Sumner County Communications System

Requests for additional information can be emailed to Ken Weidner kweidner@sumnerema.org.

Questions must be received by 1:00PM (Local time) on Monday November 26th 2018.

All responses to inquiries will be posted on the Sumner County website (http://www.sumnertn.org/) under the “Bids” link. Any inquiries received will not be answered individually, but will be posted for all interested vendors.

A Pre-Bid Conference will be held at the Sumner County Administration Building, located at 355 North Belvedere Drive, Gallatin, TN 37066 in room 112 on December 4, 2018 at 9:00 am (local time).

Attendance to the Prebid Conference is MANDATORY.

PROPOSAL REQUEST

20190108-CO

COMMUNICATIONS SYSTEM FOR SUMNER COUNTY

SUMNER COUNTY BOARD OF EDUCATION
SUMNER COUNTY, TENNESSEE

Purchasing Staff Contact:

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This proposal solicitation document is available in an Adobe Acrobat (pdf) format. Any alterations to this document made by the proposer may be grounds for rejection of proposal, cancellation of any subsequent award, or any other legal remedies available to the Sumner County Board of Education.

Introduction

Sumner County Government, or herein known as "Sumner County", is hereby requesting a proposal for Communications System for Sumner County In addition, pricing shall be extended to any Agency/Municipality within Tennessee Homeland Security District 5.

General Information

I. Proposal Package

All sealed proposal packages must include all of the following, when applicable. Any sealed proposals shall be rejected as a non-conforming bid if any applicable item is missing.

- Three (3) complete copies of proposal
- Evidence of a valid State of Tennessee Business License and/or Sumner County Business License
- Evidence of compliance with the Sumner County Insurance Requirements, if work is performed on Sumner County Property
- Signed and completed Statement of Non-Collusion (Attachment 1)
- Properly completed Internal Revenue Service Form W-9
- Evidence of a company's safety program and, if supported, a drug testing program (Attachment 2) Drug-Free Workplace Affidavit
- If bid is in excess of $25,000, a certification of non-debarment must be completed (Attachment 3) Certification Regarding Debarment, Suspension, and Other Responsibility Matters
- Certification By Contractor (Attachment 4)

NEW VENDORS

1. To comply with Internal Revenue Service requirements, all vendors who perform any type of service are required to have a current IRS Form W-9 on file with the Sumner County. At the time of requisition, the individual requesting a purchase order or disbursement will be informed if it is a new vendor and if a form W-9 is required. If form W-9 is required for a new vendor, the department head shall forward a completed form W -9 to the finance department. It can be obtained from the Internal Revenue Service's website at www.irs.gov.
2. To comply with the Tennessee Lawful Employment Act, non-employees (individuals hired as independent contractors) must have on file any 2m: of the following documents.

- Valid Tennessee driver license or photo ID issued by department of safety
- Valid out-of-state driver license
- U.S. birth certificate
- Valid U.S. passport
- U.S. certificate of birth abroad
- Report of birth abroad of a U.S. citizen
- Certificate of citizenship
- Certificate of naturalization
- U.S. citizen identification card
- Valid alien registration documentation or proof of current immigration registration

3. In addition, for all vendors with annual purchases in excess of $50,000 (if a business license is required), a business license must be on file in the finance department, or the requisitioner must submit a copy with the purchase order requisition form or the payment requisition form, as applicable.

II. Responses

- Proposal must include point-by-point responses to the RFP.
- Proposal must include a list of any exceptions to the requirements.
- Proposal must include the legal name of the vendor and must be signed by a person or persons legally authorized to bind the vendor to a contract.
- If applicable, proposal must include a copy of the contract(s) the vendor will submit to be signed.
- Any and all proposal requirements must be met prior to submission.
- The bidder understands and accepts the non-appropriation of funds provision of the Sumner County Government.
- If noted in the section "proposal requirements" or later requested, the contractor will be required to provide a reference list of clients that have a current contract for services with their company.

III. Clarification and Interpretation of RFP

The words "must" and "shall" in this Request for Proposal indicate mandatory requirements. Taking exception to any mandatory requirement shall be grounds for rejection of the proposal. There are other requirements that Sumner County considers important but not mandatory. It is important to respond in a concise manner to each section of this document and submit an itemized list of all exceptions.

In the event that any interested vendor finds any part of the listed specifications, terms, or conditions to be discrepant, incomplete, or otherwise questionable in any respect, it shall be the responsibility of the concerned party to notify Sumner County, via email at purchasing@sumnerschools.org, of such matters immediately upon receipt of this Request for Proposal. All questions must be received a minimum of five days before proposal's "deadline". All responses to inquiries will be posted on the School System website (http://www.sumnerschools.org) under "Invitation to Bid" and Sumner County website at www.sumnertn.org.

IV. Proposal Guarantee

Vendors must guarantee that all information included in their proposal will remain valid for a period of 120 days from the date of proposal opening to allow for evaluation of all proposals.

V. Related Costs

Sumner County is not responsible for any costs incurred by any vendor pursuant to the Request for Proposal. The vendor shall be responsible for all costs incurred in connection with the preparation and submission of its proposal.

VI. Insurance Requirements and Liability

Each bidder or respondent to the RFP who may have employees, contractors, or agents working on Sumner County properties shall provide copies of current certificates for general and professional liability insurance and for workers' compensation of a minimum of $250,000. The owner or principal of each respondent must also be insured by workers' compensation if they perform any of the services on School System properties. There will be no exceptions to the insurance requirement.

VII. Payment Terms

Payment terms shall be specified in the bid response, including any discounts for early payment. All payments, unless agreed upon differently, will be after receipt of service or product and School System's approval of conformance with specifications. The Sumner County Finance Department does not allow the practice of picking up checks in person

VIII. Deadline

Sealed proposals will be accepted until **January 8 ,2019 @ 9:00 a.m.** local time. Proposals received after that time will be deemed invalid and returned unopened to the vendor. Vendors mailing proposal packages must allow sufficient time to ensure receipt of their package by the time specified. There will be no exceptions.

IX. Withdrawal or Modification of Proposal

A withdrawn proposal may be resubmitted up to the time designated for the receipt of proposals provided that it fully conforms to the same general terms and requirements.

X. Package

The package containing the proposal must be sealed and clearly marked "**20190108-CO Communications System for Sumner County and Do Not Open** on the outside of the package. Responses must be hand delivered or mailed to the following address.

Sumner County Board of Education
Attn: Purchasing Supervisor
1500 Airport Road
Gallatin, TN 37066

XI. Right to Seek a New Proposal

The Sumner County reserves the right to accept or reject any and all proposals for any reason. Proposals will be awarded to the best overall respondent as determined by that which is in the best interests of Sumner County

XII. Procedures for Evaluating Proposals and Awarding Contract

In comparing the responses to this RFP and making awards, Sumner County may consider such factors as quality and thoroughness of a proposal, the record of experience, the references of the respondents, and the integrity, performance, and assurances in the proposal in addition to that of the proposal price.

- Proposals will be examined for compliance with all requirements set forth herein.
- Proposals that do not comply shall be rejected without further evaluation.
- Proposals will be subjected to a technical analysis and evaluation.
- Oral presentations and written questions for further clarifications may be required of some or all vendors.

XIII. Discussions

Discussions may be conducted with the vendors which have submitted proposals determined to be reasonably likely of being considered for selection to assure a full understanding of and responsiveness to the RFP requirements. Every effort shall be afforded to assure fair and equal treatment with respect to the opportunity for discussion and/or revision of their respective proposals. Revisions may be permitted after the submission and prior to the award for the purpose of obtaining the best offers.

XIV. Open Records

After the bid is awarded, all proposals will be subject to the Tennessee Open Records Act, and the proposals will be available to the public upon written request.

Summary information on bids submitted will be posted on the School System website at http://www.sumnerschools.org

XV. Assignment

Neither the vendor nor School System may assign this agreement without prior written consent of the other party.

XVI. Liabilities

The vendor shall indemnify Sumner County against liability for any suits, actions, or claims of any character arising from or relating to the performance under this contract by the vendor or its subcontractors.

Sumner County has no obligation for the payment of any judgment or the settlement of any claim made against the vendor or its subcontractors as a result of obligations under this contract.

XVII. Tax Status

Sumner County Government is tax exempt.

XVIII. Invoicing

Invoices are to be submitted to:

Sumner County Emergency Management Agency
255 Airport Road
Gallatin TN 37066

The vendor must provide an invoice(s) detailing the terms and amounts due and the dates due. All invoices shall indicate payment terms and any prepayment discounts.

XIX. Contract Nullification

Sumner County may, at any time, nullify the agreement if, in the judgment of Sumner County, the contractor(s) has failed to comply with the terms of the agreement. In the event of nullification, any payment due in arrears will be made to the contractor(s), but no further sums shall be owed to the contractor(s). The agreement between Sumner County and the contractor(s) is contingent upon an approved annual budget allotment, and is subject, with thirty (30) days notification, to restrictions or cancellation if budget adjustments are deemed necessary by Sumner County.

XX. Applicable Law

Sumner County, Tennessee is an equal opportunity employer. Sumner County does not discriminate towards any individual or business on the basis of race, sex, color, age, religion, national origin, disability or veteran status.

The successful contractor(s) agrees that they shall comply with all local, state, and federal law statutes, rules, and regulations including, but not limited to, the Rehabilitation Act of 1973 and the Americans with Disabilities Act.

In the event that any claims should arise with regards to this contract for a violation of any such local, state, or federal law, statues, rules, or regulations, the provider will indemnify and hold Sumner County harmless for any damages, including court costs or attorney fees, which might be incurred.

Any contract will be interpreted under the laws and statutes of the state of Tennessee.

Sumner County does not enter into contracts which provide for mediation or arbitration.

Any action arising from any contract made from these specifications shall be brought in the state courts in Sumner County, Tennessee or in the United States Federal District Court for the Middle District of Tennessee.

Additionally, it is a violation of state statues to purchase materials, supplies, services, or any other item from a vendor that is a commissioner, official, employee, or board member that has any financial or beneficial interest in such transaction.

Evaluation Factors

Proposals will be evaluated for overall responsiveness and completeness to the RFP specifications.

Proposals that are determined responsive and complete will be evaluated by the County.

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

1. Performance, compatibility, expansion capabilities and versatility
2. Reliability, redundancy and warranty
3. Proposer qualifications, history of product support and RFP deviations
4. Multiple sources of radio subscriber manufacturers provided in RFP response
5. Equipment repair, installation, and implementation
6. Interoperability with agencies WITHIN Sumner County and those in neighboring Counties and jurisdictions to Sumner County
7. Training
8. Maintenance and time limit of availability of service parts
9. Organization, scope and detail of proposal
10. Overall system costs (initial cost, plus 10 year Total Cost of Ownership)

4 Specifications

4.1 Applicable Codes and Standards

All equipment supplied, and all installation and maintenance work to be performed under this Contract shall comply, unless otherwise specified, with the applicable sections of the standards and or regulations of the following organizations:

- Federal Communications Commission (FCC)
- Federal Aviation Administration (FAA) regulations and advisory circulars.
- MIL-810 F or G
- Federal Environmental Protection Agency (EPA)
- American National Standards Institute (ANSI-603)
- National Fire Protection Association (NFPA)
- Electronics Industry Association (EIA-603)
- Associated Public-Safety Communications Officers (APCO) P25 Phase I and/or Phase II
- National Electrical Manufacturers Assoc. (NEMA)
- National Electric Code (NEC)
- Occupational Safety and Health Administration (OSHA)
- Telecommunications Industries Association (TIA-603)
- Underwriters Laboratories (UL)
- American Institute of Steel Construction (AISC)
- American Welding Society (AWS)
- American Concrete Institute (ACI)
- American Society for Testing and Materials (ASTM)

4.2 Type Acceptance of FCC Authorized Transmission Masks

Base stations, control stations, mobile radios, and portable radios used in the network shall comply with all requirements of Part 90, Subparts R and S of the FCC's Rules and Regulations governing the licensing and use of frequencies including, but not limited to

- Type Acceptance
- Current and proposed published narrow banding and spectral efficiency mandates.

