system and the operation of their individual equipment.
2. The training shall be scheduled to allow sufficient time for all participants from all shifts to be trained. The selected Respondent shall provide a preliminary training schedule for review and approval by the City.

3.2 ACCEPTANCE CRITERIA

- A. Written acknowledgment by authorized representatives of the City and the engineer that all system acceptance test plan criteria, as specified, have been met.

3.3 FLEET MAP PLANNING AND PROGRAMMING

- A. Selected Respondent shall provide fleet mapping and programming plans for user equipment.
- B. The selected Respondent shall work with the City's project team to create the plan.
- C. Selected Respondent shall meet with the City's project team and users to provide a complete understanding of what information must be gathered, the limitations of equipment, the nominal settings of parameters, and a structured methodology for gathering this information.
- D. The selected Respondent shall be available to consult with City's personnel and to meet with users during the information gathering process.
- E. All computer-based programming tools must be provided to the City to assist in the accurate compilation of information. These tools must be included in the price of the system.
- F. Once the requirements are gathered, the selected Respondent and City must hold a "paper" programming review session. At the end of this session, the selected Respondent will be given all identified programming requirements for the staging area functional demonstration.
- G. The selected Respondent will provide at the staging area demonstration a small sample of radio units representing the City's gathered needs. When the demonstration is completed to the City's satisfaction, which will be stated in the form of a letter written to selected Respondent, the selected Respondent may commence programming and installing radio units in accordance with the pre-approved schedule. Selected Respondent assumes risk for any programming of mobiles prior to formal notice to proceed subsequent to demonstration.
- H. Costs relating to any other programming errors, omissions or product defects preventing the completion of the predetermined programming needs will be borne by the selected Respondent.

**END OF SECTION**

### **SECTION 3.c – OPTION A – RADIO DISPATCH CONSOLE SYSTEM**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This Section provides specifications and requirements for a digital dispatch radio console system using LCD graphic monitors for access and control of the new 800 MHz P25 digital simulcast trunked radio system, interoperable VHF base stations, control station radio equipment, and paging channels.
- B. Respondent shall provide fully integrated, graphic based dispatch consoles at the following locations:
  - 1. Four positions at Timbrook Public Safety Building
    - a. All positions to be configured for regular dispatch operations
- C. The Respondent must include all necessary cabling and interfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Respondents: Subject to compliance with requirements, this section is open to all radio dispatch console manufacturers and integrators offering products that meet or exceed specifications in the following sections.

### 2.2 GENERAL REQUIREMENTS AND FEATURES

A. Radio Dispatch Console System (RDCS)

1. The RDCS system shall be fully modular and based on a configuration which supports a large number of local operator positions.
2. The RDCS system shall be comprised of one or more units of **LCD** graphic operator position equipment (OPE) and master control equipment (MCE).
3. The RDCS shall be capable of alert tone paging using pre-programmed screen "buttons" representing the various resources for which the City provides dispatch services. The RDCS shall be capable of stacking multiple resources tones to permit sequential paging of a large number of tones in a single dispatch operation. The RDCS must be capable of transmitting these tones on any channel selected on the console. This paging plan is dynamic and the Respondent will be responsible for ensuring the most current version is used for any necessary engineering or configuration.
4. The RDCS shall be able to monitor and transmit on all proposed and existing conventional repeaters, base stations, trunking systems and receivers.
5. RDCS system shall be designed for high reliability with no single points of failure. Any RDCS position shall be capable to back-up any other position with full features and functions.
6. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.
7. Capability to program, store, retrieve, and edit multiple, custom operator screens and configurations for each operator position shall be provided.
8. Operator screen configurations and alias database shall be stored on a centrally located server. All operator positions shall be linked in a LAN configuration, which allows the supervisors or system administrators to access and update all positions from the central location.

B. Operator Position Equipment (OPE)

1. OPE (Operator Position Equipment) shall be designed to be placed on modular workstation furniture, not part of this contract. Built in RDCS bays will not be used.
2. The OPE shall be of an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.
3. All connectivity and any special considerations needed to accommodate remote operator positions shall be detailed in the response.

4. To minimize operator confusion and the chance of mistakes being made, operators shall be able to perform all functions by looking only at the **LCD** screen of the RDCS. They will not be required to look away from the screen to a separate screen interface in order to perform a function.
5. The screen display shall be designed so that the number of items that will appear on the screen at one time shall be minimized, reducing the potential distractions to operators. However, all radio dispatch functions shall be operable from one screen display. Operators shall not be required to access another screen display in order to perform a radio dispatch function.
6. The screen display shall be very flexible, allowing authorized personnel to determine which functions are available at each operator position, which channels/talkgroups are available at each operator position, how these channels/talkgroups appear on the screen, and the names associated with channels, talkgroups, channel options, auxiliary outputs and auxiliary indicators.
7. OPE shall be capable of being configured, on a unit basis, for either single or dual headset operation for radio and telephony functions.

### 2.3 CONVENTIONAL RADIO REQUIREMENTS

- A. The RDCS shall be equipped with an instant transmit switch for each conventional base station, repeater station, paging base station or control station.
- B. A control/indicator shall be provided to select the desired transmit and/or receive frequency via DC or Tone remote control on all proposed and existing conventional repeaters and/or base stations.
- C. The RDCS shall be able to monitor and transmit on all proposed and all existing conventional repeaters, base stations, and receivers. A call indicator shall be provided for each conventional repeater controlled from the RDCS. If the channel is selected, the call indicator shall flash when audio is present.
- D. A control/indicator shall be provided to disable/enable the base station/repeater in-cabinet repeat capability via DC or Tone remote control on all proposed and existing conventional repeaters and/or base stations.
- E. A control/indicator shall be provided which allows receive audio from a duplex base station or a voting comparator to be re-transmitted under operator control through the RDCS.
- F. The RDCS shall have the capability to select multiple simulcast channels and/or conventional repeaters or base stations in order to transmit to more than one group of field radios.
- G. The RDCS shall have the capability to patch two or more conventional repeaters and/or base stations together so users may communicate directly.
- H. Respondent shall indicate the maximum number of simultaneous patches supported by
  1. Each dispatch position
  2. The entire RDCS
    - a. as initially specified in this RFP and
    - b. with the expanded capacity specified in this RFP.

- I. When a mobile or portable unit initiates an emergency alert, the RDCS shall provide an audible alert and display the ID of the calling unit.
- J. A display graphic shall be provided for the control and status of a receiver voting system. If used, the display graphic shall be available at each OPE.
- K. The RDCS shall be able to acoustically cross mute channels on an operator-by-operator basis in order to eliminate acoustic feedback between operators.
- L. It shall be possible to temporarily mute unselected channels. The unselected audio will un-mute automatically after a 60 sec programmable preset time. Mute shall be 20 dB minimum.
- M. The capability to converse on the telephone using the same operator headset that is used for radio conversations shall be provided. A third auxiliary output shall be available for use in either a PA or intercom system. The telephone audio shall be provided on a separate instant recall recorder output, mixed, and balanced with the operator microphone audio.
- N. Separate volume controls shall be provided to control radio volume and telephone volume to the headsets.
- O. An Alert Tone function shall be provided on screen that places a tone burst onto the selected resource(s) when pressed. The Alert Tone function shall support single tone, warble tone, and pulsed tone as a minimum.
- P. The RDCS shall support interfaces to auxiliary switches and indicators for controlling external devices from the RDCS.

#### 2.4 TRUNKED RADIO REQUIREMENTS

- A. The RDCS shall be compatible with the trunked radio system.
- B. The RDCS shall directly interface with single and multi site trunked system controllers and shall allow interoperability between trunked and non-trunked channels in the system.
- C. The RDCS shall be able to monitor and transmit on all proposed and existing trunked systems.
- D. The RDCS shall be equipped with an instant transmit switch for each talkgroup.
- E. In a trunked system with radio IDs, the PTT ID of the unit calling will appear in addition to a Call indicator. After the call is completed, the unit PTT ID will remain displayed until another call is received.
- F. In order to enhance dispatcher effectiveness in a PTT ID system, the various display modes available shall interact as follows:
  - 1. An operator shall be capable of setting up (and subsequently knocking down) an emergency call from the RDCS position.
  - 2. Capability shall be provided to allow private communication between a RDCS operator and a radio user. Once the operator is involved in a private call on a specific resource, it shall not receive audio from another radio attempting to call on that same resource.
  - 3. Capability shall be provided which assigns priority to associated talk groups. The dispatcher shall have the choice between normal preset priority and tactical priority, with tactical being the second highest priority for a talkgroup in a system.

- G. It shall be possible to temporarily mute unselected talkgroups. The unselected audio will un-mute automatically after a programmable preset time. Mute shall be 20 dB minimum.
- H. The RDCS shall have the capability to patch two or more talkgroups together so users may communicate directly.
- I. If the dispatcher attempts to make a call on a trunked radio system connected to the RDCS and all trunked channels are busy, a visual and audible alert will be initiated at the RDCS.

## 2.5 INSTANT RECALL RECORDER

- A. The RDCS shall be capable of two-channel instant recall providing a minimum of four (4) minutes of instant recall recording per channel. A method of controlling an instant recall recorder shall be provided on the screen.

## 2.6 OPERATOR POSITION EQUIPMENT (OPE)

### A. General

#### 1. Description

- a. All equipment supplied for use by the operators of the RDCS shall be constructed of high-quality, durable materials that will stand up to the 24-hour use environment of a dispatch center. Consumer-grade equipment shall not be acceptable to meet the requirements outlined in this document.
- b. Final operator position configuration shall be coordinated with City.

### B. Display

#### 1. Description

- a. **Flat Panel LCD** monitors shall be provided.

#### 2. Minimum technical specifications

- a. **20"** wide screen format LCD monitors Dell Professional P2210 PLHD 22" wide screen monitor or equivalent.
- b. Super VGA 1680 x 1050 resolution or better.

### C. Keyboard, mouse

#### 1. Description

- a. The OPE shall be equipped with a standard 101-key keyboard
- b. The operator shall execute functions and operations by positioning a screen pointer (cursor) on the screen and pressing one of two buttons located on the mouse. The mouse shall be available in both left and right handed versions to accommodate operator preferences. The mouse will have a scrolling wheel to aid in screen movements.

### D. Microphone

#### 1. Description

- a. Standard - A high quality cardioid pattern gooseneck microphone having a uniform frequency response and a minimum front-to-back discrimination of

15 dB shall be provided on an 24-inch flexible arm at each operator position.

- b. Microphone shall be flexible to permit wide diversity for operator positioning, but shall also be self-supporting and remain in the position assigned by the operator without sagging under its own weight.

#### E. Headset Operation

##### 1. Description

- a. Wireless headsets suitable for the application shall be proposed for all positions. Wireless headsets shall be proposed with adequate charging bases and spare batteries to permit continuous use in a 24/7 environment.
- b. Two headset jacks shall be provided at each operator position which allows the operator to hear select audio via a headset and to allow the operator to respond via a microphone attached to the headset. This jack shall be compatible with either 4 or 6 wire headsets. Inserting the headset plug into the headset jack shall automatically disconnect the RDCS microphone and select speaker and disable the acoustic feedback cross-muting features.
- c. Trainer or supervisor shall be able to use the second headset jack to monitor transmissions at any user position without degradation of audio quality.
- d. Each headset jack box shall be equipped with a cable which connects the jack box to the RDCS. The length of this cable shall allow the jack box to be mounted in a logical location at the time of installation. The cable shall be long enough to provide the proper cable dressing upon installation.
- e. The capability to converse on the telephone using the same operator headset that is used for radio conversations shall be provided at each operator position. Connection to the telephone equipment shall be provided. Registered couplers shall be provided if required. The telephone audio shall be provided on a separate instant recall recorder output.

##### 2. Headset Equipment – OPTION

- a. Wired headsets suitable for the application shall be proposed as an OPTION.

#### F. Footswitch

##### 1. Description

- a. A footswitch shall be provided to permit the RDCS operator to key the selected talkgroup or to disable the coded squelch within the base station without the use of hands.

#### G. Audio unit

##### 1. Description

- a. The desktop audio panel shall include a minimum of select and unselect speakers, system control buttons, audio level controls, and a VU meter

##### 2. Technical specifications

- a. Operator position audio unit shall include:

- 1) Speakers for monitoring select and unselect channels. Speaker outputs shall be rated at 1 Watt minimum at no more than 3 percent THD.
- 2) Individual volume controls for each speaker.
- 3) VU meter.
- 4) General transmit switch or bar.
- 5) Capabilities to connect at least two OPTIONAL monitor speakers.

#### H. Speakers

1. Each operator shall be equipped with a minimum of one select speaker and one unselect speaker.
2. All speakers shall be assignable. Any speaker shall be capable of being assigned to be used as a select, unselect, monitor, or dedicated speaker.

#### I. Personal Computer Equipment

##### 1. Description

- a. Operator position system processor units shall be based on present state of the art Personal Computer (PC) technology and meet the following minimum requirements. In the event that enhanced technology, exceeding the specifications below, is available for the same cost, the City reserves the right to require the latest technology be supplied.

- 1) Use of standard hardware for workstation.
- 2) Use **LCD** monitor and mouse, keyboard for operator control.
- 3) Provide Graphical User Interface (GUI) using Microsoft Windows.
- 4) Use Ethernet LAN client-server architecture for network access to RDCS configuration and operating information.
- 5) Support multiple, concurrent, screen windows within the same or different applications.

2. PC computers and workstations proposed and supplied shall be the latest standard models in current production, fully configured for the intended use. RAM shall be configured to maximize the amount of available RAM in the minimum number of memory slots to permit easy expansion if desired.

3. It is anticipated that some PC models and configurations may change during the time between proposal and implementation, therefore:

- 1) Equipment to be supplied, including models and the final hardware and software configuration shall be coordinated with, and approved by, the City before delivery will be authorized.
- 2) City will authorize delivery of approved equipment in writing to the Respondent.

## 2.7 MASTER CONTROL EQUIPMENT

### A. General

1. MCE shall contain the base station interfaces and receiver interfaces that are required to control the system.
  2. It shall also contain the required phone patch interfaces, operator interfaces; trunked system interfaces, signaling interfaces, power supplies, reference clock interface and auxiliary input and/or output interfaces.
  3. Either digital or analog switching architectures shall be acceptable under this specification provided that hum, noise, and cross-talk are at least 45 dB below the desired audio at full output.
- B. Racks
1. The MCE shall be installed in one or more open rack(s) measuring 84"H x 21"W.
- C. Power Supply
1. Description
    - a. A continuous duty power supply shall be provided for furnishing regulated low voltage to the MCE package. The regulator circuit shall incorporate an electronic circuit to protect RDCS equipment from excessive voltage should a malfunction occur. No human intervention shall be required. Short circuit current limiting shall be provided on each regulator circuit to protect the regulator circuit from accidental shorts and thereby prevent nuisance fuse blowing.
    - b. Redundant power supplies shall be available in a hot standby mode such that, if one supply fails, its redundant backup shall take over.
    - c. Charging of and transfer to backup batteries shall be provided.
    - d. MCE shall use UPS or battery to provide a minimum of 5 minutes backup at full load.
    - e. position to the MCE without intrinsic limitations on distance.
- D. Conventional Base Station Interface
1. Description
    - a. Each conventional base station interface shall incorporate all circuitry required to operate a remotely controlled base station. The conventional base station interface shall be capable of controlling base stations using industry standard tone remote control, DC remote control and E & M control.
    - b. Six input-output functions shall be provided as needed on each module. The identity of these functions shall be established by settings at the operator positions. Undefined I/O functions shall remain available for future use. If defined as an output function, a relay shall be provided to switch the load. If defined as an input, a buffer shall be provided to isolate the RDCS from transients.
- E. Trunked Base Station Interface
1. Description

- a. Each trunked base station interface shall incorporate the circuitry required to operate a remotely controlled single transmitter, single receiver trunked repeater.
  - b. The trunked base station interface shall accept data from the system trunking controller. This data shall consist of current talkgroup and repeater assignments. Using this data, the RDCS trunking module shall update the RDCS talkgroup control indicators.
  - c. Six input-output functions shall be provided as needed on each module. The identity of these functions shall be established by settings at the operator positions. Undefined I/O functions shall remain available for future use. If defined as an output function, a relay shall be provided to switch the load. If defined as an input, a buffer shall be provided to isolate the RDCS from transients.
- F. Voting Receiver Interface
1. Description
    - a. The RDCS voting interface shall accept status inputs from a comparator and provide control lines to a comparator. Using the proper RDCS controls, the operator shall be able to monitor the comparator's activity and force selection to a different site.
- G. Time Sync Input
1. Description
    - a. The RDCS shall support clock synchronization

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. All work shall be coordinated with the City for minimum downtime on the existing console system.

**END OF SECTION**

### **SECTION 3.d – OPTION A – NON-FIXED USER RADIO EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This specification describes portable, mobile, and control station equipment and is intended for Public Safety and Non Public Safety applications.
- B. Non-fixed radio equipment shall be proposed for conventional and trunked radio channels in the 800 MHz band.
- C. Key attributes of all subscriber equipment are:
  - 1. High quality, durable designs, manufactured to provide high reliability under heavy use in severe environments.
  - 2. Ease of operation, including controls and indicators that enhance user operation in low visibility or high stress situations.
  - 3. Software programmability.
  - 4. Availability of accessories to adapt equipment to different situations.
- D. The scope includes:
  - 1. Procurement, installation, programming, and support for the following
    - a. Portable radios and accessories
    - b. Mobile radios and accessories
    - c. Control station radios and accessories
    - d. Pagers and accessories
  - 2. Acceptance testing
  - 3. Training

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Respondents: Subject to compliance with requirements, this section is open to all non-fixed user equipment manufacturers and integrators offering products that meet or exceed specifications in the following sections.

### 2.2 GENERAL REQUIREMENTS

- A. FCC type accepted and designed in accordance with the requirements of Part 90 of the FCC Rules and the appropriate EIA and related agency specifications.
- B. Equipped with the following modes of operation on any channel, including the following;
  - 1. P25 Phase 1
- C. Support new features through software programming and not reconfiguration of hardware. Software programming shall be conducted at the selected Respondent's local service facility or at an Owner-designated location.
- D. Capable of being programmed to operate on any 800 MHz narrow-band radio channel in the corresponding licensed band of the land mobile spectrum.
- E. Accommodate all channels in that band programmed into the radio without any performance degradation. Talk-around (direct) mode shall also be supported.
- F. Be of an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.

### 2.3 TRUNKED RADIOS

- A. General:
  - 1. Be compatible with the proposed P25 trunked radio network.
  - 2. Programmed to support all applicable talk group calls.
  - 3. Programmed to provide a visible and audible alert when all channels are busy.
  - 4. Equipped with an emergency alert that requires acknowledgement.
- B. Specially equipped subscriber units:
  - 1. Final quantity and talk group assignment to be determined following contract award.
  - 2. Shall be provisioned to receive unit ID or alias name for incoming calls.
  - 3. Shall be provisioned to transmit unit ID or alias name with every PTT.
  - 4. Have the ability to selectively alert another radio and require a response to the alert. The radio receiving the alert shall display the unit ID of the transmitting radio.
- C. Trunked radio models
  - 1. For trunked portable, mobile, and control station radios, at least three different models of subscriber radio equipment shall be offered. The purpose is to provide a range of standard products from which radios can be selected to match

the user needs. All units differ only in features and capabilities such as display, modes, channels, options, etc.

a. Type D1

- 1) Typically identified as the model with no display.
- 2) The purpose of the D1 radio is reliable trunked radio use at the lowest cost.
- 3) Type D1 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide a basic set of features with less channel and/or talkgroup capacity than a D2 or D3 unit.
- 4) D1 units shall meet the specifications as further described in this section and provide the following minimum features:
  - a) P25 radios will operate on other 800 MHz systems outside the bounded coverage areas
  - b) Trunked and/or Conventional Operation
  - c) Receives verification tone when channel has been acquired
  - d) Receives tone to indicate in queue to acquire a channel
  - e) Emergency Alert button sends portable user's identification to the dispatcher with any emergency alert tone or message
  - f) Remote shut-off/radio disable capability
  - g) Selectively disable/enable channels remotely
  - h) Equipped to seamlessly roam from different sites in the network

b. Type D2

- 1) Typically identified as the model with a display and limited keypad.
- 2) Units are typically assigned to personnel who may need to access a large number of channels with an enhanced feature set.
- 3) Type D2 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide an enhanced set of features with less channel and/or talkgroup capacity than a Type D3 unit but more than a Type D1.
- 4) Type D2 units shall meet the specifications of Type D1 units with the following additional features:
  - a) Caller ID display
  - b) Alphanumeric display
  - c) Limited Keypad
  - d) Private or single unit calling
  - e) Noise suppression microphone
  - f) AMBE +2 Vocoder

c. Type D3

- 1) Typically identified as the model with full display and keypad.
- 2) Type D3 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide a full set of features with more channel and/or talkgroup capacity than a Type D2 and Type D3 unit.
- 3) Type D3 units shall meet the specifications of a Type D2 unit with the following additional features:

- a) Full Keypad
- 2. Trunked radio quantities
  - a. D1 Portables
    - 1) 160
  - b. D2 Portables
    - 1) 177
  - c. D3 Portables
    - 1) 0 (model shall still be quoted)
  - d. D1 Mobiles
    - 1) 152
  - e. D2 Mobiles
    - 1) 125
  - f. D3 Mobiles
    - 1) 0 (model shall still be quoted)
  - g. Control Stations
    - 1) 27

#### 2.4 PAGER REQUIREMENTS

##### A. Features:

1. Respond to all industry standard tone alert formats used by emergency service personnel for tone and voice dispatch.
2. VHF Narrowband tone and voice pagers
3. UL Certified as intrinsically safe for use in hazardous classified locations.
4. Large sturdy knobs suitable for use with gloves.
5. Durable, rugged housing.
6. Meet MIL standard 810 F Procedures II for rain
7. Field programmable function switch
8. Scan
9. Monitor
10. Selective call
11. Tone/vibrate
12. Capable of 2 channel operation
13. Capability to scan both channels for pages while giving priority to pages received to channel 1.
14. Monitor mode feature permitting users to listen to all communication on the selected channel.
15. Be supplied with standard charger, belt clip and batteries

- B. The Respondent shall provide 27 standard pagers (Motorola Minitor V equivalency) for personnel and an additional 5 pagers including desktop battery charger/amplifier with antenna and relay. The 5 additional pagers are for house alert and require installation to activate existing firehouse lights and bells.

## 2.5 EQUIPMENT FEATURES AND ACCESSORIES

### A. Portables

1. Size and construction of unit shall permit one hand operation.
2. Weight, including battery shall not exceed 25 ounces.
3. Rotary control knobs with click stops for selecting the desired channel.
4. Battery:
  - a. Unit shall be supplied with, and operate from, a single self-contained, removable lithium ion battery.
  - b. The battery shall be capable of an operational duty cycle of 5/5/90, for eight hours of continual use.
  - c. Recharge time for the battery shall not exceed one hour.
5. Supplied with a 120 V battery charger with ability to charge radio and a spare battery.
6. Supplied with a flexible 1/2 wave antenna.
7. Options
  - a. Spare battery
  - b. High capacity battery
  - c. Leather carrying case with swivel belt clip and shoulder strap swivel connectors.
  - d. 12V DC charger.
  - e. 120 V Multi-unit/gang bank charger
  - f. 120 V Multi-unit/gang bank charger/battery conditioner/optimizer
  - g. Extra long leather shoulder strap
  - h. Intrinsically safe battery
  - i. 1/4 wave stub antenna
  - j. Lapel speaker microphone
  - k. Lapel speaker microphone with antenna
  - l. Headset
  - m. Programming software
  - n. Programming cable
  - o. Encryption
  - p. GPS (either in subscriber or remote speaker mic)

### B. Mobiles

1. Mobile radio equipment shall include the following:
    - a. Microphone
    - b. Internal speaker
    - c. External speaker - OPTION
    - d. Cables
    - e. Fusing
    - f. Mounting hardware
    - g. Coax and permanent mount antennas
  2. Dash mount radios shall consist of a single unit combining the functions of the control head and main chassis. The control head shall provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.
  3. Trunk mount radios shall consist of two to three parts, the control head (s) and the main chassis. The main chassis should be mounted in the trunk, behind the seat, or in another area generally inaccessible to the vehicle operator during normal operation. The control head shall be mounted in the dash area of the vehicle or other location and is remote from the chassis. The control head shall provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.
  4. All mounting hardware shall securely attach to the vehicle. The unit shall be equipped with a "key lock" into the housing for added security.
  5. Antenna: Nominal mobile antenna gain shall be a minimum of 3 dB and shall be optimized for vehicle function, type, and geographic location. Antenna specifications must be submitted with consideration given to bandwidth range and proposed gain.
  6. Options:
    - a. Motorcycle mounting kit
    - b. Dual control head
    - c. Dual Tone Multi-Frequency (DTMF) microphone to allow for encoding capabilities for the operator
    - d. External siren, controllable from the radio control head.
    - e. Programming cable
    - f. Programming software
    - g. Encryption
    - h. GPS
- C. Control stations
1. Shall be prepackaged in an enclosure suitable for desktop positioning in an office environment, configured for 120VAC operation, and have no exposed wiring that presents a shock hazard.

2. Shall be equipped with desktop microphone and external speaker.
3. Control station antennas, connectors and coaxial cable shall be provisioned to comprise a complete operational package. Antennas shall be high quality and all connectors shall be weatherproof. Control station antennas shall be Yagi types, with gain suitable for the application. Control station antennas shall be mounted outdoors on structures approved for the applicable load. In no case shall the control station antenna be located inside of manned buildings or utilize magnetic mount type antennas.
4. The control stations shall be equipped to support a minimum of six remote units using digital remote control technology. The remote units must be able to control frequency and all other control station capabilities.
5. Options:
  - a. Programming software
  - b. Programming cable

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Installation shall include delivery to the site, unloading inside, setting in place, fastening to facility or vehicle, where required, internal wiring and connection of components to the system, programming, testing, and all other work, whether or not expressly required herein which is necessary to result in a complete tested and operating system. This shall include the removal and/or relocation of any existing equipment to allow for the installation of new equipment.
- B. Selected Respondent shall determine proper cable lengths for the equipment to be installed.
- C. All cutting, patching and finishing required in connection with Respondent's installation and the Contractor so as to match the original conditions perfectly both as to material and workmanship shall do the repair of any damage caused by the installation.
- D. Installation shall be performed by the selected Respondent's factory trained field personnel or service shop. No sub-contractor will be allowed without approval from the City.
- E. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the National Electrical code, IEEE and all local authorities having jurisdiction.
- F. Selected Respondent shall install all required programming and software on each radio.

### 3.2 SPECIFIC INSTALLATION REQUIREMENTS

- A. Standard Installations and Documentation
  - 1. Respondent shall develop and document standard installations for each type of location, vehicle, etc., based on input and consultation with City personnel.
  - 2. Standard installation documentation shall include sufficient specifications, equipment, descriptions, procedures, photos, drawings, etc., to completely describe the work to be performed and final installation configuration.
  - 3. Respondent shall submit standard installation to City for review and approval at least 30 days before any installations shall take place.
- B. Portable radios
  - 1. Program unit
  - 2. Charge all batteries
  - 3. Test
  - 4. Deliver documentation and test results
  - 5. Obtain customer inspection and sign-off
- C. Mobile radios
  - 1. Install in vehicle using approved procedure
  - 2. Document installation
  - 3. Program unit

4. Test
  5. Deliver documentation and test results
  6. Obtain customer inspection and sign-off
- D. Control Station radios
1. Install using approved procedure
  2. Program units
  3. Test
  4. Deliver documentation and test results
  5. Obtain customer inspection and sign-off
- E. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten (10) years from date of system acceptance.

**END OF SECTION**

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## SECTION 4

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### 800 MHz / VHF HYBRID SYSTEM

## SECTION 4.a – OPTION B – PROJECT OVERVIEW

### PART 1 - GENERAL

#### 1.1 OPTION B - 800 MHZ/VHF HYBRID SYSTEM PROJECT SUMMARY

- A. The Project includes several related networks and Project components.
1. A 800 MHz Project 25 Phase 1 Trunked radio system,
  2. Conventional, analog, narrowband VHF Interoperability channels
  3. Conventional, analog, narrowband channels for non-Public Safety users
  4. Radio Dispatch Console System
    - a. Respondent shall provide pricing for provision of a new four position Radio Dispatch Console System
    - b. The Radio Dispatch Console System must interface with existing legacy conventional equipment.
  5. VHF conventional, narrowband channels for mutual aid with adjacent agencies coming into the City and provides paging tones to City agencies.
    - a. Conventional, analog, narrowband VHF Interoperability channels
    - b. Conventional, analog, narrowband channels for non-Public Safety users
  6. Internet Protocol (IP) based microwave network linking transmitter sites, dispatch consoles, master controller, and all other system components.
  7. New tower sites that may include the provision of towers, shelters, and other site equipment.
  8. New subscriber equipment and/or upgrade of existing subscriber equipment for use by first responders.
- B. IP network connectivity has emerged as the standard for Project 25 system interconnect and backhaul, replacing tone and circuit switched system control and backhaul. It is desired that the respondents propose IP-based system control and backhaul.
- C. It is desired that all equipment locations and sites be secure and have adequate uninterruptible power and backup power systems. In choosing sites for this system, respondents must ensure that the facilities provide secure equipment rooms have adequate environmental control systems for the equipment proposed, have adequate uninterruptible power supply (UPS) systems for the equipment proposed, and meet all of the grounding and installation requirements for communications facilities as published in Harris (M/ACOM 4618/1 R3A) or Motorola R56, or MIL 188-124B standards.
- D. Because of the high recurring costs to use commercially owned tower sites, the City provided a list of current properties that may be considered in Appendix C and may be considered for the provision of “green field” sites.

## E. System Configuration

1. This system specification describes a City-wide radio system providing “public safety grade” performance in general, and to the specific requirements as described herein.
2. The radio infrastructure shall be capable of operation in Project 25 digital trunked simulcast mode, and must be compliant with the then-current, applicable TIA-102 PROJECT 25 Phase 1 standards.
3. Multiple Sites:
  - a. Multiple sites will be needed to provide City-wide coverage. This wide-area, multi-site network should consist of the number of simulcast radio sites required to provide the desired coverage.
  - b. The system must seamlessly integrate all multiple sites such that field users can freely roam throughout the service area without the need to manually select sites.
  - c. Respondent shall determine the number and location of sites needed to provide the required coverage.
    - 1) A list of candidate sites is included in Appendix C, which includes the existing Jefferson Water Tank (WT) and Timbrook Public Safety Building as the prime candidates.
  - d. Respondents are urged to investigate all available sites in the City, including commercial sites, to obtain optimum performance with the smallest number of sites, and lowest recurring cost.

## F. General requirements for all components of this project include:

1. Robust and fault tolerant network infrastructure with sufficient capability to support all users on a common platform.
2. Interface with conventional channels.
3. Provide complete services including design, project management, permitting, installation, testing, documentation, training, and warranty maintenance.

## G. General requirements for 800 MHz Project 25 Digital Trunked Radio Network

1. Project 25 Phase I equipped compliant network. Compliance with the TIA-102 suite of Project 25 published standards is required.
2. City-wide mobile and portable in-street and 20 dB in-building radio coverage with detailed areas of in-building coverage as specified in maps provided in Appendix D.
3. The City desires a robust system design to minimize the chance of system downtime due to the loss of any critical component or path.
4. Provide interfaces to support operations on conventional radio channels.

## H. General Requirements for Radio Dispatch Console System

1. IP Based console system, which replicates and improves the functionality and features of the currently installed console sub system.
2. Console must be able to perform tone alerting.