4.3 Compliance to APCO Project 25 Standards (Phases I & II)

The communications system required by the County and specified in this document is generally comprised of a digitally trunked UHF simulcast radio network categorized as follows:

- Six (6) channels are to be implemented in conformity to APCO Project 25, Phases I (FDMA) & 2 (TDMA), meaning, the system shall fully support both Phase I and Phase II calls from the outset, and will not require an upgrade to Phase II

- The system shall be capable of handling calls in either P25 Phase I or Phase II on all RF channels, as well as the mobile and portable radios,

- The County will determine which user groups will operate in which mode (Phase I or II) with the ability for the system to dynamically detect modes (Phase I & II) and process calls accordingly.

All channels shall, as depicted in TIA TSB 102, the objectives for operational function of a new digital Public Safety radio system are as follows:

- Obtain maximum radio spectrum efficiency.
- Ensure complete Open Architecture design
- Ensure competition in system life cycle procurements.
- Allow effective, efficient and reliable intra-agency and inter-agency communications.
- Provide "user friendly" equipment, "user friendly" being defined as the least amount of mental and physical interaction by the operator.
- Provide a graceful path of migration of technologies through all phases of Project 25.
- No additional hardware or antennas shall be required for Phase II operation.

The Vendors' proposed UHF trunked radio system shall comply with the latest applicable Project 25 digital radio technical standards defined and adopted as TIA TSB/IS or ANSI documents in effect at the time of RFP submission. Adherence to the approved, applicable Project 25 digital standards shall ensure compatibility and interoperability of digital radio equipment and systems manufactured by various public-safety communications companies. The network shall be fully APCO P 25 compliant. The trunked control channel as well as all of the voice channels must use the industry-accepted Project 25 trunked signaling protocols.

4.4 P25 Digital Communications

The system being proposed shall conform to the objectives/standards of APCO Project 25 with regard to the following features:

- Digital Modulation (QPSK-C, Pi/4DQPSK, LSM, 4-ARY CPM)
- Ability to support at least one message within present 12.5 kHz channel assignment through FDMA technology; and 2 messages within the 12.5 kHz channel assignment as anticipated for APCO 25 Phase II standards.
- The Control Channel shall be a minimum of 9600 BPS.
- Architecture shall support Advanced Multiband Excitation 2nd Generation (AMBE+2) vocoder.
- Ability to support advanced digital encryption algorithms including but not limited to AES encryption.
- Superior audio clarity through advanced error correction techniques.

4.5 Spectrum Efficiency

The Vendor shall specify how they plan to support APCO Project 25 Phase II spectrum efficiency requirements that shall provide for 6.25 kHz bandwidth channels or equivalent. For proposed optional single channel TDMA technology, TDMA transmitters and receivers shall be capable of operating in 12.5 kHz channel bandwidth with a minimum spectrum efficiency of 6.25 kHz per time slot.

The County wishes to implement this infrastructure at the present time by assignment of two users per 12.5 KHz channel for their six (6) licensed UHF channels.

4.6 Spectrum

The County is authorized to operate six (6) trunked UHF channels. Shown in Table 1 below are the transmit and receive frequencies which authorize construction of the system specified in this RFP.

	Base TX Frequency	Mobile TX Frequency	Use	Call Sign
1	TBD			
2	TBD			
3	TBD			
4	TBD			
5	TBD			
6	TBD			

Table 1 COUNTY's FCC licensed frequencies.

4.7 Radio Coverage

Vendor shall be responsible for demonstrating mobile and portable radio coverage performance in accordance with the test plan defined in this RFP. The Vendor's proposed coverage requirements shall include all areas within the COUNTY as the service area.
All coverage design shall contemplate deployment of narrowband digital communications for both the trunked and conventional radio system platforms. All coverage acceptance testing performed as part of system acceptance testing shall be in compliance for digital radio communications.

The digital communications coverage criteria for the COUNTY Network are as follows:

- Ninety-five percent (95%) area coverage reliability over the County service Area, for a handheld portable radio with a 1/4 wave antenna.
- Coverage will be defined as ninety-five percent (95%) area coverage reliability throughout the political boundaries of the COUNTY ninety-five percent (95%) of the time, (aka "95/95" coverage) for a portable radio operating in-building with no more than 12 DB of building loss. .
- Vendors shall also provide coverage predictions showing residual in-building with 20 dB building penetration loss, using coverage from the same sites that depict portable-in-building coverage.
- The coverage shall be designed to simulate a portable radio mounted at the user's waist level, with a swivel case and shoulder microphone accessory (SMA).
- Designs shall have a balanced uplink and downlink path. If Vendor decides that more receiver sites are needed than transmitter/receiver sites in their design, they shall provide the technical detail showing that a system imbalance between uplink and downlink coverage is not introduced as a consequence of adding more receiver sites in the system.
- A minimum DAQ criterion of 3.4 is required within the defined coverage area and is described in TSB-88-C as "Speech understandable with repetition only required. Some Noise/Distortion."
- Vendor shall specifically document the minimum signal strength, in units of microvolts/meter needed to produce a DAQ 3.4, the voice quality requirement for acceptance testing purposes.

4.7.1 Link Budget Analysis

The Vendor shall submit a detailed link budget analysis in a tabular format to demonstrate the estimated uplink and downlink signal strength for portable radio signal levels; the bit error rate (BER) corresponding to a DAQ of 3.4; and the coverage requirements stated within this RFP. At a minimum, the following data/criteria shall be included in the analysis:

- Static sensitivity for portable radios (dBm), and corresponding BER performance.
- Faded sensitivity for portable radios (for DAQ 3.4) in dBm, and corresponding BER performance.
- Statistical distribution assumed for multipath fading (Rayleigh, Nakagami-Rice, etc.).
- Fading factor (dB) and statistical assumptions (log-normal fading, etc.) used to account for location variability (i.e. adjustment from median required signal level in a given coverage sector or grid segment to provide reliable operation at ninety-five percent (95%) of the locations in that sector or grid segment).
- Transmit antenna network gain (dBd).
- Transmission antenna network loss (dB).
- Base Station Receiver Multi-coupler Net Gain (dB).
- Base Station Receiver Multi-coupler Noise Figure (dB).
- Portable radio antenna network net gain (or loss) based on the actual Vendor supplied portable radio antennas mounted at the user's waist level.
- Portable radio transmitter output power (dBm).
- Downlink and uplink path reciprocity (e.g. any offset factor used to compensate for the difference between downlink and uplink coverage and to allow downlink signal targets and acceptance test procedures to be used to confirm uplink coverage reliability).
- Any difference between downlink and uplink transmission paths and network performance that may affect the validity of the assumption of path reciprocity with an offset for the difference in base station and mobile and/or portable radio transmitter output power, as described in TSB-88C.

4.7.2 Coverage Predictions

The radio network coverage shall be predicted through the use of a radio wave propagation model which has been developed on the basis of theoretical and empirical data, and which will take into account channel bandwidth; modulation schemes including digital, analog & Linear Simulcast; delivered audio quality; coverage reliability; terrain irregularity; seasonal foliage; land use / land cover; building penetration losses; noise; and long- and short-term signal variations.

The model used for the purposes of the coverage prediction process shall be identified in the Vendor’s proposal, and the rationale for network gains and losses used shall be provided in the proposal.

A table of network coverage parameters such as gains and losses utilized in each propagation analysis shall be provided.

A terrain database with a minimum of 3 arc-seconds of resolution is required. The Vendor shall identify the terrain data model used in the coverage predictions. The vendor’s propagation analysis network shall utilize both vertical and horizontal antenna patterns.

Data included in the Vendor's propagation prediction documentation shall include, at the minimum, the following elements:

- RF propagation prediction model (including version number, if applicable) used to provide coverage predictions.
- The Vendor shall submit uplink and downlink coverage maps for the proposed network. All coverage maps shall be based on the assumptions shown in the Link Budget Analysis described above.
- The Vendor shall provide individual site and composite system radio coverage maps.
- The Individual radio coverage prediction maps shall be provided for each radio site as well as composites of the predicted RF coverage utilizing all of the RF sites in the proposed network design.
- These maps shall be provided in a scale such that all areas less than ninety-five percent (95%) reliable are easily spotted during the review of such maps.
- The paper size shall be no smaller than 11" by 17" ("C-size") for system-level plots.
- The Vendor shall provide individual radio coverage maps for the following types of coverage.
    - Mobile radio voice –In Bound and Out Bound
    - Portable radio voice- In Bound and Out Bound
- The Vendor shall show all residual coverage which extends beyond the boundaries of the County resulting from use of the system sites, although the County will not seek a coverage guarantee from the Vendor for residual coverage which extends beyond the County's borders.

Coverage maps for individual site analyses shall be presented on 11" x 17" media using USGS topographical maps. The scale on the finished map shall be 1" = 1 mile. Each coverage analysis shall include a legend with the following information:

- Type of coverage displayed on the map, mobile, portable on-street, portable in 12 dB buildings.
- Location of portable radio (radio and antenna at belt level – 3ft. AGL)
- Delivered Audio Quality (DAQ 3.4)
- Radio coverage reliability shown, percent reliability and type of reliability (area vs. contour)
- Type of carrying device used with portable radio (belt clip)
- RF signal levels in dBm corresponding to the coverage colors displayed on the map
- Simulcast capture ratio in dB and targeted propagation delay in microseconds for simulcast sites (if proposed)
- Square mileage of each type of proposed coverage shown on the coverage analysis or on an accompanying parameter sheet.

4.7.2.1 Simulcast Time Delay Interference (TDI)

Since the proposed architecture is simulcast technology, the coverage maps shall account for (display) of any harmful time delay interference (TDI) that may occur in the proposed network configuration. This means that forecasted areas of TDI shall be clearly shown on coverage maps as “non-covered” areas and a separate TDI map shall be provided depicting areas with potential TDI.

The Vendor shall state the simulcast threshold delay that is utilized in microseconds and capture ratio in dB on which the COUNTY system design is based.

4.7.2.2 Coverage Predictions to be Included in Proposal

Vendor shall show the following types of coverage:

- On-Street portable coverage with portable radio worn at hip level (3' AGL) using a speaker microphone without antenna (coverage shown in green)
- In-building portable coverage, radio worn at belt level (3' AGL) showing 12 dB of signal penetration loss (shown in blue)

Portable coverage maps shall be prepared for the limiting case (downlink vs. uplink).

A mobile coverage map for both uplink and downlink shall be provided along with the bit error threshold for DAQ performance.

All RF coverage maps shall be provided in both printed and electronic formats.

4.7.3 Voice Quality

Coverage is defined as the minimum signal required to provide Delivered Audio Quality greater than or equal to 3.4 (DAQ 3.4) voice quality, defined as “Speech understandable with slight effort. Occasional repetition required due to noise/distortion”. Vendor shall relate this voice quality to Bit Error Rate (BER) for acceptance testing purposes.

The Vendor shall use the DAQ scale as defined in TSB-88C.

4.7.4 Portable Radio Coverage Requirement

Portable voice coverage shall be provided over at least 95% of the jurisdictional boundaries of the County at a reliability level of 95%(In building). The County’s boundaries shall be clearly indicated on the Vendor’s coverage maps provided with their proposal and the estimated percentage coverage within this area also shown to validate that the predicted coverage meets the 95% requirement.

Vendor shall provide detailed RF propagation coverage prediction analysis for the limiting case of downlink or uplink for portable radios. Note if the network downlink and uplink are balanced within 1 dB, then downlink shall be displayed.

4.8 Radio Interference Analyses

The Vendor shall conduct radio interference analyses for each of the County’s existing radio sites to determine potential radio interference both to the County’s equipment and from/to non-COUNTY equipment. Vendor shall analyze and identify both Active Intermodulation/Passive Intermodulation Interference hazards and Transmitter Noise/Receiver Desensitization hazards for each site. Vendor shall provide all equipment necessary to mitigate such interference. The Vendor shall provide the

results of the study and interference mitigation solution to the County for review and approval as part of the final network design

4.9 County System Sites

Contained herein is a list of the COUNTY system sites that are utilized in the existing system and the conceptual system specified in this RFP, with the site coordinates. Vendors shall familiarize themselves with these sites in order to understand what is needed within each site to facilitate their use in the replacement system.

The Vendor is responsible for recommending the optimum site selection using the existing and conceptual COUNTY's sites first before looking at alternative sites. In all cases, existing tower/rooftop facilities shall be utilized.

4.9.1 Site Survey Requirements

The Vendor is responsible to complete the required site development and work at all proposed COUNTY RF sites, microwave sites, and other facilities as necessary to deliver a functional radio system as detailed in this RFP.

Shown in the Table 2 below are all the COUNTY sites.

Table 2 COUNTY public-safety communications system critical infrastructure sites and coordinates

MUSIC MOUNTAIN	**MUSIC MOUNTAIN ROAD GALLATIN, TN.**	**180'**	**36°28'01.94" N 86°28'38.95" W**
CENTER POINT	**WHUD WATER TANK GATES @DEAD END CHASE POINTE DR. HENDERSONVILLE, TN**	**180'**	**36° 20'22.80"N 86°38' 50.85"W**
GALLATIN	**641 LONG HOLLOW PIKE GALLATIN, TN**	**180'**	**36°23'07.47"N 86° 27' 43.82"W**
PORTLAND	**PORTLAND MIDDLE SCHOOL 604 SOUTH BROADWAY PORTLAND, TN**	**180'**	**36°34'13.31"N 86°30' 31.10"W**
WESTMORELAND	**WESTMORELAND FIRE DEPT. 1204 WALNUT ST. WESTMORELAND, TN**	**180'**	**36°33'45.43"N 86°14'55.07"W**
MUTTON HOLLOW	**640 MUTTON HILL HOLLOW RD BETHPAGE, TN**	**180'**	**36°28'26.41"N 86°16'38.37"W**
ECC/EOC (Rx Only)	**253 AIRPORT ROAD GALLATIN, TN**	**165'**	**36°40'29.62"N 86°40'44.71"W**
OAK GROVE	**SCEMS STATION 8 164 BLACKEY BANDY RD. BETHPAGE, TN**	**180'**	**36°57'02.41"N 86°35'85.59"W**

WILSON LANE	**WHITE HOUSE UTILITY DIST. WILSON LANE GOODLESTVILLE, TN**	**180'**	**36°41'31.82"N 86°71'45.35"W**
SUGAR TREE	**GALLATIN PUBLIC UTILITIES N. SUGAR LANE GALLATIN, TN**	**180'**	**36°37'78.62"N 86°53'66.84"W**
BOONE HOLLEMAN (Microwave Only)	**173 BOONE HOLLEMAN DR HENDERSONVILLE, TN**	**180'**	**36°31'13.53"N 86°64'49.08"W**
HPD (Microwave Only)	**3 EXECUTIVE PARK DRIVE HENDERSONVILLE, TN**	**100'**	**36°30'12.55"N 86°62'90.49"W**
CUMBERLAND HILLS	**393 CUMBERLAND HILLS DR. HENDERSONVILLE, TN**	**140'**	**36°29'68.50"N 86°58'36.82"W**

All work necessary to provide fixed infrastructure installations which meet all COUNTY inspections and approvals.

The Vendor shall be responsible for a complete and fully operable installation in accordance with the latest version of the National Electrical Code, local building codes, environmental laws, zoning and planning regulations or ordinances, land use restrictions, Federal Aviation Administration and Federal Communications Commission rules and regulations, Department of Transportation regulations governing road access and entry, and all other applicable local, state or federal codes, regulations, laws and/or ordinances.

Materials furnished by the Vendor shall be new and of first quality as defined in industry standards. The Vendor shall not make substitutes unless prior approval has been obtained from the COUNTY project manager.

Each Vendor (prior to submitting a proposal) shall participate in site visits and examine the sites so as to fully understand all the existing conditions relating to the work.

The Vendor assumes full responsibility for materials and equipment employed in construction of the project and agrees to make no claims against the COUNTY for damages to such materials and equipment except for that which is caused by the COUNTY, its employees or agents. The Vendor shall be responsible for storage of all materials purchased and turned over to him by the COUNTY and shall receive all delivered items by suppliers at the job site or at a staging area to be furnished by the Vendor.

The Vendor shall clean up and remove from the work site on a daily basis (or sooner if directed by the COUNTY project manager) all rubbish and construction debris, resulting from his own work in the building. Upon completion of all work, the entire job site areas shall be left clean and free of trash, debris, mud, dirt, dust, scrap materials and excess materials. Floors in radio equipment shelters and rooms shall be mopped and polished to the satisfaction of the COUNTY project manager upon completion of installation and construction work.

The Vendor shall coordinate the work of all the trades under his responsibility to insure that interferences between cable support trays, grounding and radio system work shall be avoided so that the project is completed within budget and schedule.

The Vendor shall keep up-to-date marked-up prints of the Project Drawings. Markings indicating changes to the drawings shall be red or green and clearly visible. Two (2) sets of "As- Built" drawings (reproducible on the most updated Microsoft Visio or AutoCAD Release) shall be furnished to the COUNTY project manager at the completion of the project. Project Drawings shall on CD/DVD and in JPEG format.

4.10 System Topology

4.10.1 Six (6) Channel Trunked System

The proposed six (6) channel, P25 UHF trunked simulcast radio system shall consist of one simulcast cell with enough simulcast sites to meet the required coverage. The trunked repeaters shall be managed by the Master Network and/or Primary Site Trunked Controller that selects the communications channel. When a request for communications from a field unit occurs, the controller shall acknowledge the request and assign an idle channel for communications. The proper talk group also shall be assigned.

The system shall allow a transmitting unit access to an available channel and unmute a receiving unit's speaker with the transmitting unit's audio, within 0.5 seconds of the transmitting units Push-To-Talk (PTT). Should system traffic be at a level where all channels are busy, the system will automatically give preference to higher priority units attempting access. The system shall indicate to the user that channels are busy, that the unit is placed in queue and will be offered a channel in a call back mode. The Vendor shall describe in the response the extent of priority the system offers.

The mobile and portable units shall be equipped with a dedicated switch or function that allows emergency access. The switch shall be easily accessed, but minimizing the chances for accidental activation. Upon emergency activation, the field unit shall transmit the emergency message on a periodic basis until acknowledged by the console operator (dispatcher).

Day-to-day communications by all users shall occur in transmission trunked mode. Rudimentary communications in this mode simply organizes all subscribers belonging to a specific talk group address to electronically merge to an electronically assigned available RF channel resource under the auspices of the trunked system controller for the duration of the voice transmission. Once communications has ended, network logic causes subscribers to return to the system control channel awaiting further communications instructions. Trunked mode communications shall allow for the following variety of call and transmission types including:

- Talk group calls
- Individual calls
- Private calls

- Alert Calls
  - Short Data messages
  - Site Registration
  - RF Subsystem registration
  - Dynamic unit talk group regrouping

- Emergency alarm
- User identification

4.10.1.1 Simulcast Methodology

The County prefers that the proposed system utilize Linear Simulcast Modulation (LSM). Linear Simulcast Modulation shall be applied in the outbound direction of a simulcast system while the inbound signal shall use C4FM modulation. An LSM system has the advantage in allowing greater site separation should the County wish to integrate the proposed system with neighboring jurisdictions.

For the simulcast distribution, the County wishes the Vendors to use an IP based simulcast methodology to synchronize the prime site with the remote sites. Simulcast processing delays, levels, phasing or shaping shall be managed through the IP network which shall include open architecture routers, switches, and servers as necessary. No distribution amplifiers, modems, or special components shall be required. To lessen the power required at the sites all voting operations shall be a software function of the master site base stations.

- Frequency Stability – Vendor shall provide highly accurate, fully redundant, high stability, GPS fed frequency clocks (reference oscillators) for driving either 5 MHz or 10 MHz reference signals to repeaters with output accuracy of ± 1x⟦10⟧^(-12) average over 24 hours when GPS locked; and 1 PPS output with accuracy of ± 25 ns when GPS locked. The GPS reference unit shall be powered by - 48V DC from the microwave power plant or by a UPS with no less than 1 hour of run time. The unit shall have an operating range between -30C to +60C. The unit shall be provided with an external GPS antenna, transmission line, lightning surge arrestor, and mounting accessories for installation at each site in the system. A fully redundant frequency standard reference oscillator shall be supplied and configured for hot switchover backup operation in case of failure of the primary GPS fed frequency clock

- Simulcast Time Delay Control - Path time delay shall be a software feature of the master site base stations and will be automatically controlled and equalized to provide phase and amplitude correction to all simulcast transmitters. Adjustment of the delay and amplitude shall be such that it can be downloaded from user provided software utility. Control to set both bulk delays, from 0 to 500,000 microseconds in 1 microsecond increments, and delay for amplitude correction shall be provided.

4.10.1.2 Network Address Scalability

Up to 64,000 different radios shall be uniquely identifiable. Further, each radio subsystem shall provide for up to 2,000 uniquely identifiable functional talk-groups or vertical partitions for distinct and separate organizations. Through hierarchical numbering, individual subscriber units and talk-groups from any radio subsystem are uniquely identifiable in any radio subsystem in concert with their home subsystem identification.

Users/subscribers roaming from other systems must also be uniquely addressed and identified during roaming type operations and/or inter-intra-operability operations.

4.10.1.3 Channel Access Time

Vendors shall meet APCO Project 25 specifications for trunked voice access.
Throughput delay shall be as follows:

a. Less than 250 milliseconds in direct radio-to-radio communications.

b. Less than 500 milliseconds in radio-to-radio communications within an RF subsystem.

4.10.2 Base Station Repeaters

Vendors shall propose P25 compliant base station repeaters, which are of the appropriate type, to configure six (6) simulcast channels at the required sites.

Vendors shall be fully responsible to fully integrate the new base station repeaters as necessary to configure a P25, six (6) channel, required sites digital simulcast system that operates without compatibility issues, simulcast distortion issues, or any other issues that would prevent a fully optimal simulcast system in the final system configuration.

All base stations shall be FCC type accepted for transmission of the proposed narrowband modulation, RF channel bandwidths and appropriate masks. Each base station must be capable of providing automatic station identification compliant with FCC Base Station Identification specifications.

The base station must operate full duplex, and be capable of handling simultaneous, independent transmission and reception of voice messages.

Each base station shall operate on a single transmit and receive frequency pair. The equipment shall meet or exceed the current specified EIA Standards for transmitters and for receivers. The equipment shall contain all the necessary base station control and interface circuitry, as well as power supply and cabinetry or equipment racks appropriate for the installation location. All equipment offered must be FCC type accepted at the time of submission of the proposal.

Base Station Specifications

Vendors shall comply with or define the following specifications for all base station repeaters proposed. All electrical measurements either shall be referenced to a specific test procedure or shall be described in full by the manufacturer. Vendor shall install 12V Battery back-up at each site sufficient to sustain operations for minimum 2 hours from failure.