- I. General Requirements for VHF Conventional Channels
  - 1. At proposed 800 MHz trunking sites, additional VHF channels shall be implemented to provide mutual aid to adjacent VHF narrowband agencies. The City anticipates only one site of the trunking sites for VHF channels. The Respondent shall assign this site based on the site that provides the best coverage based on existing licensing information provided in Appendix B.
  - 2. The City anticipates a separate antenna system to support these channels.
  - 3. The City requires the ability to provide VHF-800 MHz communications between the City and Frederick County (County).
  - 4. Any communications that supports fire/rescue operations needs to be available concurrently on both 800 MHz and on VHF. These are referred to as the VHF-800 Interop channels. The reason is that any fire/rescue incident in the city is subject to requiring assistance from Frederick County. A fire/rescue mutual aid response with Frederick County is a frequent event.
  - 5. Respondents shall provide a five-channel solution for fire/rescue/police.
  - 6. In addition to the previously mentioned five channels, the City requires two more conventional channels for non-public safety agencies. These additional channels are the basis for the hybrid approach to separate public safety users on the trunked system and non-public safety users on VHF conventional. The provides a total of seven VHF conventional channels in total.
  - 7. All necessary gateway type devices shall be provided to connect the VHF and 800 MHz channels together either via permanent gateway patch or via a console patch that does not require dispatcher intervention.
- J. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, speaker microphones, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment, in either or both analog and digital voice alternatives.
- K. Voice RF Coverage Requirements
  - 1. The City requires Respondents to propose an 800 MHz system design that provides for talk out and talk back coverage to a portable radio used on the street, with portable and antenna on the hip. Coverage is to be provided with 95% reliability in 95% of the geographic area of the City.
  - 2. In addition, the City requires coverage to penetrate the denser buildings found in the city. Respondents shall provide for coverage to/from a portable radio inside a 20 dB building in the geographical area of the city with 95% reliability with the same radio configuration noted in 1.1.K.1.
- L. Interoperability With Legacy Systems
  - 1. The proposed system shall interface with existing City radio systems in a way that enables seamless dispatch and field communications to support incident communications during system transition.
- M. Standards Conformance

1. The proposed radio network and related equipment and installation shall meet applicable portions of the following codes, standards, regulations and recommendations of the following entities, except as limited by herein.
  - a. APCO Project 25 TIA-102
  - b. TIA TSB-88-C or latest revision
  - c. TIA/EIA -603
  - d. Building Industry Consultant Services International(BICSI)
  - e. American National Standards Institute (ANSI)
  - f. National Electrical Manufactures Association (NEMA)
  - g. Telecommunications Distribution Methods Manual (TDMM)
  - h. National Electrical Code (NEC)
  - i. Institute of Electrical & Electronics Engineers (IEEE)
  - j. Underwriters Laboratories (UL)
  - k. National Fire Protection Association (NFPA)
  - l. American Standards Association (ASA)
  - m. Federal Communications Commission (FCC)
  - n. Occupational Safety and Health Administration (OSHA)
  - o. American Society of Testing Materials (ASTM)
2. Governing Codes and Conflicts: If the requirements of this specification section conflict with those of the governing codes and regulations, then the more stringent of the two shall become applicable.

N. Site Use, Acquisition And Development

1. The City prefers that current City-owned and currently leased sites be considered first in any system design, but otherwise has no preference as to sites to be utilized, as long as the requirements in this RFP are met. The City's intent is to allow Respondents to use any set of sites that will result in an efficient and cost effective design.
2. Regardless of the sites proposed, Respondents shall retain complete responsibility for system performance and coverage. In support of the design, Respondents will submit documentation that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
3. Respondent shall be responsible for identifying the optimum sites and contacting the site owner to determine feasibility of lease of the site and sufficient space for the system equipment. Sites should be selected to provide best performance and optimize the respondent's system design.
4. The City prefers to use new raw land sites rather than new commercial/leased sites. The City encourages respondents to consider the use of government owned properties for new sites.

5. A list of existing tower sites that may be used in engineering the specified coverage is summarized in Appendix C.
  6. Negotiation of site purchase or lease shall be the responsibility of the City.
  7. Site Development
    - a. Respondent shall be responsible for site development of new radio sites and/or upgrade of existing sites. Site development work will be listed as a separate cost line item on a site-by-site basis.
    - b. Site development services include:
      - 1) Final site layout and design per network requirements design
      - 2) Preparation and submission of NEPA/SHPO studies
      - 3) Site preparation
      - 4) Grounding
      - 5) Shelters
      - 6) Towers
      - 7) Fencing
      - 8) Project management
      - 9) Installation
      - 10) Testing & Commissioning
      - 11) Training
      - 12) Documentation
- O. Provision Of New Equipment
1. All equipment shall be provided in new condition, and be covered by a full factory and/or manufacturer's warranty.
  2. All equipment proposed shall be current production equipment with a minimum of two years continued production anticipated before end of life.
  3. Lifecycle roadmaps for all equipment and system components shall be provided.
  4. Used, refurbished, or previously installed equipment may not be proposed.
  5. All equipment supplied as part of the system(s) shall be subject to system warranty.

## 1.2 WORK INCLUDED

- A. The intent of this RFP is to obtain an end-to-end, turnkey solutions meeting the functional requirements of the City for any of the Options but does not require Respondents to provide solutions for all Options.
- B. Turnkey Respondent Responsibility
  1. Provide a total system design including any and all subsystem components.

2. Provide all systems necessary to meet the specification and as outlined in Respondent's proposal, regardless of manufacturer.
  3. Provide full turnkey installation and optimization services for all systems, subsystems and components, as outlined in Respondents response, regardless of manufacturer.
  4. All respondent, contractor, and/or sub-contractor labor, travel, lodging, delivery, and other expenses shall be provided as part of the project. No additional charges for expenses shall be paid by the City unless expressly agreed to in writing.
- C. The Contractor shall be responsible for providing all products and services for a complete working system, whether or not specifically required and proposed, unless specifically excluded from the project.
1. Radio Network, consoles, control points, and user equipment
    - a. Complete system design
    - b. Network infrastructure including RF and control
    - c. Dispatch console equipment
    - d. User equipment including mobile, portable, and control station radios
    - e. Project management
    - f. Installation and programming
    - g. Testing
    - h. Training
    - i. Documentation
  2. Site Development
    - a. Project management
    - b. Site construction
    - c. Site commissioning
    - d. Documentation
  3. Grounding and Bonding
    - a. As part of the work to be performed all RF equipment, antenna systems, transmission lines, and the design of the antenna support structures (towers), shelters, electrical and generator systems must be designed, and installed in compliance with grounding and Installation standards such as
      - 1) Harris (Formerly M/A-COM) 4618/1 R3A or
      - 2) MIL 188-124B.
      - 3) Motorola R-56,
    - b. Respondent shall detail which grounding and installation standard(s) are to be used in the construction of the City's system.
  4. RF Interference

- a. Respondent shall demonstrate good engineering practice in design and installation such that all proposed equipment is configured and installed to minimize RF interference to, from, or with co-located equipment.
- b. Respondent shall be responsible to identify and analyze potential interference sources during system design activities.
- c. Respondent shall conduct and provide suitable inter-modulation calculations as part of final system design.
- d. Suitable filtering, isolation, and other means shall be proposed to correct any identified interference between the proposed and existing systems.
- e. Respondent shall be responsible to correct mutual interference between proposed and existing systems.
- f. Construction of new towers shall not interfere with existing broadcast systems per FCC rules Section 22.371. Pattern mitigation shall be respondent responsibility.
- g. Interference caused by the proposed systems or equipment shall be corrected by the Respondent at no additional cost to the City.

D. City Responsibilities

1. Provide reasonable access to City facilities where equipment is to be installed including a designated work area with adequate heat, light and a secure storage area for equipment delivered for installation to the City designated location.
2. Assist Contractor in obtaining building permits required in conjunction with this project, where practical.
3. Secure additional sites and/or facilities recommended by the selected Respondent, and agreed upon by the City.

1.3 PROJECT SUBMITTALS

A. The following information shall be submitted within twenty (30) working days of contract award:

1. Firm detailed Project schedule indicating all Project milestones and specific dates relating to the installation of the system.
2. The schedule shall include the following milestones:
  - a. Procurement
  - b. Pre-Shipment Integration Testing
  - c. Start and Finish of Equipment Installation
  - d. Start and Finish of Antenna System Installation
  - e. Start and Finish of System Equipment Testing

- f. Operator Training
  - g. End User Training
  - h. Network Administration Training
  - i. Start and Finish of Coverage Testing
  - j. Final Inspection
  - k. Delivery of final documentation.
  - l. System Certification
  - m. Final System Acceptance
- B. The following information shall be submitted within forty (45) working days of Contract award:
- 1. System block level diagrams
  - 2. Patching schedules and termination details for all horizontal cables necessary for a complete record of the installation.
  - 3. Radio and microwave channel plans
  - 4. Site Drawings including:
    - a. Site Plan Drawings which indicate scale, orientation and locations of proposed and existing features including towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - b. Equipment Shelter/Room Plan drawings, which indicate, scale, orientation, termination and proposed and existing hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - d. Tower Profile Drawings indicating current and planned antenna mounting locations of all new, existing, and modified sites
  - 5. Detailed list of materials for each site, including size and quantity, required to achieve calculated availability (i.e., antennas, waveguide, connectors, and hardware).

6. Detailed configuration information for each site, including link and launch delay settings, signal level settings, antenna manufacturer, model number, tilt, orientation, and mounting height required to achieve specified design coverage performance.
- C. Final Design: The following information shall be submitted within sixty (90) working days of contract award:
1. Any updates to previously submitted design information
  2. System operation and maintenance manuals for all equipment including, but not limited to:
    - a. Instructions for installation, alignment procedures, testing, commissioning
    - b. Information, procedures, and recommendations for maintenance and troubleshooting of the equipment.
  3. Installation Site Drawings: Drawings shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the architectural and electrical power plans. Installation Site Drawings shall include:
    - a. Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - b. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Tower Profile Drawings indicating antenna mounting locations
    - d. Respondent is responsible for coordination of final site drawings with the site construction contractor selected by the City.
- D. System Staging, Delivery and Installation: The following information shall be submitted as equipment is staged, delivered and installed:
1. Detailed Staging Acceptance Test Plan (SATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for shipment. The SATP shall include but not be limited to tests demonstrating:
    - a. Radio Console Features
      - 1) Instant Transmit
      - 2) Talkgroup selection and calling
      - 3) Talkgroup patching (Trunking and conventional)
      - 4) Multi-Select
      - 5) Multi Talkgroup calls
      - 6) Private calls

- 7) Emergency Notification
- 8) Alert Tone Generation
- b. Radio Network Features
  - 1) Emergency Call
  - 2) Emergency Call with System Busy
  - 3) Transmit Grant Tone
  - 4) System Busy Tone
  - 5) Out of Range Tone
  - 6) System Busy Queuing and Call back
  - 7) Reaction to failed base station(s)
  - 8) Reaction to failed backhaul link(s)
  - 9) Recovery from failed base station
  - 10) Recovery from failed backhaul link(s)
  - 11) Reaction to Failed Controller/Server
  - 12) Recovery from Failed Controller / Server
- c. System Network Management Features
  - 1) Display current system activity
  - 2) Display individual site status
  - 3) Display individual base station status
  - 4) Start/Stop individual base station
  - 5) Radio Enable / Disable
  - 6) Fault Management / Alarm Indications
  - 7) Reporting Capabilities
2. Detailed SATP shall be submitted no later than ninety (90) days before the testing starts.
3. Final SATP shall be approved no later than thirty (30) days before the testing starts.
4. User manual – one (1) copy per unit, to be kept at the installation site, plus five file copies delivered to the City
5. Installation manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
6. Maintenance manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
7. Bill of Materials – one (1) copy per shipment plus five (5) file copies delivered to the City
8. Installation documentation shall include complete system and site drawings.
- E. System Acceptance and Commission: The following information shall be submitted upon completion of installation and prior to Final System Acceptance and commissioning:

1. Detailed Final System Acceptance Test Plan (FATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for Final System Acceptance by City.
2. Detailed FATP shall be submitted no later than 90 days before the testing starts.
3. FATP shall be approved no later than 30 days before the testing starts.
4. Five final and complete sets of as-built documentation, bound and containing all previous submitted manuals and materials including:
  - a. Documentation index
  - b. List of deliverables
  - c. Field Test reports
  - d. Coverage testing reports
  - e. Maintenance Data
  - f. As-Built System Block and Level Diagrams
  - g. As-Built Site Drawings including:
    - 1) Site Plan Drawings which indicate scale, orientation and locations of towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - 2) Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - 3) Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - 4) Tower Profile Drawings indicating antenna mounting locations

#### 1.4 TRAINING

- A. The successful Respondent shall develop and conduct professionally prepared training programs to allow City operating personnel to become knowledgeable with the system and the operation of their individual equipment.
- B. Respondent shall describe in detail end-user, system administrator, and maintenance training programs.
  1. Model specific end-user equipment training shall be proposed.

2. Hands-on System Administrator training shall be proposed.
3. Hands-on Radio Console training shall be proposed.

C. End User Equipment Training

1. A large number of users from a wide variety of agencies will need to be trained, this training should be designed as a "train the trainer" course to permit agencies to have their designees trained.
2. Respondent shall be prepared to train, and provide retraining materials to approximately forty to fifty agency trainers from various agencies during each session. Approximately 8-10 sessions to be conducted during days, evenings, and weekends will be needed.
3. The training should be oriented to optimum use of the equipment, proper non-technical care and operation, and characteristics of faulty operation.
4. Training shall include the function and operation of all controls.
5. The instructor shall give operational demonstrations of all Respondent supplied equipment and shall permit "hands-on" operation of equipment by trainees.

D. System Administrator Training

1. The System Administrator Training shall be oriented to optimum use of the equipment, proper non-technical operation and care, and the characteristics of faulty operation.
2. Training shall be oriented to permit City personnel to effectively manage and administer the operation of the radio network
3. Training should provide basic knowledge of the overall System Management functions, their purposes, and an introduction to basic navigation and use of the Radio System Management applications.
4. Training shall provide information regarding the use of system reports and real-time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.

E. Console System Training

1. The Respondent will be required to train approximately 15 Console Operators, and two (2) System Administrators.
  - a. The training shall be scheduled to allow sufficient time for all participants from all shifts to be trained. The Respondent shall provide a preliminary training schedule for review and approval by the City for each type of training to be provided.

- b. City trainers shall receive both standard operations training and “train the trainer” specific training.

F. Training Materials

1. Training materials shall be provided for all students covering all aspects of the training. Students will retain all such training materials.
  2. Illustrations and photographs, where provided, shall be specific to the Winchester City installation. Color photos must be provided where detail or clarity is supported by use of color. Black and white photocopying of color materials is unacceptable.
  3. Respondent shall provide fully editable (softcopy) versions of all training materials so that the City trainers can update the course materials over time.
- G. The Respondent shall provide unit pricing for all media (CDs, DVDs, Manuals, etc.) used for training to allow the City to purchase additional training materials if necessary. The pricing provided shall be valid for a period of three (3) years following system acceptance.

1.5 WARRANTY

A. Warranty- One (1) Year After Final System Acceptance

1. The system described herein shall be the total responsibility of the Respondent prior to final system acceptance, and for one (1) year following final system acceptance, at no additional cost to the City.
2. Respondent agrees that any hardware or software warranties whose term exceeds one year after Final System Acceptance will be passed through to the City and will remain in effect for the full term of that warranty.
3. The warranty period shall begin on the date of Final System Acceptance.
4. System performance, and all hardware, parts and materials shall be warranted, including all related equipment labor, installation, handling, inspection, return and delivery charges and fees.
5. All software and firmware associated with system features, functions, and capacity as required by this RFP shall be warranted.
6. During the installation and warranty periods, the Respondent shall provide, at no additional cost, commercially available upgrades of any and all software and firmware sold to the City as part of the installation. The frequency and timing of installation of upgrades during this period will be at the sole discretion of the City based on availability by the Respondent.
  - a. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:
    - 1) Patches for defective software;

- 2) New releases that are corrective revisions for earlier versions and/or; no-cost enhancements to earlier releases.
    - b. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
    - c. The Respondent should make every effort to separate corrective revisions from enhancements. If the Respondent is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.
  7. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions. If deemed necessary by the City, software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City.
  8. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the warranty period.
  9. Any notices either generated and circulated internally by the Respondent or received by the Respondent from the original Software Provider, alerting the Respondent to software problems found elsewhere, shall be passed onto the City within 30 days of receipt of such material.
  10. All conditions above also apply to all firmware installed in any products included as part of this system.
  11. Respondent shall fully describe all other terms and conditions of warranty in the Proposal.
  12. Respondent shall provide updates for documentation of all system components (hardware, software etc.) at the completion of the system warranty period.
- B. Latent Defects:
1. The Respondent, at no cost to the City, shall correct latent design defects or recurring problems relating to software, hardware or overall system design, even if such latent defects are discovered after final system acceptance.
  2. Nothing contained in this RFP shall be deemed to have caused any applicable statute of limitations to commence to run or any alleged cause of action to have accrued in the event of any latent defect not discovered until after final system acceptance and final payment. The statute of limitations shall commence to run on any alleged latent cause of action only upon actual discovery of such latent defect.
  3. System malfunctions due to software shall be corrected at no cost to the City.
- C. OPTIONAL Extended Warranty Beyond First Year

1. Respondent shall propose extended warranty services AS AN OPTION on an annual basis for years two through five.
2. The extended warranty specified shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Respondent under requirements of the Contract Documents.
3. Respondent shall provide repair/return services for a period of ten (10) years from date of Final System Acceptance.
4. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten (10) years from date of Final System Acceptance.
5. Notification shall be given at least one (1) year in advance of any change of status from products available from regular production to maintenance only.
6. Respondent shall fully describe all other terms and conditions of the extended warranty in the Proposal.
7. Respondent may also propose other optional extended warranties as part of the Proposal.

D. OPTIONAL End-User Equipment

1. End User equipment warranties may have terms of longer than one year, respondent is expected to provide warranty service throughout the term of the warranty for all end-user equipment.
2. During the full term of the warranty period malfunctioning mobile and portable non-fixed equipment units will be replaced by the Respondent.
3. Respondent personnel will remove and re-install equipment at the customer location. City or other agency personnel will not be required to travel to Respondent service shop for repair.
4. During the full term of the warranty period cost of unit removal and re-installation shall be borne by the Respondent.
5. The Respondent shall state the method for handling and the turn-around-time for the repair of mobile and portable radios during the warranty period.

1.6 MAINTENANCE SERVICE

A. General Requirements:

1. The approach to maintenance of this system shall be preventive maintenance.
2. Comprehensive maintenance services shall be proposed for each network.

3. The Respondent shall include in the Proposal the terms and conditions of the warranty / maintenance contract covering the equipment. The Respondent shall state in the Proposal the name, address, and capabilities of the service station(s) providing warranty / maintenance service.
  4. Maintenance for all items in the system shall be quoted on a standard maintenance contract basis for two (2)-hour response time, seven (7) days a week, unless otherwise specified
  5. Provide twenty-four (24) hour system alarm monitoring capability where users can dial one toll free number to report problems.
    - a. Respondent staff will then dispatch the proper technician in the allotted response time to resolve problem.
    - b. Respondent staff must generate a trouble report detailing who called, what the problem was, how it was resolved, response turn time and how much it cost to repair.
    - c. Trouble report must be deliverable in softcopy format by email to addresses specified by the City.
  6. Provide a list of maintenance plans available. These shall include:
    - a. Radio unit drive-in service;
    - b. Radio unit on-site service;
    - c. Fixed equipment on-site service;
      - 1) 2-hour response time
      - 2) 8-hour response time
      - 3) Next day response time
      - 4) Stocking of replacement units at shop
    - d. Fixed equipment mail in board repair;
      - 1) Normal response - 7 day
      - 2) Emergency response - Next day
      - 3) Full time on-site technician availability.
- B. Maintenance Standards:
1. Replacement parts shall be equal in quality and ratings as the original parts, rebuilt parts are not permitted.
  2. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
  3. 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 that this has been done.

4. Records shall be available for the City's inspection upon request. Records shall be maintained by the Respondent's radio maintenance shop throughout the warranty period (and any subsequent maintenance contract period), and shall revert to the City upon termination of the warranty (or maintenance contract).
5. Respondent shall provide only factory trained and authorized maintenance personnel.
6. The service organization(s) shall maintain comprehensive installation and instruction manuals for all systems equipment. These manuals shall be the property of the City, and shall revert to the City at such time as the City assumes the maintenance responsibility for the system.
7. Maintenance of non-fixed equipment shall be on a unit replacement basis, at no cost to the City or the subscriber agency, such that the amount of time users spend in the maintenance shop shall be minimized.
8. If a fixed equipment module or a non-fixed unit (or control head if applicable) fails twice during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that the equipment is potentially prone to continuing failures, the Respondent shall replace it at no cost to the City.
  - a. If the same fixed equipment module fails twice at a separate location during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that this specific model of device is potentially prone to continuing failures, the Respondent shall provide an equivalent equipment line for complete replacement at no cost to the City.

C. Preventive and Routine Maintenance

1. Routine maintenance procedures recommended by the equipment manufacturer shall be followed.

D. Response Times

1. Catastrophic Failures
  - a. Catastrophic failures are defined as those failures which severely impact the overall performance some examples include but are not limited to:
    - 1) System down, communications unavailable
    - 2) Site down, communications severely impacted
    - 3) Radio console system down
    - 4) Microwave system failure
  - b. Declaration of a catastrophic failure will be at the sole discretion of the City of Winchester.

- c. The Respondent shall have a qualified technician respond to the location of catastrophic failures within 1 hour during normal working hours (8 AM to 5 PM weekdays), and within 2 hours at other times.
    - d. Catastrophic failures not caused by outside effects such as Acts of God will be expected to be resolved within 2 hours after arrival of the technician.
  2. Non-catastrophic Failures
    - a. Declaration of a non-catastrophic failure will be at the sole discretion of the City of Winchester.
    - b. Non-catastrophic failures require the following responses:
      - 1) 0000- 1600 Same working day -- overtime if needed
      - 2) 1601- 2400 Next working day -- start job in AM
  3. Response times shall be the same as above during the acceptance test period.
- E. Escalation Procedures
  1. Respondent shall describe escalation procedures and equipment priority levels in their proposal to be used if the trouble is not resolved within required times.
  2. The City reserves the right to approve the proposed escalation procedures or to recommend alternative methods of escalation and problem resolution
- F. Hardware Maintenance Contract:
  1. As an OPTION, the Respondent shall offer separate one-year hardware maintenance contracts for each non-radio component contained in the proposal. Maintenance contracts shall commence immediately following the expiration of the warranty period. It is the intent of this paragraph to obtain maintenance quotations on those items, which are not directly related to the normal radio shop maintenance articles.
  2. As an OPTION, the Respondent shall offer a maintenance contract for the system fixed equipment and non-fixed equipment, that maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis. This system maintenance contract shall be based on the initial system configuration for fixed equipment and on a per unit basis for non-fixed equipment.
- G. Software Maintenance Contract:
  1. As an OPTION, the Respondent shall offer a software maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis.
  2. During the software maintenance contract period, the Respondent shall provide at no additional cost, periodic upgrades of any and all system operational software. The frequency and timing of these upgrades during this period will be

at the sole discretion of the City. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:

- a. Patches for defective software;
  - b. New releases that are corrective revisions for earlier versions and/or;
  - c. No-cost enhancements to earlier releases.
3. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
  4. The software provider should make every effort to separate corrective revisions from enhancements. If the software provider is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.
  5. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions.
  6. Software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City, if so directed by the City.
  7. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the maintenance period. All system definition parameters and other unique information (data sets) used to operate the mobile radio system or any associated sub-system included shall be backed-up onto movable media on a quarterly basis during the maintenance period by the Respondent at no cost to the City. These media shall be turned over to the City for safe, off-site storage.
  8. All conditions above also apply to all firmware installed in any products included as part of this system or in any spare parts in possession of the City at the end of the warranty period.
  9. Any annual software license fees or software maintenance fees should be clearly identified in the Respondent's response and should either be rolled into this software maintenance contract fee or paid in full as part of the initial system price.

#### 1.7 SPARE PARTS

- A. Appropriate and sufficient spare parts shall be provided to the City by the Contractor.
- B. Respondent shall provide a comprehensive list of all proposed spare parts and equipment, which lists each recommended component and a description of its function.
- C. All spare parts and equipment shall be packaged with protective covering for storage and identified with conspicuous labels describing contents.

- D. The Respondent may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing those used on an as-used and timely basis. The spares complement shall include sufficient non-fixed units to enable maintenance on a unit replacement basis.
- E. At the end of the warranty/maintenance period, the full complement of spares shall be delivered to the City.
- F. Spare parts shall be available for shipment on an expedited basis twenty-four (24) hours a day, 365 days a year including weekends and holidays. The manufacturer shall provide a 24-hour hotline telephone number for the handling of such orders.
- G. Notification shall be given at least one (1) year in advance of any change of status for products available from regular production to maintenance only (MO). The specific statement shall be provided with the bid response.

## PART 2 - SYSTEM REQUIREMENTS

## 2.1 GENERAL REQUIREMENTS

- A. Systems proposed shall meet the requirements here and in other sections of this RFP for Option A.
- B. New system minimum requirements. The following items reflect the basic objectives for minimum system performance as identified by City users. Proposed systems shall meet these requirements to the greatest extent practical.
1. APCO Project 25 compliant trunked radio network.
  2. RF coverage for the 800 MHz trunked radio network shall assume any belt-mounted portable radio indicated by the manufacturer as providing guaranteed service in the system design. Radios will be used w/swivel carry case antenna on hip for talk-out and talk-back to a standard of 95/95 percent (area defined by City borders) in street coverage, and 20 dB heavy in-building coverage and those buildings identified in Appendix D.
  3. Unit ID displayed at dispatcher positions and available for subscriber units with unit ID-capable displays and alias display.
  4. "Emergency/Man Down" button on subscriber units
  5. Subscriber priority administratively selectable
  6. Subscriber unit "talk-around" capability for localized use and system redundancy.
  7. Regrouping, re-fleeting of subscriber units administratively selectable.
  8. Intra-operability within the system.
  9. Inter-operability with surrounding mutual aid jurisdictions.
  10. Continued use of existing VHF High band, tone and voice paging
  11. 99.999 percent system reliability
  12. All user equipment built to Mil. Spec
  13. As an Option, Respondents shall provide a network and user equipment equipped of providing secure, encrypted communications to selected users.
    - a. AES Encryption Protocol, compliant with the P25 standards in general and TIA/EIA/IS-102-AAAA Rev A (or latest revision), shall be provided.
    - b. Other protocols shall be considered as an option.

14. As an Option, Respondents shall provide a network equipped with Global Positioning System (GPS) mapping system. The GPS system shall support a select number of upgraded subscriber units and Respondent provided mapping program located at the dispatch facility. All network and server components shall be included console interface, dispatch display, and management.
- C. Primary site selection shall be driven by the 800 MHz Project 25 Digital Trunked voice network.
- D. Infrastructure includes the radios, combiners, antenna systems, controllers, switching equipment, dispatching console systems, and alarm and monitoring sub-systems and all related equipment.
- E. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment.

## 2.2 800 MHZ PUBLIC SAFETY VOICE RADIO NETWORK

- A. The 800 MHz Project 25 Digital Trunked voice radio network shall include the following:
  1. Complete system design
  2. Network infrastructure including RF and all control
  3. Dispatch console equipment
  4. User equipment including mobile, portable, and control station radios
  5. Alarm and control system
  6. Project management
  7. FCC licensing
  8. Installation and programming
  9. Testing
  10. Training
  11. Documentation
- B. Coverage
  1. The basic requirement for the Project 25 Trunked Radio System is for

- a. 95% City-wide in street, 20 dB in-building portable coverage measured on the hip and in-building coverage per locations found in Appendix D.
- C. Analog and digital equipment
1. Project 25 Trunked radio system infrastructure shall support digital trunked user equipment.
  2. VHF / 800 Conventional Base/Repeater Mutual Aid radio system infrastructure shall support analog user equipment.
  3. User equipment, fully compatible with the infrastructure shall be provided.
- D. Anticipated acceptable system configurations include:
1. Simulcast network
- E. 800 MHz FCC Licenses
1. The City has conducted a preliminary frequency analysis, which contains a list of channels in Appendix B for potential use in the system.
- F. Dispatch Consoles
1. Dispatch consoles shall be provided that integrate the following functions, to the greatest extent possible:
    - a. Radio dispatch – conventional and trunked
  2. Fully integrated, graphic based dispatch consoles shall be provided at the following locations:
    - a. Timbrook Public Safety Building
      - 1) 4 positions
  3. The console controller and/or switch and related equipment shall be designed to fully support expansion by fifty percent (50%).
  4. Current dispatch consoles will need to be kept operational during the transition period.
  5. The City requires that dispatch personnel be able to use ONE headset to interface with the existing 9-1-1 and administrative telephone systems AND with the new radio dispatch console system.
- G. Alarm and Control
1. An integrated alarm and control system shall be provided for network management.
- H. User Equipment:

1. Estimated equipment counts for mobile radios, portable radios, and control stations are provided in Section 4.d. The information provided is estimates only. Individual agencies may have more or less radios currently in use, and agencies may opt to deploy more or less radios on the new radio system.
2. As part of the evaluation process, the City will require respondents to provide fully programmed functional samples of all subscriber equipment and accessories proposed. Radios shall be programmed to operate on common interop channels so that evaluators can adequately assess the equipment's functionality.

## 2.3 SITE SELECTION AND ACQUISITION

- A. The City has provided a list of tower sites that may be used in engineering the specified coverage. These sites are summarized in Appendix C.
- B. Respondents shall use tower sites that best optimize the design of the proposed system and offering alternatives for sites critical to the design.
- C. The City's intent is to allow Respondents to use any set of sites that will result in an efficient and cost effective design.
- D. Regardless of the sites proposed, Respondents shall retain complete responsibility for system performance and coverage. In support of the design, Respondents will submit documentation ensuring that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
- E. Sufficient data shall be presented to permit adequate cost/ benefit analysis of lifecycle costs to aid trade-off decision processes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION PLANNING

- A. The Respondent Project Manager shall convene a Project planning session with the City within twenty (20) days of contract award, and together they will jointly develop a Project plan. The Project plan shall include:
1. Project description statement.
  2. A work statement that includes the Project deliverables and Project objectives.
  3. A Work Breakdown Structure (WBS) to the level at which control will be exercised.
  4. Updated Cost estimates, scheduled start dates, and responsibility assignments that support the WBS.
  5. Performance measurement baselines for schedule and cost.
  6. Major milestones and target dates for each.
  7. Key and required staff.
  8. Key risks, including constraints and assumptions, and planned responses for each.
  9. Subsidiary (supporting) management plans including scope management plan, schedule management plan, Project budget(s), change control process, acceptance testing, Project closure process, etc.
  10. Project communications plan or strategy, including periodic reporting requirements and milestone achievement determination.
  11. A written list of open issues and pending decisions.
  12. Supporting detail for all the above.
- B. The Project plan shall be presented to the City not more than fifteen (15) days after the Planning Session meeting.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Installation of equipment shall not begin prior to the City's approval of Shop Drawings and other required submittals.
- B. Installation shall include a complete, tested, system to include placement of associated cabling, appropriate system layout and terminal connections. Respondent shall provide

associated power supplies and any other hardware, adapters and or connections to deliver a complete operable system to the City at the time of acceptance.

- C. All installations shall be performed by factory authorized or Respondent affiliated service shops. Other shops or installers may be used upon mutual agreement between the customer and Respondent. Qualified, adequately trained personnel familiar with this type of work shall perform all installations.
- D. Prior to the start of the system installation the Respondent shall participate in a mandatory Project site survey with the City or City's representative to confirm actual equipment location within each space. At that time, the exact equipment locations will be determined and documented by the Respondent.
- E. The installation Respondent shall coordinate with others, as appropriate, to confirm that any prep work, such as tower work, coring, bracing, conduit, electrical, etc that affects the installation of any equipment is complete before final inspection.
- F. During site visits, the Respondent shall review existing conditions at the Jefferson WT for additional structural capabilities to place new antennas on the water tower.

### 3.3 FACTORY TESTING AND STAGING

#### A. Products and Equipment:

- 1. Each individual assembly or equipment shall undergo factory testing prior to shipment.
- 2. Standard factory test documentation, indicating successful completion of testing, and fully documenting the tests performed, shall be submitted to the City to demonstrate compliance.

#### B. System Staging:

- 1. The complete system shall be staged and tested at the factory to the greatest extent practical.
- 2. The Respondent shall provide all necessary technical personnel, and test equipment to conduct staging tests. The Respondent shall remedy all deviations, anomalies, and test or specification failures in a timely manner and at the Respondent's sole expense.
- 3. Staging tests will be conducted using final, approved Staging Acceptance Test Plan (SATP).
- 4. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation. Therefore, the Respondent is expected to execute the SATP and correct all deficiencies before the City is on-site.

5. The City Project Manager or designee shall conduct and/or witness staging tests. The City's cost of travel and expenses associated with staging will be borne by the City.
6. Each section of the SATP, will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
7. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
8. Retest of the failed SATP section or the entire plan shall be at the City's sole discretion,
9. The fully executed and completed SATP document shall be provided to the City.