P25 compliant Base Station Repeater Specifications	
Function / Parameter	Specification
Modulation	Analog FM, APCO P25 CAI, Phase I, & Phase II
Input Voltage	120 VAC +/- 20% 60 Hz
Temperature Range	-30º to +60º C
Antenna port impedance	50 Ohms
Automatic Station Identification	Included
Emission Designators	8K70D1E, 8K70D1D 8K70D1W, 8K10F1E 8K10F1D, 8K10F1W 10K0F1E, 10K0F1D 10K0F1W, 9K80D7E 9K80D7D, 9K80D7W 17K7D7D, 16K0F1D 16K0F3E, 11K0F3E 14K0F1D, 14K0F3E 21K7D7E, 21K7D7D 21 K7D7W
Channel Spacing	12.5 kHz
Humidity (non-condensing)	0-90%
Frequency Range	440 - 480 MHz
Receiver Frequency Stability	, 0.1 PPM (with External Ref)
Sensitivity	0.25µV/m (12 dB SINAD)
Intermodulation Rejection	<80 dB
Spurious and Image Rejection	<100 dB
Transmitter Frequency Range	440 - 480 MHz
Transmitter Operation	Continuous Duty Full Duplex

	Channel Bandwidth: 12.5 KHz
Transmitter External Connections	Accept and Lock External Clock, either 5MHz or 10 MHz;
Transmitter Frequency Stability	<0.1 PPM (external ref)
Transmit power	Variable to 100 Watts
Spurious & Harmonic Emissions	<85 dB

4.10.4 Digital Encryption (Optional)

The system shall provide for full AES encryption capability and shall provide the same functions associated with clear (unencrypted digital) operation. All infrastructure components shall be capable of processing encrypted calls.

4.11 P 25 Trunked Network Core

The P25 Trunked RF Station Interface control, or Network Control, or Network Core shall be fully redundant and provide intelligent interconnection of the trunked radio sites, and data network to form a fully integrated radio access network supporting wide area voice and data communications. For ease of discussion, the P25 TRFSI shall be referred from this point forward as the “Core”. If a dedicated Core is not necessary to perform the aforementioned functions, the vendor shall describe how these functions are accommodated without a Core.

The Core shall track each trunked radio and its affiliated talk group as it roams throughout the coverage area of the COUNTY network. The Core shall route calls to individuals or groups at the appropriate sites. A mobile or portable radio shall be de-registered from a site when it logs onto a new site, or after a programmable period of inactivity.

The Core shall be capable of interfacing to other network Cores through the Inter-System Station-Interface (“ISSI”). The ISSI shall support automatic roaming between ISSI connected RFSS from different manufacturers by sending, receiving and making use of the Site Adjacency Information outlined in TIA-102-BACA –B Section 3.8.21. Operational differences caused by manufacturer proprietary signaling on auto-roaming operation between the manufacturers own RFSS and how it operates when the manufacturers is interfaced to another manufacturers RFSS via the ISSI interface is not acceptable.

The Core shall also interface with, or be expandable to accommodate multiple trunked radio sites, multiple conventional radio channels, centralized telephone interconnect network, voice logging recorder, data gateway, and Network Management System. If gateways are required to accomplish any of these capabilities, this shall be described in detail and the appropriate gateways shall be included in proposal.

Complete control over the Core shall be provided to personnel authorized to access through the Network Management System.

4.11.1 Redundancy In and Through P25 Trunked RFSI ("TRFSI") / Network Core

It is the intent of this specification to provide a trunked system that will not suffer the loss of trunking capability as a result of the failure of a single system component, in especially any Network and/or Primary Controller equipment. Should any component of the network fail, sufficient redundancy shall be incorporated in the system design so that full trunking operation continues without interrupting existing communications. Trunking capability is defined in this context as the ability of the system to assign voice channels to independent talkgroups, as required, and the ability of the system user groups to remain functionally independent with no loss of features. A core failure that diminishes the system to a reduced calling feature set operation is not acceptable.

Any system component, enclosure, or power distribution design, that could render the system or its channel resources useless for communication from a single point of failure, shall incorporate redundancy. This may be in the form of a redundant component/enclosure or a distributed redundant design, which distributes single points of failure among multiple card cages, cabinets or housing each, operating on its own dedicated power circuit.

In the case of redundant Cores, both Cores shall remain on line continuously with parallel updating of the system database to provide seamless transition (no loss of calls in-progress) and continued operation of service in the event of failure of the main controller. Switching from main to standby operation shall be fully automatic, with audible and visual indication of the switchover provided the Network System Management Computer in the case of a network where control is distributed, Vendor shall describe how control is handed over to another control node while maintaining network integrity and call processing. Vendors shall be evaluated on how quickly alternate control is provided and impacts to calls in progress and call processing in general.

Remote switching from main to standby controller operation shall be provided at the supervisory console as a manual override to automatic switchover. Vendors shall state in their response the period of time required and the procedure for manual switchover to a redundant central controller.

Switching between controllers (manually or automatically) shall not cause subscriber units to attempt to roam away from the site or subsystem they are currently on. Also, subscriber units shall not have to re-affiliate themselves with the system after a controller switch has occurred. This is to prevent inbound signaling overload of the controller.

Vendors shall state in their response, the procedure and the time required for switchover to a conventional or reduced capability operating mode in the event of the failure of all trunked control logic. It is understood that all systems that meet the intent of this specification shall suffer multiple system element failures before a conventional or reduced capability operating mode is encountered. Vendors are nonetheless required to describe such a failure mode, regardless of how unlikely its occurrence.

4.11.2 Wide Area Communications

The network shall provide the ability to place and receive calls to and from any point in the network covered by the trunked radio sites in the COUNTY.

All radio sites shall be linked to the radio network by means of digital microwave.

Vendor shall describe in the event of disruption of a microwave path, the level of redundancy in the microwave network.

4.11.3 Voice, Data, & Control

The network shall provide a minimum of one voice call per 12.5 kHz when operated in the Phase I configuration, or one voice call per 6.25 KHz when operated in Phase II configuration.

The trunked radio network shall support both voice and data communications. Voice, data, and control transmissions shall have equal RF coverage.

The Vendor shall indicate whether control messages are transmitted on a dedicated channel (dedicated control channel approach) or transmitted on the working channels (distributed control channel approach).

The network shall support data communications on all available channels. The network shall provide the capability to configure individual channels as data only or shared voice and data. The network shall provide priority to voice calls on shared voice and data channels.

Mobile and portable radios shall be capable of voice and data operation.

The network shall support voice calls and data messaging to a single mobile or portable radio without loss (in the case of voice and data conflict, it is permissible for the data messages to be delayed).

Mobile radios shall be capable of transmitting on voice while receiving data, and vice versa.

4.11.4 Commercial Carrier Interface (As an option to purchase)

The County desires to implement an interface technology that enables specially equipped cellular handsets to access specific talk groups on the communication System.

The Contractor shall provide in their proposal a comprehensive technical and operational description of their offering and the estimated cost for hardware, software, and licensing fees. The Contractor shall provide in their proposal a listing of the estimated cost for software and licensing fees by quantities of user groups of 50 and the costs of 5 talk groups.

4.11.5 System Addressing

The network shall support a fleet of at least 2000 registered voice users, and capable of addressing 64,000 individual I Ds.

The network shall be capable of addressing 1000 voice groups.

4.11.6 Voice Capacity

Vendor’s proposal shall provide a Grade of Service (GoS) of P.02 (Erlang-C lost calls queued). Queued calls shall have access to a channel in (2) seconds or less. During the peak period, vendors shall assume that 80% of the subscriber base makes one call of the standard holding time of 5 seconds.

4.11.7 Network Expandability

Should the COUNTY choose to expand their network into a regional system; the network shall be expandable to support a minimum of 64 trunking sites and 512 base station radios.

4.11.8 Subscriber Transmit Override

There are situations where it is desirable for the network to have the ability to stop a radio from transmitting, and force the radio into receive mode. Examples include: stuck mike, dispatcher override, supervisor override, and activation of an emergency call when the talk group is active on a normal call.

4.11.9 Subscriber Radio Inhibit

The purpose of this feature is to prevent a lost or stolen radio from being used to transmit and receive on the network.

The network shall have ability to selectively enable or disable an individual radio from the Network Management System.

Vendor shall indicate to what extent the proposed network is capable of preventing a stolen radio from accessing the network.

4.11.10 Caller Identification in Display

The radio ID shall be included in each transmission. The network shall display this ID in its corresponding alias, on the console at the dispatch center, and in all subscriber radios equipped with a display in the field.

Suitably equipped mobile and portable radios shall be able to display the calling unit ID in alias format for both individual and group calls.

Each mobile radio, portable radio, control station, and dispatch console shall be capable of displaying an alphanumeric alias corresponding to the unit ID, if available from the transmitting device. Vendor shall describe how aliases are managed and if they have to reside in each subscriber or if they are transmitted to subscriber with each transmission. Ideally, aliases should reside in a single database that is accessed as necessary to transmit aliases to consoles and subscribers.

4.11.11 IP Addressing

Every device that accesses the COUNTY radio system shall have either a static or dynamic IP address that uniquely identifies the specific device. Vendors shall specify in their proposal whether the IP address of system devices shall be static or dynamic, and the logical mechanism by which these IP address assignments are performed.

4.11.12 Over-The-Air Programming

The network shall provide the ability to provision and program radio parameters, software (such as firmware or flash upgrades) to the mobile and portable radios over the air without the need to physically connect a radio programming device to the radio – aka “OTAP.” Although the capability to program subscribers via WiFi and/or Bluetooth interfaces are encouraged offerings by Vendors, these wireless interfaces shall not be considered suitable alternatives to OTAP over the radio system.

OTAP shall include the supply of network information such as available radio channels, and user specific information such as talk group lists, scan priorities and user privileges. This requirement applies to both radios manufactured by the Vendor as well as radios manufactured by third party vendors.

It will be permissible for the Vendor to utilize third party vendor provisioning/programming servers, software, API’s, etc., however Vendor shall demonstrate that these functions can be performed for all P25 compliant third party subscriber radios.

4.11.13 Encryption (Optional)

Vendors shall furnish and install all software, firmware, and management tools and devices needed to deploy and manage the AES digital encryption algorithm.

This option shall include over the air rekeying (OTAR) of mobile and portable radios.

All voice channels on the network shall be capable of end-to-end encryption from a dispatch console to a mobile or portable radio and from one mobile or portable radio to another mobile or portable radio.

Encryption shall be enabled and disabled manually via a switch or menu function on the radio and/or at the console.

Encryption coding shall be encoded using the appropriate key and coding algorithm after the voice signal at either end is converted from analog to digital form and decoded using the corresponding key and algorithm before the digital signal at either end is converted back to an analog voice signal.

Encryption shall not result in any degradation of the voice signal quality compared to a clear voice signal on a radio operating in the same circumstances and location as the encrypted radio.

Operation in encrypted voice mode shall be transparent to users, except that an icon or some other indicator on the mobile or portable radio and at the console shall indicate such operation.

4.11.14 Paging

The P25 system shall be capable of two tone paging. County agencies and municipal Fire Departments desire the ability to perform individual fire station alerting. The Vendor shall describe its proposed fire altering capability, inclusive of its ability to appropriately transact alert tones via P25. A balanced 600-ohm, level-adjustable interface shall be provided at each field location for interconnection with existing station house audio public address systems

4.11.14 Trunking Features

4.11.14.1 Basic Trunking Operation

The network shall support voice group operation, where a voice group consists of a number of operational users distributed through the radio network.

The radio user manually selects the voice group he wishes to communicate with, then presses PTT on the radio. If resources are available the network shall respond by establishing a voice call to the selected group. Once the group call has been established, voice from the source radio is transmitted to all members of the group, which may involve multiple repeater sites.