### 3.4 LABELING AND IDENTIFICATION

- A. All equipment, cables, connections, etc shall be clearly and permanently labeled per the Project drawings, manufacturer's requirements, and TIA/EIA-606A.
  1. Any other signage or labeling as required by law shall be provided.

### 3.5 FIELD QUALITY CONTROL

- A. Installation monitoring and meetings
  1. The Respondent shall attend monthly Project and construction meetings to discuss status, problems, and schedule with individuals deemed necessary by the City prior to and during installation. More frequent meetings may be held at the request of the City.
  2. Respondent shall maintain the written Project schedule on a monthly basis or more frequently if necessary to properly reflect Project activities.
- B. Inspection:
  1. When installation is substantially complete, Respondent shall schedule with the City an inspection of the work.
  2. The City Project Manager or designee will conduct an inspection of the work. Any deficiencies will be documented in a punch list format and delivered to Respondent for resolution.
- C. Pre-final testing

1. Before final testing, Respondent shall completely execute the final approved FATP to verify proper installation and operation of all equipment before presentation to the City.

D. Meeting Minutes and Reports:

1. Respondent shall provide written minutes of all meetings no later than the earlier of five days after the meeting or two (2) days prior to a subsequent meeting relating to the same issue(s).
2. Respondent shall submit a written status report at the end of each week noting progress to date, meetings held, schedule adherence, and variances.
3. Respondent shall provide written reports of corrected punch list items.

E. As-Built Documentation:

1. Respondent shall provide two (2) copies of all as-built documentation
2. All submittals shall be provided in hard copy, paper format, and in electronic format on CD-ROM or USB "thumb drives."
3. Documentation shall be professionally produced, and provided in heavy duty three ring "D ring" style locking binders. Loose leaf materials are not permitted. Paper shall be shall be 8 ½ x 11" whenever possible. If larger paper is utilized it must be professionally incorporated into the document. Minimum paper quality permissible shall be 24# bond and ISO brightness of 90. Binders shall be color coded where it will provide an organizational benefit.
4. Respondent shall provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for the installation including detailed documentation for City review and detailed documentation of as-built conditions.
5. Respondent shall provide complete as built documentation detailing all aspects of the installation including but not limited to:
  - a. Equipment provided
  - b. Plan and elevation drawings of all equipment including antennas on tower
  - c. Cabling and terminations
  - d. Installed location
  - e. Block and level diagrams
  - f. Termination panels
  - g. Programming

h. Set-up and alignment information

6. Equipment/Terminal Elevations: Furnish details showing equipment racks, terminal block and backboard elevations, including all cable terminals, spaces for equipment, equipment racks, and station cable routing. Communications equipment distribution frames shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the Contract Documents and shall show additional detail as indicated herein.

3.6 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.
  1. Worksites shall be left neat and broom swept upon completion of work. All trash shall be removed weekly.

3.7 FINAL INSPECTION

- A. Upon notification of completion of all installation and resolution of all punch list items, City Project Manager or designee will conduct final inspection of the installation.
- B. Any deficiencies will be noted on the punch list and provided to the Respondent for resolution.
- C. Final System Acceptance testing will not commence until all punch list items are resolved.

3.8 TRAINING

- A. The Respondent shall complete all training prior to Final System Acceptance.

3.9 FINAL SYSTEM ACCEPTANCE TESTING

- A. Respondent shall verify and document that all equipment, assemblies, hardware, software, and firmware are upgraded to the latest factory revision before the start of Final System Acceptance testing. Multiple revision levels among similar equipment are unacceptable.
- B. City shall be given two (2) weeks written notice that the system is ready for Final System Acceptance testing.
- C. The Respondent shall provide all necessary technical personnel, and test equipment to conduct final testing.

- D. The Respondent shall remedy all variances or deficiencies in a timely manner and at the Respondent's sole expense.
- E. Final tests will be conducted using the complete and approved Final System Acceptance Test Plan (FATP).
- F. The intent of the Final System Acceptance tests is to demonstrate to the City that the system is complete and ready for commissioning and operation. Therefore, the Respondent is expected to perform preliminary execution of the FATP prior to final execution with the City.
- G. The City or Engineer shall conduct and/or witness execution of the FATP.
- H. Each section of the FATP will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
- I. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
- J. Retest of the failed FATP section or the entire plan shall be at the City's sole discretion,
- K. The fully executed and completed FATP document shall be provided to the City.

### 3.10 FINAL SYSTEM ACCEPTANCE

- A. "Final System Acceptance" shall mean the date on which the Respondent delivers all required documentation to the City and completes all of the work on the Project as required by the Contract Documents, including, without limitation, the date on which the Respondent completes all of the following requirements and demonstrates that the Project is complete in all respects, as determined by the City in its sole discretion, as evidenced by written notice from the City to the Respondent:
  - 1. Receipt and approval of the Staging Acceptance Test Plan (SATP)
  - 2. Satisfactory completion of the Staging Acceptance Test and resolution of punchlist items
  - 3. Completion of System installation
  - 4. Final inspection and resolution of installation punch list items
  - 5. Receipt and approval of the as-built documentation
  - 6. Receipt and approval of the Coverage Acceptance Test Plan (CATP)
  - 7. Satisfactory completion of the Coverage Acceptance Test and resolution of punchlist items

8. Satisfactory completion of installation of subscriber equipment
9. Completion of all training required by the Contract Documents
10. Receipt and approval of the Final System Acceptance Test Plan (FATP) and related test;
11. Satisfactory completion of the Final System Acceptance Test and resolution of punchlist items

**END OF SECTION**

## SECTION 4.b – OPTION B – RADIO NETWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section provides specifications and requirements for an 800 MHz P25-compliant digital trunked simulcast radio system for public safety and hybrid VHF conventional system for non-public safety voice communications. The system is comprised of several main subsystems or components.
- B. The scope includes:
  - 1. Basic system configuration criteria
  - 2. Coverage requirements
  - 3. RF infrastructure
    - a. Repeaters
    - b. Combiners
    - c. Antenna systems
    - d. Controllers and switch equipment
    - e. System Configuration and Control
    - f. VHF Conventional Channels

## PART 2 - PRODUCTS AND SYSTEMS

### 2.1 MANUFACTURERS

- A. Available Respondents. Subject to compliance with requirements, this section is open to all manufacturers of trunked radio equipment and/or systems integrators offering products that meet or exceed specifications indicated in Option B.

### 2.2 SYSTEM CONFIGURATION

- A. Respondents shall propose six (6) P25 Phase I compliant base stations (one control channel and five voice paths)
- B. This system specification describes a Citywide radio system providing “public safety grade” performance in general, and to the specific requirements as described herein.
- C. The system shall have two (2) VHF conventional channels to support non-public safety users.
- D. The Respondent’s offering must be compliant to the P25 standard.
- E. Any feature required in the system specification must function with all TIA102 P25 compliant subscriber units regardless of manufacturer in order to be considered compliant.
- F. No manufacturer specific feature will be permitted if it limits, disables or defeats multi-Respondent interoperability unless the Respondent fully describes in their response the functionality provided by the feature and how subscriber hardware from vendors other than the Respondent will function/integrate.
- G. The respondents’ proposed system shall provide a balanced system design where talkback performance is the same or better than talk out performance.
- H. The new system shall comply with the standard features and functions defined in the following documents.
- I. Environmental
  - 1. All equipment rooms are air-conditioned; however, the Respondent must provide the guaranteed operating temperature range and the BTU's of heat generated for each primary piece of equipment in the proposed system.
- J. Multiple Sites
  - 1. Multiple sites will be needed to provide City-wide coverage. This wide-area, multiple-site network will consist of simulcast radio sites.
  - 2. The system must seamlessly integrate all multiple sites and any cells or zones such that field users can freely roam throughout the service area without the need to manually select sites.
  - 3. Respondent shall determine the number and location of sites needed to efficiently provide the required coverage.
  - 4. Candidate sites which are known to be available for City use are described in Appendix C. While the City desires the use of these sites final site selection to provide the required coverage is at the discretion of the Respondent.

## 2.3 INTEROPERABILITY

- A. The proposed system shall interface with conventional radio systems in a way that enables seamless dispatch and field communications to support incident communications.
- B. Conventional Interoperability Requirements
  - 1. Respondent shall provide conventional interoperable base stations to provide portable radio coverage for mutual aid responders.
  - 2. To decrease the overall cost of the interoperability overlay, these base stations shall be located only at one of the proposed sites that provides the best level of VHF coverage based on the final licensing potential for existing channels already provided.
  - 3. Respondent will provide five VHF High Band, narrowband, conventional base stations/repeaters.
  - 4. Respondent shall provide interoperability gateway(s) to interface the interoperability channels to the trunked system.
  - 5. The Interoperability channels will be mapped to trunked talk groups by the system and at the dispatch consoles.
  - 6. A live demonstration of the Respondent's ability to provide an acceptable mutual aid solution shall be part of the acceptance test plan. The following shall apply:
    - a. The exhibit must demonstrate the interoperability between a narrowband VHF analog conventional radio and a P25 digital trunked radio system that meets the operational requirements of the City. The P25 vocoder used in the demonstration shall be the same as that provided by the Respondent
  - 7. In addition to the five conventional stations, the City requires two more conventional narrowband channels for non-public safety agencies including public works and schools. These channels will be for day to day usage.

## 2.4 VOICE RF COVERAGE REQUIREMENTS

- A. Channel Performance Criteria (CPC)
  - 1. RF coverage is defined as the digital bit-error-rate (BER) that provides a minimum delivered audio quality (DAQ) 3.4 audio signal to the operator as defined in TIA TSB-88-C (OR LATEST REVISION) for both talk-out and talk back to portable radios on hip used outdoors (in street) in 20 dB buildings throughout the City, and in-building coverage for locations identified in Appendix D.
  - 2. The DAQ 3.4 performance level shall provide 95 percent reliability throughout 95 percent of the geographical area of the City.
- B. Minimum Radio System Coverage Requirements (MRSCR)
  - 1. The City seeks to implement a system design that best meets its operational coverage needs. Therefore, the MRSCR must be based on a geographic area basis using grid sizes providing enough grids to achieve the associated confidence factor as described later in this section.
  - 2. The system shall provide a minimum service area reliability of 95 percent voice radio coverage, by area, for the City for portable radios carried on the hip in 20 dB buildings and locations identified in Appendix D.

## C. Coverage Maps

1. Respondents shall submit both talk-out and talk-back, or system composite coverage maps for the proposed configuration, showing system gain calculations, for
  - a. P25 mobile radios
  - b. P25 portable radios in the street
  - c. P25 portable radios in 20 dB buildings
  - d. VHF analog portable radios in the street
  - e. VHF analog paging coverage in the street with pager worn on hip.
2. Map Criteria
  - a. The operating parameters and factors pertaining to the coverage commitment for a specific map must be shown for that map (preferably on the map). If a Respondent chooses to show the operating parameters and factors on a separate page, the Respondent is responsible to clearly identify the correct information for each map. Each and every map must have this information.
  - b. The following minimum information must be clearly defined, relating to each map and each site:
    - 1) The base/repeater RF power output
    - 2) The base/repeater antenna gain and directivity (if applicable)
    - 3) The "down tilt" angle (in degrees) of the base/repeater antenna
    - 4) The transmit ERP
    - 5) The effective receiver sensitivity
    - 6) Receiver tower top amplifier gain
    - 7) The base/repeater antenna height above ground
    - 8) The base/repeater antenna height above average terrain
    - 9) The mobile or portable antenna type
    - 10) The mobile or portable antenna height above ground for transmitting position and for receiving position, if different
    - 11) The mobile or portable RF output power
    - 12) Any areas within the coverage contours shown on a map that are predicted to have a reliability of less than 95 percent for the conditions and operating parameters applicable to that map must be clearly marked on the map.
  - c. If backup or standby sites are proposed, appropriate maps showing system coverage utilizing these sites must be included in the proposal.
  - d. Coverage should not be limited to the City boundaries and shall show coverage provided outside the City limits based on the proposed sites for informational purposes.

- D. Coverage Model
1. A description of how the Respondent calculated the coverage must be included in each proposal. List the coverage model(s) used (for example—Okumura, etc.)
- E. Guarantee of Proposed Coverage
1. The City has identified minimum coverage requirements in this RFP.
  2. The City anticipates that the proposed coverage will not exactly match the required coverage on a grid-by-grid basis. In each sub-area, some required grids may not be covered and other non-required grids may be covered.
  3. The City will evaluate proposals based on overall coverage value to the City.
  4. The selected Respondent will be required to guarantee the proposed system coverage based on the submitted grid maps and the testing methodology of this RFP.
  5. Any subsequent design changes based on mutual agreement between the City and selected Respondent that impact coverage will require revision of the coverage grid maps and guarantee based on the grid maps.
- F. TIA TSB-88-C– User Choices
1. [E.1] User Choices
    - a. Coverage predictions, design and proof of performance testing must be conducted in accordance with TIA TSB-88-C, or latest revision to the greatest extent possible. The following criterion is provided in accordance with TIA TSB-88-C.
  2. [E.2] Service Area
    - a. The service area is defined as the City of Winchester, Virginia.
    - b. Coverage testing shall be performed within the Winchester City boundaries.
    - c. The target device, usage and location are:
      - 1) Mobile radios—standard dash or trunk mount with antenna mounted in the center of the roof
      - 2) Portable radios—standard portable radio (for in-building applications):
        - a) Talk-out and talk-back to portable radio on hip with swivel belt clip
      - 3) Basic network coverage shall be designed to accommodate vehicles traveling at speeds up to 85 MPH
      - 4) Basic network coverage shall be designed to accommodate supplemental 20 dB in-building coverage.
      - 5) Basic network coverage shall be designed to accommodate supplemental in-building coverage as identified in the locations included as Appendix D.
  3. [E.3] Channel Performance Criterion (CPC)
    - a. Minimum CPC shall be DAQ 3.4 for digital channels.

4. [E.4] Reliability Design Targets
  - a. The CPC reliability design target is a service area probability of 95 percent.
5. [E.5] Terrain Profile Extraction Method
  - a. Either the bilinear interpolation or the snap to grid method of terrain profile extraction is acceptable.
6. [E.6] Interference Calculation Method
  - a. Either the equivalent interferer or the Monte Carlo Simulation Method of interference calculation is acceptable.
7. [E.7] Metaphors to Describe the Plane of the Service Area
  - a. The tiled method is preferred
  - b. Grid mapped from radial method is also acceptable
8. [E.8] Required Service Area Reliability
  - a. The CPC is required for 95 percent of the service area.
9. [E.9] Willingness to Accept a Lower Area Reliability in Order to Obtain a Frequency
  - a. The City is not willing to accept a lower area reliability in order to obtain a frequency.
10. [E.10] Adjacent Channel Drift Confidence Factor
  - a. Adjacent channel drift confidence factor shall be 95 percent.
11. [E.11] Conformance Test Confidence Level
  - a. A conformance test confidence level of 99 percent is required.
12. [E.12] Sampling Error Allowance
  - a. A sampling error allowance of  $\pm 1$  percent is required.
13. [E.13] Pass/Fail Criterion
  - a. The "greater than" test is required.
14. [E.14] Treatment of Inaccessible Grids
  - a. All inaccessible grids will be eliminated from the calculation.

## 2.5 RF COVERAGE TESTING

### A. General:

1. RF coverage testing is critical to verifying that the proposed system design meets the City's requirements.
2. The intent of RF coverage testing is to verify proposed coverage based on TSB-88-C, or latest revision. Any deviations from TSB-88-C shall be noted by the Respondent otherwise they are assumed to meet the recommendations of the standard document.
3. Respondent shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the proposal meeting the requirements of this Section.

4. Both the City and the selected Respondent shall agree upon the final CATP and method to be used no later than 90 days after award of contract.
  5. Respondents may propose alternative test methods as an option for consideration, consistent with the requirements, TSB-88-C, and achieving the same results however, the City shall make the final determination as to whether the proposed alternative is acceptable.
    - a. Roundtrip BER testing will be accepted as a valid test method if:
      - 1) Must include talk-out BER and talk-in BER measurements for each tile.
      - 2) Must contain a sufficient number of BER samples per tile to be statistically valid.
      - 3) Must include an acceptable methodology for combining the talk-out and the talk-in BER data into a composite round trip BER mean value for each tile.
      - 4) A BER of 2 percent or less for 95 percent of the tested tiles is the pass criterion.
      - 5) Accompanied by subjective voice quality tests that validate a DAQ 3.4, 95 percent pass criterion. Voice quality tests may be conducted while moving.
  6. Coverage testing shall be conducted after the system is fully tested and aligned.
  7. Significant changes to system alignment will require re-testing of coverage.
- B. Types of Testing
1. Two types of coverage testing will be conducted in all areas:
    - a. Automated mobile drive testing for overall grid acceptance testing purposes
    - b. Non-automated intelligibility testing to verify DAQ and base-lining purposes for portable radio configurations in street and in buildings located in Appendix D.
  2. Automated and intelligibility testing shall be complementary and serve to fully verify that coverage requirements are met both technically and operationally.
  3. Automated testing shall be objective and quantitative in nature and used to:
    - a. Verify that system coverage meets signal level and BER threshold requirements on a grid basis.
    - b. Automated testing results may also be used as a baseline of system performance such that system alignment and coverage performance can be re-tested at a later date to determine if degradation has occurred.
  4. Intelligibility testing shall be quantitative and qualitative in nature and used to:
    - a. Verify that system DAQ meets requirements in selected grids tested as covered.
    - b. Respondent shall provide audio samples to permit City personnel to grade audio quality.

- c. City personnel will evaluate audio quality based on Respondent provided audio samples.
- d. Conduct in-building testing for locations in Appendix D for both intelligibility and measure signal strength at all testing locations.

#### C. Test Configurations

1. Testing configurations for automated and intelligibility testing shall correspond as closely as possible to anticipated typical operating configurations.
2. Testing configurations shall use typical mobile and portable radios delivered with the system. Selected Respondent and City shall mutually agree on a testing plan utilizing a selection of Respondent's multi-featured low and high-tiered mobile and portable radios.
3. If test configuration does not use delivered mobile or portable radios, Respondent shall fully describe and demonstrate correlation between test measurements obtained with test equipment used and the performance of actual operational equipment.
4. City personnel or representatives will participate in and witness all coverage testing at City option.

#### D. Automated Mobile Drive Testing

1. To verify coverage for final system acceptance, the selected Respondent must, to the satisfaction of the City, measure the signal level and/or BER, as applicable, at a statistically significant number of test locations randomly and homogeneously distributed throughout the City, for each coverage sub-area.
2. The intent of this procedure is to define a coverage testing method that is consistent with TSB-88-C.
3. The City is approximately 9.3 square miles in area. Respondents are required to create the appropriate grid size for testing purposes to achieve the confidence level noted previously.
4. Selected Respondent may evenly subdivide grids, if necessary, to provide a statistically significant number of grids in a sub-area as is acceptable to the City.
5. Using automated drive testing equipment, the signal level or BER shall be measured in each accessible bin.
6. Inaccessible bins will not be counted for any calculations.
7. The automated test equipment shall be capable of making and recording multiple measurements within each bin per TSB-88-C (OR LATEST REVISION) and averaging the readings to produce the final test result for that bin. All samples and the final average value shall be stored and retained as part of the test data.
8. A PASS shall be scored for each average bin measurement that exceeds the threshold determined to correspond with each bin as shown in proposed/contracted coverage map.
9. Ninety-five percent of the bins tested, in each sub-area, must PASS the corresponding threshold or the test will be graded as "FAILED."

10. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

E. Non-automated Intelligibility Testing

1. Non-automated intelligibility coverage testing will be conducted using Respondent and City mutually-agreed on and Respondent-supplied mobile and portable radios
2. Digital audio quality coverage will be tested at each location and in all critical buildings identified in Appendix D.
3. Both talk-out and talk-back will be recorded
4. Testing shall be performed using typically configured portable radios.
5. Testing will be done in teams with one part of the team in the field and the other at a dispatch console.
  - a. Field personnel will document talk out testing
  - b. Dispatch personnel will document talk back testing
6. A standard test result form shall be used to document test information for each test location including:
  - a. Date
  - b. Time
  - c. Personnel
  - d. Digital
  - e. Talk-out or talkback
  - f. Equipment
  - g. Location
  - h. Received signal level for in-building tests
  - i. Pass or fail status
7. Individual Building Tests
  - a. The following number of test locations shall be used based on the type of building.
    - 1) Residential building (single/2 story family) – Single test in center of ground floor.
    - 2) Small commercial building (single story, open floor plan) – Five test locations, one in each corner and one in center.
    - 3) Medium building (small school, light industrial, medical office) – 20 test locations, uniformly distributed on the ground floor.
    - 4) Large buildings (shopping malls, factories, buildings over 5 stories) – Multiple test points (minimum 20) uniformly distributed on the ground floor.

- b. The final standard deviation of test locations confirmation shall be agreed to by both the City and Respondent with a minimum 50% of test locations passing.
- c. Physical in-building test shall be conducted by walking in a circle, approximately 1 meter in diameter, while conducting a subjective test.
  - 1) In addition, received signal level shall be recorded at each test location.
8. Data from the testing forms will be analyzed to determine the percentage of tested locations that passed.
9. At least 95 percent of the test locations in each sub-area must PASS or the test will be graded as "FAILED."
10. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

F. Test Unit Configuration

1. Mobile units operating in this system may be traveling on any street, road (paved or unpaved), or highway at any time within the coverage area.
2. Vehicular antennas are to be center mounted on each vehicle unless specifically noted elsewhere in this specification for any particular vehicle or class of vehicles.
3. Respondent shall fully describe vehicular antenna to be used, including:
  - a. Make
  - b. Model
  - c. Frequency range
  - d. Gain

2.6 HIGH NOISE AMBIENT ENVIRONMENT TESTING

A. General

1. The City's fire and rescue users shall frequently operate in high noise environments with and without masks.
2. Respondent shall propose a detailed plan how high ambient noise acceptance testing shall be done.
3. The proposed test plan the City is attempting to replicate is based on the NTIA Technical Report TR-08-453 "Intelligibility of Selected Radio Systems in the presence of Fireground Noise: Test Plan and Results"

B. Testing Configurations

1. Respondents' detail plan may include any combination of the below environmental noise conditions or alternates to validate operation in these situations.
  - a. No background noise, no mask (or the Clean condition)
  - b. Fire truck pump panel, no mask
  - c. Mask with no background noise

- d. Two personal alert safety system (PASS) alarms, with mask
  - e. In-mask low air alarm
  - f. Rotary saw cutting metal garage door, with mask
  - g. Chainsaw cutting wood, with mask
  - h. 2 ½ inch hose with fog nozzle, with mask
  - i. Rotary saw cutting metal garage door, with amplified mask
2. Respondents shall detail any requirements for the City to provide the necessary equipment to proceed with the testing.
  3. The intent of the high noise ambient environment testing is for both subscriber and network.
    - a. Subscriber – Demonstrate the audio intelligibility performance in an all P25 environment of a subscriber operating in a high noise ambient environment test.
    - b. Network Interoperability– Demonstrate the audio intelligibility performance of the proposed VHF-800 patch/gateway. The VHF analog radio will transmit in a high noise ambient environment with a noise-cancelling microphone under the conditions defined. The audio to be evaluated is received by an 800 MHz P25 subscriber through the VHF-800 interoperability gateway/patch.

#### C. References

1. Respondents shall provide a reference that will permit a demonstration provided at a completed and accepted installation using the same technology as proposed for Winchester. The Respondent is responsible for coordinating the test demonstration with the host site owner including access to the console. Winchester designees will provide the turnout gear and mask, rotary saw, metal, wood, and other ancillary equipment necessary to conduct the test. The vendor will provide the radios and arrange clearance with the host site to use the dispatch console. The City shall reserve the right to request this test during or after the Respondent selection process

## 2.7 TRUNKED RADIO SYSTEM FEATURES

### A. General

1. The system shall provide the following general features:
  - a. Compliance with P25 features.
  - b. Digital talk group and voice call operation
  - c. Network management
2. Required features are grouped and described in the following paragraphs.

### B. Trunking Modes

1. Digital P25-compliant voice calls
2. Digital talk group calls
3. Message or transmission trunked

- C. Dispatch Consoles
  - 1. The City plans to purchase digital radio consoles as part of this procurement.
  - 2. The network system shall support cross muting of radio consoles.
  - 3. Any console position must be able to communicate with any talkgroup it is equipped for in the system regardless of the site or sites involved in the call.
  - 4. The connection of the multiple site network system to the console network must be completely digital end-to-end.
- D. Non-fixed User Equipment
  - 1. System shall support the following:
    - a. P25-compliant mobile radios
    - b. P25-compliant portable radios
    - c. P25-compliant control station radios
  - 2. Field units shall be capable (via programming) of accessing or being denied access to any and all sites within the system.
- E. Network Site Capacity
  - 1. The network switch and associated control equipment must be capable of fully interconnecting all sites in the system.
  - 2. Spare capacity, sufficient to integrate additional sites equal to 50 percent of the initial proposed sites, shall be supported.
  - 3. Site Configuration
    - a. The network shall be capable of the following site configurations:
      - 1) Single site trunking
      - 2) Multiple site simulcast cells
      - 3) Satellite receiver sites
    - b. A simulcast cell consisting of several physical sites shall count as one site and not as a total of the simulcast sites.
    - c. The number of channels supported must also range from a standard single channel conventional repeater to a 24-channel trunking system.
      - 1) Initial design is for a 6-channel trunking system.
    - d. Respondent shall fully describe all site/repeater configurations proposed.
- F. Control Data
  - 1. The trunked system shall operate using the P25-compliant control channel protocol as defined in TIA-102. All working and control channels will function on frequencies licensed for this system.
  - 2. Broadcast of talkgroup assignments, emergency assignments, individual signaling calls, and special signal calls shall occur on the control channel.
- G. Channel Assignment

1. A system control computer shall allocate all RF channels or timeslots such that any and all system users (field units and console dispatchers) will have access to all voice channels via a system priority protocol.
  2. Channel access time, assuming a channel is available, shall be less than 850 milliseconds. Access time is defined as the time period from the radio Push-to-Talk until the receiving unit speaker is un-muted and audio is emitted from that speaker.
- H. Talkgroups
1. The system shall have initial capability to support at least 300 talkgroups.
  2. Respondent shall state maximum number of talkgroups the system can support and what is required to achieve this expansion.
  3. Each talkgroup must be capable of consisting of any and all individual unit ID's.
    - a. Respondents shall list any restrictions/limitations of their fleet map.
    - b. This will include any restrictions or reprogramming required if additional talkgroups are created later.
  4. Any field unit or console dispatcher can be programmed to be a member of any talkgroup either at initial implementation or at any time in the future. Respondents shall describe how this process takes place and what restrictions there would be when adding any units to any talkgroups.
  5. All field units (mobiles, portables, and RF control stations) and console dispatch positions will be capable of being assigned talkgroup address designators that shall permit communications between groups of field units or groups of field units and individual dispatch positions.
  6. All units operating within the same talkgroup must receive both sides of every conversation addressed to or from the talkgroup.
- I. Number of Individual Discrete Addresses
1. The signaling protocol will permit the system to assign not less than 16,256 discrete field unit addresses (unit ID). Respondent shall state maximum number of unit ID's the proposed system can support, and what is required to achieve this expansion.
  2. All discrete addresses must have the capability of being a member of any or all talkgroups. Regardless of the talkgroup affiliation, the discrete unit address for a unit will not change. Each unit will have a unique discrete unit address.
- J. Call Management
1. Call types supported:
    - a. Talk group calls
    - b. Individual calls
  2. Call processing:
    - a. All call types must be maintained across the network.
    - b. Talkgroup calls and management commands such as unit-to-unit calls, console operator calls, individual unit disable commands, remote radio

assignments, data messages, etc., must follow a user or group throughout the area of operation.

- c. Call processing shall be highly channel efficient and not unnecessarily tie up multiple channels at multiple sites for the same user. The system shall optimize the number of channels used in any given conversational scenario.
3. Call Routing Management
    - a. Site Registration
      - 1) For multi-site networks, the system shall automatically perform site registration and de-registration on a talkgroup and radio unit basis.
      - 2) The system controller shall maintain the site registration status of all units active on the network.
      - 3) Real-time and logged status of units and talk groups shall be available via the system management subsystem.
      - 4) All unassigned units that are turned on within, or move into, the RF coverage area will initiate a registration process with the network in a manner that is consistent with the trunking protocol in use.
    - b. Site Hand-off and Roaming
      - 1) System shall automatically detect loss of signal and control roaming from one site to another.
      - 2) Audio loss during site hand-off shall not exceed one second.
    - c. Default Site
      - 1) Any or all sites within the multiple-site network shall be capable of being designated as a default site. These sites must always be included in a talkgroup call before the call can proceed.
    - d. Preferred Site
      - 1) In areas of overlapping coverage from two or more sites, one site may be designated as a preferred site.
      - 2) Designation shall be on a talkgroup or unit basis.
    - e. Call Busy
      - 1) System shall issue a busy status for a talkgroup call if a channel is not available at all sites where talk group units are registered.
      - 2) Busy calls shall be placed in queue on a priority basis.
      - 3) System shall allow programmable override of call busy on a site, talkgroup, or unit basis.
  4. Priority Levels
    - a. A minimum of eight levels of operational talkgroup priority will be incorporated into the system.
    - b. The network manager terminal shall allow authorized personnel to assign individual and/or talkgroup priority levels to all field units.

- c. The signaling protocol shall be structured so that access to the system will be in accordance with the level of priority involved.
  - d. Dispatch consoles shall be capable of temporarily elevating the operational priority of a talkgroup to facilitate channel assignments in critical situations.
  - e. Respondents shall provide information in their proposal explaining how the voice and emergency call features have priority over data-messaging traffic.
  - f. Emergency Priority
    - 1) All public safety and other identified subscriber units in the system will have a preemptive "emergency" capability.
      - a) Within 500 milliseconds of activation of the emergency button, the field unit's ID must be displayed at the dispatch terminal and other talkgroup units and an audible alert shall also be activated.
      - b) A channel shall be immediately assigned to handle the emergency communications regardless of system loading condition.
      - c) Respondents shall detail the exact method of obtaining an emergency channel during system busy times and explain how queuing of an emergency message is averted.
      - d) Respondents shall describe in detail the function of the emergency button when a subscriber unit is using a talkaround or fireground channel.
5. Queuing of Request for Voice Channel
- a. When all available talking channels are assigned, the second and lower precedence level requests for a talking channel will be placed in a queue according to the priority levels involved. The queue will cause the system to assign talking channels (as they become available) on a priority level basis. If multiple talkgroups with the same priority are in the queue, they will be assigned a channel on a first-in, first-out (FIFO) basis.
  - b. The queuing protocol shall process and assign channels to requesting units that have been involved in recent conversations before processing and assigning channels to units not involved in any recent conversations (assuming both talkgroups have equal priorities). The desired result is to keep current conversations from becoming fragmented by any delays that might be caused by a new user request for a channel.
6. Busy Queuing Callback
- a. The system shall provide a callback feature when any unit is placed into a system busy queue. The unit requesting the channel must be notified automatically by the system when the system assigns the unit a channel. The system will cause the field unit to emit an audible alert, specific for callback, and the unit shall automatically access the assigned channel.
  - b. The channel shall be reserved for a short period of time to allow the requesting unit's user to activate the PTT switch and broadcast the message. The selected talkgroup members will automatically be assigned

to the talking channel so they will hear the voice message and can reply as necessary.

K. Unit ID

1. Each unit will send its unique discrete address identification to the system each time the unit transmits regardless of whether the system is operating in the message trunking mode or transmission trunking mode.

L. Selective Alerting

1. The system shall provide a means for selectively alerting one unit from another unit or from a dispatch location (for field units equipped with the selective alerting feature).
2. Selected field units shall be capable of viewing the sending party's unit ID or alias during this mode of communication.

M. System Database Update:

1. Whenever a field unit is turned on (with this system selected), and the unit is within range of the system, the unit's discrete address and talkgroup affiliation shall be transmitted to and recorded into the system database.
2. Whenever a field unit is on, this trunked system is selected, and is in range of the system, any change of talkgroup affiliation for the field unit will automatically update the system database with the unit's ID (discrete data signaling address) and current talkgroup affiliation. This will allow authorized personnel to have up-to-date information on which talkgroup any radio is currently selected.

N. Continuous Talkgroup Affiliation Notification

1. The system shall provide for continuous talkgroup affiliation updates. The system shall broadcast a continuous update of the talkgroup channel assignments to field units. The field units shall monitor this signaling. Those units that become activated during a conversation, or those which leave the system coverage and return, will use this process to immediately affiliate with their proper talkgroup conversation.

O. Out of Range Indication:

1. Whenever a field unit leaves the coverage area of the signaling channel or is otherwise unable to receive the signaling channel a unique audible alert shall be sounded when it attempts to access the system (PTT).
2. This alert shall have a different "sound" than any other audible alert capable of being generated by the field unit.

P. Individual Unit Disable

1. Hardware and software must be included in the system that allows a dispatcher, using a system management terminal, to selectively disable any field unit(s) currently operational on the system. The disabling of a field unit must prevent the unit from monitoring any voice communications on any channel or talkgroup in the system. A disabled unit must not be able to transmit or otherwise join into any voice conversation on the system. The disabling function must occur while the field unit is on the system anywhere within RF coverage.

2. The system must have the capability to automatically search multiple times for the unit to be disabled if so requested by the dispatcher. The terminal must indicate to the dispatcher when the unit is disabled. The field unit and system must "handshake" so that the system will have a positive indication of success. This process must be able to take place even if the dispatch console or network manager terminal is inoperative.
3. The enable/disable control operation should not require the use of any talking channel. All Respondents shall describe what resources (i.e., control channel, working channel, etc.) are required for the unit disable feature to be implemented.
4. A disabled unit can only be re-enabled by authorized personnel. If for any reason the trunked system is shutdown or disabled, any disabled units must stay disabled. If the unit is not on the system at the time the disabling function is initially invoked, the system must have the ability to capture the unit when it comes into the system. When the target unit accesses the system, the system must have the capability to automatically disable the unit. Respondents are to describe this process in detail.
5. The system must have the ability to enable a disabled unit by request of the dispatcher using an appropriately configured console. The system must have the ability to search for a turned on, disabled unit in the system. When the system finds the unit, it will re-enable the unit, give an indication to the dispatchers, and log the reactivation.

Q. Wide Area Talkgroup Scan

1. A multiple site network talkgroup scan feature must be available in specified radios. This scan feature must allow the user to listen to any talkgroup that is using the same site as the user, and is in the user's scan list.
2. It is not required to allow a user to listen to talkgroups that are not assigned at the site in question due to traffic loading considerations.
3. The ability to become a member of an active talkgroup, even though a user is listening to another talkgroup, shall be supported. This switching is to be made to predetermined higher priority talkgroups only. Each radio shall be capable of handling a higher priority talkgroup, not including the talkgroup the user has selected.

## 2.8 PROPRIETARY FEATURES

- A. The City is interested in using features described in this section when available under P25 standards. It is understood Respondents may not currently offer these features because they are not standardized. Respondents should provide their best estimates when/if these features shall be supported in the future on their proposed system. If the features below are available now using only that Respondent's user equipment (that is they are proprietary to the Respondent and their equipment), the Respondent's may propose those features and provide information (including budgetary costs and schedule for implementation) on policies in place for meeting the P25 standards for their current proprietary features.
- B. Other Features - OPTIONAL
1. Respondents may provide full details of any other specific features that are offered in their systems which the City may desire to take advantage. Where

such options are provided at additional cost, Respondents shall provide these costs as optional additions to their response.

2. Two optional features include AES encryption and GPS mapping integration.

## 2.9 TRUNKED RADIO SITE REQUIREMENTS

### A. Basic Trunked Network Configuration

1. The City is seeking to secure licensing for six 800 MHz channels.
2. Each transmitter and receiver will be capable of operating independently of, and simultaneously with, any or all of the others assigned to the system.
3. Repeaters shall be of modular design and consist of a transmitter, receiver, power supply, and all related control and signaling circuitry.
4. Repeaters shall employ frequency-synthesized transmitters and receivers such that any repeater can be programmed for any channel. Base stations using crystal controlled or discrete channel elements are not acceptable.
5. Repeaters shall be under the control of the system controller. All interface circuitry and cables will be provided.
6. The quantity of base stations required will depend upon the coverage design and number of sites required.
7. Final system layout will be coordinated with the City.

- B. The equipment offered will be capable of meeting full specifications when operating in the general vicinity of FM and TV transmitters and vehicular mobile UHF/VHF/800 transmitters.

## 2.10 SYSTEM RELIABILITY, AVAILABILITY, AND BACKUP

- A. The network system will support a large number of users based on the subscriber counts in Section 4.d. The system being proposed shall have adequate reliability mechanisms included in its design and shall be very reliable.
- B. No Single Point of Failure. The system must continue to operate with all specified features if any single system controller device fails.
  1. The City requires that for any design requiring central controller equipment, main equipment shall be redundant to avoid any single point of failure.
  2. The network control processor must be of a fault-tolerant design. This shall prevent a single point failure from reducing the call processing capabilities of the system.
- C. Cold standby, redundant multiple-site network processors are unacceptable.
- D. When a hardware failure occurs, backup hardware must be automatically and instantaneously activated to prevent loss of any call processing capability or feature.
- E. The failure of a critical sub-system shall trigger software and/or contact closure notification to a system administrator.
- F. Voice communication channels between the network system central site and the remote radio sites are required. Such communications transport can be achieved by various means. The multiple site network must be able to accommodate these different transport methods.

- G. Proposed system's network control processor shall have the capability to "down" a failed site and allow the remaining sites to operate in a multiple-site network environment.
- H. Proposed system's network control processor shall be capable of supporting alternate end-to-end path configurations.
- I. The remote radio site controller shall allow continued trunking operation in the event of a link failure. In dual controller, [a redundant (standby) configuration], equipped sites, a failure of the first controller must not stop trunking at the site. In the event of a failure in the second controller, the remote radio site shall operate in a reduced-capability mode.

## 2.11 CONVENTIONAL REQUIREMENTS

- A. One 800 MHz repeater site shall also include conventional base stations to provide the best VHF portable radio coverage for mutual aid responders.
- B. The City anticipates each of these conventional channels to be prone to high noise environments. The Respondent shall detail how their proposed system will alleviate any concerns with outside agencies using analog conventional channels as the City's agencies will be listening to those channels on assigned talkgroups on the digital system.
- C. Respondent will provide VHF High Band conventional base stations operating on the following frequencies. The overall goal of the City is to create repeated pairs for all channels. Additional frequencies will be needed to support this scenario and a final plan shall be developed by the critical design review with the selected Respondent and City.
  - 1. VHF High Band (5 bases for interoperability)
    - a. VHF FD-1 – Fire and Tone & Voice Paging
      - 1) TX 158.9250 MHz, RX 156.0000 MHz
    - b. VHF FD-2 – Fire Simplex Tactical
      - 1) TX/RX 154.4150 MHz
    - c. VHF FD-3 – Fire Simplex Tactical
      - 1) TX/RX 154.2500 MHz
    - d. VHF PD-1 – Police Simplex Tactical
      - 1) TX 159.2100 MHz, RX 155.9100 MHz
    - e. City TAC – City wide Tactical
      - 1) TX/RX Not Defined Yet
  - 2. VHF High Band (2 bases for non-public safety users)
    - a. PW Dispatch – Public Works
      - 1) TX/RX 159.6500 MHz
    - b. Schools – School District
      - 1) TX/RX Not Defined Yet
- D. Respondent shall provide interoperability gateways to interface the interoperability channels to the trunked system.

- E. The Interoperability channels will be mapped to trunked talk groups by the system and at the dispatch consoles.

## 2.12 FIXED END TRUNKED RADIO SYSTEM EQUIPMENT

### A. System and Site Controllers

#### 1. General Requirements

- a. The Respondent shall describe in the response to this RFP the manner in which the proposed system and site controller functions and operates.
- b. The system and site controller shall perform all functions and control activities necessary to completely control the trunked radio system. The Respondent shall provide a redundant or distributed processing system and site controllers.
- c. The City plans that system control equipment be located at the Timbrook Public Safety Building.
  - 1) Successful respondent shall assess the existing equipment room HVAC capacity and shall provide additional HVAC capacity to provide sufficient cooling for the equipment room and the adjacent server room.
  - 2) Successful respondent shall assess the existing equipment room power capacities and shall provide additional power capacity to for the equipment
  - 3) Services provided in sections one and two above will require coordination with the City who is a willing and cooperative participant.
- d. This shall include all of the necessary hardware and software for overall monitoring and control of the trunked radio system. The controllers shall fully support all functions described in the functional requirements section of this RFP; including automatic RF channel assignment in accordance with priorities, call queuing, late entry assignment, recent user priority option, and logging system activity.
- e. The controllers shall be capable of controlling all voice and control channels in a trunked, multi-site system. The controllers shall have sufficient processing capacity and memory to fully support these functions during system overload conditions. The controllers shall fully support P25 features, and performance objectives, including the common air interface (CAI), and trunking procedures.
- f. Voice signals from the dispatch console shall be processed and routed via the backbone transmission system to the selected repeaters. All dispatch consoles shall be based on a decentralized architecture to assure minimal points of failure. The controllers shall process and execute requests for service from field radio units, RF control stations and dispatch positions. Channel assignment shall be automatic and user-transparent. The controllers shall recognize group, subgroup, and unit ID, organization, and shall direct messages accordingly.
- g. The system controller and other elements of the trunked radio system shall correctly assign an RF channel within 500 milliseconds of the receipt of the

initial request for service, assuming an available RF channel and loading at full-system design capacity.

- h. The system controller shall interface with the system manager, console system, logging recorders, and site controllers to monitor system and equipment parameters.
  - i. The controllers shall be capable of detecting the failure of any repeater or other system element and taking the appropriate corrective action to maintain system trunking. The site controllers shall be capable of supporting successive fallback modes to maintain trunking to the extent practical before reverting to conventional repeater operation.
  - j. The controllers shall be capable of removing a single site from a multi-site system, upon failure of the site, without the effected site reverting to a fallback operation. Any equipment failure or out-of-tolerance condition must immediately be reported to the system manager terminal for subsequent analysis and resolution.
2. Simulcast Equipment
- a. The entire 800 MHz system is of simulcast design.
  - b. The Respondent shall provide all necessary simulcast components and signal processing elements that are required to optimize transmission quality in coverage overlap areas. The system design shall minimize the potential for simulcast distortion by using a GPS-disciplined, high-stability, precision frequency source at each transmitter location to assure that each of the simulcast transmitters operate at precisely the correct frequency. Intelligent digital channel bank equipment, in conjunction with GPS-directed digital audio delay buffers, shall be used to automatically maintain the modulating signal amplitude and phase at each simulcast transmitter site. Non-captured overlap areas with delay spreads in excess of those required to meet the DAQ objective shall be minimized inside the service area.
  - c. The simulcast trunked system shall not require constant manual alignment to maintain the specified system level performance. The simulcast equipment, including the transmitters, timing elements, intelligent channel banks, and other system components shall be designed to support long-term stability and maintainability. The trunked simulcast system shall operate without the need for frequent manual optimization. All alignment and adjustments shall be automated where possible, (i.e. signal conditioning adjustments for channel banks, signal launch times at sites, etc).
3. RECEIVER VOTING
- a. The receiver voting equipment shall monitor all receivers in a simulcast cell or multiple sites and select the best signal for processing and re-broadcast through the network.
  - b. Receiver voting equipment shall meet the following minimum requirements:
    - 1) Voter shall have audio processing capability for digital signals for all configurations of conventional, trunking, multiple sites and simulcast configurations.

## 2.13 TRUNKED LOGGING RECORDER

- A. The Respondent shall propose an upgrade to the existing NICE digital voice logging recorder capable of capturing radio voice conversations as they occur without requiring recombination of the individual voice segments.

## 2.14 NETWORK MANAGEMENT SUBSYSTEM

## A. Network Management Subsystem Requirements

1. Provide at least two levels of administrative access for managing functions and features.
  - a. The first level is the multiple site network administrators who assure the system stays operational and sets the parameters for the system's operation.
  - b. The second level is the multiple site network dispatcher or radio user supervisors.
2. Provide secured access via a multiple level password scheme.
3. Respondents shall provide descriptions of the full capability of the multiple-site network management packages and indicate which are included in the base price.
4. Networking interfaces shall use TCP/IP (or Ethernet) protocols.
5. The network management sub-system must support at least one computer terminal with the capability to expand without modification to the computer network.
6. This system shall include printers to print alarms and customizable reports.

## B. Network Manager Features

1. The network manager subsystem shall allow authorized operators to perform the following radio network configuration and control tasks:
  - a. Add/delete field units permitted to access the system
  - b. Assign alias names to augment numeric ID of units
  - c. On/off control of individual repeater channel
  - d. Adjust system-timing parameters
  - e. Report channel activity/status
  - f. On/off control of individual telephone interconnect
  - g. Report airtime and telephone interconnect usage by unit, talkgroup, or organization
  - h. Display alarm status
  - i. Configure emergency call parameters
  - j. Modify priority level assignments of units, talkgroups or both
  - k. Query and report dispatch interconnect call-loading information for each 15-minute period, for the previous seven days (minimum) of operation
  - l. Display in real-time the unit ID and talkgroup affiliation

- m. Display unit ID and annunciate "emergency" activation.
- n. Disable an individual unit
- o. Selectively call one or more field units
- p. Provide status/message displays
- q. Backup the radio subscriber databases

C. Report Requirements

- 1. Provide the following traffic reports:
  - a. Airtime summary report that lists, by talkgroup or unit ID, the number of calls and the amount of airtime used
  - b. Transaction summary that lists, by call type, the talkgroup or unit id
- 2. Provide the following system configuration reports:
  - a. User Access Control Report. List by user identification number, the types of calls the user can initiate and which sites they may use. A desired feature is the ability to record affiliations of radios even though they might be denied service at the specific site.
  - b. Talkgroup/fleet map report
- 3. Database reports that are customizable through a report writer package
- 4. Ability to print standard summation reports on system usage
- 5. Display of status of a particular radio, including unit ID, last talkgroup selected. Whether it was disabled or regrouped.
- 6. Provide customizable system usage reports for the City's immediate use.
- 7. Provide data export of report information in a format for use in Excel, Access or other standard PC applications.

D. Network Manager Equipment

- 1. Local and remote terminals shall be supported. The City anticipates the need for one network management terminal located at the Timbrook Public Safety Building.

2.15 SYSTEM ALARMS AND CONTROL

- A. An alarm subsystem shall be provided.
- B. A remote alarm indication subsystem must be provided to capture diagnostic and alarm reports as well as summarizing traffic operations.
- C. 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. Digital Microwave System
  - 3. Local and remote site facilities
  - 4. Primary and backup power systems

- D. All components shall be properly grounded and installed with surge protection per standard industry practice and manufacturer's standards.
- E. The alarm and control shall meet the following general requirements:
  - 1. Hardware and software platform shall be PC based using current versions of hardware and software.
  - 2. Provide instantaneous and comprehensive network status information on both graphic and tabular displays
  - 3. Provide full archiving and control functions
  - 4. Mediate multiple alarm protocols for higher lever network management systems
  - 5. Designed to monitor a large cross section of equipment so that it can consolidate multiple alarm systems rather than just poll alarms manufacturer's RTUs.
  - 6. Report alarms to managers and other interrogators
  - 7. Perform full management functions with a local terminal
  - 8. Provide email notification of alarms
  - 9. Provide alarm filtration and consolidation
- F. Work Stations provided:
  - 1. Local work station(s)
    - a. One local workstation shall be provided and installed at the Timbrook Public Safety Building.
    - b. If the alarm and control workstation can be combined into the network management work station it shall be permitted.
- G. Standard Features:
  - 1. Tabular Screen Based Monitoring Operation- shall provide 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 Screen Operation- shall provide for the 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. 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

4. Control Points- the following relay control types shall be supported:
  - a. Direct control
  - b. Select before operate
  - c. Batch – control multiple relay with a single operation
5. Analog points - display the value of a telemetered quantity such as temperature, fuel level, VSWR, etc
6. Time stamp indicating date and time of message within 0.5 seconds
7. Alarm qualification- on a point basis, programmable delay before alarm is issued
8. Alarm de-activation – on a point basis, the ability for the operator to de-activate an alarm to inhibit additional annunciation.
9. Alarm history
10. Email support- text message of alarm sent to email lists
11. Ping interrogator – to confirm that servers, routers, and IP based equipment are physically present on the network.
12. Editor providing point configuration utilities to create and edit point databases.
13. Security – Multiple levels of user name and password protection to all for flexible system management
14. Provide primary dedicated and dial-up back-up master to remote communication channels.
15. Provide detection of loss of connectivity with the alarm sensor.

#### 2.16 SITE ACQUISITION

- A. Respondent shall be responsible for identifying any additional sites needed, contacting site owner and working with the City to determine feasibility of purchase or lease of site or sufficient space.
- B. Negotiation of site purchase or lease shall be the responsibility of the City.
- C. Leased or private City-owned and non-City-owned remote sites will be considered.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Respondent shall provide the following:
1. Materials and Labor
    - a. The Respondent 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 the specifications and drawings. Workmanship and materials shall be of good quality suitable for the purpose of the new system. The Respondent shall, if required, furnish satisfactory evidence as to the kind and quality of materials. All work not conforming shall be considered defective.
    - b. All materials furnished and work completed shall be subject to inspection by the City's engineer. Such inspection shall not relieve the selected Respondent from supplying the best materials and laboring strict accordance with the specification. Notwithstanding such inspection, the selected Respondent will be held responsible for the acceptability of the work and furnished materials.
    - c. The City requires that installation occur in a timely fashion and in accordance with the project schedule mutually agreed between the City and selected Respondent.
    - d. The work will be performed by qualified individuals specifically trained on the systems they are implementing. All work will be done in a workmanship-like manner. The assurance of the quality of the work is the responsibility of the selected Respondent. The selected Respondent shall, if requested by the City, remove from the project any worker who the City determines to be incompetent or undesirable.
    - e. Respondent shall provide implementing procedures written in layman's terms for infrequently used features or procedures.
  2. Project Management
  3. System Design
  4. Equipment Engineering
  5. Factory Assembly and Test
  6. Equipment (Radio and Ancillary Equipment)
- B. Installation and testing (field radio equipment) in accordance with manufacturer's installation best practices and procedures.
- C. Installation and testing (field antennas) in accordance with manufacturer's installation best practices and procedures.

D. Training

1. The selected Respondent shall develop and conduct professionally prepared training programs to allow City's operating personnel to become knowledgeable with the system and the operation of their individual equipment.
2. The training shall be scheduled to allow sufficient time for all participants from all shifts to be trained. The selected Respondent shall provide a preliminary training schedule for review and approval by the City.

3.2 ACCEPTANCE CRITERIA

- A. Written acknowledgment by authorized representatives of the City and the engineer that all system acceptance test plan criteria, as specified, have been met.

3.3 FLEET MAP PLANNING AND PROGRAMMING

- A. Selected Respondent shall provide fleet mapping and programming plans for user equipment.
- B. The selected Respondent shall work with the City's project team to create the plan.
- C. Selected Respondent shall meet with the City's project team and users to provide a complete understanding of what information must be gathered, the limitations of equipment, the nominal settings of parameters, and a structured methodology for gathering this information.
- D. The selected Respondent shall be available to consult with City's personnel and to meet with users during the information gathering process.
- E. All computer-based programming tools must be provided to the City to assist in the accurate compilation of information. These tools must be included in the price of the system.
- F. Once the requirements are gathered, the selected Respondent and City must hold a "paper" programming review session. At the end of this session, the selected Respondent will be given all identified programming requirements for the staging area functional demonstration.
- G. The selected Respondent will provide at the staging area demonstration a small sample of radio units representing the City's gathered needs. When the demonstration is completed to the City's satisfaction, which will be stated in the form of a letter written to selected Respondent, the selected Respondent may commence programming and installing radio units in accordance with the pre-approved schedule. Selected Respondent assumes risk for any programming of mobiles prior to formal notice to proceed subsequent to demonstration.
- H. Costs relating to any other programming errors, omissions or product defects preventing the completion of the predetermined programming needs will be borne by the selected Respondent.

**END OF SECTION**

## **SECTION 4.c – OPTION B – RADIO DISPATCH CONSOLE SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section provides specifications and requirements for a digital dispatch radio console system using LCD graphic monitors for access and control of the new 800 MHz P25 digital simulcast trunked radio system, hybrid VHF conventional channels, interoperable VHF base stations, control station radio equipment, and paging.
- B. Respondent shall provide fully integrated, graphic based dispatch consoles at the following locations:
  - 1. Four positions at Timbrook Public Safety Building
    - a. All positions to be configured for regular dispatch operations
- C. The Respondent must include all necessary cabling and interfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Respondents: Subject to compliance with requirements, this section is open to all radio dispatch console manufacturers and integrators offering products that meet or exceed specifications in the following sections.

### 2.2 GENERAL REQUIREMENTS AND FEATURES

A. Radio Dispatch Console System (RDCS)

1. The RDCS system shall be fully modular and based on a configuration which supports a large number of local operator positions.
2. The RDCS system shall be comprised of one or more units of **LCD** graphic operator position equipment (OPE) and master control equipment (MCE).
3. The RDCS shall be capable of alert tone paging using pre-programmed screen "buttons" representing the various resources for which the City provides dispatch services. The RDCS shall be capable of stacking multiple resources tones to permit sequential paging of a large number of tones in a single dispatch operation. The RDCS must be capable of transmitting these tones on any channel selected on the console. This paging plan is dynamic and the Respondent will be responsible for ensuring the most current version is used for any necessary engineering or configuration.
4. The RDCS shall be able to monitor and transmit on all proposed and existing conventional repeaters, base stations, trunking systems and receivers.
5. RDCS system shall be designed for high reliability with no single points of failure. Any RDCS position shall be capable to back-up any other position with full features and functions.
6. New features and screen configurations shall be supported through software programming and not reconfiguration of hardware.
7. Capability to program, store, retrieve, and edit multiple, custom operator screens and configurations for each operator position shall be provided.
8. Operator screen configurations and alias database shall be stored on a centrally located server. All operator positions shall be linked in a LAN configuration, which allows the supervisors or system administrators to access and update all positions from the central location.

B. Operator Position Equipment (OPE)

1. OPE (Operator Position Equipment) shall be designed to be placed on modular workstation furniture, not part of this contract. Built in RDCS bays will not be used.
2. The OPE shall be of an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.
3. All connectivity and any special considerations needed to accommodate remote operator positions shall be detailed in the response.

4. To minimize operator confusion and the chance of mistakes being made, operators shall be able to perform all functions by looking only at the **LCD** screen of the RDCS. They will not be required to look away from the screen to a separate screen interface in order to perform a function.
5. The screen display shall be designed so that the number of items that will appear on the screen at one time shall be minimized, reducing the potential distractions to operators. However, all radio dispatch functions shall be operable from one screen display. Operators shall not be required to access another screen display in order to perform a radio dispatch function.
6. The screen display shall be very flexible, allowing authorized personnel to determine which functions are available at each operator position, which channels/talkgroups are available at each operator position, how these channels/talkgroups appear on the screen, and the names associated with channels, talkgroups, channel options, auxiliary outputs and auxiliary indicators.
7. OPE shall be capable of being configured, on a unit basis, for either single or dual headset operation for radio and telephony functions.

### 2.3 CONVENTIONAL RADIO REQUIREMENTS

- A. The RDCS shall be equipped with an instant transmit switch for each conventional base station, repeater station, paging base station or control station.
- B. A control/indicator shall be provided to select the desired transmit and/or receive frequency via DC or Tone remote control on all proposed and existing conventional repeaters and/or base stations.
- C. The RDCS shall be able to monitor and transmit on all proposed and all existing conventional repeaters, base stations, and receivers. A call indicator shall be provided for each conventional repeater controlled from the RDCS. If the channel is selected, the call indicator shall flash when audio is present.
- D. A control/indicator shall be provided to disable/enable the base station/repeater in-cabinet repeat capability via DC or Tone remote control on all proposed and existing conventional repeaters and/or base stations.
- E. A control/indicator shall be provided which allows receive audio from a duplex base station or a voting comparator to be re-transmitted under operator control through the RDCS.
- F. The RDCS shall have the capability to select multiple simulcast channels and/or conventional repeaters or base stations in order to transmit to more than one group of field radios.
- G. The RDCS shall have the capability to patch two or more conventional repeaters and/or base stations together so users may communicate directly.
- H. Respondent shall indicate the maximum number of simultaneous patches supported by
  1. Each dispatch position
  2. The entire RDCS
    - a. as initially specified in this RFP and
    - b. with the expanded capacity specified in this RFP.

- I. When a mobile or portable unit initiates an emergency alert, the RDCS shall provide an audible alert and display the ID of the calling unit.
- J. A display graphic shall be provided for the control and status of a receiver voting system. If used, the display graphic shall be available at each OPE.
- K. The RDCS shall be able to acoustically cross mute channels on an operator-by-operator basis in order to eliminate acoustic feedback between operators.
- L. It shall be possible to temporarily mute unselected channels. The unselected audio will un-mute automatically after a 60 sec programmable preset time. Mute shall be 20 dB minimum.
- M. The capability to converse on the telephone using the same operator headset that is used for radio conversations shall be provided. A third auxiliary output shall be available for use in either a PA or intercom system. The telephone audio shall be provided on a separate instant recall recorder output, mixed, and balanced with the operator microphone audio.
- N. Separate volume controls shall be provided to control radio volume and telephone volume to the headsets.
- O. An Alert Tone function shall be provided on screen that places a tone burst onto the selected resource(s) when pressed. The Alert Tone function shall support single tone, warble tone, and pulsed tone as a minimum.
- P. The RDCS shall support interfaces to auxiliary switches and indicators for controlling external devices from the RDCS.

#### 2.4 TRUNKED RADIO REQUIREMENTS

- A. The RDCS shall be compatible with the trunked radio system.
- B. The RDCS shall directly interface with single and multi site trunked system controllers and shall allow interoperability between trunked and non-trunked channels in the system.
- C. The RDCS shall be able to monitor and transmit on all proposed and existing trunked systems.
- D. The RDCS shall be equipped with an instant transmit switch for each talkgroup.
- E. In a trunked system with radio IDs, the PTT ID of the unit calling will appear in addition to a Call indicator. After the call is completed, the unit PTT ID will remain displayed until another call is received.
- F. In order to enhance dispatcher effectiveness in a PTT ID system, the various display modes available shall interact as follows:
  - 1. An operator shall be capable of setting up (and subsequently knocking down) an emergency call from the RDCS position.
  - 2. Capability shall be provided to allow private communication between a RDCS operator and a radio user. Once the operator is involved in a private call on a specific resource, it shall not receive audio from another radio attempting to call on that same resource.
  - 3. Capability shall be provided which assigns priority to associated talk groups. The dispatcher shall have the choice between normal preset priority and tactical priority, with tactical being the second highest priority for a talkgroup in a system.

- G. It shall be possible to temporarily mute unselected talkgroups. The unselected audio will un-mute automatically after a programmable preset time. Mute shall be 20 dB minimum.
- H. The RDCS shall have the capability to patch two or more talkgroups together so users may communicate directly.
- I. If the dispatcher attempts to make a call on a trunked radio system connected to the RDCS and all trunked channels are busy, a visual and audible alert will be initiated at the RDCS.

## 2.5 INSTANT RECALL RECORDER

- A. The RDCS shall be capable of two-channel instant recall providing a minimum of four (4) minutes of instant recall recording per channel. A method of controlling an instant recall recorder shall be provided on the screen.

## 2.6 OPERATOR POSITION EQUIPMENT (OPE)

### A. General

#### 1. Description

- a. All equipment supplied for use by the operators of the RDCS shall be constructed of high-quality, durable materials that will stand up to the 24-hour use environment of a dispatch center. Consumer-grade equipment shall not be acceptable to meet the requirements outlined in this document.
- b. Final operator position configuration shall be coordinated with City.

### B. Display

#### 1. Description

- a. **Flat Panel LCD** monitors shall be provided.

#### 2. Minimum technical specifications

- a. **20"** wide screen format LCD monitors Dell Professional P2210 PLHD 22" wide screen monitor or equivalent.
- b. Super VGA 1680 x 1050 resolution or better.

### C. Keyboard, mouse

#### 1. Description

- a. The OPE shall be equipped with a standard 101-key keyboard
- b. The operator shall execute functions and operations by positioning a screen pointer (cursor) on the screen and pressing one of two buttons located on the mouse. The mouse shall be available in both left and right handed versions to accommodate operator preferences. The mouse will have a scrolling wheel to aid in screen movements.

### D. Microphone

#### 1. Description

- a. Standard - A high quality cardioid pattern gooseneck microphone having a uniform frequency response and a minimum front-to-back discrimination of

15 dB shall be provided on an 24-inch flexible arm at each operator position.

- b. Microphone shall be flexible to permit wide diversity for operator positioning, but shall also be self-supporting and remain in the position assigned by the operator without sagging under its own weight.

#### E. Headset Operation

##### 1. Description

- a. Wireless headsets suitable for the application shall be proposed for all positions. Wireless headsets shall be proposed with adequate charging bases and spare batteries to permit continuous use in a 24/7 environment.
- b. Two headset jacks shall be provided at each operator position which allows the operator to hear select audio via a headset and to allow the operator to respond via a microphone attached to the headset. This jack shall be compatible with either 4 or 6 wire headsets. Inserting the headset plug into the headset jack shall automatically disconnect the RDCS microphone and select speaker and disable the acoustic feedback cross-muting features.
- c. Trainer or supervisor shall be able to use the second headset jack to monitor transmissions at any user position without degradation of audio quality.
- d. Each headset jack box shall be equipped with a cable which connects the jack box to the RDCS. The length of this cable shall allow the jack box to be mounted in a logical location at the time of installation. The cable shall be long enough to provide the proper cable dressing upon installation.
- e. The capability to converse on the telephone using the same operator headset that is used for radio conversations shall be provided at each operator position. Connection to the telephone equipment shall be provided. Registered couplers shall be provided if required. The telephone audio shall be provided on a separate instant recall recorder output.

##### 2. Headset Equipment – OPTION

- a. Wired headsets suitable for the application shall be proposed as an OPTION.

#### F. Footswitch

##### 1. Description

- a. A footswitch shall be provided to permit the RDCS operator to key the selected talkgroup or to disable the coded squelch within the base station without the use of hands.

#### G. Audio unit

##### 1. Description

- a. The desktop audio panel shall include a minimum of select and unselect speakers, system control buttons, audio level controls, and a VU meter

##### 2. Technical specifications

- a. Operator position audio unit shall include:

- 1) Speakers for monitoring select and unselect channels. Speaker outputs shall be rated at 1 Watt minimum at no more than 3 percent THD.
- 2) Individual volume controls for each speaker.
- 3) VU meter.
- 4) General transmit switch or bar.
- 5) Capabilities to connect at least two OPTIONAL monitor speakers.

#### H. Speakers

1. Each operator shall be equipped with a minimum of one select speaker and one unselect speaker.
2. All speakers shall be assignable. Any speaker shall be capable of being assigned to be used as a select, unselect, monitor, or dedicated speaker.

#### I. Personal Computer Equipment

##### 1. Description

- a. Operator position system processor units shall be based on present state of the art Personal Computer (PC) technology and meet the following minimum requirements. In the event that enhanced technology, exceeding the specifications below, is available for the same cost, the City reserves the right to require the latest technology be supplied.

- 1) Use of standard hardware for workstation.
- 2) Use **LCD** monitor and mouse, keyboard for operator control.
- 3) Provide Graphical User Interface (GUI) using Microsoft Windows.
- 4) Use Ethernet LAN client-server architecture for network access to RDCS configuration and operating information.
- 5) Support multiple, concurrent, screen windows within the same or different applications.

2. PC computers and workstations proposed and supplied shall be the latest standard models in current production, fully configured for the intended use. RAM shall be configured to maximize the amount of available RAM in the minimum number of memory slots to permit easy expansion if desired.

3. It is anticipated that some PC models and configurations may change during the time between proposal and implementation, therefore:

- 1) Equipment to be supplied, including models and the final hardware and software configuration shall be coordinated with, and approved by, the City before delivery will be authorized.
- 2) City will authorize delivery of approved equipment in writing to the Respondent.