The network shall track voice group members as they roam through the network and ensure that each multi-site call is routed to all repeater sites containing members of that voice group.

The network shall support “all calls” to agencies and fleets through suitable definition of voice group membership.

4.11.14.2 Call Queuing

If resources are not immediately available the network shall queue the request and inform the user that the call is queued through a suitable audible indicator. The user can then release PTT. Later when channel resources become available the network shall establish the call and notify the user through an audible “grant” indicator. The user can then press PTT and the call proceeds in a normal fashion.

4.11.14.3 Voice Group Priority

The network shall queue calls based on voice group priority, with a minimum of eight priority levels. Calls will be positioned in the queue based on priority, with calls of highest priority (such as emergency calls) being serviced first. Calls of equal priority shall be processed on a first in, first out basis.

4.11.14.4 Voice Path Management

The vendor shall describe how voice paths are assigned / reserved during the length of a transmission between two or more members of a common talk group. Vendors shall describe whether voice paths are reserved for the entire length of the transaction or if they are released after each transmission.

If there is an option to control voice path management, the vendor shall describe in detail.

4.11.14.5 Ruthless Preemption

The network shall permit a high priority call (such as an emergency call) to immediately preempt a lower priority call.

4.11.14.6 Group Busy Lockout

This feature prevents other voice group members from interrupting a user who is actively transmitting on a voice group.

If a member of a currently active voice group presses PTT to initiate a call on the same voice group, the network shall refuse the call and provide the user with an audible indication that the call has been refused.

Emergency calls, dispatcher override, and supervisor override shall have priority over group busy lockout.

4.11.14.7 Dispatcher Override
This feature not required

4.11.14.8 Supervisor Override
This feature not required

4.11.14.9 Individual Call

The network shall support individual call mode, where a suitably equipped radio or console user can establish an individual call to any other radio user in the network.

In individual call mode the group membership is limited to the source and destination radios and the call will not be overheard by other mobile or portable units.

Vendor shall indicate how an individual call is established in the proposed network.

4.11.14.10 Confirmed Call
This feature not required

4.11.14.11 Scan & Priority Scan

The network shall provide individual radios with the capability of scanning multiple voice groups. This function shall provide the ability to scan through multiple modes (talkgroups) within the same system. It shall also contain the capability to store and scan a list of conventional frequencies. Subscriber units shall be provided with at least one (1) scan list per system. Each list shall contain at least ten (10) talkgroups or frequencies.

Priority Scan - This feature shall provide the ability to apply two priority levels to a defined scan list. While in the scan mode, a Priority One transmission shall be received regardless of the activity on the Priority Two (or other non-priority modes). A Priority two message is heard over all (except Priority One messages) non-priority modes.

Vendor shall indicate the maximum number of voice groups on the scan list, and how the scan sequence is resolved if several voice groups are active at the same time.

4.11.14.12 Talkback Scan

The network shall provide individual radios with the capability of talking back on a scanned talk group.

4.11.14.13 Scan Group Lockout

The network shall provide the user with the ability to temporarily disable scanning on selected voice groups.

4.11.14.14 Emergency Alert and Emergency Call

The network shall support emergency call in the subscriber radios similar to the description that follows.

- The subscriber shall contain an integral emergency button. The display of this emergency signal is described for consoles in Section 5 and as follows below.

- It is a mandatory requirement that users shall be able to select no audible signaling, or any or all of the default types of signaling as configured by the System Manager.

- A channel marker is an indication that is placed periodically on a talk channel that indicates to new arrivals that the channel is in use. This feature allows someone coming onto the channel late to know that the channel is in use even when speech is not present, when talk group is in an emergency condition.

- When the emergency button is pressed on a subscriber radio, the radio shall immediately transmit an emergency alert message to the central dispatch location. Emergency configurations shall allow for “hot-mic,” ruthless pre-emption, talk group level emergency calling or system-wide emergency calling as defined by System Manager. The emergency alert message should include the radio ID, alphanumeric alias, emergency talk group, and the location of the radio through GPS.

- Upon receipt of an emergency alert message the network shall immediately establish an emergency voice call.

- An emergency voice call shall utilize ruthless pre-emption and/or highest priority and an infinite hang time. The network shall permit the call to be cleared only from the initiating radio, a dispatch console, a supervisor console, or a network management console.

4.11.14.15 Trunking Assignment Messages

The system shall continually transmit assignment information allowing a new user to join calls in progress after the group has been assigned a working channel. As long as the radio is turned on and is in range of the network, users shall not miss a call.

The Vendor shall indicate the maximum amount of time it will take for a newly joined subscriber to join an active talk group when all system resources are busy.

4.11.14.16 Direct Communications

The system shall allow direct mode subscriber-to-subscriber communication at any time without the need for the fixed infrastructure.

4.11.14.17 Interference Control

The system shall be designed to be resistant to undesired signals.

Vendor shall describe the mechanism used to differentiate between desired and undesired signals as well as algorithms invoked by the system to properly manage unwanted system interference. Vendor shall also describe any tools and/or indications available to the System Manager for management of interference.

4.11.15 Trunking Channel Access Time

Vendors shall specify maximum network-wide trunked voice channel access time from initial push-to-talk assuming the system is in a non-blocking condition.

Vendors shall specify access time for both direct and trunked modes. Vendors shall describe the variables that impact channel access time in a non-blocking condition, and the tools and/or features available for optimizing channel access time.

4.11.16 System Reliability and Fault Tolerance

System reliability and fault tolerance shall be major objectives in the design of the network.

Vendor shall describe in detail all measures taken to ensure reliable operation of the network including, as a minimum, the trunked repeaters, trunking controllers, network controllers, extended network controllers, and Network Management System.

4.11.16.1 Network Core Fault Tolerance

The network shall be designed such that there are no situations where a single failure in Vendor supplied equipment will disable wide area trunking operation.

No single point failure within the network Core shall prevent the unit from normal operation.

Where hot standby redundancy is provided for the network Core, the hot standby equipment shall be capable of full operations from remote location. If Core control is distributed throughout the network, Vendor shall describe how control is passed from the active node to alternate node upon active node failure.

If one or more site elements or site links fail, the rest of the network shall continue wide area communication, and the isolated failure is restored to full trunked operation. The network shall be reliable such that a failed link to any site will not affect the rest of the wide area communications.

Vendor shall indicate the impact on network operation of each of the following network element failures, how the network responds, and what features, if any, are lost:

- Network Core failure
- Network Management System failure
- Backhaul link failure

4.11.16.2 Trunking Channel Fault Tolerance

Should a voice traffic channel fail at a site, that channel shall be shut down from operation at the other simulcast sites, and there shall be no functional impact on the operation of the network other than reduced channel capacity. The remaining equipment at the site shall detect the failure and remove the voice traffic channel from the site's trunking pool and send an alarm to the network management system.

Vendor shall indicate the impact on network operation of each of the following network element failures, how the network responds, and what features, if any, are lost:

- Working channel failure
- Control/dedicated channel failure (if applicable)
- Station trunking controller failure
- Site controller (if provided) failure
- Routers / switches failure

4.11.16.3 Control Channel Fault Tolerance

If the proposed network uses a dedicated control channel architecture, in the event that the control channel fails the failure shall be detected and one of the remaining trunked repeater stations will automatically be assigned as the control channel. Field radio units shall automatically search for and acquire the new control channel. All trunked repeaters shall be available to be a control channel, voice channel or a data channel without any intervention.

4.11.16.4 System Management Computer Fault Tolerance

The proposed architecture shall consist of a single Network Management System. A redundant configuration shall be available as an option. It should be possible to locate the redundant computer at the remote site.

4.11.17.2 Controlling System Access

Vendor shall demonstrate that system access is restricted those who are authorized to and have access. Vendor shall also show the ability to audit the information system to ensure that the policies and regulations are being implemented appropriately and to provide accountability for the actions of those with the responsibility of using and administering the system.

4.11.18 Wireless Data Communications

As an option the network shall support data communications between fixed host computers connected to the LMR network, and laptop and palmtop computers connected to mobile and portable radios.

The network shall provide efficient support of both short (e.g. automatic vehicle location) and long (e.g. file transfer) data messaging.

Data applications may include computer aided dispatch, data base access, report generation, email, and status message transmissions. Vendor shall describe the hardware and software required for data communications over the wide area radio network.

The network shall support both individual data messages (point to point) and group data messages (point to multipoint).

The network shall permit the use of third party application software for data messaging.

The component of the network which interfaces to the COUNTY data network will be referred to in this document as the “data gateway”. It shall be capable of being located anywhere where there is IP access to the LMR infrastructure. The data gateway shall use Internet Protocol and be capable of interfacing directly with the COUNTY enterprise data network through the use of TCP/IP or UDP/IP. Networks utilizing a proprietary interface will not be accepted.

The network shall be capable of supporting standards-based data encryption using either AES, 3-DES, or TEA1 -4 algorithms between the data gateway and the mobile and portable radios.

The data gateway shall be a packet switching device which facilitates multiple simultaneous data transactions between the trunked radios and host computers.

Data network malfunctions detected by the data gateway shall be reported to the network manager.

4.13 Antenna System Requirements

As with most public safety radio systems, the COUNTY requires that the antenna systems be deployed that offer the least amount of losses and the maximum amount of gains, for both inbound and outbound transmissions to the highest degree permissible in accordance with the FCC license which authorizes operation of the channels. Vendors shall examine COUNTY’s FCC licenses for complete cognizance of the permissible ERP requirements for each channel at each site.

Vendors shall include in their proposal further antenna system design and equipment requirements specified in the following subsections.

4.13.1 Transmitter Combiners / Receiver Multi-couplers

Vendors shall provide new transmitter combiners, and receiver multi-couplers as follows:

Vendors shall show proof that Intermodulation Interference Analysis, Transmitter Noise/Receiver De-sense Analysis have been performed to demonstrate that all prospective interference issues have been mitigated in design and manufacture of a minimal loss, maximum gain transmitter combiner / receiver multi-coupler for use at this site.

Vendors shall also specify the minimum vertical antenna separation requirements that must be applied for installation on the towers in order to provide interference free operation of all the base station transmitters and receivers operating at this site. Vendors shall indicate in their proposal, the insertion losses for each transmitter and receiver to be installed at each site.

Vendors shall state the manufacturer and model number of the transmitter combiner(s) at each site and provide complete specifications and documentation. Vendors shall also calculate and provide the expected effective radiated power of the proposed system

Combiners shall be equipped with a Power Monitor system that can monitored local and by SNMP messages at the Network Management System.

4.13.2 Antennas and Transmission Lines

Vendors shall identify the type of antenna systems proposed to provide the specified System coverage. The Successful Vendor shall supply and install all antenna sub-system components. Antenna sub-systems include, but are not limited to the following; antennas, combiners, isolators, cavity devices, hybrid couplers, receiver multi-couplers, transmission line, all mounting hardware such as hangers and mounting brackets, surge suppressors, jumper cables, grounding straps, transmission line boots, RF connectors, waterproofing, labeling, and all ancillary items required to complete the installation at shared radio site in accordance with the manufacturer specifications, installation manuals, and good engineering practices.

Vendors shall evaluate the need for any interference control devices at each site proposed for the System and shall provide quotations for this equipment in the proposal. The Vendor shall provide all necessary filtering (including, but not limited to, isolators, bandpass and /or band- reject filters, crystal filters, shielding, antenna relocation, or other devices or procedures) to prevent transmitter intermodulation interference, transmitter noise interference, and receiver desensitization between the System or existing equipment including the devices needed for existing COUNTY owned equipment that will be retained at the sites.

Vendors are to pay particular attention to close spacing between certain transmit and receive frequencies which will be collocated at certain sites and shall propose equipment that limits the potential for transmitter noise and receiver desensitization.

Antenna System and compatibility
All transmission sites will incorporate the best practice for alleviation of interference from and to other systems / agencies co located at the same site. This will be done by using high specification transmit combining systems as well as properly filtered receiver multicoplers. All specifications for each site must be made available with attenuation and isolation curves relating to each channel (agency) at the co-located site. Any discrepancy or interference issue with relation to other equipment at the site will be

handled on a channel by channel basis and the addition of additional antennas and /or filter will be included to resolve the issue.

4.13.3 Transmit and Receive Antenna Information

Vendors shall provide in the proposal a complete base station antenna specification sheet for each unique antenna configuration at each site proposed for use in the System. Vendors shall reproduce the matrix below on a site by site basis.

Base Station and Receiver *Site Name (one table per site):* ***TX Antenna***	**Site Antenna** #1	**System** #2	**Specifications** #3	#4
Impedance	50 Ohms			
Gain				
Pattern				
Azimuth (if directional) ref True North				
Type of Connector				
TX Transmission line				
Size				
Type				
Loss per 100’				
Length				
Type of Connectors				
RX Antenna				
Impedance	50 Ohms			
Gain				
Pattern				
Azimuth (if directional)				
Type of Connector				
RX Transmission line				
Size				
Type				
Loss per 100’				
Length				
Type of Connectors				
Base Station and Receiver Site Antenna System Specifications				

Specification	Base Station
Site Name:	

Receiver Multi-coupler		
Input Voltage		
Type		
Gain (dB)		
Input Connector Type (Rcvr.)		
Output Connector Type (Ant.)		
Number of Ports		
Insertion Loss (dB)		
Transmit Combiner		
Input Voltage		
Type		
Insertion Loss (dB)		
Input Connector Type (Rcvr.)		
Output Connector Type (Ant.)		
Filtering		
Type		
Insertion Loss (dB)		
Type of Connector		
Lighting Surge Protection		
Type		
Protection Provided		

5 DISPATCH COMMUNICATIONS SYSTEM

5.1 General

The existing control station radios currently interfaced to the dispatch consoles must be programmed and made compatible with P25 Phases I & II at the County ECC. The County currently has 25 dispatch positions in operation. The Console Shall display with ID and alert the dispatcher at the console position in the event of an emergency button activation on a subscriber unit in the field.

6 INTEROPERABILITY

Vendors shall furnish options for interoperability interfaces to the following existing and/or new base stations and control station radios operating in VHF, UHF and 700/800 MHz band frequencies. Shown in Table 3 are the entities that shall be interoperable with the *new* COUNTY radio system. The Vendor shall address their plan for interoperability with these neighboring systems, such as ISSI (Inter-System Station- Interface), IP-based, or other methods.

Entity	Interface type	RX (MHz)	TX (MHz)
Hendersonville Gallatin Portland Millersville Westmoreland Trousdale County Metro Nashville Wilson County TN TACN System Robertson County			

7 FIRE STATION ALERTING SYSTEM (Optional)

Vendor shall furnish and install a new Fire Station Alerting System (FSA) to provide the required functionality in compliance with NFPA 1221 (2013 Edition). The new system shall be capable of the following:

- Activation of visual and audio devices within the fire stations
- Message acknowledge buttons
- Message boards
- I/O devices for future system enhancement.

The FSA shall have the capability for self-monitoring for component failures. The FSA shall be an integral part of, or be compatible with the new radio system. The FSA shall be integrated with the County's current Computer Aided Dispatch system.

The FSA shall utilize the P25 trunked radios system as its primary backhaul, and the backup method of communications shall utilize upon the County owned fiber network.

8 BACKHAUL SYSTEM

8.1 Backhaul Network Overview

Microwave Network Design

The network design should be considered a Point to Point to Point network incorporating either a ring based technology or spur configuration with redundant standby equipment technology. Each bidder shall submit a network drawing show how they meet this requirement. There must be no single point of failure within the backhaul network. Each site shall have redundant network interface equipment that support either ring based network or a spur based network The network must reroute traffic in less than 50 milliseconds in the event of a path or device failure. The proposer will guarantee that the provided network system will be compatible with the existing communications infrastructure for the entire transition period. The selected proposer will be responsible for providing the network service to a demarcation point within the County's radio tower shelters or buildings. The fixed network interface equipment provided will reside adjacent to the County's radio equipment in 19" equipment racks at each location. Any equipment provided must adhere to FCC Part 101 for microwave based proposals.

Network Reliability

The Network will be designed to operate at the public safety standard reliability level of 99.999% at the rated network bandwidth. Bidder must provide documentation showing network reliability and QoS calculations between all network points. Digital terminal equipment proposed shall have a MTBO rate of at least 1 million hours based on upon failure data or Bellcore reliability calculations.

Ethernet Bandwidth

The bandwidth requirement for the network full duplex will be 45Mbps at the sites. Network bandwidth is to be shared between the Ethernet traffic and the TDM traffic. Any bandwidth not partitioned as TDM must automatically revert to Ethernet bandwidth. For security reasons the supplied bandwidth must be dedicated to the County only and not accessible from the internet. The Ethernet service shall be fully compliant with IEEE 802.3 Ethernet standards. The Ethernet service shall have the ability to aggregate traffic from multiple VLANs across a common interface within the network. Vendor shall indicate the maximum bandwidth possible for each hop in the system for future expansion.

Network Monitoring System

The bidder must supply a network monitor PC that will show the overall health of the network. The Network System Monitor (NMS) must display equipment and traffic alarms for all locations in the provided network as well as bandwidth utilization. The NMS should also monitor and report packet loss, delay and jitter, reliability to 99.999% and BER. The NMS must have the ability show which equipment is active and which equipment is in standby mode. The NMS must have visual and an audio indication for all alarm events. Different visual and audio indicators are preferred for critical, major and minor alarms. It is preferred that a smartphone application be available for network alarm monitoring.

Network Specifications- Ethernet Specifications

The proposers system shall meet the following performance specifications.

- IEEE 802.3
- Framing IPv4 and IPv6 IEEE802.3D
- Flow Control IEEE802.3x
- VLAN IEEE802.1Q
- Packet Loss less than 0.1%
- End to end network latency (delay) no more than 1 millisecond

- Jitter less than 0.1%
- Bit Error Rate of less than 10-6th
- Severely Errored Seconds- No more than one SES in a 24 HR period at the 45Mbps rate.

Microwave Specifications

Bidders that propose a microwave solution must conform to the following microwave requirements.

- The Microwave design proposed shall be a Monitored Hot Standby (MHSB) or a Ring Protected Loop System. A Non Protected Design microwave design will not be considered.
- The microwave proposed shall be a two frequency, full duplex operation licensed under FCC Part #101.
- Space Diversity is acceptable if needed to meet reliability requirements.
- Unlicensed microwave links are not acceptable. 4.9 GHz Microwave is unacceptable.
- Microwave equipment will use the DC power plants at each site and proposer shall supply a new 48 VDC power plant with 4 hours of run time at each of the proposed sites.
- Proposer shall provide preliminary microwave path data sheets for each link including:
- Site Name and Geodetic NAD83 coordinates
- Ground elevation
- Antenna sizes
- Center line mounting height
- Transmission line type
- Transmission line lengths
- Fade margin calculations
- Reliability predictions.
- Path Fresnel zone clearance
- Proposer's antennas must include radomes.
- The microwave equipment must be able to reroute traffic in 50 milliseconds in the event of an equipment failure.
- Proposed microwave solid dish antennas and radomes must be wind rated for a minimum of 120 mph. Each antenna shall be equipped with stiff arm to limit antenna vibration and flexing during high wind events.
-

- The proposed microwave radios shall operate on an antenna system equal or exceeding a peak return loss of 20DB without degrading the specified performance of the system.

  .

- The provider shall conduct physical path surveys to assure that all paths meet proper clearance criteria.

- The microwave equipment must be operationally compatible with all of the existing County radio equipment and must not emit any radio frequency interference (RFI) to any equipment located in the shelter or on the tower.

General Requirements

- Proposer shall use County existing sites/structure to the greatest extent possible.

- Selected Proposer must present a Customer Design Review to County within 45 days of notice to proceed. This CDR will cover the finalized scope of work and must cover all aspects of the project for review by the County before a notice to proceed will be issued.

- Installation of all electrical equipment and associated wiring shall comply with the latest edition of the National Electrical Code.

- Exterior wall penetrations must be waterproof and secure. Internal wall penetrations must meet all fire stopping and fire code requirements.

- All metallic cables entering buildings or shelters must have surge suppression and be grounded to the shelters common grounding system.

- All work shall be planned, coordinated and conducted with no unplanned disruption of service to the existing County radio system. Proposer shall be responsible for the costs of any system recovery costs associated with an unplanned radio system outage.

- Provider must provide a technical support service that is available 24 hours per day, 7 days a week, and 365 days per year.

- Provider shall have a local service personnel capable of responding on site to an emergency call for service within 2 hours. The local provider must be factory certified on the equipment and have a minimum of two years' experience maintaining similar systems of the same brand of equipment.

- Successful bidder to submit all employees to a background check by the County Sheriff's Office check at their cost.

9 P25 NETWORK MANAGEMENT SYSTEM

9.1 General

Vendor shall furnish and install a Network Management System (NMS) that shall be a comprehensive system of software and hardware, backed by the expertise needed to incorporate network information into a complete management tool. The NMS shall eliminate the slow turnaround of management data, reduce the time and effort spent deciphering network alerts, and provides the facts needed to make effective management decisions, while easily accommodating network growth and the addition of new technologies.

The NMS shall be developed with an emphasis on customizable graphical displays and simplified interfacing to various networks. The NMS shall be of a modular structure providing end-users with the capability to expand or customize the base system by choosing from a diverse library of software objects.

The software supporting the NMS shall respond to network expansion by enabling modifications to the NMS as new devices are added or deleted.

The NMS will be provided as a turnkey system. Vendors shall supply the software and the hardware, coordinate the entire installation, create the initial graphical representations of the network, perform acceptance tests, and conduct NMS system administrator and end-user training.

NMS shall be a multi-user, multi-tasking, multi-nodal system with customized and inter-locked access, monitoring, and control functions are required per entity.

The County envisions the NMS to be comprised of the following systems: system manager and core NMS equipment at the EOC, remote user terminals at other remote locations, and network elements, element managers, Remote Terminal Units (RTUs) and other Supervisory Control and Data Acquisition (SCADA) elements at the remote radio sites.

The radio system is comprised of radio subsystems included at all radio sites and the dispatch console subsystem. . Each of these subsystems needs to be remotely monitored and controlled for management and maintenance purposes.

9.2 Simple Network Management Protocol (“SNMP”)

For Alarm and Device Management, the NMS shall allow for interfaces, or shall have built in SNMP Support. The interface shall allow for the ability for third party SNMP managers to communicate and monitor:

- SNMP Traps: Device to send SNMP to NMS managers, Management Interface Base (MIBS).
- SNMP Data

- nFLOW/sFLOW Support

Device needs to have its own SNMP agent that allows for critical system components' "health" (status alerting), mapping, and performance data collection. If device does not have its own SNMP agent, then device shall have a proxy that has SNMP capabilities for Land Mobile Radio devices.

9.3 Radio System Manager

Vendors shall provide radio subsystem managers that shall allow the system manager to monitor and manage the radio subsystems. These radio subsystem managers shall also be supplied in such a manner as to allow alarms and control functions from the radio subsystems to be passed to a remote terminal that shall monitor the entire integrated radio network. Vendors are to provide detailed information describing this functionality of the radio subsystems and the connection/access between the radio subsystem element manager systems.