## 2.7 MASTER CONTROL EQUIPMENT

### A. General

1. MCE shall contain the base station interfaces and receiver interfaces that are required to control the system.
  2. It shall also contain the required phone patch interfaces, operator interfaces; trunked system interfaces, signaling interfaces, power supplies, reference clock interface and auxiliary input and/or output interfaces.
  3. Either digital or analog switching architectures shall be acceptable under this specification provided that hum, noise, and cross-talk are at least 45 dB below the desired audio at full output.
- B. Racks
1. The MCE shall be installed in one or more open rack(s) measuring 84"H x 21"W.
- C. Power Supply
1. Description
    - a. A continuous duty power supply shall be provided for furnishing regulated low voltage to the MCE package. The regulator circuit shall incorporate an electronic circuit to protect RDCS equipment from excessive voltage should a malfunction occur. No human intervention shall be required. Short circuit current limiting shall be provided on each regulator circuit to protect the regulator circuit from accidental shorts and thereby prevent nuisance fuse blowing.
    - b. Redundant power supplies shall be available in a hot standby mode such that, if one supply fails, its redundant backup shall take over.
    - c. Charging of and transfer to backup batteries shall be provided.
    - d. MCE shall use UPS or battery to provide a minimum of 5 minutes backup at full load.
    - e. position to the MCE without intrinsic limitations on distance.
- D. Conventional Base Station Interface
1. Description
    - a. Each conventional base station interface shall incorporate all circuitry required to operate a remotely controlled base station. The conventional base station interface shall be capable of controlling base stations using industry standard tone remote control, DC remote control and E & M control.
    - b. Six input-output functions shall be provided as needed on each module. The identity of these functions shall be established by settings at the operator positions. Undefined I/O functions shall remain available for future use. If defined as an output function, a relay shall be provided to switch the load. If defined as an input, a buffer shall be provided to isolate the RDCS from transients.
- E. Trunked Base Station Interface
1. Description

- a. Each trunked base station interface shall incorporate the circuitry required to operate a remotely controlled single transmitter, single receiver trunked repeater.
  - b. The trunked base station interface shall accept data from the system trunking controller. This data shall consist of current talkgroup and repeater assignments. Using this data, the RDCS trunking module shall update the RDCS talkgroup control indicators.
  - c. Six input-output functions shall be provided as needed on each module. The identity of these functions shall be established by settings at the operator positions. Undefined I/O functions shall remain available for future use. If defined as an output function, a relay shall be provided to switch the load. If defined as an input, a buffer shall be provided to isolate the RDCS from transients.
- F. Voting Receiver Interface
1. Description
    - a. The RDCS voting interface shall accept status inputs from a comparator and provide control lines to a comparator. Using the proper RDCS controls, the operator shall be able to monitor the comparator's activity and force selection to a different site.
- G. Time Sync Input
1. Description
    - a. The RDCS shall support clock synchronization

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. All work shall be coordinated with the City for minimum downtime on the existing console system.

**END OF SECTION**

**SECTION 4.d – OPTION B – NON-FIXED USER RADIO EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This specification describes portable, mobile, and control station equipment and is intended for Public Safety and Non Public Safety applications.
- B. Non-fixed radio equipment shall be proposed for conventional and trunked radio channels in the 800 MHz band.
- C. Reprogramming of existing radios that will operate on the VHF narrowband conventional channels.
- D. Key attributes of all subscriber equipment are:
  - 1. High quality, durable designs, manufactured to provide high reliability under heavy use in severe environments.
  - 2. Ease of operation, including controls and indicators that enhance user operation in low visibility or high stress situations.
  - 3. Software programmability.
  - 4. Availability of accessories to adapt equipment to different situations.
- E. The scope includes:
  - 1. Procurement, installation, programming, and support for the following
    - a. Portable radios and accessories
    - b. Mobile radios and accessories
    - c. Control station radios and accessories
    - d. Pagers and accessories
  - 2. Acceptance testing
  - 3. Training

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Respondents: Subject to compliance with requirements, this section is open to all non-fixed user equipment manufacturers and integrators offering products that meet or exceed specifications in the following sections.

### 2.2 GENERAL REQUIREMENTS

- A. FCC type accepted and designed in accordance with the requirements of Part 90 of the FCC Rules and the appropriate EIA and related agency specifications.
- B. Equipped with the following modes of operation on any channel, including the following;
  - 1. P25 Phase 1
- C. Support new features through software programming and not reconfiguration of hardware. Software programming shall be conducted at the selected Respondent's local service facility or at an Owner-designated location.
- D. Capable of being programmed to operate on any 800 MHz narrow-band radio channel in the corresponding licensed band of the land mobile spectrum.
- E. Accommodate all channels in that band programmed into the radio without any performance degradation. Talk-around (direct) mode shall also be supported.
- F. Be of an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.

### 2.3 TRUNKED RADIOS

- A. General:
  - 1. Be compatible with the proposed P25 trunked radio network.
  - 2. Programmed to support all applicable talk group calls.
  - 3. Programmed to provide a visible and audible alert when all channels are busy.
  - 4. Equipped with an emergency alert that requires acknowledgement.
- B. Specially equipped subscriber units:
  - 1. Final quantity and talk group assignment to be determined following contract award.
  - 2. Shall be provisioned to receive unit ID or alias name for incoming calls.
  - 3. Shall be provisioned to transmit unit ID or alias name with every PTT.
  - 4. Have the ability to selectively alert another radio and require a response to the alert. The radio receiving the alert shall display the unit ID of the transmitting radio.
- C. Trunked radio models
  - 1. For trunked portable, mobile, and control station radios, at least three different models of subscriber radio equipment shall be offered. The purpose is to provide a range of standard products from which radios can be selected to match

the user needs. All units differ only in features and capabilities such as display, modes, channels, options, etc.

a. Type D1

- 1) Typically identified as the model with no display.
- 2) The purpose of the D1 radio is reliable trunked radio use at the lowest cost.
- 3) Type D1 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide a basic set of features with less channel and/or talkgroup capacity than a D2 or D3 unit.
- 4) D1 units shall meet the specifications as further described in this section and provide the following minimum features:
  - a) P25 radios will operate on other 800 MHz systems outside the bounded coverage areas
  - b) Trunked and/or Conventional Operation
  - c) Receives verification tone when channel has been acquired
  - d) Receives tone to indicate in queue to acquire a channel
  - e) Emergency Alert button sends portable user's identification to the dispatcher with any emergency alert tone or message
  - f) Remote shut-off/radio disable capability
  - g) Selectively disable/enable channels remotely
  - h) Equipped to seamlessly roam from different sites in the network

b. Type D2

- 1) Typically identified as the model with a display and limited keypad.
- 2) Units are typically assigned to personnel who may need to access a large number of channels with an enhanced feature set.
- 3) Type D2 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide an enhanced set of features with less channel and/or talkgroup capacity than a Type D3 unit but more than a Type D1.
- 4) Type D2 units shall meet the specifications of Type D1 units with the following additional features:
  - a) Caller ID display
  - b) Alphanumeric display
  - c) Limited Keypad
  - d) Private or single unit calling
  - e) Noise suppression microphone
  - f) AMBE +2 Vocoder

c. Type D3

- 1) Typically identified as the model with full display and keypad.
- 2) Type D3 subscriber radio equipment shall be analog and digital voice equipped, fully programmable and provide a full set of features with more channel and/or talkgroup capacity than a Type D2 and Type D3 unit.
- 3) Type D3 units shall meet the specifications of a Type D2 unit with the following additional features:

- a) Full Keypad
- 2. Trunked radio quantities
  - a. D1 Portables
    - 1) 0 (model shall still be quoted)
  - b. D2 Portables
    - 1) 177
  - c. D3 Portables
    - 1) 0 (model shall still be quoted)
  - d. D1 Mobiles
    - 1) 108
  - e. D2 Mobiles
    - 1) 125
  - f. D3 Mobiles
    - 1) 0 (model shall still be quoted)
  - g. Control Stations
    - 1) 27

#### 2.4 CONVENTIONAL RADIOS

- A. As part of the 800 MHz trunked and VHF conventional hybrid option, the City has 154 mobile radios that require reprogramming for narrowband and with new proposed VHF conventional channels.
- B. The majority of equipment is a mixture of older Motorola analog only radios.

#### 2.5 PAGER REQUIREMENTS

- A. Features:
  - 1. Respond to all industry standard tone alert formats used by emergency service personnel for tone and voice dispatch.
  - 2. VHF Narrowband tone and voice pagers
  - 3. UL Certified as intrinsically safe for use in hazardous classified locations.
  - 4. Large sturdy knobs suitable for use with gloves.
  - 5. Durable, rugged housing.
  - 6. Meet MIL standard 810 F Procedures II for rain
  - 7. Field programmable function switch
  - 8. Scan
  - 9. Monitor
  - 10. Selective call
  - 11. Tone/vibrate
  - 12. Capable of 2 channel operation

13. Capability to scan both channels for pages while giving priority to pages received to channel 1.
14. Monitor mode feature permitting users to listen to all communication on the selected channel.
15. Be supplied with standard charger, belt clip and batteries

- B. The Respondent shall provide 27 standard pagers (Motorola Minitor V equivalency) for personnel and an additional 5 pagers including desktop battery charger/amplifier with antenna and relay. The 5 additional pagers are for house alert and require installation to activate existing firehouse lights and bells.

## 2.6 EQUIPMENT FEATURES AND ACCESSORIES

### A. Portables

1. Size and construction of unit shall permit one hand operation.
2. Weight, including battery shall not exceed 25 ounces.
3. Rotary control knobs with click stops for selecting the desired channel.
4. Battery:
  - a. Unit shall be supplied with, and operate from, a single self-contained, removable lithium ion battery.
  - b. The battery shall be capable of an operational duty cycle of 5/5/90, for eight hours of continual use.
  - c. Recharge time for the battery shall not exceed one hour.
5. Supplied with a 120 V battery charger with ability to charge radio and a spare battery.
6. Supplied with a flexible 1/2 wave antenna.
7. Options
  - a. Spare battery
  - b. High capacity battery
  - c. Leather carrying case with swivel belt clip and shoulder strap swivel connectors.
  - d. 12V DC charger.
  - e. 120 V Multi-unit/gang bank charger
  - f. 120 V Multi-unit/gang bank charger/battery conditioner/optimizer
  - g. Extra long leather shoulder strap
  - h. Intrinsically safe battery
  - i. 1/4 wave stub antenna
  - j. Lapel speaker microphone
  - k. Lapel speaker microphone with antenna
  - l. Headset

- m. Programming software
  - n. Programming cable
  - o. Encryption
  - p. GPS (either in subscriber or remote speaker mic)
- B. Mobiles
- 1. Mobile radio equipment shall include the following:
    - a. Microphone
    - b. Internal speaker
    - c. External speaker - OPTION
    - d. Cables
    - e. Fusing
    - f. Mounting hardware
    - g. Coax and permanent mount antennas
  - 2. Dash mount radios shall consist of a single unit combining the functions of the control head and main chassis. The control head shall provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.
  - 3. Trunk mount radios shall consist of two to three parts, the control head (s) and the main chassis. The main chassis should be mounted in the trunk, behind the seat, or in another area generally inaccessible to the vehicle operator during normal operation. The control head shall be mounted in the dash area of the vehicle or other location and is remote from the chassis. The control head shall provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.
  - 4. All mounting hardware shall securely attach to the vehicle. The unit shall be equipped with a "key lock" into the housing for added security.
  - 5. Antenna: Nominal mobile antenna gain shall be a minimum of 3 dB and shall be optimized for vehicle function, type, and geographic location. Antenna specifications must be submitted with consideration given to bandwidth range and proposed gain.
  - 6. Options:
    - a. Motorcycle mounting kit
    - b. Dual control head
    - c. Dual Tone Multi-Frequency (DTMF) microphone to allow for encoding capabilities for the operator
    - d. External siren, controllable from the radio control head.
    - e. Programming cable
    - f. Programming software
    - g. Encryption

h. GPS

C. Control stations

1. Shall be prepackaged in an enclosure suitable for desktop positioning in an office environment, configured for 120VAC operation, and have no exposed wiring that presents a shock hazard.
2. Shall be equipped with desktop microphone and external speaker.
3. Control station antennas, connectors and coaxial cable shall be provisioned to comprise a complete operational package. Antennas shall be high quality and all connectors shall be weatherproof. Control station antennas shall be Yagi types, with gain suitable for the application. Control station antennas shall be mounted outdoors on structures approved for the applicable load. In no case shall the control station antenna be located inside of manned buildings or utilize magnetic mount type antennas.
4. The control stations shall be equipped to support a minimum of six remote units using digital remote control technology. The remote units must be able to control frequency and all other control station capabilities.
5. Options:
  - a. Programming software
  - b. Programming cable

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Installation shall include delivery to the site, unloading inside, setting in place, fastening to facility or vehicle, where required, internal wiring and connection of components to the system, programming, testing, and all other work, whether or not expressly required herein which is necessary to result in a complete tested and operating system. This shall include the removal and/or relocation of any existing equipment to allow for the installation of new equipment.
- B. Selected Respondent shall determine proper cable lengths for the equipment to be installed.
- C. All cutting, patching and finishing required in connection with Respondent's installation and the Contractor so as to match the original conditions perfectly both as to material and workmanship shall do the repair of any damage caused by the installation.
- D. Installation shall be performed by the selected Respondent's factory trained field personnel or service shop. No sub-contractor will be allowed without approval from the City.
- E. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the National Electrical code, IEEE and all local authorities having jurisdiction.
- F. Selected Respondent shall install all required programming and software on each radio.

### 3.2 SPECIFIC INSTALLATION REQUIREMENTS

- A. Standard Installations and Documentation
  - 1. Respondent shall develop and document standard installations for each type of location, vehicle, etc., based on input and consultation with City personnel.
  - 2. Standard installation documentation shall include sufficient specifications, equipment, descriptions, procedures, photos, drawings, etc., to completely describe the work to be performed and final installation configuration.
  - 3. Respondent shall submit standard installation to City for review and approval at least 30 days before any installations shall take place.
- B. Portable radios
  - 1. Program unit
  - 2. Charge all batteries
  - 3. Test
  - 4. Deliver documentation and test results
  - 5. Obtain customer inspection and sign-off
- C. Mobile radios
  - 1. Install in vehicle using approved procedure
  - 2. Document installation
  - 3. Program unit

4. Test
  5. Deliver documentation and test results
  6. Obtain customer inspection and sign-off
- D. Control Station radios
1. Install using approved procedure
  2. Program units
  3. Test
  4. Deliver documentation and test results
  5. Obtain customer inspection and sign-off
- E. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten (10) years from date of system acceptance.

**END OF SECTION**

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## SECTION 5

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### VHF NARROWBAND COMPLIANCE SYSTEM

## SECTION 5.a – OPTION C – PROJECT OVERVIEW

### PART 1 - GENERAL

#### 1.1 OPTION C – VHF NARROWBAND COMPLIANCE SYSTEM PROJECT SUMMARY

- A. The Project includes several related networks and Project components.
  - 1. The City requires this option to provide minimum enhancements to the existing system to meet the FCC narrowbanding requirements and provide enhancements for reliable equipment and back up.
  - 2. VHF conventional, narrowband channels shall be included to provide all public safety and non public safety agencies conventional channels from the Jefferson Water Tower with redundant back up stations at the Timbrook Public Safety Building.
  - 3. Internet Protocol (IP) based microwave network linking the two transmitter sites and all other system components.
  - 4. New tower sites that may include the provision of towers, shelters, and other site equipment to accommodate the new antenna systems and microwave connectivity.
  - 5. New subscriber equipment and/or upgrade of existing subscriber equipment for use by first responders.
- B. IP network connectivity has emerged as the standard for Project 25 system interconnect and backhaul, replacing tone and circuit switched system control and backhaul. It is desired that the respondents propose IP-based system control and backhaul.
- C. It is desired that all equipment locations and sites be secure and have adequate uninterruptible power and backup power systems. Respondents must ensure that the facilities provide secure equipment rooms have adequate environmental control systems for the equipment proposed, have adequate uninterruptible power supply (UPS) systems for the equipment proposed, and meet all of the grounding and installation requirements for communications facilities as published in Harris (M/ACOM 4618/1 R3A) or Motorola R56, or MIL 188-124B standards.
- D. The City provided a list of current sites that may be considered in Appendix C.
- E. System Configuration
  - 1. This system specification describes a City-wide radio system providing “public safety grade” performance in general, and to the specific requirements as described herein.
  - 2. Multiple Sites:
    - a. Two sites will be needed to provide the narrowbanding requirement. One shall be the primary site and the other fully redundant for back up. Under Alternate Proposals, Respondents may propose and enhancements such as simulcast that could improve system performance and that has the

greatest possibility of licensing. Based on frequency searches, existing licenses shall have extreme difficulty to expand their existing contours.

- F. General requirements for all components of this project include:
1. Robust and fault tolerant conventional, narrowband system to support all users on a common platform.
  2. Interface with conventional channels.
  3. Provide complete services including design, project management, permitting, installation, testing, documentation, and warranty maintenance.
- G. General requirements for VHF Narrowband Compliance System
1. Six repeaters shall be located at the Jefferson WT and six additional repeaters at the Timbrook Public Safety Building for redundant back up.
  2. All channels shall be tied into the existing radio dispatch console system.
  3. The City anticipates a single antenna system to support these channels and not separate antennas for each base station.
- H. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, speaker microphones, antenna systems, etc. Reprogramming of non-fixed user equipment is also included.
- I. Voice RF Coverage Requirements
1. Coverage requirements shall be based on the Respondents' proposed coverage maps from the single site and recommended ERP levels based on existing FCC licenses.
  2. Any enhancements to the existing coverage via additional sites, simulcast, etc. should be included as an Alternate Proposal.
- J. Standards Conformance
1. The proposed radio network and related equipment and installation shall meet applicable portions of the following codes, standards, regulations and recommendations of the following entities, except as limited by herein.
    - a. TIA TSB-88-C or latest revision
    - b. TIA/EIA -603
    - c. Building Industry Consultant Services International(BICSI)
    - d. American National Standards Institute (ANSI)
    - e. National Electrical Manufactures Association (NEMA)
    - f. Telecommunications Distribution Methods Manual (TDMM)
    - g. National Electrical Code (NEC)
    - h. Institute of Electrical & Electronics Engineers (IEEE)
    - i. Underwriters Laboratories (UL)
    - j. National Fire Protection Association (NFPA)

- k. American Standards Association (ASA)
  - l. Federal Communications Commission (FCC)
  - m. Occupational Safety and Health Administration (OSHA)
  - n. American Society of Testing Materials (ASTM)
2. Governing Codes and Conflicts: If the requirements of this specification section conflict with those of the governing codes and regulations, then the more stringent of the two shall become applicable.
- K. Site Use and Development
1. The City prefers that current City used sites be utilized in this system.
  2. In support of the design, Respondents will submit documentation that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
  3. A list of existing tower sites that may be used in engineering the specified coverage is summarized in Appendix C.
  4. Site Development
    - a. Respondent shall be responsible for site development of upgrading the existing sites. Site development work will be listed as a separate cost line item on a site-by-site basis.
    - b. Site development services include:
      - 1) Final site layout and design
      - 2) Preparation and submission of NEPA/SHPO studies
      - 3) Site preparation
      - 4) Grounding
      - 5) Shelters
      - 6) Towers
      - 7) Fencing
      - 8) Project management
      - 9) Installation
      - 10) Testing & Commissioning
      - 11) Documentation
- L. Provision Of New Equipment
1. All equipment shall be provided in new condition, and be covered by a full factory and/or manufacturer's warranty. All existing base stations are at their end of life and shall be replaced at both locations.
  2. All equipment proposed shall be current production equipment with a minimum of two years continued production anticipated before end of life.
  3. Lifecycle roadmaps for all equipment and system components shall be provided.
  4. Used, refurbished, or previously installed equipment may not be proposed.

5. All equipment supplied as part of the system(s) shall be subject to system warranty.

## 1.2 WORK INCLUDED

- A. The intent of this RFP is to obtain an end-to-end, turnkey solutions meeting the FCC narrowband requirements. For items exceeding the requirements of this system shall be provided as an Alternate Proposal.
- B. Turnkey Respondent Responsibility
  1. Provide a total system design including any and all subsystem components.
  2. Provide all systems necessary to meet the specification and as outlined in Respondent's proposal, regardless of manufacturer.
  3. Provide full turnkey installation and optimization services for all systems, subsystems and components, as outlined in Respondents response, regardless of manufacturer.
  4. All respondent, contractor, and/or sub-contractor labor, travel, lodging, delivery, and other expenses shall be provided as part of the project. No additional charges for expenses shall be paid by the City unless expressly agreed to in writing.
- C. The Contractor shall be responsible for providing all products and services for a complete working system, whether or not specifically required and proposed, unless specifically excluded from the project.
  1. Radio Network and user equipment
    - a. Complete system design
    - b. Network infrastructure including RF and control
    - c. User equipment including mobile, portable, and control station radios
    - d. Project management
    - e. Installation and programming
    - f. Testing
    - g. Documentation
  2. Site Development
    - a. Project management
    - b. Site construction
    - c. Site commissioning
    - d. Documentation
  3. Grounding and Bonding
    - a. As part of the work to be performed all RF equipment, antenna systems, transmission lines, and the design of the antenna support structures

(towers), shelters, electrical and generator systems must be designed, and installed in compliance with grounding and Installation standards such as

- 1) Harris (Formerly M/A-COM) 4618/1 R3A or
- 2) MIL 188-124B.
- 3) Motorola R-56,

b. Respondent shall detail which grounding and installation standard(s) are to be used in the construction of the City's system.

4. RF Interference

- a. Respondent shall demonstrate good engineering practice in design and installation such that all proposed equipment is configured and installed to minimize RF interference to, from, or with co-located equipment.
- b. Respondent shall be responsible to identify and analyze potential interference sources during system design activities.
- c. Respondent shall conduct and provide suitable inter-modulation calculations as part of final system design.
- d. Suitable filtering, isolation, and other means shall be proposed to correct any identified interference between the proposed and existing systems.
- e. Respondent shall be responsible to correct mutual interference between proposed and existing systems.
- f. Construction of new towers shall not interfere with existing broadcast systems per FCC rules Section 22.371. Pattern mitigation shall be respondent responsibility.
- g. Interference caused by the proposed systems or equipment shall be corrected by the Respondent at no additional cost to the City.

D. City Responsibilities

1. Provide reasonable access to City facilities where equipment is to be installed including a designated work area with adequate heat, light and a secure storage area for equipment delivered for installation to the City designated location.
2. Assist Contractor in obtaining building permits required in conjunction with this project, where practical.
3. Secure additional sites and/or facilities recommended by the selected Respondent, and agreed upon by the City.

1.3 PROJECT SUBMITTALS

A. The following information shall be submitted within twenty (30) working days of contract award:

1. Firm detailed Project schedule indicating all Project milestones and specific dates relating to the installation of the system.
2. The schedule shall include the following milestones:

- a. Procurement
  - b. Start and Finish of Equipment Installation
  - c. Start and Finish of Antenna System Installation
  - d. Start and Finish of System Equipment Testing
  - e. Start and Finish of Coverage Testing
  - f. Final Inspection
  - g. Delivery of final documentation.
  - h. System Certification
  - i. Final System Acceptance
- B. The following information shall be submitted within forty (45) working days of Contract award:
1. System block level diagrams
  2. Patching schedules and termination details for all horizontal cables necessary for a complete record of the installation.
  3. Radio and microwave channel plans
  4. Site Drawings including:
    - a. Site Plan Drawings which indicate scale, orientation and locations of proposed and existing features including towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - b. Equipment Shelter/Room Plan drawings which indicate scale, orientation, termination and proposed and existing hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - d. Tower Profile Drawings indicating current and planned antenna mounting locations of all new, existing, and modified sites
  5. Detailed list of materials for each site, including size and quantity, required to achieve calculated availability (i.e., antennas, waveguide, connectors, and hardware).

6. Detailed configuration information for each site, including link and launch delay settings, signal level settings, antenna manufacturer, model number, tilt, orientation, and mounting height required to achieve specified design coverage performance.
- C. Final Design: The following information shall be submitted within sixty (90) working days of contract award:
1. Any updates to previously submitted design information
  2. System operation and maintenance manuals for all equipment including, but not limited to:
    - a. Instructions for installation, alignment procedures, testing, commissioning
    - b. Information, procedures, and recommendations for maintenance and troubleshooting of the equipment.
  3. Installation Site Drawings: Drawings shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the architectural and electrical power plans. Installation Site Drawings shall include:
    - a. Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - b. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Tower Profile Drawings indicating antenna mounting locations
    - d. Respondent is responsible for coordination of final site drawings with the site construction contractor selected by the City.
- D. System Delivery and Installation: The following information shall be submitted as equipment is delivered and installed:
1. User manual – one (1) copy per unit, to be kept at the installation site, plus five file copies delivered to the City
  2. Installation manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
  3. Maintenance manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
  4. Bill of Materials – one (1) copy per shipment plus five (5) file copies delivered to the City

5. Installation documentation shall include complete system and site drawings.
- E. System Acceptance and Commission: The following information shall be submitted upon completion of installation and prior to Final System Acceptance and commissioning:
1. Detailed Final System Acceptance Test Plan (FATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for Final System Acceptance by City.
  2. Detailed FATP shall be submitted no later than 90 days before the testing starts.
  3. FATP shall be approved no later than 30 days before the testing starts.
  4. Five final and complete sets of as-built documentation, bound and containing all previous submitted manuals and materials including:
    - a. Documentation index
    - b. List of deliverables
    - c. Field Test reports
    - d. Coverage testing reports
    - e. Maintenance Data
    - f. As-Built System Block and Level Diagrams
    - g. As-Built Site Drawings including:
      - 1) Site Plan Drawings which indicate scale, orientation and locations of towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
      - 2) Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
      - 3) Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
      - 4) Tower Profile Drawings indicating antenna mounting locations

#### 1.4 WARRANTY

- A. Warranty- One (1) Year After Final System Acceptance

1. The system described herein shall be the total responsibility of the Respondent prior to final system acceptance, and for one (1) year following final system acceptance, at no additional cost to the City.
2. Respondent agrees that any hardware or software warranties whose term exceeds one year after Final System Acceptance will be passed through to the City and will remain in effect for the full term of that warranty.
3. The warranty period shall begin on the date of Final System Acceptance.
4. System performance, and all hardware, parts and materials shall be warranted, including all related equipment labor, installation, handling, inspection, return and delivery charges and fees.
5. All conditions above also apply to all firmware installed in any products included as part of this system.
6. Respondent shall fully describe all other terms and conditions of warranty in the Proposal.
7. Respondent shall provide updates for documentation of all system components (hardware, software etc.) at the completion of the system warranty period.

B. Latent Defects:

1. The Respondent, at no cost to the City, shall correct latent design defects or recurring problems relating to software, hardware or overall system design, even if such latent defects are discovered after final system acceptance.
2. Nothing contained in this RFP shall be deemed to have caused any applicable statute of limitations to commence to run or any alleged cause of action to have accrued in the event of any latent defect not discovered until after final system acceptance and final payment. The statute of limitations shall commence to run on any alleged latent cause of action only upon actual discovery of such latent defect.
3. System malfunctions due to software/firmware shall be corrected at no cost to the City.

C. OPTIONAL Extended Warranty Beyond First Year

1. Respondent shall propose extended warranty services AS AN OPTION on an annual basis for years two through five.
2. The extended warranty specified shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Respondent under requirements of the Contract Documents.
3. Respondent shall provide repair/return services for a period of ten (10) years from date of Final System Acceptance.

4. Notification shall be given at least one (1) year in advance of any change of status from products available from regular production to maintenance only.
5. Respondent shall fully describe all other terms and conditions of the extended warranty in the Proposal.
6. Respondent may also propose other optional extended warranties as part of the Proposal.

## 1.5 MAINTENANCE SERVICE

### A. General Requirements:

1. The approach to maintenance of this system shall be preventive maintenance.
2. Comprehensive maintenance services shall be proposed for each network.
3. The Respondent shall include in the Proposal the terms and conditions of the warranty / maintenance contract covering the equipment. The Respondent shall state in the Proposal the name, address, and capabilities of the service station(s) providing warranty / maintenance service.
4. Maintenance for all items in the system shall be quoted on a standard maintenance contract basis for two (2)-hour response time, seven (7) days a week, unless otherwise specified
5. Provide twenty-four (24) hour system alarm monitoring capability where users can dial one toll free number to report problems.
  - a. Respondent staff will then dispatch the proper technician in the allotted response time to resolve problem.
  - b. Respondent staff must generate a trouble report detailing who called, what the problem was, how it was resolved, response turn time and how much it cost to repair.
  - c. Trouble report must be deliverable in softcopy format by email to addresses specified by the City.
6. Provide a list of maintenance plans available. These shall include:
  - a. Fixed equipment on-site service;
    - 1) 2-hour response time
    - 2) 8-hour response time
    - 3) Next day response time
    - 4) Stocking of replacement units at shop
  - b. Fixed equipment mail in board repair;
    - 1) Normal response - 7 day
    - 2) Emergency response - Next day

3) Full time on-site technician availability.

B. Maintenance Standards:

1. Replacement parts shall be equal in quality and ratings as the original parts, rebuilt parts are not permitted.
2. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
3. 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 that this has been done.
4. Records shall be available for the City's inspection upon request. Records shall be maintained by the Respondent's radio maintenance shop throughout the warranty period (and any subsequent maintenance contract period), and shall revert to the City upon termination of the warranty (or maintenance contract).
5. Respondent shall provide only factory trained and authorized maintenance personnel.
6. The service organization(s) shall maintain comprehensive installation and instruction manuals for all systems equipment. These manuals shall be the property of the City, and shall revert to the City at such time as the City assumes the maintenance responsibility for the system.
7. Maintenance of non-fixed equipment shall be on a unit replacement basis, at no cost to the City or the subscriber agency, such that the amount of time users spend in the maintenance shop shall be minimized.
8. If a fixed equipment module fails twice during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that the equipment is potentially prone to continuing failures, the Respondent shall replace it at no cost to the City.
  - a. If the same fixed equipment module fails twice at a separate location during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that this specific model of device is potentially prone to continuing failures, the Respondent shall provide an equivalent equipment line for complete replacement at no cost to the City.

C. Preventive and Routine Maintenance

1. Routine maintenance procedures recommended by the equipment manufacturer shall be followed.

D. Response Times

1. Catastrophic Failures

- a. Catastrophic failures are defined as those failures which severely impact the overall performance some examples include but are not limited to:
  - 1) System down, communications unavailable
  - 2) Site down, communications severely impacted
  - 3) Radio console system down
  - 4) Microwave system failure
- b. Declaration of a catastrophic failure will be at the sole discretion of the City of Winchester.
- c. The Respondent shall have a qualified technician respond to the location of catastrophic failures within 1 hour during normal working hours (8 AM to 5 PM weekdays), and within 2 hours at other times.
- d. Catastrophic failures not caused by outside effects such as Acts of God will be expected to be resolved within 2 hours after arrival of the technician.

2. Non-catastrophic Failures

- a. Declaration of a non-catastrophic failure will be at the sole discretion of the City of Winchester.
- b. Non-catastrophic failures require the following responses:
  - 1) 0000- 1600 Same working day -- overtime if needed
  - 2) 1601- 2400 Next working day -- start job in AM

3. Response times shall be the same as above during the acceptance test period.

E. Escalation Procedures

- 1. Respondent shall describe escalation procedures and equipment priority levels in their proposal to be used if the trouble is not resolved within required times.
- 2. The City reserves the right to approve the proposed escalation procedures or to recommend alternative methods of escalation and problem resolution

1.6 SPARE PARTS

- A. Appropriate and sufficient spare parts shall be provided to the City by the Contractor.
- B. Respondent shall provide a comprehensive list of all proposed spare parts and equipment, which lists each recommended component and a description of its function.
- C. All spare parts and equipment shall be packaged with protective covering for storage and identified with conspicuous labels describing contents.
- D. The Respondent may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing those used on an as-used and timely basis.

The spares complement shall include sufficient non-fixed units to enable maintenance on a unit replacement basis.

- E. At the end of the warranty/maintenance period, the full complement of spares shall be delivered to the City.
- F. Spare parts shall be available for shipment on an expedited basis twenty-four (24) hours a day, 365 days a year including weekends and holidays. The manufacturer shall provide a 24-hour hotline telephone number for the handling of such orders.
- G. Notification shall be given at least one (1) year in advance of any change of status for products available from regular production to maintenance only (MO). The specific statement shall be provided with the bid response.

## PART 2 - SYSTEM REQUIREMENTS

### 2.1 GENERAL REQUIREMENTS

- A. Systems proposed shall meet the requirements here and in other sections of this RFP for Option C.
- B. New system minimum requirements. The following items reflect the basic objectives for minimum system performance. Proposed systems shall meet these requirements to the greatest extent practical. If additional enhancements are available, they can be proposed part of the Alternate Proposal requirements.
  - 1. Unit ID displayed at dispatcher positions and for subscriber units with unit ID-capable displays and alias display.
  - 2. "Emergency/Man Down" button on subscriber units
  - 3. Subscriber unit "talk-around" capability for localized use and system redundancy.
  - 4. Continued use of existing VHF High band, tone and voice paging
  - 5. All user equipment built to Mil. Spec
- C. Sites utilized shall be the Jefferson WT and Timbrook Public Safety Building.
- D. Infrastructure includes the radios, combiners, antenna systems, and alarm and monitoring sub-systems and all related equipment.
- E. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, antenna systems, etc.