System Manager will supply fleet mapping of the system as well as the system ID per new state requirements.

9.4 Radio Subsystem Monitoring

The radio subsystem shall provide the capability of automatic monitoring on a 24-hour basis the following radio infrastructure components.

- Communications links to base station sites
- Base Stations
- Base Station Controllers
- Radio IP Subsystem (Routers / Switches)
- Radio System Servers

The RSMS shall provide a robust set of voice and data traffic statistical data that will allow the COUNTY to manage network traffic in a proactive manner in order to plan effectively, manage resources, and avoid unnecessary problems and malfunctions. The Vendor shall provide the management tools needed to manage all aspects of this mission-critical network.

Within the RSMS, the Vendor shall provide the statistics and performance data related to all traffic within the COUNTY network. Use of the RSMS shall enable the County to identify traffic levels, perform circuit utilization studies, calculate and monitor call completion rates and track routing of calls throughout the entire network in real time.

Available RSMS reports shall include comprehensive QoS reports and data traffic analysis to help the COUNTY maximize voice and data call completion rates and assign resources as necessary. Detailed voice and data traffic reports shall enable the COUNTY to characterize network traffic quickly, including type, volume, origination and destination, as well as causes for uncompleted calls. The COUNTY shall be readily equipped with the information necessary to identify and quantify voice and data traffic in the network, manage trunk utilization, calculate throughput of network elements and perform traffic studies across all network segments.

Through the RSMS, the Vendor shall equip the COUNTY with the tools to analyze throughput performance, potential interference, system diagnostics, and manner of call processing events including the following:

- Automatic Radio system infrastructure component fault and failure detection and alarm generation

- Audible and/or visual alarm operator alerting
- Diagnostics for isolating and trouble-shooting faults and alarms including all communications links and link equipment
- Mobile unit radio link communications integrity test
- Message volume statistics by radio channels per hour
- Message volume statistics by base stations per hour
- Message volume statistics by subscriber units per hour
- Voice and Data throughput performance analysis
- Call attempts and failures
- Call durations
- Blocked Calls
- Dropped calls
- 30 day alarm history log file(s)
- Remote dial-in service support capability

9.5 Dispatch Centers and Other Remote Locations

The implementation of the integrated radio system shall support monitoring and control of the radio system. The Vendor shall provide information describing the manner in which this can be achieved through the offered products. Two (2) monitor terminals shall be provided for performing NMS functions. These terminals shall be capable of simultaneously viewing and controlling independent system elements in reference to alarms and control functions.

9.6 Network Management System and Performance Requirements

The following section describes requirements of the NMS as it pertains to features, functionality, and performance. The Vendor shall supply a NMS that can interface with and support different systems and elements.

The NMS shall be capable of allowing users to quickly detect, evaluate, and respond to changing network conditions. Network devices shall be managed by manager modules, and the system shall automatically respond to the alert messages generated by all network devices.

A point-and-click mouse operation shall provide access to detailed menus and update data fields on any window. The NMS shall also incorporate a feature that graphically illustrates network trends and statistics. The NMS shall provide accurate information in a format most useful for network management.

9.6.1 General Requirements

The following list defines the required performance requirements:

- Use of Open System Standards
- Use Client /Server Architecture
- Expandable Number of Users (Vendors to identify quantity of simultaneous users)
- User Friendly
- Modular Software
- Security and User Partitioning (Vendors to identify number and capabilities of partitions)

9.6.2 Functional Requirements

Vendor shall supply, at minimum, functionality, performance, and quality of the specific requirements as follows:

- Use of Open System Standards
- Use Client /Server Architecture For The Network Design
- Message and Alarm Processing
- Terminal Reach-Through
- User Friendly
- Management Reports
- User Interface
- Hardware/Software/Protocol Interfaces
- On-Line Help
- Modular Software

- SMTP

- Manager Modules
- System Software Support
- System Software License
- System Manager Terminal
- Security and User Partitioning

9.6.2.1 Function Descriptions

The following section describes the primary functionality and feature requirements of the network management system.

Intended functionality for the NMS is defined in the following paragraphs. It is the NMS Vendors' responsibility to ensure they completely understand the relationship and impact of the NMS and all functional requirements as related to each of the systems, even if they are not specifically addressed in this RFP.

The following list of functional requirements and requested information establishes the COUNTY's requirements for the network management system. NMS Vendors are being requested to provide a response to the following items as part of the RFP response.

The NMS hardware architecture shall provide multiple levels of computing power based on the size of the network being managed. The NMS system shall be a multi-tasking system capable of simultaneous access and control from multiple users, each having a unique access level, operational capabilities, and information set.

9.6.2.1.1 Use of Open System Standards

The NMS shall be developed using Open Systems Standards (i.e. non-proprietary) in order to provide maximum flexibility and scalability of the NMS. This functionality will also allow for easier enhancements from other software/hardware providers.

9.6.2.1.2 Use Client/Server Architecture for the Network Design

The Vendor shall supply a true multi-user, multi-tasking system, following a client/server architecture and be capable of supporting 10/100/1000 MB/S Ethernet. The hardware architecture shall provide multiple levels of computing power based on the size of the network. NMS Vendors shall define the operating system programming language and platforms that are used to develop the offered NMS.

9.6.2.1.3 Message and Alarm Processing

The NMS shall process messages sent by the network elements and other element managers (different Vendors' system network managers and elements) to the central monitoring station(s) located at the Network Control Center, backup Network Control Center, dispatch centers and other remote locations. Major, minor and all other types of messages shall be processed in real time and displayed, alerted, logged, emailed, etc.

All alarms and messages shall be automatically recorded in real time. The NMS shall be capable of customized defined actions for each individual message from each managed element.

Vendors shall provide detailed information, in the form of bullets and text that will define and describe in detail the message processing functionality of the NMS being offered. Additionally, Vendors shall describe capabilities of customizing alarms, messages, etc. that can be made available for external NMS systems supplied by other Vendors for other systems. Vendors proposed NMS shall accept SNMP messages, through defined traps, from external sources. Also the vendor supplied NMS shall generate SNMP messages to be sent to other NMS systems.

9.6.2.1.4 Remote Access

The NMS shall allow authorized users access to network elements, element management systems, native element manager interface or other support systems through a Vendor supported commonly available Web Browser.

9.6.2.1.5 Graphical User Interface

The NMS system User Interface shall be GUI allowing the user to easily understand the conceptual layout of the overall network. Vendor shall provide easily understandable icons allowing a user to drill down to card level diagrams and references. The design shall allow for on screen help menus and user understood prompts that provide direction and assistance through the learning process. These learning tools shall be able to be placed in the background after user efficiency is achieved. Vendor shall include both form-based and command line interfaces for entering data.

Training and user manuals shall contain the same information provided on help screens and prompts.

9.6.2.1.6 Management Reports

The NMS shall be capable of performing time-based analysis and generating statistical reports of the system based on alarm occurrence. The system shall be able to retain report formats, layouts and schedules for future use, and shall be able to be routed to a file, printer, or screen.

Alarm related data shall be reported as text reports, spreadsheets, charts or line graphs and be used to depict network performance by various categories.

9.6.2.1.7 User Interface

The NMS shall allow the user to access alarms and messages in both graphical and text format. The graphical user interface (GUI) and its display shall be fully integrated and independent of Vendor or protocol components. The GUI shall support the following features:

- Object oriented
- Provide real time updating of events
- Support industry standard graphic interfaces up to 1920 x 1080
- Provide multiple views hierarchically
- Provide point and click methodology
- Support customer network layouts (locations, equipment, geographic configurations, etc.)
- Provide a library of icon symbols and be expandable using edit tools
- Provide the capability of utilizing scanned-in graphic images
- Provide the capability of customizing all scenes with color, graphic symbols and linking
- Navigation shall be made through menus, dialog boxes and buttons
- Provide the capability to assign hot keys
- Provide the capability for prioritizing alarm indications
- Provide the capability of user defined colors
- Provide a hierarchy view of scenes in a tree-like representation
- The text format shall support the following features:
    - Provide the capability to display all event details and status in text
    - Provide events in a scrolled list format
    - Provide the capability to color code the events by priority
    - Provide the capability to attach messages to events

9.6.2.1.8 **FLEET – CONFIGURATION & MANAGEMENT TOOL** –

The radio system proposed shall feature a management tool that features the ability to configure and manage the maintenance of the radios in an organization's fleet. The County requires the ability to update radio configurations periodically, to reflect changed work patterns and operational procedures, enable new features introduced by network upgrades, to add new talkgroups and to refine and add to the existing configuration. In addition, new radios need to be configured and replacement radios need to inherit the configuration of the radios they replace.

The fleet configuration and management tool should have the ability to store all configuration data in a central database and automatically generate the settings required for each radio. This configuration data should consist of radio programming files, feature license keys, and firmware packages. Configurations should be deployed to radios via wired update (without requiring any radio programming expertise). Alternatively, after an initial wired update, changes to the configuration able to send data using over-the-air programming (OTAP)

9.6.3 Hardware, Software, & Protocol Interfaces

The Vendors shall provide an explanation of the network management tool being offered. The explanation shall be divided into (3) three main sections: hardware, software, and protocol interfaces. These main sections shall be further divided as required in order to further define the types and capabilities of these items.

9.6.4 On-Line Help

The Vendor shall provide an on-line help feature. This feature shall provide fingertip access to “help” information, related user documentation, and system functions in a text format.

9.6.5 Software

Radio related software shall be fully validated. The radio Vendor shall identify what validated standard is utilized or explain the internal validation process which its company uses on its product’s software. The software shall functionally do what it is supposed to, it shall satisfy all functional requirements as the radio Vendor defines of its product. Radio Vendor shall provide documented requirements/functionality of all software to the COUNTY prior to contract award.

All radio Vendors shall be held accountable to their own specifications as it relates to software during installation and functional testing of new radio system. The software version and release of all new radio components shall be documented at time of validation or at time of radio system turnover to the COUNTY. Vendor shall describe the software naming convention associated with each radio component. The COUNTY IT shall first approve any software patch fix once the Vendor has described the nature of the bug/malfunction to which to patch is to remedy.

Vendor shall provide a schedule of routine software updates and recommend the upgrade times for various components which will have the least impact of the COUNTY business. The COUNTY may option to adopt or edit the software update recommendations.

Vendor shall work with the COUNTY IS on patch management and maintain an update log for all radio software updates and maintain a historical data base on all software revisions. The COUNTY should receive software alerts from Vendor related to security, bug fixes and software feature enhancements.

9.6.6 SMTP

The new radio system Network Management System will require event/alerts from devices to be forwarded to the internal the COUNTY mail server via SMTP. The integration of the hardware and software shall be provided by Vendor. The Vendor shall test and verify functionality with internal the COUNTY system personnel.

9.6.7 Manager Module

The NMS shall be provided with the capability of managing devices and elements through the use of different interfaces. Vendors shall describe the type of interfaces that are available in the response offering. The COUNTY is requesting information on interfaces such as SNMP (Simple Network Management Protocol), Q3, Non-standard Protocols, and others.

9.6.8 System Software Support

The Vendor shall explain the procedure for identifying and correcting software deficiencies as well as the method of distribution for updates and changes. The Vendor's explanation shall include, as a minimum, the process for introduction of new software releases and costs. The Vendor shall also distinguish between operating system, third party software, and custom software and provide a description of technical support provided for software and hardware offered.

9.6.9 Security and User Partitioning

The NMS shall support multiple levels of access that are protected in a manner that will allow users to control, monitor and use software applications that have been partitioned for specific use by the end-user. Vendors shall provide a detailed description of this capability by defining the levels of partitioning and security, total number of end-users, the total number of simultaneous users with independent views, and the method used to achieve this requirement.