### 2.2 VHF NARROWBAND CONVENTIONAL RADIO NETWORK

- A. The VHF Narrowband Conventional voice radio network shall include the following:
  - 1. Network infrastructure including RF and all control
  - 2. User equipment including mobile, portable, and control station radios
  - 3. Alarm and control system
  - 4. Project management
  - 5. FCC licensing
  - 6. Installation and programming
  - 7. Testing

8. Documentation

B. Coverage

1. Coverage requirements shall be based on the Respondents' proposed coverage maps from the single site and recommended ERP levels based on existing FCC licenses.

C. Analog and digital capable equipment

1. VHF Conventional Base/Repeater radio system infrastructure shall support analog user equipment.
2. The City prefers that all Base/Repeater stations be P25 Phase 1 digital capable.
3. User equipment, fully compatible with the infrastructure shall be provided.

D. VHF FCC Licenses

1. A list of all available frequencies are provided in Appendix B. The City does not anticipate the existing VHF frequencies can be expanded much beyond the current contour due to VHF congestion in area.

E. Alarm and Control

1. An integrated alarm and control system shall be provided for network management.

F. User Equipment:

1. Estimated equipment counts for mobile radios, portable radios, and control stations are provided in Section 5.c. The information provided is estimates only. Individual agencies may have more or less radios currently in use, and agencies may opt to deploy more or less radios on the new radio system.

## 2.3 SITE SELECTION

- A. The City has provided a list of tower sites that may be used in engineering the specified coverage. These sites are summarized in Appendix C.
- B. In support of the design, Respondents will submit documentation ensuring that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.

## PART 3 - EXECUTION

### 3.1 INSTALLATION PLANNING

- A. The Respondent Project Manager shall convene a Project planning session with the City within twenty (20) days of contract award, and together they will jointly develop a Project plan. The Project plan shall include:
1. Project description statement.
  2. A work statement that includes the Project deliverables and Project objectives.
  3. A Work Breakdown Structure (WBS) to the level at which control will be exercised.
  4. Updated Cost estimates, scheduled start dates, and responsibility assignments that support the WBS.
  5. Performance measurement baselines for schedule and cost.
  6. Major milestones and target dates for each.
  7. Key and required staff.
  8. Key risks, including constraints and assumptions, and planned responses for each.
  9. Subsidiary (supporting) management plans including scope management plan, schedule management plan, Project budget(s), change control process, acceptance testing, Project closure process, etc.
  10. Project communications plan or strategy, including periodic reporting requirements and milestone achievement determination.
  11. A written list of open issues and pending decisions.
  12. Supporting detail for all the above.
- B. The Project plan shall be presented to the City not more than fifteen (15) days after the Planning Session meeting.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Installation of equipment shall not begin prior to the City's approval of Shop Drawings and other required submittals.
- B. Installation shall include a complete, tested, system to include placement of associated cabling, appropriate system layout and terminal connections. Respondent shall provide

associated power supplies and any other hardware, adapters and or connections to deliver a complete operable system to the City at the time of acceptance.

- C. All installations shall be performed by factory authorized or Respondent affiliated service shops. Other shops or installers may be used upon mutual agreement between the customer and Respondent. Qualified, adequately trained personnel familiar with this type of work shall perform all installations.
- D. Prior to the start of the system installation the Respondent shall participate in a mandatory Project site survey with the City or City's representative to confirm actual equipment location within each space. At that time the exact equipment locations will be determined and documented by the Respondent.
- E. The installation Respondent shall coordinate with others, as appropriate, to confirm that any prep work, such as tower work, coring, bracing, conduit, electrical, etc that affects the installation of any equipment is complete before final inspection.
- F. During site visits, the Respondent shall review existing conditions at the Jefferson WT for additional structural capabilities to place new antennas on the water tower.
- G. Pending microwave design requirements, the City anticipates potentially at one or both sites to support antenna requirements a new tower.

### 3.3 LABELING AND IDENTIFICATION

- A. All equipment, cables, connections, etc shall be clearly and permanently labeled per the Project drawings, manufacturer's requirements, and TIA/EIA-606A.
  - 1. Any other signage or labeling as required by law shall be provided.

### 3.4 FIELD QUALITY CONTROL

- A. Installation monitoring and meetings
  - 1. The Respondent shall attend monthly Project and construction meetings to discuss status, problems, and schedule with individuals deemed necessary by the City prior to and during installation. More frequent meetings may be held at the request of the City.
  - 2. Respondent shall maintain the written Project schedule on a monthly basis or more frequently if necessary to properly reflect Project activities.
- B. Inspection:
  - 1. When installation is substantially complete, Respondent shall schedule with the City an inspection of the work.

2. The City Project Manager or designee will conduct an inspection of the work. Any deficiencies will be documented in a punch list format and delivered to Respondent for resolution.
- C. Pre-final testing
1. Before final testing, Respondent shall verify proper installation and operation of all equipment before presentation to the City.
- D. Meeting Minutes and Reports:
1. Respondent shall provide written minutes of all meetings no later than the earlier of five days after the meeting or two (2) days prior to a subsequent meeting relating to the same issue(s).
  2. Respondent shall submit a written status report at the end of each week noting progress to date, meetings held, schedule adherence, and variances.
  3. Respondent shall provide written reports of corrected punch list items.
- E. As-Built Documentation:
1. Respondent shall provide two (2) copies of all as-built documentation
  2. All submittals shall be provided in hard copy, paper format, and in electronic format on CD-ROM or USB "thumb drives."
  3. Documentation shall be professionally produced, and provided in heavy duty three ring "D ring" style locking binders. Loose leaf materials are not permitted. Paper shall be shall be 8 ½ x 11" whenever possible. If larger paper is utilized it must be professionally incorporated into the document. Minimum paper quality permissible shall be 24# bond and ISO brightness of 90. Binders shall be color coded where it will provide an organizational benefit.
  4. Respondent shall provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for the installation including detailed documentation for City review and detailed documentation of as-built conditions.
  5. Respondent shall provide complete as built documentation detailing all aspects of the installation including but not limited to:
    - a. Equipment provided
    - b. Plan and elevation drawings of all equipment including antennas on tower
    - c. Cabling and terminations
    - d. Installed location
    - e. Block and level diagrams

- f. Termination panels
  - g. Programming
  - h. Set-up and alignment information
6. Equipment/Terminal Elevations: Furnish details showing equipment racks, terminal block and backboard elevations, including all cable terminals, spaces for equipment, equipment racks, and station cable routing. Communications equipment distribution frames shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the Contract Documents and shall show additional detail as indicated herein.

### 3.5 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.
  - 1. Worksites shall be left neat and broom swept upon completion of work. All trash shall be removed weekly.

### 3.6 FINAL INSPECTION

- A. Upon notification of completion of all installation and resolution of all punch list items, City Project Manager or designee will conduct final inspection of the installation.
- B. Any deficiencies will be noted on the punch list and provided to the Respondent for resolution.
- C. Final System Acceptance testing will not commence until all punch list items are resolved.

### 3.7 FINAL SYSTEM ACCEPTANCE TESTING

- A. Respondent shall verify and document that all equipment, assemblies, hardware, software, and firmware are upgraded to the latest factory revision before the start of Final System Acceptance testing. Multiple revision levels among similar equipment are unacceptable.
- B. City shall be given two (2) weeks written notice that the system is ready for Final System Acceptance testing.
- C. The Respondent shall provide all necessary technical personnel, and test equipment to conduct final testing.
- D. The Respondent shall remedy all variances or deficiencies in a timely manner and at the Respondent's sole expense.

- E. Final tests will be conducted using the complete and approved Final System Acceptance Test Plan (FATP).
- F. The intent of the Final System Acceptance tests is to demonstrate to the City that the system is complete and ready for commissioning and operation. Therefore, the Respondent is expected to perform preliminary execution of the FATP prior to final execution with the City.
- G. The City or Engineer shall conduct and/or witness execution of the FATP.
- H. Each section of the FATP will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
- I. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
- J. Retest of the failed FATP section or the entire plan shall be at the City's sole discretion,
- K. The fully executed and completed FATP document shall be provided to the City.

### 3.8 FINAL SYSTEM ACCEPTANCE

- A. "Final System Acceptance" shall mean the date on which the Respondent delivers all required documentation to the City and completes all of the work on the Project as required by the Contract Documents, including, without limitation, the date on which the Respondent completes all of the following requirements and demonstrates that the Project is complete in all respects, as determined by the City in its sole discretion, as evidenced by written notice from the City to the Respondent:
  - 1. Completion of System installation
  - 2. Final inspection and resolution of installation punch list items
  - 3. Receipt and approval of the as-built documentation
  - 4. Receipt and approval of the Coverage Acceptance Test Plan (CATP)
  - 5. Satisfactory completion of the Coverage Acceptance Test and resolution of punchlist items
  - 6. Satisfactory completion of installation of subscriber equipment
  - 7. Receipt and approval of the Final System Acceptance Test Plan (FATP) and related test;
  - 8. Satisfactory completion of the Final System Acceptance Test and resolution of punchlist items

**END OF SECTION**

## **SECTION 5.b – OPTION C – RADIO NETWORK**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This section provides specifications and requirements for VHF Narrowband Compliance radio system for voice communications. The system is comprised of several main subsystems or components.
- B. The scope includes:
  - 1. Basic system configuration criteria
  - 2. Coverage testing
  - 3. RF infrastructure
    - a. Repeaters
    - b. Combiners
    - c. Antenna systems
    - d. System Configuration and Control

## PART 2 - PRODUCTS AND SYSTEMS

### 2.1 MANUFACTURERS

- A. Available Respondents. Subject to compliance with requirements, this section is open to all manufacturers of trunked radio equipment and/or systems integrators offering products that meet or exceed specifications indicated in Option C.

### 2.2 SYSTEM CONFIGURATION

- A. Respondents shall propose six (6) analog, narrowband, conventional base stations (P25 capable) at Jefferson WT (primary site) and Timbrook Public Safety Building (back up site).
- B. The overall goal of the City is to create repeated pairs for all channels. Additional frequencies will be needed to support this scenario and a final plan shall be developed by the critical design review with the selected Respondent and City.
- C. The respondents' proposed system shall provide a balanced system design where talkback performance is the same or better than talk out performance.
- D. Environmental
  - 1. All equipment rooms are air-conditioned; however, the Respondent must provide the guaranteed operating temperature range and the BTU's of heat generated for each primary piece of equipment in the proposed system.

### 2.3 VOICE RF COVERAGE OBJECTIVES

- A. Channel Performance Criteria (CPC)
  - 1. RF coverage is defined as the analog 20 dB SINAD that provides a minimum delivered audio quality (DAQ) 3.4 audio signal to the operator as defined in TIA TSB-88-C (OR LATEST REVISION) for both talk-out and talk back to portable radios on hip used outdoors (in street) and in 20 dB buildings throughout the City.
  - 2. The DAQ 3.4 performance level shall be for Respondents proposed 95 percent reliability.
  - 3. Coverage requirements shall be based on the Respondents' proposed coverage maps from the single site and recommended ERP levels based on existing FCC licenses.
- B. Minimum Radio System Coverage Requirements (MRSCR)
  - 1. The system shall provide a minimum covered area reliability of 95 percent voice radio coverage, by area, for the City for portable radios carried on the hip in 20 dB buildings.
  - 2. There shall be no geographic coverage requirement, however, the selected Respondent shall be required to guarantee coverage they propose based on the single site and obtainable ERP levels.
    - a. The City anticipates minor changes to the final design which may be reflected in the proposed coverage and those maps may be updated based on final design.
- C. Coverage Maps

1. Respondents shall submit both talk-out and talk-back, or system composite coverage maps for the proposed configuration, showing system gain calculations, for
  - a. Analog mobile radios
  - b. Analog portable radios in the street
  - c. Analog portable radios in 20 dB buildings
  - d. VHF analog paging coverage in the street with pager worn on hip.
2. Maps shall be provided for both primary and back up site separately.
3. Map Criteria
  - a. The operating parameters and factors pertaining to the coverage commitment for a specific map must be shown for that map (preferably on the map). If a Respondent chooses to show the operating parameters and factors on a separate page, the Respondent is responsible to clearly identify the correct information for each map. Each and every map must have this information.
  - b. The following minimum information must be clearly defined, relating to each map and each site:
    - 1) The base/repeater RF power output
    - 2) The base/repeater antenna gain and directivity (if applicable)
    - 3) The "down tilt" angle (in degrees) of the base/repeater antenna
    - 4) The transmit ERP
    - 5) The effective receiver sensitivity
    - 6) Receiver tower top amplifier gain
    - 7) The base/repeater antenna height above ground
    - 8) The base/repeater antenna height above average terrain
    - 9) The mobile or portable antenna type
    - 10) The mobile or portable antenna height above ground for transmitting position and for receiving position, if different
    - 11) The mobile or portable RF output power
  - c. If backup or standby sites are proposed, appropriate maps showing system coverage utilizing these sites must be included in the proposal.
  - d. Coverage should not be limited to the City boundaries and shall show coverage provided outside the City limits based on the proposed sites for informational purposes.
- D. Coverage Model
  1. A description of how the Respondent calculated the coverage must be included in each proposal. List the coverage model(s) used (for example—Okumura, etc.)
- E. Guarantee of Proposed Coverage

1. The City anticipates that the proposed coverage will not exactly match the required coverage on a grid-by-grid basis. In each sub-area, some required grids may not be covered and other non-required grids may be covered.
2. The selected Respondent will be required to guarantee the proposed system coverage based on their proposed covered area and not a geographical area.
3. Any subsequent design changes based on mutual agreement between the City and selected Respondent that impact coverage will require revision of the coverage grid maps and guarantee based on the grid maps.

F. TIA TSB-88-C– User Choices

1. [E.1] User Choices
  - a. Coverage predictions, design and proof of performance testing must be conducted in accordance with TIA TSB-88-C, or latest revision to the greatest extent possible. The following criterion is provided in accordance with TIA TSB-88-C.
2. [E.2] Service Area
  - a. The service area is defined as the City of Winchester, Virginia.
  - b. Coverage testing shall be performed within the Winchester City boundaries.
  - c. The target device, usage and location are:
    - 1) Mobile radios—standard dash or trunk mount with antenna mounted in the center of the roof
    - 2) Portable radios—standard portable radio (for in-building applications):
      - a) Talk-out and talk-back to portable radio on hip with swivel belt clip
    - 3) Basic network coverage shall be designed to accommodate vehicles traveling at speeds up to 85 MPH
    - 4) Basic network coverage shall be designed to accommodate supplemental 20 dB in-building coverage.
3. [E.3] Channel Performance Criterion (CPC)
  - a. CPC shall be DAQ 3.4 or 20 dB SINAD.
4. [E.4] Reliability Design Targets
  - a. The CPC reliability design target is a service area probability of 95 percent.
5. [E.5] Terrain Profile Extraction Method
  - a. Either the bilinear interpolation or the snap to grid method of terrain profile extraction is acceptable.
6. [E.6] Interference Calculation Method
  - a. Either the equivalent interferer or the Monte Carlo Simulation Method of interference calculation is acceptable.
7. [E.7] Metaphors to Describe the Plane of the Service Area

- a. The tiled method is preferred
- b. Grid mapped from radial method is also acceptable
8. [E.8] Required Service Area Reliability
  - a. The CPC is for 95 percent of the covered area proposed by Respondent.
9. [E.9] Willingness to Accept a Lower Area Reliability in Order to Obtain a Frequency
  - a. The City is not willing to accept a lower area reliability in order to obtain a frequency.
10. [E.10] Adjacent Channel Drift Confidence Factor
  - a. Adjacent channel drift confidence factor shall be 95 percent.
11. [E.11] Conformance Test Confidence Level
  - a. A conformance test confidence level of 99 percent is required.
12. [E.12] Sampling Error Allowance
  - a. A sampling error allowance of  $\pm 1$  percent is required.
13. [E.13] Pass/Fail Criterion
  - a. The "greater than" test is required.
14. [E.14] Treatment of Inaccessible Grids
  - a. All inaccessible grids will be eliminated from the calculation.

## 2.4 RF COVERAGE TESTING

### A. General:

1. RF coverage testing is critical to verifying that the proposed system design meets the proposed coverage.
2. Respondent shall submit a preliminary Coverage Acceptance Test Plan (CATP) with the proposal meeting the requirements of this Section.
3. Both the City and the selected Respondent shall agree upon the final CATP and method to be used no later than 90 days after award of contract.
4. Respondents may propose alternative test methods as an Option for consideration, consistent with the requirements, TSB-88-C, and achieving the same results however, the City shall make the final determination as to whether the proposed alternative is acceptable.

### B. Types of Testing

1. Two types of coverage testing will be conducted in all areas:
  - a. Automated mobile drive testing for overall grid acceptance testing purposes
  - b. Non-automated intelligibility testing to verify DAQ and base-lining purposes for portable radio configurations
2. Automated and intelligibility testing shall be complementary and serve to fully verify that proposed coverage are met both technically and operationally.
3. Automated testing shall be objective and quantitative in nature and used to:

- a. Verify that system coverage meets signal level and threshold requirements on a grid basis.
    - b. Automated testing results may also be used as a baseline of system performance such that system alignment and coverage performance can be re-tested at a later date to determine if degradation has occurred.
  4. Intelligibility testing shall be subjective and qualitative in nature and used to:
    - a. Verify that system DAQ meets requirements in selected grids tested as covered.
- C. Test Configurations
1. Testing configurations for automated and intelligibility testing shall correspond as closely as possible to anticipated typical operating configurations.
  2. Testing configurations shall use typical mobile and portable radios delivered with the system. Selected Respondent and City shall mutually agree on a testing plan utilizing a selection of Respondent's multi-featured low and high-tiered mobile and portable radios.
  3. If test configuration does not use delivered mobile or portable radios, Respondent shall fully describe and demonstrate correlation between test measurements obtained with test equipment used and the performance of actual operational equipment.
  4. City personnel or representatives will participate in and witness all coverage testing at City option.
- D. Automated Mobile Drive Testing
1. To verify coverage for final system acceptance, the selected Respondent must, to the satisfaction of the City, measure the signal level at a statistically significant number of test locations randomly and homogeneously distributed throughout the City, for each coverage sub-area.
  2. The intent of this procedure is to define a coverage testing method that is consistent with TSB-88-C.
  3. The City is approximately 9.3 square miles in area. Respondents are required to create the appropriate grid size for testing purposes to achieve the confidence level noted previously.
  4. Selected Respondent may evenly subdivide grids, if necessary, to provide a statistically significant number of grids in a sub-area as is acceptable to the City.
  5. Using automated drive testing equipment, the signal level shall be measured in each accessible bin that shows coverage as proposed by Respondent.
  6. Inaccessible bins will not be counted for any calculations.
  7. The automated test equipment shall be capable of making and recording multiple measurements within each bin per TSB-88-C (OR LATEST REVISION) and averaging the readings to produce the final test result for that bin. All samples and the final average value shall be stored and retained as part of the test data.
  8. A PASS shall be scored for each average bin measurement that exceeds the threshold determined to correspond with each bin as shown in proposed/contracted coverage map.

9. Ninety-five percent of the bins tested in Respondents' proposed coverage area, in each sub-area, must PASS the corresponding threshold or the test will be graded as "FAILED."
10. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

E. Non-automated Intelligibility Testing

1. Non-automated intelligibility coverage testing will be conducted using Respondent and City mutually-agreed on and Respondent-supplied mobile and portable radios
2. Delivered audio quality coverage will be tested at each location
3. Testing shall be performed using typically configured portable radios.
4. Testing will be done in teams with one part of the team in the field and the other at a dispatch console.
  - a. Field personnel will document talk out testing
  - b. Dispatch personnel will document talk back testing
5. A standard test result form shall be used to document test information for each test location including:
  - a. Date
  - b. Time
  - c. Personnel
  - d. Digital
  - e. Talk-out or talkback
  - f. Equipment
  - g. Location
  - h. Pass or fail status
6. Data from the testing forms will be analyzed to determine the percentage of tested locations that passed.
7. At least 95 percent of the test locations (located in Respondent's proposed coverage) in each sub-area must PASS or the test will be graded as "FAILED."
8. If the test is graded as "FAILED," the coverage deficiency must be corrected and the test re-done.

F. Test Unit Configuration

1. Mobile units operating in this system may be traveling on any street, road (paved or unpaved), or highway at any time within the coverage area.
2. Vehicular antennas are to be center mounted on each vehicle unless specifically noted elsewhere in this specification for any particular vehicle or class of vehicles.
3. Respondent shall fully describe vehicular antenna to be used, including:
  - a. Make

- b. Model
- c. Frequency range
- d. Gain

2.5 SYSTEM RELIABILITY, AVAILABILITY, AND BACKUP

- A. The system being proposed shall have adequate reliability mechanisms included in its design and shall be very reliable.
- B. No Single Point of Failure. The system must continue to operate with all specified features if any single device fails.

2.6 SYSTEM ALARMS AND CONTROL

- A. An alarm subsystem shall be provided.
- B. A remote alarm indication subsystem must be provided to capture diagnostic and alarm reports as well as summarizing traffic operations.
- C. The system shall acquire, process and display information in an integrated and uniform fashion for a variety of critical systems including:
  - 1. Conventional radio systems
  - 2. Digital Microwave System
  - 3. Local and remote site facilities
  - 4. Primary and backup power systems
- D. All components shall be properly grounded and installed with surge protection per standard industry practice and manufacturer's standards.
- E. The alarm and control shall meet the following general requirements:
  - 1. Hardware and software platform shall be PC based using current versions of hardware and software.
  - 2. Mediate multiple alarm protocols for higher lever network management systems
  - 3. Report alarms to managers and other interrogators
  - 4. Perform full management functions with a local terminal
  - 5. Provide email notification of alarms
  - 6. Provide alarm filtration and consolidation
- F. Work Stations provided:
  - 1. Local work station(s)
    - a. One local workstation shall be provided and installed at the Timbrook Public Safety Building.
- G. Standard Features:
  - 1. Tabular Screen Based Monitoring Operation- shall provide 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
  2. Graphic Screen Operation- shall provide for the graphic depiction of the network allowing annunciation and point selection via icons
  3. 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
  4. Control Points- the following relay control types shall be supported:
    - a. Direct control
    - b. Select before operate
    - c. Batch – control multiple relay with a single operation
  5. Analog points - display the value of a telemetered quantity such as temperature, fuel level, VSWR, etc
  6. Time stamp indicating date and time of message within 0.5 seconds
  7. Alarm qualification- on a point basis, programmable delay before alarm is issued
  8. Alarm de-activation – on a point basis, the ability for the operator to de-activate an alarm to inhibit additional annunciation.
  9. Alarm history
  10. Email support- text message of alarm sent to email lists
  11. Security – Multiple levels of user name and password protection to all for flexible system management
  12. Provide detection of loss of connectivity with the alarm sensor.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Respondent shall provide the following:

1. Materials and Labor

- a. The Respondent 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 the specifications and drawings. Workmanship and materials shall be of good quality suitable for the purpose of the new system. The Respondent shall, if required, furnish satisfactory evidence as to the kind and quality of materials. All work not conforming shall be considered defective.
- b. All materials furnished and work completed shall be subject to inspection by the City's engineer. Such inspection shall not relieve the selected Respondent from supplying the best materials and laboring strict accordance with the specification. Notwithstanding such inspection, the selected Respondent will be held responsible for the acceptability of the work and furnished materials.
- c. The City requires that installation occur in a timely fashion and in accordance with the project schedule mutually agreed between the City and selected Respondent.
- d. The work will be performed by qualified individuals specifically trained on the systems they are implementing. All work will be done in a workmanship-like manner. The assurance of the quality of the work is the responsibility of the selected Respondent. The selected Respondent shall, if requested by the City, remove from the project any worker who the City determines to be incompetent or undesirable.
- e. Respondent shall provide implementing procedures written in layman's terms for infrequently used features or procedures.

2. Project Management

3. System Design

4. Equipment Engineering

5. Equipment (Radio and Ancillary Equipment)

B. Installation and testing (field radio equipment) in accordance with manufacturer's installation best practices and procedures.

C. Installation and testing (field antennas) in accordance with manufacturer's installation best practices and procedures.

3.2 ACCEPTANCE CRITERIA

- A. Written acknowledgment by authorized representatives of the City and the engineer that all system acceptance test plan criteria, as specified, have been met.

**END OF SECTION**

## SECTION 5.c – OPTION C – NON-FIXED USER RADIO EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This specification describes portable, mobile, and control station equipment and is intended for Public Safety and Non Public Safety applications.
- B. Non-fixed radio equipment shall be proposed for conventional radio channels in the VHF high band.
- C. Key attributes of all subscriber equipment are:
  - 1. High quality, durable designs, manufactured to provide high reliability under heavy use in severe environments.
  - 2. Ease of operation, including controls and indicators that enhance user operation in low visibility or high stress situations.
  - 3. Software programmability.
  - 4. Availability of accessories to adapt equipment to different situations.
- D. The scope includes:
  - 1. Procurement, installation, programming, and support for the following
    - a. Portable radios and accessories
    - b. Mobile radios and accessories
    - c. Control station radios and accessories
    - d. Pagers and accessories

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Respondents: Subject to compliance with requirements, this section is open to all non-fixed user equipment manufacturers and integrators offering products that meet or exceed specifications in the following sections.

### 2.2 GENERAL REQUIREMENTS

- A. FCC type accepted and designed in accordance with the requirements of Part 90 of the FCC Rules and the appropriate EIA and related agency specifications.
- B. Support new features through software programming and not reconfiguration of hardware. Software programming shall be conducted at the selected Respondent's local service facility or at an Owner-designated location.
- C. Capable of being programmed to operate on any VHF narrow-band radio channel in the corresponding licensed band of the land mobile spectrum.
- D. Accommodate all channels in that band programmed into the radio without any performance degradation. Talk-around (direct) mode shall also be supported.
- E. Be of an ergonomic design permitting ease of operation over extended periods, typically 8-12 hours for each operator.

### 2.3 CONVENTIONAL RADIOS

- A. General:
  - 1. Equipped with an emergency alert that requires acknowledgement.
- B. Specially equipped subscriber units:
  - 1. Final quantity to be determined following contract award.
  - 2. Shall be provisioned to receive unit ID or alias name for incoming calls.
  - 3. Shall be provisioned to transmit unit ID or alias name.
- C. Conventional radio models
  - 1. For conventional portable, mobile, and control station radios, at least three different models of subscriber radio equipment shall be offered. The purpose is to provide a range of standard products from which radios can be selected to match the user needs. All units differ only in features and capabilities such as display, modes, channels, options, etc.
    - a. Type A1
      - 1) Typically identified as the model with no display.
      - 2) The purpose of the A1 radio is reliable trunked radio use at the lowest cost.
      - 3) Type A1 subscriber radio equipment shall be analog equipped, fully programmable and provide a basic set of features with less channel capacity than an A2 or A3 unit.
      - 4) A1 units shall meet the specifications as further described in this section and provide the following minimum features:

- a) Operate on other VHF systems outside the bounded coverage areas
  - b) Conventional Operation
  - c) Emergency Alert button sends portable user's identification to the dispatcher with any emergency alert tone or message
- b. Type A2
- 1) Typically identified as the model with a display and limited keypad.
  - 2) Units are typically assigned to personnel who may need to access a large number of channels with an enhanced feature set.
  - 3) Type A2 subscriber radio equipment shall be analog equipped, fully programmable and provide an enhanced set of features with less channel capacity than a Type A3 unit but more than a Type A1.
  - 4) Type A2 units shall meet the specifications of Type A1 units with the following additional features:
    - a) Display
    - b) Limited Keypad
- c. Type A3
- 1) Typically identified as the model with full display and keypad.
  - 2) Type A3 subscriber radio equipment shall be analog equipped, fully programmable and provide a full set of features with more channel capacity than a Type A2 and Type A3 unit.
  - 3) Type A3 units shall meet the specifications of a Type A2 unit with the following additional features:
    - a) Full Keypad
2. Trunked radio quantities
- a. A1 Portables
    - 1) 0 (model shall still be quoted)
  - b. A2 Portables
    - 1) 47
  - c. A3 Portables
    - 1) 0 (model shall still be quoted)
  - d. A1 Mobiles
    - 1) 0 (model shall still be quoted)
  - e. A2 Mobiles
    - 1) 179
  - f. A3 Mobiles
    - 1) 0 (model shall still be quoted)
  - g. Control Stations
    - 1) 27
- D. As part of the VHF narrowband, conventional option, the City has 154 mobile radios and 146 portable radios that require reprogramming for narrowband and with new proposed VHF conventional channels.

1. The majority of equipment is a mixture of older Motorola analog only radios.

## 2.4 PAGER REQUIREMENTS

### A. Features:

1. Respond to all industry standard tone alert formats used by emergency service personnel for tone and voice dispatch.
2. VHF Narrowband tone and voice pagers
3. UL Certified as intrinsically safe for use in hazardous classified locations.
4. Large sturdy knobs suitable for use with gloves.
5. Durable, rugged housing.
6. Meet MIL standard 810 F Procedures II for rain
7. Field programmable function switch
8. Scan
9. Monitor
10. Selective call
11. Tone/vibrate
12. Capable of 2 channel operation
13. Capability to scan both channels for pages while giving priority to pages received to channel 1.
14. Monitor mode feature permitting users to listen to all communication on the selected channel.
15. Be supplied with standard charger, belt clip and batteries

- B. The Respondent shall provide 27 standard pagers (Motorola Minitor V equivalency) for personnel and an additional 5 pagers including desktop battery charger/amplifier with antenna and relay. The 5 additional pagers are for house alert and require installation to activate existing firehouse lights and bells.

## 2.5 EQUIPMENT FEATURES AND ACCESSORIES

### A. Portables

1. Size and construction of unit shall permit one hand operation.
2. Weight, including battery shall not exceed 25 ounces.
3. Rotary control knobs with click stops for selecting the desired channel.
4. Battery:
  - a. Unit shall be supplied with, and operate from, a single self-contained, removable lithium ion battery.
  - b. The battery shall be capable of an operational duty cycle of 5/5/90, for eight hours of continual use.
  - c. Recharge time for the battery shall not exceed one hour.

5. Supplied with a 120 V battery charger with ability to charge radio and a spare battery.
6. Supplied with a flexible 1/2 wave antenna.
7. Options
  - a. Spare battery
  - b. High capacity battery
  - c. Leather carrying case with swivel belt clip and shoulder strap swivel connectors.
  - d. 12V DC charger.
  - e. 120 V Multi-unit/gang bank charger
  - f. 120 V Multi-unit/gang bank charger/battery conditioner/optimizer
  - g. Extra long leather shoulder strap
  - h. Intrinsically safe battery
  - i. 1/4 wave stub antenna
  - j. Lapel speaker microphone
  - k. Lapel speaker microphone with antenna
  - l. Headset
  - m. Programming software
  - n. Programming cable

B. Mobiles

1. Mobile radio equipment shall include the following:
  - a. Microphone
  - b. Internal speaker
  - c. External speaker - OPTION
  - d. Cables
  - e. Fusing
  - f. Mounting hardware
  - g. Coax and permanent mount antennas
2. Dash mount radios shall consist of a single unit combining the functions of the control head and main chassis. The control head shall provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.
3. Trunk mount radios shall consist of two to three parts, the control head (s) and the main chassis. The main chassis should be mounted in the trunk, behind the seat, or in another area generally inaccessible to the vehicle operator during normal operation. The control head shall be mounted in the dash area of the vehicle or other location and is remote from the chassis. The control head shall

provide all controls and indicators for operation of the radio, including on/off, volume, channel selection, etc.

4. All mounting hardware shall securely attach to the vehicle. The unit shall be equipped with a "key lock" into the housing for added security.
5. Antenna: Nominal mobile antenna gain shall be a minimum of 3 dB and shall be optimized for vehicle function, type, and geographic location. Antenna specifications must be submitted with consideration given to bandwidth range and proposed gain.
6. Options:
  - a. Motorcycle mounting kit
  - b. Dual control head
  - c. Dual Tone Multi-Frequency (DTMF) microphone to allow for encoding capabilities for the operator
  - d. External siren, controllable from the radio control head.
  - e. Programming cable
  - f. Programming software

C. Control stations

1. Shall be prepackaged in an enclosure suitable for desktop positioning in an office environment, configured for 120VAC operation, and have no exposed wiring that presents a shock hazard.
2. Shall be equipped with desktop microphone and external speaker.
3. Control station antennas, connectors and coaxial cable shall be provisioned to comprise a complete operational package. Antennas shall be high quality and all connectors shall be weatherproof. Control station antennas shall be Yagi types, with gain suitable for the application. Control station antennas shall be mounted outdoors on structures approved for the applicable load. In no case shall the control station antenna be located inside of manned buildings or utilize magnetic mount type antennas.
4. The control stations shall be equipped to support a minimum of six remote units using digital remote control technology. The remote units must be able to control frequency and all other control station capabilities.
5. Options:
  - a. Programming software
  - b. Programming cable

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Installation shall include delivery to the site, unloading inside, setting in place, fastening to facility or vehicle, where required, internal wiring and connection of components to the system, programming, testing, and all other work, whether or not expressly required herein which is necessary to result in a complete tested and operating system. This shall include the removal and/or relocation of any existing equipment to allow for the installation of new equipment.
- B. Selected Respondent shall determine proper cable lengths for the equipment to be installed.
- C. All cutting, patching and finishing required in connection with Respondent's installation and the Contractor so as to match the original conditions perfectly both as to material and workmanship shall do the repair of any damage caused by the installation.
- D. Installation shall be performed by the selected Respondent's factory trained field personnel or service shop. No sub-contractor will be allowed without approval from the City.
- E. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the National Electrical code, IEEE and all local authorities having jurisdiction.
- F. Selected Respondent shall install all required programming and software on each radio.

### 3.2 SPECIFIC INSTALLATION REQUIREMENTS

- A. Standard Installations and Documentation
  - 1. Respondent shall develop and document standard installations for each type of location, vehicle, etc., based on input and consultation with City personnel.
  - 2. Standard installation documentation shall include sufficient specifications, equipment, descriptions, procedures, photos, drawings, etc., to completely describe the work to be performed and final installation configuration.
  - 3. Respondent shall submit standard installation to City for review and approval at least 30 days before any installations shall take place.
- B. Portable radios
  - 1. Program unit
  - 2. Charge all batteries
  - 3. Test
  - 4. Deliver documentation and test results
  - 5. Obtain customer inspection and sign-off
- C. Mobile radios
  - 1. Install in vehicle using approved procedure
  - 2. Document installation
  - 3. Program unit

4. Test
  5. Deliver documentation and test results
  6. Obtain customer inspection and sign-off
- D. Control Station radios
1. Install using approved procedure
  2. Program units
  3. Test
  4. Deliver documentation and test results
  5. Obtain customer inspection and sign-off

**END OF SECTION**

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## SECTION 6

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### ALTERNATE SOLUTIONS

## SECTION 6.a – OPTION D – PROJECT OVERVIEW

### PART 1 - GENERAL

#### 1.1 OPTION D – ALTERNATE SOLUTIONS

- A. This solution will invite vendors to introduce other technologies or solutions that exist in the market place as an alternative to the technologies cited in the previously identified solutions. These solutions will be considered as alternatives and should meet the necessary elements of the communications system as identified in this RFP.
- B. The Project may include one or more several related networks and Project components.
  - 1. A 800 MHz Project 25 Phase 1 Trunked radio system,
  - 2. VHF conventional, narrowband channels for mutual aid with adjacent agencies coming into the City and provides paging tones to City agencies.
    - a. Conventional, analog, narrowband VHF Interoperability channels
  - 3. Radio Dispatch Console System
    - a. Respondent may provide pricing for provision of a new four position Radio Dispatch Console System
    - b. The Radio Dispatch Console System must interface with existing legacy conventional equipment.
  - 4. Internet Protocol (IP) based microwave network linking transmitter sites, dispatch consoles, master controller, and all other system components.
  - 5. New tower sites that may include the provision of towers, shelters, and other site equipment.
  - 6. New subscriber equipment and/or upgrade of existing subscriber equipment for use by first responders.
- C. IP network connectivity has emerged as the standard for Project 25 system interconnect and backhaul, replacing tone and circuit switched system control and backhaul. It is desired that the respondents propose IP-based system control and backhaul.
- D. It is desired that all equipment locations and sites be secure and have adequate uninterruptible power and backup power systems. In choosing sites for this system, respondents must ensure that the facilities provide secure equipment rooms have adequate environmental control systems for the equipment proposed, have adequate uninterruptible power supply (UPS) systems for the equipment proposed, and meet all of the grounding and installation requirements for communications facilities as published in Harris (M/ACOM 4618/1 R3A) or Motorola R56, or MIL 188-124B standards.

- E. Because of the high recurring costs to use commercially owned tower sites, the City provided a list of current properties that may be considered in Appendix C and may be considered for the provision of "green field" sites.
- F. General requirements for all components of this project include:
1. Robust and fault tolerant network infrastructure with sufficient capability to support all users on a common platform.
  2. Interface with conventional channels.
  3. Provide complete services including design, project management, permitting, installation, testing, documentation, training, and warranty maintenance.
- G. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, speaker microphones, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment, in either or both analog and digital voice alternatives.
- H. Voice RF Coverage Requirements
1. The City goal is a system design that provides for talk-out and talk back coverage to a portable radio used on the street, with portable and antenna on the hip. Coverage is to be provided with 95% reliability in 95% of the geographic area of the City.
  2. In addition, the City requires coverage to penetrate the denser buildings found in the city. Respondents shall provide for coverage to/from a portable radio inside a 20 dB building in the geographical area of the city with 95% reliability with the same radio configuration noted in above.
- I. Site Use, Acquisition And Development
1. The City prefers that current City-owned and currently leased sites be considered first in any system design, but otherwise has no preference as to sites to be utilized, as long as the requirements in this RFP are met. The City's intent is to allow Respondents to use any set of sites that will result in an efficient and cost effective design.
  2. Regardless of the sites proposed, Respondents shall retain complete responsibility for system performance and coverage. In support of the design, Respondents will submit documentation that appropriate due diligence has been performed with respect to tower space availability, pricing, shelter space, and other such items.
  3. Respondent shall be responsible for identifying the optimum sites and contacting the site owner to determine feasibility of lease of the site and sufficient space for the system equipment. Sites should be selected to provide best performance and optimize the respondent's system design.
  4. The City prefers to use new raw land sites rather than new commercial/leased sites. The City encourages respondents to consider the use of government owned properties for new sites.
  5. A list of existing tower sites that may be used in engineering the specified coverage is summarized in Appendix C.

6. Negotiation of site purchase or lease shall be the responsibility of the City.
7. Site Development
  - a. Respondent shall be responsible for site development of new radio sites and/or upgrade of existing sites. Site development work will be listed as a separate cost line item on a site-by-site basis.
  - b. Site development services include:
    - 1) Final site layout and design per network requirements design
    - 2) Preparation and submission of NEPA/SHPO studies
    - 3) Site preparation
    - 4) Grounding
    - 5) Shelters
    - 6) Towers
    - 7) Fencing
    - 8) Project management
    - 9) Installation
    - 10) Testing & Commissioning
    - 11) Training
    - 12) Documentation
- J. Provision Of New Equipment
  1. All equipment shall be provided in new condition, and be covered by a full factory and/or manufacturer's warranty.
  2. All equipment proposed shall be current production equipment with a minimum of two years continued production anticipated before end of life.
  3. Lifecycle roadmaps for all equipment and system components shall be provided.
  4. Used, refurbished, or previously installed equipment may not be proposed.
  5. All equipment supplied as part of the system(s) shall be subject to system warranty.

## 1.2 WORK INCLUDED

- A. The intent of this RFP is to obtain an end-to-end, turnkey solutions meeting the functional requirements of the City for any of the Options but does not require Respondents to provide solutions for all Options.
- B. Turnkey Respondent Responsibility
  1. Provide a total system design including any and all subsystem components.
  2. Provide all systems necessary to meet the specification and as outlined in Respondent's proposal, regardless of manufacturer.

3. Provide full turnkey installation and optimization services for all systems, subsystems and components, as outlined in Respondents response, regardless of manufacturer.
  4. All respondent, contractor, and/or sub-contractor labor, travel, lodging, delivery, and other expenses shall be provided as part of the project. No additional charges for expenses shall be paid by the City unless expressly agreed to in writing.
- C. The Contractor shall be responsible for providing all products and services for a complete working system, whether or not specifically required and proposed, unless specifically excluded from the project.
1. Radio Network, consoles, control points, and user equipment
    - a. Complete system design
    - b. Network infrastructure including RF and control
    - c. Dispatch console equipment
    - d. User equipment including mobile, portable, and control station radios
    - e. Project management
    - f. Installation and programming
    - g. Testing
    - h. Training
    - i. Documentation
  2. Site Development
    - a. Project management
    - b. Site construction
    - c. Site commissioning
    - d. Documentation
  3. Grounding and Bonding
    - a. As part of the work to be performed all RF equipment, antenna systems, transmission lines, and the design of the antenna support structures (towers), shelters, electrical and generator systems must be designed, and installed in compliance with grounding and Installation standards such as
      - 1) Harris (Formerly M/A-COM) 4618/1 R3A or
      - 2) MIL 188-124B.
      - 3) Motorola R-56,
    - b. Respondent shall detail which grounding and installation standard(s) are to be used in the construction of the City's system.
  4. RF Interference

- a. Respondent shall demonstrate good engineering practice in design and installation such that all proposed equipment is configured and installed to minimize RF interference to, from, or with co-located equipment.
- b. Respondent shall be responsible to identify and analyze potential interference sources during system design activities.
- c. Respondent shall conduct and provide suitable inter-modulation calculations as part of final system design.
- d. Suitable filtering, isolation, and other means shall be proposed to correct any identified interference between the proposed and existing systems.
- e. Respondent shall be responsible to correct mutual interference between proposed and existing systems.
- f. Construction of new towers shall not interfere with existing broadcast systems per FCC rules Section 22.371. Pattern mitigation shall be respondent responsibility.
- g. Interference caused by the proposed systems or equipment shall be corrected by the Respondent at no additional cost to the City.

D. City Responsibilities

1. Provide reasonable access to City facilities where equipment is to be installed including a designated work area with adequate heat, light and a secure storage area for equipment delivered for installation to the City designated location.
2. Assist Contractor in obtaining building permits required in conjunction with this project, where practical.
3. Secure additional sites and/or facilities recommended by the selected Respondent, and agreed upon by the City.

1.3 PROJECT SUBMITTALS

A. The following information shall be submitted within twenty (30) working days of contract award:

1. Firm detailed Project schedule indicating all Project milestones and specific dates relating to the installation of the system.
2. The schedule shall include the following milestones:
  - a. Procurement
  - b. Pre-Shipment Integration Testing
  - c. Start and Finish of Equipment Installation
  - d. Start and Finish of Antenna System Installation
  - e. Start and Finish of System Equipment Testing

- f. Operator Training
  - g. End User Training
  - h. Network Administration Training
  - i. Start and Finish of Coverage Testing
  - j. Final Inspection
  - k. Delivery of final documentation.
  - l. System Certification
  - m. Final System Acceptance
- B. The following information shall be submitted within forty (45) working days of Contract award:
- 1. System block level diagrams
  - 2. Patching schedules and termination details for all horizontal cables necessary for a complete record of the installation.
  - 3. Radio and microwave channel plans
  - 4. Site Drawings including:
    - a. Site Plan Drawings which indicate scale, orientation and locations of proposed and existing features including towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - b. Equipment Shelter/Room Plan drawings which indicate scale, orientation, termination and proposed and existing hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - d. Tower Profile Drawings indicating current and planned antenna mounting locations of all new, existing, and modified sites
  - 5. Detailed list of materials for each site, including size and quantity, required to achieve calculated availability (i.e., antennas, waveguide, connectors, and hardware).

6. Detailed configuration information for each site, including link and launch delay settings, signal level settings, antenna manufacturer, model number, tilt, orientation, and mounting height required to achieve specified design coverage performance.
- C. Final Design: The following information shall be submitted within sixty (90) working days of contract award:
1. Any updates to previously submitted design information
  2. System operation and maintenance manuals for all equipment including, but not limited to:
    - a. Instructions for installation, alignment procedures, testing, commissioning
    - b. Information, procedures, and recommendations for maintenance and troubleshooting of the equipment.
  3. Installation Site Drawings: Drawings shall be coordinated with architectural and electrical power plans and shall be produced at the same scale as the architectural and electrical power plans. Installation Site Drawings shall include:
    - a. Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - b. Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - c. Tower Profile Drawings indicating antenna mounting locations
    - d. Respondent is responsible for coordination of final site drawings with the site construction contractor selected by the City.
- D. System Staging, Delivery and Installation: The following information shall be submitted as equipment is staged, delivered and installed:
1. Detailed Staging Acceptance Test Plan (SATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for shipment. The SATP shall include but not be limited to tests demonstrating:
    - a. Radio Console Features
      - 1) Instant Transmit
      - 2) Talkgroup selection and calling
      - 3) Talkgroup patching (Trunking and conventional)
      - 4) Multi-Select
      - 5) Multi Talkgroup calls
      - 6) Private calls

- 7) Emergency Notification
- 8) Alert Tone Generation
- b. Radio Network Features
  - 1) Emergency Call
  - 2) Emergency Call with System Busy
  - 3) Transmit Grant Tone
  - 4) System Busy Tone
  - 5) Out of Range Tone
  - 6) System Busy Queuing and Call back
  - 7) Reaction to failed base station(s)
  - 8) Reaction to failed backhaul link(s)
  - 9) Recovery from failed base station
  - 10) Recovery from failed backhaul link(s)
  - 11) Reaction to Failed Controller/Server
  - 12) Recovery from Failed Controller / Server
- c. System Network Management Features
  - 1) Display current system activity
  - 2) Display individual site status
  - 3) Display individual base station status
  - 4) Start/Stop individual base station
  - 5) Radio Enable / Disable
  - 6) Fault Management / Alarm Indications
  - 7) Reporting Capabilities
2. Detailed SATP shall be submitted no later than ninety (90) days before the testing starts.
3. Final SATP shall be approved no later than thirty (30) days before the testing starts.
4. User manual – one (1) copy per unit, to be kept at the installation site, plus five file copies delivered to the City
5. Installation manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
6. Maintenance manual – one (1) copy to be kept at the installation site plus five file copies delivered to the City
7. Bill of Materials – one (1) copy per shipment plus five (5) file copies delivered to the City
8. Installation documentation shall include complete system and site drawings.
- E. System Acceptance and Commission: The following information shall be submitted upon completion of installation and prior to Final System Acceptance and commissioning:

1. Detailed Final System Acceptance Test Plan (FATP), for City review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for Final System Acceptance by City.
2. Detailed FATP shall be submitted no later than 90 days before the testing starts.
3. FATP shall be approved no later than 30 days before the testing starts.
4. Five final and complete sets of as-built documentation, bound and containing all previous submitted manuals and materials including:
  - a. Documentation index
  - b. List of deliverables
  - c. Field Test reports
  - d. Coverage testing reports
  - e. Maintenance Data
  - f. As-Built System Block and Level Diagrams
  - g. As-Built Site Drawings including:
    - 1) Site Plan Drawings which indicate scale, orientation and locations of towers, buildings, ice bridges, fuel tanks, security fences, gates, utility service entrances and all other pertinent features
    - 2) Equipment Shelter/Room Plan drawings, which indicate scale, orientation termination and hardware placement. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - 3) Equipment Rack/Cabinet Elevations. The name of the building, room number and the title of room shall be included. The Respondent must show dimensions of space designated for future expansion of equipment.
    - 4) Tower Profile Drawings indicating antenna mounting locations

#### 1.4 TRAINING

- A. The successful Respondent shall develop and conduct professionally prepared training programs to allow City operating personnel to become knowledgeable with the system and the operation of their individual equipment.
- B. Respondent shall describe in detail end-user, system administrator, and maintenance training programs.
  1. Model specific end-user equipment training shall be proposed.

2. Hands-on System Administrator training shall be proposed.
3. Hands-on Radio Console training shall be proposed.

C. End User Equipment Training

1. A large number of users from a wide variety of agencies will need to be trained, this training should be designed as a "train the trainer" course to permit agencies to have their designees trained.
2. Respondent shall be prepared to train, and provide retraining materials to approximately forty to fifty agency trainers from various agencies during each session. Approximately 8-10 sessions to be conducted during days, evenings, and weekends will be needed.
3. The training should be oriented to optimum use of the equipment, proper non-technical care and operation, and characteristics of faulty operation.
4. Training shall include the function and operation of all controls.
5. The instructor shall give operational demonstrations of all Respondent supplied equipment and shall permit "hands-on" operation of equipment by trainees.

D. System Administrator Training

1. The System Administrator Training shall be oriented to optimum use of the equipment, proper non-technical operation and care, and the characteristics of faulty operation.
2. Training shall be oriented to permit City personnel to effectively manage and administer the operation of the radio network
3. Training should provide basic knowledge of the overall System Management functions, their purposes, and an introduction to basic navigation and use of the Radio System Management applications.
4. Training shall provide information regarding the use of system reports and real-time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.

E. Console System Training

1. The Respondent will be required to train approximately fifteen Console Operators, and two (2) System Administrators.
  - a. The training shall be scheduled to allow sufficient time for all participants from all shifts to be trained. The Respondent shall provide a preliminary training schedule for review and approval by the City for each type of training to be provided.

- b. City trainers shall receive both standard operations training and “train the trainer” specific training.

F. Training Materials

1. Training materials shall be provided for all students covering all aspects of the training. Students will retain all such training materials.
2. Illustrations and photographs, where provided, shall be specific to the Winchester City installation. Color photos must be provided where detail or clarity is supported by use of color. Black and white photocopying of color materials is unacceptable.
3. Respondent shall provide fully editable (softcopy) versions of all training materials so that the City trainers can update the course materials over time.

- G. The Respondent shall provide unit pricing for all media (CDs, DVDs, Manuals, etc.) used for training to allow the City to purchase additional training materials if necessary. The pricing provided shall be valid for a period of three (3) years following system acceptance.

1.5 WARRANTY

A. Warranty- One (1) Year After Final System Acceptance

1. The system described herein shall be the total responsibility of the Respondent prior to final system acceptance, and for one (1) year following final system acceptance, at no additional cost to the City.
2. Respondent agrees that any hardware or software warranties whose term exceeds one year after Final System Acceptance will be passed through to the City and will remain in effect for the full term of that warranty.
3. The warranty period shall begin on the date of Final System Acceptance.
4. System performance, and all hardware, parts and materials shall be warranted, including all related equipment labor, installation, handling, inspection, return and delivery charges and fees.
5. All software and firmware associated with system features, functions, and capacity as required by this RFP shall be warranted.
6. During the installation and warranty periods, the Respondent shall provide, at no additional cost, commercially available upgrades of any and all software and firmware sold to the City as part of the installation. The frequency and timing of installation of upgrades during this period will be at the sole discretion of the City based on availability by the Respondent.
  - a. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:
    - 1) Patches for defective software;

- 2) New releases that are corrective revisions for earlier versions and/or; no-cost enhancements to earlier releases.
    - b. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
    - c. The Respondent should make every effort to separate corrective revisions from enhancements. If the Respondent is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.
  7. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions. If deemed necessary by the City, software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City.
  8. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the warranty period.
  9. Any notices either generated and circulated internally by the Respondent or received by the Respondent from the original Software Provider, alerting the Respondent to software problems found elsewhere, shall be passed onto the City within 30 days of receipt of such material.
  10. All conditions above also apply to all firmware installed in any products included as part of this system.
  11. Respondent shall fully describe all other terms and conditions of warranty in the Proposal.
  12. Respondent shall provide updates for documentation of all system components (hardware, software etc.) at the completion of the system warranty period.
- B. Latent Defects:
1. The Respondent, at no cost to the City, shall correct latent design defects or recurring problems relating to software, hardware or overall system design, even if such latent defects are discovered after final system acceptance.
  2. Nothing contained in this RFP shall be deemed to have caused any applicable statute of limitations to commence to run or any alleged cause of action to have accrued in the event of any latent defect not discovered until after final system acceptance and final payment. The statute of limitations shall commence to run on any alleged latent cause of action only upon actual discovery of such latent defect.
  3. System malfunctions due to software shall be corrected at no cost to the City.
- C. OPTIONAL Extended Warranty Beyond First Year

1. Respondent shall propose extended warranty services AS AN OPTION on an annual basis for years two through five.
2. The extended warranty specified shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Respondent under requirements of the Contract Documents.
3. Respondent shall provide repair/return services for a period of ten (10) years from date of Final System Acceptance.
4. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten (10) years from date of Final System Acceptance.
5. Notification shall be given at least one (1) year in advance of any change of status from products available from regular production to maintenance only.
6. Respondent shall fully describe all other terms and conditions of the extended warranty in the Proposal.
7. Respondent may also propose other optional extended warranties as part of the Proposal.

D. OPTIONAL End-User Equipment

1. End User equipment warranties may have terms of longer than one year, respondent is expected to provide warranty service throughout the term of the warranty for all end-user equipment.
2. During the full term of the warranty period malfunctioning mobile and portable non-fixed equipment units will be replaced by the Respondent.
3. Respondent personnel will remove and re-install equipment at the customer location. City or other agency personnel will not be required to travel to Respondent service shop for repair.
4. During the full term of the warranty period cost of unit removal and re-installation shall be borne by the Respondent.
5. The Respondent shall state the method for handling and the turn-around-time for the repair of mobile and portable radios during the warranty period.

1.6 MAINTENANCE SERVICE

A. General Requirements:

1. The approach to maintenance of this system shall be preventive maintenance.
2. Comprehensive maintenance services shall be proposed for each network.

3. The Respondent shall include in the Proposal the terms and conditions of the warranty / maintenance contract covering the equipment. The Respondent shall state in the Proposal the name, address, and capabilities of the service station(s) providing warranty / maintenance service.
  4. Maintenance for all items in the system shall be quoted on a standard maintenance contract basis for two (2)-hour response time, seven (7) days a week, unless otherwise specified
  5. Provide twenty-four (24) hour system alarm monitoring capability where users can dial one toll free number to report problems.
    - a. Respondent staff will then dispatch the proper technician in the allotted response time to resolve problem.
    - b. Respondent staff must generate a trouble report detailing who called, what the problem was, how it was resolved, response turn time and how much it cost to repair.
    - c. Trouble report must be deliverable in softcopy format by email to addresses specified by the City.
  6. Provide a list of maintenance plans available. These shall include:
    - a. Radio unit drive-in service;
    - b. Radio unit on-site service;
    - c. Fixed equipment on-site service;
      - 1) 2-hour response time
      - 2) 8-hour response time
      - 3) Next day response time
      - 4) Stocking of replacement units at shop
    - d. Fixed equipment mail in board repair;
      - 1) Normal response - 7 day
      - 2) Emergency response - Next day
      - 3) Full time on-site technician availability.
- B. Maintenance Standards:
1. Replacement parts shall be equal in quality and ratings as the original parts, rebuilt parts are not permitted.
  2. Equipment shall be maintained in a clean condition. Oil, dust and other foreign substances shall be removed on a routine basis.
  3. 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 that this has been done.

4. Records shall be available for the City's inspection upon request. Records shall be maintained by the Respondent's radio maintenance shop throughout the warranty period (and any subsequent maintenance contract period), and shall revert to the City upon termination of the warranty (or maintenance contract).
5. Respondent shall provide only factory trained and authorized maintenance personnel.
6. The service organization(s) shall maintain comprehensive installation and instruction manuals for all systems equipment. These manuals shall be the property of the City, and shall revert to the City at such time as the City assumes the maintenance responsibility for the system.
7. Maintenance of non-fixed equipment shall be on a unit replacement basis, at no cost to the City or the subscriber agency, such that the amount of time users spend in the maintenance shop shall be minimized.
8. If a fixed equipment module or a non-fixed unit (or control head if applicable) fails twice during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that the equipment is potentially prone to continuing failures, the Respondent shall replace it at no cost to the City.
  - a. If the same fixed equipment module fails twice at a separate location during the acceptance test and one year warranty period, the Respondent shall meet with the City to discuss and explain such failures. If, in the opinion of the City, these failures indicate that this specific model of device is potentially prone to continuing failures, the Respondent shall provide an equivalent equipment line for complete replacement at no cost to the City.

C. Preventive and Routine Maintenance

1. Routine maintenance procedures recommended by the equipment manufacturer shall be followed.

D. Response Times

1. Catastrophic Failures
  - a. Catastrophic failures are defined as those failures which severely impact the overall performance some examples include but are not limited to:
    - 1) System down, communications unavailable
    - 2) Site down, communications severely impacted
    - 3) Radio console system down
    - 4) Microwave system failure
  - b. Declaration of a catastrophic failure will be at the sole discretion of the City of Winchester.

- c. The Respondent shall have a qualified technician respond to the location of catastrophic failures within 1 hour during normal working hours (8 AM to 5 PM weekdays), and within 2 hours at other times.
    - d. Catastrophic failures not caused by outside effects such as Acts of God will be expected to be resolved within 2 hours after arrival of the technician.
  - 2. Non-catastrophic Failures
    - a. Declaration of a non-catastrophic failure will be at the sole discretion of the City of Winchester.
    - b. Non-catastrophic failures require the following responses:
      - 1) 0000- 1600 Same working day -- overtime if needed
      - 2) 1601- 2400 Next working day -- start job in AM
  - 3. Response times shall be the same as above during the acceptance test period.
- E. Escalation Procedures
  - 1. Respondent shall describe escalation procedures and equipment priority levels in their proposal to be used if the trouble is not resolved within required times.
  - 2. The City reserves the right to approve the proposed escalation procedures or to recommend alternative methods of escalation and problem resolution
- F. Hardware Maintenance Contract:
  - 1. As an OPTION, the Respondent shall offer separate one-year hardware maintenance contracts for each non-radio component contained in the proposal. Maintenance contracts shall commence immediately following the expiration of the warranty period. It is the intent of this paragraph to obtain maintenance quotations on those items, which are not directly related to the normal radio shop maintenance articles.
  - 2. As an OPTION, the Respondent shall offer a maintenance contract for the system fixed equipment and non-fixed equipment, that maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis. This system maintenance contract shall be based on the initial system configuration for fixed equipment and on a per unit basis for non-fixed equipment.
- G. Software Maintenance Contract:
  - 1. As an OPTION, the Respondent shall offer a software maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis.
  - 2. During the software maintenance contract period, the Respondent shall provide at no additional cost, periodic upgrades of any and all system operational software. The frequency and timing of these upgrades during this period will be

at the sole discretion of the City. This covers only upgrades by the Respondent or Original Equipment Manufacturer or Original Software Respondent that are:

- a. Patches for defective software;
  - b. New releases that are corrective revisions for earlier versions and/or;
  - c. No-cost enhancements to earlier releases.
3. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
  4. The software provider should make every effort to separate corrective revisions from enhancements. If the software provider is unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to the City at no additional expense.
  5. All back-up media and revised software manuals shall also be provided to the City at no extra cost at the time of any software revisions.
  6. Software upgrades shall be performed by the Respondent during evenings or weekends at no expense to the City, if so directed by the City.
  7. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the maintenance period. All system definition parameters and other unique information (data sets) used to operate the mobile radio system or any associated sub-system included shall be backed-up onto movable media on a quarterly basis during the maintenance period by the Respondent at no cost to the City. These media shall be turned over to the City for safe, off-site storage.
  8. All conditions above also apply to all firmware installed in any products included as part of this system or in any spare parts in possession of the City at the end of the warranty period.
  9. Any annual software license fees or software maintenance fees should be clearly identified in the Respondent's response and should either be rolled into this software maintenance contract fee or paid in full as part of the initial system price.

#### 1.7 SPARE PARTS

- A. Appropriate and sufficient spare parts shall be provided to the City by the Contractor.
- B. Respondent shall provide a comprehensive list of all proposed spare parts and equipment, which lists each recommended component and a description of its function.
- C. All spare parts and equipment shall be packaged with protective covering for storage and identified with conspicuous labels describing contents.

- D. The Respondent may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing those used on an as-used and timely basis. The spares complement shall include sufficient non-fixed units to enable maintenance on a unit replacement basis.
- E. At the end of the warranty/maintenance period, the full complement of spares shall be delivered to the City.
- F. Spare parts shall be available for shipment on an expedited basis twenty-four (24) hours a day, 365 days a year including weekends and holidays. The manufacturer shall provide a 24-hour hotline telephone number for the handling of such orders.
- G. Notification shall be given at least one (1) year in advance of any change of status for products available from regular production to maintenance only (MO). The specific statement shall be provided with the bid response.

## PART 2 - SYSTEM REQUIREMENTS

### 2.1 GENERAL REQUIREMENTS

- A. The following items reflect the basic objectives for system performance as identified by City users. Proposed systems should meet these requirements to the greatest extent practical.
1. RF coverage for the trunked radio network shall assume any belt-mounted portable radio indicated by the manufacturer as providing guaranteed service in the system design. Radios will be used w/swivel carry case antenna on hip for talk-out and talk back to a standard of 95/95 percent (area defined by City borders) in street coverage, 20 dB heavy in-building coverage and those buildings identified in Appendix D.
  2. Unit ID displayed at dispatcher positions and for subscriber units with unit ID-capable displays and alias display.
  3. "Emergency/Man Down" button on subscriber units
  4. Subscriber unit "talk-around" capability for localized use and system redundancy.
  5. Intra-operability within the system.
  6. Inter-operability with surrounding mutual aid jurisdictions.
  7. Continued use of existing VHF High band, tone and voice paging
  8. 99.999 percent system reliability
  9. All user equipment built to Mil. Spec
- B. Infrastructure includes the radios, combiners, antenna systems, controllers, switching equipment, dispatching console systems, and alarm and monitoring sub-systems and all related equipment.
- C. Non-fixed equipment includes subscriber field equipment such as mobile and portable radios, control station radios, and accessories and other equipment such as batteries and power systems, antenna systems, etc. Non-fixed user equipment shall be proposed in several levels or grades of equipment.

## PART 3 - EXECUTION

### 3.1 INSTALLATION PLANNING

- A. The Respondent Project Manager shall convene a Project planning session with the City within twenty (20) days of contract award, and together they will jointly develop a Project plan. The Project plan shall include:
1. Project description statement.
  2. A work statement that includes the Project deliverables and Project objectives.
  3. A Work Breakdown Structure (WBS) to the level at which control will be exercised.
  4. Updated Cost estimates, scheduled start dates, and responsibility assignments that support the WBS.
  5. Performance measurement baselines for schedule and cost.
  6. Major milestones and target dates for each.
  7. Key and required staff.
  8. Key risks, including constraints and assumptions, and planned responses for each.
  9. Subsidiary (supporting) management plans including scope management plan, schedule management plan, Project budget(s), change control process, acceptance testing, Project closure process, etc.
  10. Project communications plan or strategy, including periodic reporting requirements and milestone achievement determination.
  11. A written list of open issues and pending decisions.
  12. Supporting detail for all the above.
- B. The Project plan shall be presented to the City not more than fifteen (15) days after the Planning Session meeting.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Installation of equipment shall not begin prior to the City's approval of Shop Drawings and other required submittals.
- B. Installation shall include a complete, tested, system to include placement of associated cabling, appropriate system layout and terminal connections. Respondent shall provide

associated power supplies and any other hardware, adapters and or connections to deliver a complete operable system to the City at the time of acceptance.

- C. All installations shall be performed by factory authorized or Respondent affiliated service shops. Other shops or installers may be used upon mutual agreement between the customer and Respondent. Qualified, adequately trained personnel familiar with this type of work shall perform all installations.
- D. Prior to the start of the system installation the Respondent shall participate in a mandatory Project site survey with the City or City's representative to confirm actual equipment location within each space. At that time the exact equipment locations will be determined and documented by the Respondent.
- E. The installation Respondent shall coordinate with others, as appropriate, to confirm that any prep work, such as tower work, coring, bracing, conduit, electrical, etc that affects the installation of any equipment is complete before final inspection.
- F. During site visits, the Respondent shall review existing conditions at the Jefferson WT for additional structural capabilities to place new antennas on the water tower.

### 3.3 FACTORY TESTING AND STAGING

#### A. Products and Equipment:

- 1. Each individual assembly or equipment shall undergo factory testing prior to shipment.
- 2. Standard factory test documentation, indicating successful completion of testing, and fully documenting the tests performed, shall be submitted to the City to demonstrate compliance.

#### B. System Staging:

- 1. The complete system shall be staged and tested at the factory to the greatest extent practical.
- 2. The Respondent shall provide all necessary technical personnel, and test equipment to conduct staging tests. The Respondent shall remedy all deviations, anomalies, and test or specification failures in a timely manner and at the Respondent's sole expense.
- 3. Staging tests will be conducted using final, approved Staging Acceptance Test Plan (SATP).
- 4. The intent of the staging tests is to demonstrate to the City that the system is ready for shipment and installation. Therefore, the Respondent is expected to execute the SATP and correct all deficiencies before the City is on-site.

5. The City Project Manager or designee shall conduct and/or witness staging tests. The City's cost of travel and expenses associated with staging will be borne by the City.
6. Each section of the SATP, will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
7. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
8. Retest of the failed SATP section or the entire plan shall be at the City's sole discretion,
9. The fully executed and completed SATP document shall be provided to the City.

### 3.4 LABELING AND IDENTIFICATION

- A. All equipment, cables, connections, etc shall be clearly and permanently labeled per the Project drawings, manufacturer's requirements, and TIA/EIA-606A.
  1. Any other signage or labeling as required by law shall be provided.

### 3.5 FIELD QUALITY CONTROL

- A. Installation monitoring and meetings
  1. The Respondent shall attend monthly Project and construction meetings to discuss status, problems, and schedule with individuals deemed necessary by the City prior to and during installation. More frequent meetings may be held at the request of the City.
  2. Respondent shall maintain the written Project schedule on a monthly basis or more frequently if necessary to properly reflect Project activities.
- B. Inspection:
  1. When installation is substantially complete, Respondent shall schedule with the City an inspection of the work.
  2. The City Project Manager or designee will conduct an inspection of the work. Any deficiencies will be documented in a punch list format and delivered to Respondent for resolution.
- C. Pre-final testing

1. Before final testing, Respondent shall completely execute the final approved FATP to verify proper installation and operation of all equipment before presentation to the City.

D. Meeting Minutes and Reports:

1. Respondent shall provide written minutes of all meetings no later than the earlier of five days after the meeting or two (2) days prior to a subsequent meeting relating to the same issue(s).
2. Respondent shall submit a written status report at the end of each week noting progress to date, meetings held, schedule adherence, and variances.
3. Respondent shall provide written reports of corrected punch list items.

E. As-Built Documentation:

1. Respondent shall provide two (2) copies of all as-built documentation
2. All submittals shall be provided in hard copy, paper format, and in electronic format on CD-ROM or USB "thumb drives."
3. Documentation shall be professionally produced, and provided in heavy duty three ring "D ring" style locking binders. Loose leaf materials are not permitted. Paper shall be shall be 8 ½ x 11" whenever possible. If larger paper is utilized it must be professionally incorporated into the document. Minimum paper quality permissible shall be 24# bond and ISO brightness of 90. Binders shall be color coded where it will provide an organizational benefit.
4. Respondent shall provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for the installation including detailed documentation for City review and detailed documentation of as-built conditions.
5. Respondent shall provide complete as built documentation detailing all aspects of the installation including but not limited to:
  - a. Equipment provided
  - b. Plan and elevation drawings of all equipment including antennas on tower
  - c. Cabling and terminations
  - d. Installed location
  - e. Block and level diagrams
  - f. Termination panels
  - g. Programming

h. Set-up and alignment information

6. Equipment/Terminal Elevations: Furnish details showing equipment racks, terminal block and backboard elevations, including all cable terminals, spaces for equipment, equipment racks, and station cable routing. Communications equipment distribution frames shall be arranged to maximize the utility and growth potential available in spaces shown on the floor plans. Terminal elevations shall be based on detail elevations included in the Contract Documents and shall show additional detail as indicated herein.

3.6 CLEANING

- A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.
  1. Worksites shall be left neat and broom swept upon completion of work. All trash shall be removed weekly.

3.7 FINAL INSPECTION

- A. Upon notification of completion of all installation and resolution of all punch list items, City Project Manager or designee will conduct final inspection of the installation.
- B. Any deficiencies will be noted on the punch list and provided to the Respondent for resolution.
- C. Final System Acceptance testing will not commence until all punch list items are resolved.

3.8 TRAINING

- A. The Respondent shall complete all training prior to Final System Acceptance.

3.9 FINAL SYSTEM ACCEPTANCE TESTING

- A. Respondent shall verify and document that all equipment, assemblies, hardware, software, and firmware are upgraded to the latest factory revision before the start of Final System Acceptance testing. Multiple revision levels among similar equipment are unacceptable.
- B. City shall be given two (2) weeks written notice that the system is ready for Final System Acceptance testing.
- C. The Respondent shall provide all necessary technical personnel, and test equipment to conduct final testing.

- D. The Respondent shall remedy all variances or deficiencies in a timely manner and at the Respondent's sole expense.
- E. Final tests will be conducted using the complete and approved Final System Acceptance Test Plan (FATP).
- F. The intent of the Final System Acceptance tests is to demonstrate to the City that the system is complete and ready for commissioning and operation. Therefore, the Respondent is expected to perform preliminary execution of the FATP prior to final execution with the City.
- G. The City or Engineer shall conduct and/or witness execution of the FATP.
- H. Each section of the FATP will be sequentially executed, signed and dated by representatives of both the Respondent and the City and shall indicate the status of the section as either passed or failed.
- I. Failed tests will be documented, corrected, and retested. All defective components shall be replaced and re-tested. Defective components that cannot be corrected shall be replaced at the expense of the Respondent.
- J. Retest of the failed FATP section or the entire plan shall be at the City's sole discretion,
- K. The fully executed and completed FATP document shall be provided to the City.

### 3.10 FINAL SYSTEM ACCEPTANCE

- A. "Final System Acceptance" shall mean the date on which the Respondent delivers all required documentation to the City and completes all of the work on the Project as required by the Contract Documents, including, without limitation, the date on which the Respondent completes all of the following requirements and demonstrates that the Project is complete in all respects, as determined by the City in its sole discretion, as evidenced by written notice from the City to the Respondent:
  - 1. Receipt and approval of the Staging Acceptance Test Plan (SATP)
  - 2. Satisfactory completion of the Staging Acceptance Test and resolution of punchlist items
  - 3. Completion of System installation
  - 4. Final inspection and resolution of installation punch list items
  - 5. Receipt and approval of the as-built documentation
  - 6. Receipt and approval of the Coverage Acceptance Test Plan (CATP)
  - 7. Satisfactory completion of the Coverage Acceptance Test and resolution of punchlist items

8. Satisfactory completion of installation of subscriber equipment
9. Completion of all training required by the Contract Documents
10. Receipt and approval of the Final System Acceptance Test Plan (FATP) and related test;
11. Satisfactory completion of the Final System Acceptance Test and resolution of punchlist items

**END OF SECTION**

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# APPENDIX A

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## GLOSSARY

## APPENDIX A - GLOSSARY

### - A -

<b>ANSI:</b>	American National Standards Institute
<b>APCO:</b>	Association of Public Safety Communications Officers
<b>ATP</b>	Acceptance Test Plan
<b>ATS:</b>	Automatic Transfer Switch
<b>AVL:</b>	Automatic Vehicle Location

### - B -

<b>Base station:</b>	A radio station licensed by the FCC to operate at a certain location, at a specific frequency, at a specified power output for the purpose of communicating to other base stations and/or mobile radio units.
<b>BER:</b>	Bit Error Rate; A rate at which errors occur on a digital channel.
<b>BHP:</b>	Brake Horsepower
<b>Bidder:</b>	Entity providing a submittal in response to the requirements. Synonyms include Proposer, Respondent, Offeror, and/or Vendor.

### - C -

<b>CAD:</b>	Computer Aided Dispatch
<b>CATP:</b>	Coverage Acceptance Test Plan
<b>Combiner:</b>	A device that will permit multiple transmitters to share a common antenna.
<b>Console:</b>	A device that has the capacity to control transmissions and monitor reception of multiple remote located base stations
<b>Contractor:</b>	Successful Proposer to whom a contract is awarded
<b>Control point:</b>	Any location from which a base station's operation may be controlled.
<b>CRT:</b>	Cathode ray tube display
<b>CTCSS:</b>	Continuous tone coded squelch system.
<b>Customer:</b>	Same as Owner

**-D-**

<b>DADE:</b>	Differential Absolute Delay Equalizer, as related to microwave terminal equipment.
<b>DTE:</b>	Digital Transverse Equalizer, as related to microwave terminal equipment.
<b>DTE:</b>	Data Terminal Equipment, as related to Mobile Data and LAN networks.
<b>Duplex, Full:</b>	A communication circuit that permits simultaneous operation in both directions.
<b>Duplex, Half:</b>	A communications circuit that allows operation in both directions, one direction at a time.
<b>Duplexer:</b>	A device that will permit a transmitter and receiver to share a common antenna.

**-E-**

<b>EIA:</b>	Electronic Industries Association
<b>EMI:</b>	Electromagnetic Interference
<b>Engineer:</b>	The Owners technical representative for the project, L. Robert Kimball and Associates.
<b>ERP:</b>	Effective radiated power

**-F-**

<b>FATP:</b>	Final Acceptance Test Plan
<b>Fault tolerant:</b>	A system that upon failure of major components is still able to provide operation.
<b>FCC:</b>	Federal Communications Commission
<b>FDMA:</b>	(Frequency Division Multiple Access) A communications technique in which individual traffic channels are separated by being routed over separate frequencies.
<b>FRP:</b>	Fiberglass Reinforced Plastic
<b>Furnish:</b>	To supply and deliver, ready to install

**-G-**

<b>Gain:</b>	The level a signal is increased beyond its original level.
<b>GUI:</b>	Graphical User Interface

**-H-**

**Hertz (Hz):** Unit of frequency. Used to specify the frequency of operation, or the block of frequencies used by a communications system or device.

**-I-**

**IEEE:** Institute of Electrical and Electronics Engineers

**Install:** Position for service, ready for use

**Interference:** The reception of unwanted radio emissions that degrade or interrupt the reception of the desired signal.

**-L-**

**Leaky coax:** A type of transmission cable that has multiple perforations along its inner shield that permits radio transmissions to radiate outward along its length. This type of coax is used to provide coverage inside tunnels and buildings.

**LCD:** Liquid Crystal Display

**LNA:** Low noise amplifier

**- M -**

**MTBF:** Mean time between failures.

**MCE:** Master Control Equipment, related to dispatch console electronics

**MHSB:** Monitored - Hot Standby, as related to microwave terminal equipment.

**MSE:** Master Station Equipment, related to alarm and control,

**Multicoupler:** A device that permits several receivers to share a single antenna.

**Mux:** Multiplex or channel bank equipment

**- N -**

**Narrowband:** A radio channel that requires 12.5 KHz or less of bandwidth to provide intelligible information.

**Non-fixed equipment:** Mobile, portable, and control station radios, and pager units, as distinguished from infrastructure equipment.

**NWS:** New World Systems (CAD vendor)

**NPSPAC:** National Public Safety Planning Advisory Committee

- O -

**Offerer:** Entity providing a submittal in response to the requirements. Synonyms include Proposer, Bidder, Contractor, and/or Vendor.

**Omni directional:** A type of antenna that theoretically radiates rf energy equally in all directions.

**OPE:** Operator Position Equipment, related to dispatch console electronics.

**Owner:** Entity that will issue final contract to procure, and assume possession of, the system upon final acceptance. Synonyms include Customer, User, Purchaser.

- P-

**Polyphaser:** A brand name of a device installed in transmission lines between antennas and radio equipment that is used to prevent damage from lightning strikes to the antenna from reaching the radio equipment.

**Prime Contractor:** Contractor in overall charge of the work, including other Contractors or sub-contractors

**Product:** All supplied materials, systems, equipment, and services

**Proposer:** Entity providing a submittal in response to the requirements. Synonyms include Respondent, Bidder, Offeror, and/or Vendor.

**Provide:** To furnish and install, ready for use.

**PTT:** Push to talk. A common radio industry term referring to the keying of a microphone transmit button.

**PTT-ID:** Each time a radio unit transmits a call, the individual ID of the radio unit shall be made available to the system management and displayed to the dispatcher. This ID can be "aliased" to a user name or radio unit number. Properly equipped wireless dispatch or field radio units can display the ID and optionally display the alias as well.

- Q -

**Queuing:** The holding of overflow calls in memory until a channel becomes available.

- R -

**RDCS:** Radio Dispatch Console System

<b>Refarming:</b>	FCC initialize to provide additional channel assignments, primarily by reduces the bandwidth of existing channels below 512 MHZ.
<b>Remote unit:</b>	A device that is used to control transmission and monitor reception of a single distant base station.
<b>Respondent:</b>	Entity providing a submittal in response to the requirements. Synonyms include Proposer, Bidder, Offeror, and/or Vendor.
<b>RFI:</b>	Radio Frequency Interference
<b>RFP:</b>	Request for Proposal
<b>Repeater:</b>	A radio device that receives a signal on one frequency and rebroadcasts it over another frequency.
<b>RTU:</b>	Remote Terminal Unit

- S -

<b>SATP:</b>	Staging Acceptance Test Plan
<b>SCADA:</b>	Supervisory Control and Data Acquisition
<b>SINAD:</b>	(Signal noise and distortion) A measurement of receiver performance that is typically listed in equipment specification information.
<b>Subscriber Equipment:</b>	Same as non-fixed equipment

- T -

<b>Talk-around:</b>	Talk-around is the ability of voice radio units to operate unit-to unit without going through the radio tower site base repeater stations. Generally, the radio subscriber units transmit and receive on the base repeater station's transmit frequency or some other frequency(s) not operational at the fixed radio sites. Range is limited to the power of the subscriber radio units. Talk-around allows unit to unit operations when out of range of the system or allows a tactical operation to exist within the system range but not load the system talk-paths.
<b>Talkgroup:</b>	A Talkgroup is an operational group of radio users requiring two-way radio communications. An agency shall have multiple talkgroups within their overall operations. Unique digital ID's allow talkgroups to provide a "virtual RF channel" to radio users, even if there is only a single talk-path to be shared between multiple talkgroups.
<b>TDMA:</b>	Time division multiple access- A digital modulating technique in which a number of signals are transmitted over the same frequency and are separated by time slots.

**TTA:** Tower top amplifier

**- U -**

**UHF Band:** Ultra High Frequency - A group of communications channels operating in the 450 to 470 MHz band.

**UHF-T Band:** A group of communications channels operating in the 470 to 512 MHz band that share the bandwidth with UHF television channels.

**- V -**

**Vendor:** Entity providing a submittal in response to the requirements. Synonyms include Proposer, Bidder, Offeror, and/or Contractor.

**VOX:** Voice Operated Transmit as related to PTT applied through a headset/boom microphone.

**-W-**

**Wideband:** A radio channel that requires 25 KHz of bandwidth to provide intelligible information.

**-Y-**

**Yagi:** A narrow beam directional antenna used for directing a radio transmission towards a distant point.

**END OF SECTION**

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# APPENDIX B

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## FCC LICENSE INFORMATION

**APPENDIX B - FCC LICENSE INFORMATION**

<b>Existing Frequency Assignments</b>			
<b>Call sign</b>	<b>TX</b>	<b>RX</b>	<b>Designator</b>
<b>KB79505</b>	<b>158.925</b>	<b>156.000</b>	<b>PD3</b>
			<b>PD4</b>
<b>KIA408</b>	<b>159.210</b>	<b>155.910</b>	<b>PD1</b>
			<b>PD2</b>
<b>KIG279</b>	<b>154.220</b>		<b>Fred Co Fire</b>
	<b>154.370</b>		<b>FD1</b>
	<b>154.415</b>		<b>FD2</b>
	<b>154.250</b>		<b>FD3</b>
	<b>154.280</b>		<b>Metro</b>
<b>WNSH503</b>	<b>155.205</b>		<b>Disaster</b>
<b>WQDW620</b>	<b>159.060</b>		<b>PW</b>

<b>Frequencies Awaiting FCC Approval (Location is Jefferson WT)</b>			
<b>Call sign</b>	<b>TX</b>	<b>RX</b>	<b>ERP</b>
<b>N/A</b>	<b>856.4625</b>	<b>811.4625</b>	<b>500</b>
	<b>857.4625</b>	<b>812.4625</b>	<b>500</b>
	<b>858.4625</b>	<b>813.4625</b>	<b>500</b>
	<b>859.4625</b>	<b>814.4625</b>	<b>500</b>
	<b>859.7125</b>	<b>814.7125</b>	<b>500</b>
	<b>855.2125</b>	<b>810.2125</b>	<b>500</b>

**REFERENCE COPY**

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**Federal Communications Commission  
Public Safety and Homeland Security Bureau**

**RADIO STATION AUTHORIZATION**

LICENSEE: WINCHESTER, CITY OF

ATTN: ERIN ELROD  
WINCHESTER, CITY OF  
231 E PICCADILLY ST  
WINCHESTER, VA 22601

<b>Call Sign</b> KB79505	<b>File Number</b>
<b>Radio Service</b> PW - Public Safety Pool, Conventional	
<b>Regulatory Status</b> PMRS	
<b>Frequency Coordination Number</b>	

FCC Registration Number (FRN): 0004631966

<b>Grant Date</b> 11-30-2010	<b>Effective Date</b> 01-19-2011	<b>Expiration Date</b> 02-22-2021	<b>Print Date</b>
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**STATION TECHNICAL SPECIFICATIONS**

**Fixed Location Address or Mobile Area of Operation**

**Loc. 1 Area of operation**

Operating within a 32.0 km radius around 39-11-08.4 N, 078-09-52.0 W,  
FREDERICK county, VA

**Loc. 2 Address: 540 JEFFERSON STREET**

**City: WINCHESTER County: State: VA**  
**Lat (NAD83): 39-10-48.9 N Long (NAD83): 078-11-02.9 W ASR No.: Ground Elev: 246.0**

**Antennas**

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000156.00000000	MO	50		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	30.000	30.000			

**Conditions:**

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: WINCHESTER, CITY OF

Call Sign: KB79505

File Number:

Print Date:

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000158.92500000	MO	50		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	30.000	30.000			
2	1	000158.92500000	FB2	1		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	100.000	125.000	47.0	61.4	01-19-2012

Frequency 000158.92500000 Special Condition  
Authorization on a secondary basis.

Control Points

Control Pt. No. 1

Address: 231 EAST PICCADILLY STREET

City: WINCHESTER County: FREDERICK State: VA Telephone Number: (540)545-4715

Associated Call Signs

Waivers/Conditions:

Beginning January 1, 2013, this station must operate on channels with a bandwidth of 12.5 kHz or less, or with equivalent efficiency, regardless of the emission bandwidths set forth on this license. See Section 90.209(b)(5) of the Commission's Rules. Note, however, that the narrowbanding requirement does not apply to specific channels designated in Rule 90.20 or 90.35 for paging only.

**REFERENCE COPY**

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**Federal Communications Commission  
Public Safety and Homeland Security Bureau**

**RADIO STATION AUTHORIZATION**

LICENSEE: WINCHESTER, CITY OF

ATTN: ERIN ELROD  
WINCHESTER, CITY OF  
231 E PICCADILLY STREET SUITE 330  
WINCHESTER, VA 22601

<b>Call Sign</b> KIA408	<b>File Number</b> 0004510361
<b>Radio Service</b> PW - Public Safety Pool, Conventional	
<b>Regulatory Status</b> PMRS	
<b>Frequency Coordination Number</b>	

FCC Registration Number (FRN): 0004631966

<b>Grant Date</b> 11-30-2010	<b>Effective Date</b> 11-30-2010	<b>Expiration Date</b> 01-22-2021	<b>Print Date</b> 11-30-2010
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**STATION TECHNICAL SPECIFICATIONS**

**Fixed Location Address or Mobile Area of Operation**

- Loc. 2** Address: 231 E PICCADILLY ST  
City: WINCHESTER County: State: VA  
Lat (NAD83): 39-11-05.0 N Long (NAD83): 078-09-39.0 W ASR No.: Ground Elev: 217.0
- Loc. 3** Address: 540 JEFFERSON STREET  
City: WINCHESTER County: State: VA  
Lat (NAD83): 39-10-47.4 N Long (NAD83): 078-09-52.0 W ASR No.: Ground Elev: 215.0
- Loc. 4** Area of operation  
Operating within a 32.0 km radius around fixed location 3

**Antennas**

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	2	000155.9100000	FX1	1		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	40.000	28.000	24.4	16.0	

**Conditions:**

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: WINCHESTER, CITY OF

Call Sign: KIA408

File Number: 0004510361

Print Date: 11-30-2010

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	2	000159.21000000	FB	1	200	11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	40.000	28.000	24.4	16.0	
3	1	000037.18000000	FB	1	200	20K0F3E	100.000	72.000	34.0	23.8	
3	1	000037.28000000	FB	1	200	20K0F3E	100.000	72.000	34.0	23.8	
3	1	000039.54000000	FB	1	200	20K0F3E	100.000	72.000	34.0	23.8	
3	1	000159.21000000	FB2	1	200	11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	110.000	146.000	34.0	23.8	
4	1	000037.18000000	MO	30		20K0F3E	100.000				
4	1	000037.28000000	MO	30		20K0F3E	100.000				
4	1	000039.54000000	MO	16		20K0F3E	100.000				
4	1	000155.91000000	MO	30		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	30.000	30.000			
4	1	000159.21000000	MO	30		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	30.000	30.000			

Control Points

Control Pt. No. 1

Address: 231 E PICCADILLY ST.

City: WINCHESTER County: State: VA Telephone Number: (540)545-4715

**Licensee Name:** WINCHESTER, CITY OF

**Call Sign:** KIA408

**File Number:** 0004510361

**Print Date:** 11-30-2010

**Associated Call Signs**

KIG279

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**Waivers/Conditions:**

Beginning January 1, 2013, this station must operate on channels with a bandwidth of 12.5 kHz or less, or with equivalent efficiency, regardless of the emission bandwidths set forth on this license. See Section 90.209(b)(5) of the Commission's Rules. Note, however, that the narrowbanding requirement does not apply to specific channels designated in Rule 90.20 or 90.35 for paging only.

Beginning January 1, 2013, this station must operate on channels with a bandwidth of 12.5 kHz or less, or with equivalent efficiency, regardless of the emission bandwidths set forth on this license. See Section 90.209(b)(5) of the Commission's Rules. Note, however, that the narrowbanding requirement does not apply to specific channels designated in Rule 90.20 or 90.35 for paging only.

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**Federal Communications Commission  
Public Safety and Homeland Security Bureau**

**RADIO STATION AUTHORIZATION**

LICENSEE: WINCHESTER, CITY OF

ATTN: ERIN ELROD  
WINCHESTER, CITY OF  
231 E PICCADILLY ST  
WINCHESTER, VA 22601

<b>Call Sign</b> KIG279	<b>File Number</b> 0004221350
<b>Radio Service</b> PW - Public Safety Pool, Conventional	
<b>Regulatory Status</b> PMRS	
<b>Frequency Coordination Number</b> 100204000293	

FCC Registration Number (FRN): 0004631966

<b>Grant Date</b> 08-22-2003	<b>Effective Date</b> 06-08-2010	<b>Expiration Date</b> 11-05-2013	<b>Print Date</b> 06-09-2010
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**STATION TECHNICAL SPECIFICATIONS**

**Fixed Location Address or Mobile Area of Operation**

- Loc. 1** Address: 540 W JEFFERSON ST  
City: WINCHESTER County: State: VA  
Lat (NAD83): 39-10-47.4 N Long (NAD83): 078-11-03.0 W ASR No.: Ground Elev: 244.0
- Loc. 2** Address: 231 E PICCADILLY ST  
City: WINCHESTER County: State: VA  
Lat (NAD83): 39-11-05.0 N Long (NAD83): 078-09-39.0 W ASR No.: Ground Elev: 217.0
- Loc. 3** Area of operation  
Operating within a 32.0 km radius around fixed location 1

**Antennas**

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000154.22000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	53.0	64.0	

**Conditions:**

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: WINCHESTER, CITY OF

Call Sign: KIG279

File Number: 0004221350

Print Date: 06-09-2010

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000154.28000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	53.0	64.0	
1	1	000154.37000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	53.0	64.0	
1	1	000154.41500000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	53.0	64.0	
2	1	000154.22000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	24.4	16.0	
2	1	000154.25000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	100.000	100.000	24.4	16.0	

Licensee Name: WINCHESTER, CITY OF

Call Sign: KIG279

File Number: 0004221350

Print Date: 06-09-2010

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	1	000154.28000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	100.000	100.000	24.4	16.0	
2	1	000154.37000000	FB	1	200	11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000	24.4	16.0	
3	1	000154.22000000	MO	50		11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			
3	1	000154.25000000	MO	50		11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			
3	1	000154.28000000	MO	50		11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			

Licensee Name: WINCHESTER, CITY OF

Call Sign: KIG279

File Number: 0004221350

Print Date: 06-09-2010

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
3	1	000154.37000000	MO	50		11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			
3	1	000154.41500000	MO	50		11K0F1D 11K0F2D 11K0F3E 20K0F1D 20K0F2D 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			

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Control Points

Control Pt. No. 1

Address: 231 E PICCADILLY ST.

City: WINCHESTER County: State: VA Telephone Number: (540)545-4715

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Associated Call Signs

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Waivers/Conditions:

NONE

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**Federal Communications Commission  
Public Safety and Homeland Security Bureau**

**RADIO STATION AUTHORIZATION**

LICENSEE: WINCHESTER, CITY OF

ATTN: ERIN D. ELROD  
WINCHESTER, CITY OF  
231 E PICCADILLY STREET SUITE  
WINCHESTER, VA 22601

<b>Call Sign</b> WNSH503	<b>File Number</b> 0004184169
<b>Radio Service</b> PW - Public Safety Pool, Conventional	
<b>Regulatory Status</b> PMRS	
<b>Frequency Coordination Number</b> 100204000294	

FCC Registration Number (FRN): 0004631966

<b>Grant Date</b> 05-28-2005	<b>Effective Date</b> 03-25-2010	<b>Expiration Date</b> 06-04-2015	<b>Print Date</b> 03-26-2010
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**STATION TECHNICAL SPECIFICATIONS**

**Fixed Location Address or Mobile Area of Operation**

**Loc. 1 Area of operation**  
Statewide: VA

**Antennas**

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000155.2050000	MO	20		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	100.000	100.000			

**Control Points**

**Control Pt. No. 1**

**Address:** 231 E. PICCADILLY STREET

**City:** WINCHESTER    **County:** FREDERICK    **State:** VA    **Telephone Number:** (540)545-4715

**Associated Call Signs**

**Conditions:**

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

**Licensee Name:** WINCHESTER, CITY OF

**Call Sign:** WNSH503

**File Number:** 0004184169

**Print Date:** 03-26-2010

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**Waivers/Conditions:**

NONE

Preferred  
Copy

REFERENCE COPY

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Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: WINCHESTER, CITY OF

ATTN: ERIN D. ELROD
WINCHESTER, CITY OF
231 E PICCADILLY STREET SUITE 330
WINCHESTER, VA 22601

Table with 2 columns: Call Sign (WQDW620), File Number (0004221339), Radio Service (PW - Public Safety Pool, Conventional), Regulatory Status (PMRS), Frequency Coordination Number (100204000292)

FCC Registration Number (FRN): 0004631966

Table with 4 columns: Grant Date (11-16-2005), Effective Date (06-08-2010), Expiration Date (11-16-2015), Print Date (06-09-2010)

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

- Loc. 1 Address: 540 JEFFERSON STREET, City: WINCHESTER, County: , State: VA, Lat (NAD83): 39-10-47.4 N Long (NAD83): 078-09-52.0 W ASR No.: 1243722 Ground Elev: 215.0
Loc. 2 Address: 12 MILES SSW WINCHESTER, City: MIDDLETOWN, County: FREDERICK, State: VA, Lat (NAD83): 39-01-03.4 N Long (NAD83): 078-16-39.0 W ASR No.: Ground Elev: 213.0
Loc. 3 Address: 301 E CORK STREET, City: WINCHESTER, County: , State: VA, Lat (NAD83): 39-10-53.3 N Long (NAD83): 078-09-39.0 W ASR No.: Ground Elev: 207.0
Loc. 4 Area of operation Countywide: FREDERICK, VA

Conditions:

Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: WINCHESTER, CITY OF

Call Sign: WQDW620

File Number: 0004221339

Print Date: 06-09-2010

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000159.06000000	FB	1		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	110.000	150.000	20.0	7.8	11-16-2006
<b>Frequency 000159.06000000 Special Condition</b> Authorization on a secondary basis.											
2	1	000159.06000000	FB	1		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	150.000	150.000	13.0	-21.6	11-16-2006
<b>Frequency 000159.06000000 Special Condition</b> Authorization on a secondary basis.											
3	1	000159.06000000	FB	1		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	150.000	150.000	20.0	8.3	11-16-2006
<b>Frequency 000159.06000000 Special Condition</b> Authorization on a secondary basis.											
4	1	000159.06000000	MO	200		11K0F2D 11K0F3E 20K0F3E 6K00F3E 8K10F1E	110.000	110.000			11-16-2006

Control Points

Control Pt. No. 1

Address: 231 E PICCADILLY STREET

City: WINCHESTER County: State: VA Telephone Number: (540)545-4715

Associated Call Signs

Waivers/Conditions:

NONE

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# APPENDIX C

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## CANDIDATE RADIO SITES

### APPENDIX C - CANDIDATE RADIO SITES

COMMON NAME	ADDRESS	X/Y COORDINATES	GROUND ELEVATION	STRUCTURE HEIGHT	OWNER	AVAILABILITY
Timbrook Public Safety Center	231 East Piccadilly Street	78-9-39.643 W 39-11-5.292 N	720'	50 ft tower	City of Winchester	Available
Jefferson Water Tower	540 Jefferson Street	78-11-01.80 W 39-10-48.10 N	866'	150 Water Tower	City of Winchester	Available
Frederick Douglas Elementary School	100 W. Cedarmeade Ave.	78-10-53.674 W 39-9-6.812 N	744'	Land only	Winchester Public Schools	Available
Health Professionals Building	1775 North Sector Court	78-11-9.427 W 39-12-1.066 N	866'	83'	Valley Health Systems	Unknown
North Loudoun Parking Garage	50 East Fairfax Lane	78-9-50.584 W 39-11-16.306 N	728'	728' includes structure height at roof (NW corner)	Winchester Parking Authority	Available
Winchester City Yards	310 E. Pall Mall Street	78-9-44.721 W  39-10-37.572 N	702'	Land only	City of Winchester, (Northeast of Spreader Storage Area)	Available
Virginia Avenue Charlotte DeHart Elementary School	550 Virginia Ave.	78-9-8.052 W  39-11-20.829 N	712'	Land only	Winchester Public Schools (North of School Parking Lot)	Available
John Handley High School	425 Handley Blvd..	78-10-41.366 W 39-10-42.935 N	852'	Land only	Winchester Public Schools	Available
Active Living Center/War Memorial Building	1001 East Cork Street	78-9-18.867 W 39-10-29.826 N	716'	Land only	City of Winchester	Available
Shentel Stadium	1122 Ralph Shockey Drive	78-9-13.96 W  39-9-57.065 N	853'	Land only	Shenandoah University  outside city limits	Unknown
Shentel Tower	701 Fairmont Ave	78-10-9.173 W 39-11-57.389 N	870'	201'	National Fruit Products	Unknown

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# APPENDIX D

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## CRITICAL BUILDINGS

**APPENDIX D**  
City of Winchster, VA Critical Buildings

Item	Building Name	Address	Town and Zip
1			
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**APPENDIX D**  
City of Winchster, VA Critical Buildings

Item	Building Name	Address	Town and Zip
33			
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40			
41			
42			
43			
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# APPENDIX E

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## SUBSCRIBER COUNTS

## APPENDIX E

### City of Winchester Subscriber Counts

OPTION A	
MODEL	QUANTITY
D1 Portable	160
D2 Portable	177
D3 Portable	0
D1 Mobile	152
D2 Mobile	125
D3 Mobile	0
Control Station	27
Individual Pager	27
Desktop Pager	5

OPTION B	
MODEL	QUANTITY
D1 Portable	0
D2 Portable	177
D3 Portable	0
D1 Mobile	108
D2 Mobile	125
D3 Mobile	0
Control Station	27
Individual Pager	27
Desktop Pager	5
Reprogramming Mobile	154

OPTION C	
MODEL	QUANTITY
A1 Portable	0
A2 Portable	47
A3 Portable	0
A1 Mobile	0
A2 Mobile	179
A3 Mobile	0
Control Station	27
Individual Pager	27
Desktop Pager	5
Reprogramming Mobile	154
Reprogramming Portable	146

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# APPENDIX F

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## JEFFERSON WATER TOWER DRAWING

To Be Provided by the time Site Visits are Completed