End-users shall be located at different locations such as dispatch centers, offices, maintenance facilities, and other remote sites. Therefore, this feature shall be provided to remote locations in order to allow restricted access to the overall radio network.

9.6.10 Monitoring and Control of Systems (Optional)

The NMS shall be capable of controlling each and every system contained in the integrated radio system. These systems shall include, but not be limited to, the items listed below. A list of elements and alarms is provided as a beginning point in the development of the NMS.

- UPS Systems
- Tower Lights
- Shelter
- Emergency Generator
- DC Charging System
- Backhaul System Elements
- Radio System Elements

Each of these items and systems shall to be monitored and controlled for specific management and diagnostic reasons. The monitoring and controlling operations shall be performed by network elements, such as RTUs and SCADA elements, as required.

9.6.11 Tower System Alarms

The following alarm inputs, as a minimum, shall be supplied, installed and connected to the Network Management System.

- Beacon on
- Beacon off
- Side marker(s) lamp failure

- Photo cell failure
- Beacon failure

9.6.12 Shelter Subsystem Alarms (Optional)

The following alarm inputs, as a minimum, shall be supplied, installed and connected to the Network Management System.

- Fire/Smoke Detector
- Intrusion (door) Alarm
- High Temperature Alarm
- Low Temperature Alarm
- High Humidity Alarm
- AC #1 Failure
- AC #2 Failure
- DC Charging System Alarm

9.6.13 Emergency Generator System Alarms (Optional)

The following alarm inputs, as a minimum, shall be supplied, installed and connected to the Network Management System on County supplied gensets.

- Utility Power Failure
- Generator in Operation
- Failure to start (over-crank)
- Generator Over Crank Shutdown
- Generator Over Speed Shutdown
- Generator High Coolant Temperature
- Low Coolant Level
- Generator Low Oil Pressure
- High Engine Temperature
- Generator Low Fuel
- Over Speed
- Low Voltage Output

9.6.14 Optional Features for the Network Management System

The Vendor shall provide a detailed list of optional features that can be supplied for review and understanding. Vendors shall provide a complete listing and explanation of all options that can be offered.

9.6.15 Remote Access and Monitoring

The COUNTY is interested in having the capability of monitoring the integrated radio network from remote locations via dial-up or fixed connections. System managers, technicians, and other types of personnel shall be able to perform monitoring and obtain access to the network.

9.6.16 Network Management System Design Submittals

The Vendor shall submit as part of the Vendor's response the following information and details based upon the systems defined in the RFP specifications.

- System Diagrams
- System Drawings
- Equipment Layouts and Physical Dimensions
- Electrical and Environmental Requirements

10 SUBSCRIBER EQUIPMENT

10.1 General

Vendor shall furnish and install subscriber equipment including mobile radios, portable radios, control station radios, and vehicular repeaters. The proposed equipment shall be public safety grade, state-of-the-art, microprocessor controlled, and frequency-synthesized units.

Unless otherwise stated, all control stations, mobiles, and portables shall meet the following functional requirements:

- FCC type accepted at the time of the proposal submission.
- The radio shall support digital voice trunking on any mixture of UHF channels with 6.25 KHz/voice path equivalency.
- All radios shall be capable of placing and receiving group and individual calls in trunking mode in Trunked, P25 Phase I (FDMA) & PHASE II (TDMA) – Optional
- All radios shall comply with P25 conventional, Digital (CAI, C4FM)
- All radios be capable of operation in narrowband conventional, Analog (FM)
- Some radios shall be capable of multi- band operation: VHF, UHF and 700/800UHF bands.
- The radio shall have an emergency button and be capable of placing and receiving emergency calls; Emergency Operation (ID, Alarm, Call)
- The radio shall be capable of direct mode operation (talk around - mobiles and portables only).
- The radio shall be capable of sustained DAQ 3.4 in a high noise environment.
- The radio shall be capable of selecting one of up to 256 voice "profiles". A profile is defined as a minimum set of sixteen (16) talkgroups and may correspond to different operational users, for example maintenance worker, supervisor, patrolman, etc. would each have different profiles.
- The radio shall be capable of selecting any talk group from any assigned voice profile containing up to 256 profiles.

- The radio shall be capable of scanning all talk groups within the profile, with the selected talk group having priority.

- The radio shall provide the user with separate and discrete audible tones to indicate the status of differing call types.

- All radios shall have the capability to be upgraded with Encryption Capability (P25: AES) if option is exercised by The COUNTY.

- Vendors shall describe what is available in their manufacturing portfolio for radios that are WI FI Capable

- Vendors shall describe what is available in their manufacturing portfolio for radios that are LTE Capable

- The radio's personality shall be programmable through a standard Windows- based computer and through over-the-air signaling interface.

- The radio shall include the capability to transmit and receive data through an external serial data port that conforms to USB standard for interfacing to a COTS laptop computer.

- (OPTIONAL) The radio shall contain an internal GPS receiver capable of sending GPS information through the radio's data transport capability for use by third party applications.

- Each subscriber unit shall be warranted for a minimum of 1 year from date of network acceptance

- All subscriber equipment shall meet or exceed MIL-STD-810D, E, F and G for low and high temperature, low pressure, shock, dust, sand, humidity, driven rain, salt fog, vibration, and solar radiation.

10.2 Inventory of Subscriber Quantities Required

Shown in Table 4 are the quantities and configurations of subscriber equipment that Vendor shall include in their proposal.

Quantity	Radio Type	Description of Equipment
500	Portable Radios - UHF (450-470)	Portable radios - public safety basic
90	Portable Radios - UHF (450-470) Other Agencies	Portable radios – non-public safety (mid-tier)
40	Portable Radios - UHF (450-470) and UHF Multi-Band	Multi-band portable radios - public safety
60*	Control Stations – UHF (450-470)	UHF (450-470) desk control stations – public safety
	Control Stations – UHF (450-470) Other Agencies	UHF (450-470) desk control stations – nonpublic safety
400	Mobile Radio - UHF (450-470)	Mobile radios-Public Safety
	Mobile Radio - UHF (450-470)	Mobile radios (dash mount) mid-tier
400	Mobile Radio - UHF (450-470) Other Agencies	Mobile radios (in vehicle) basic, non-public safety
10	Motorcycle Radio's	Mobile Radio

*Supply and Install one (1) desk control radio in every school in the Sumner County school system to include feed line and antennae. Supply and Install 1 desk control station radio at the Sumner County BOE and 4 desk control stations at Sumner County pupil transportations dispatch center to include feed line and antennae. See school locations at www.sumnerschools.org Install location TBD by school staff. Install (2)at Sumner County Highway Department office located at 1051 Old Hwy 109 N . Gallatin TN 37066

10.3 Competitive Availability of Subscriber Equipment

The proposed technology solution shall foster competition and provide the opportunity, over the life of the Contract, for authorized COUNTY entities to competitively procure subscriber equipment from multiple third-party vendors.

10.4 Dual Mode / Hybrid Operation

Subscriber radios shall be capable of operating in both the digital trunked and analog and digital conventional modes. Subscriber units shall be capable of interoperability without loss of functionality while operating in either mode.

Also, the system shall be designed around a suite of operational standards so that field systems manufactured by different Vendors can operate together and offer unit-to-unit communications based on predefined activation procedures.

10.5 Direct Communications

The system shall allow direct subscriber to subscriber communication at any time without degrading normal system performance. Direct communication while in range of the fixed equipment shall do no more than temporarily capture receivers from possible outbound messages. Direct communication shall be possible at any time while out of range of the fixed equipment with no degradation in system performance or capability.

10.6 Audible Signaling

The subscriber units shall be able to support audible signaling to and from subscriber units for functions as described below.

Because of the inability to faithfully pass audio signaling through vocoders, audible signals shall use data messages that cause the receiving unit to generate standardized tone signals. These standardized tone signals correspond to a specific signaling command. Audible signals use data messages in the system to initiate audible signals both in the subscriber units and also in the consoles.

It is a mandatory requirement that users shall be able to select no audible signaling, or any or all of the default types of signaling described below. As a standard option, users may require alternative signals, which are subject to personality programming in the subscriber unit and/or in the console.

Audible signals may be operator-initiated or system-initiated. The mandatory, default audible signaling shall include the following:

- Emergency - indicates the highest level of a declared emergency. The Emergency alert shall be initiated by the operation of a momentary switch at the subscriber unit and may also be initiated by a console. It shall terminate after sending for a nominal two seconds regardless of how long the operator holds the switch.

- Receipt of an Emergency alert at a console shall cause a latch up output for operation of external alarms. The console operator shall be able to release this latch.

- A receiving subscriber unit shall continue to emit periodic Emergency signals reset by the operator or dispatcher.

- Acknowledge - indicates an operator-designated affirmation of a request. This signal allows acknowledgment of a request without speaking. Acknowledge is initiated by the subscriber unit.

- Message Alert – indicates that attention is needed to the message that follows. The console operator shall initiate the Message Alert by initiating a momentary function or switch. The Message Alert tone shall continue in a repeating cycle until the operator releases the momentary function or switch.

10.7 Subscriber Tracking/GPS Location Services (OPTIONAL)

Vendor shall describe how their system will provide GPS location of portable radios when an emergency is initiated/declared by the radio user. CAD vendor is Tri-Tech.

10.8 Electrical & Mechanical

To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference which may be caused to/by electrical equipment co- located and/or adjacent to this equipment.

The equipment housings shall be suitable for mounting on vertical or horizontal surfaces.

Power loss and/or replacement of the Portable unit's battery shall not alter the operating software and/or parameters

Remote mounted transceivers for mobile radios shall be interconnected to their respective control heads through a control cable with easy plug-in connectors at both ends.

Vendor shall be responsible to supply all interface cables.

The unit shall perform a self-diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters. At the conclusion of a successful test, no operator intervention shall be required. A test that is not successful shall notify the operator.

Subscribers shall be available with an option for being intrinsically safe.

10.9 Mobile Radios

The mobile radios shall be supplied with all necessary mounting hardware for a complete installation and in compliance with SAEJ 1455. All radio controls and inter-cabling shall be supplied.
Radio functional requirements are further delineated as follows:

- Configurable function keys shall be available for sending pre-programmed messages, acknowledgements to third party applications via the radio system.
- Handset/speaker assembly.
- Emergency Alarm, with associated discrete input.
- Integrated serial interface port.
- Call Alert function, providing visual indication of pending private call on target radio.
- Individual call
- Display alphanumeric voice group ID
- Display alphanumeric caller ID
- Display caller alias
- Group call alert
- Call alert decode
- Call alert encode

- Out of range indicator
- Radios shall be flash programmable for adding future software enhancements.
- The same programming software should be used for all radio tiers proposed by Vendor.
- (OPTIONAL) AES Voice multi-key encryption
- Optional numeric keypad for unlimited individual calls
- Silent Emergency Activation
- Each subscriber shall be warranted for a total of one (1) year from date of network acceptance.

Vendor shall supply, in specified quantities, both front mount radios which shall have a self-contained control head in a single housing, and trunk mount radio with remote control head. A palm-type microphone shall be provided with the radio. A separate external speaker capable of producing a minimum of four watts shall be provided. The speaker shall be contained in housing sufficiently durable to prevent damage to the speaker.

All Mobile radios shall be furnished with appropriate external land mobile antennas and associated coaxial cabling suitable to the vehicle, ruggedized for the public-safety environment that the vehicle operates, consistent with the Vendor's link budget requirements, and in support of the functions required to be performed by the vehicle.

The mobile radio shall be powered from 12 VDC negative ground depending on specific vehicle. Vendor shall specify required current levels.

10.10 Portable Radios

The radio shall be physically small enough to facilitate easy carrying by the operator. It shall be self-contained in a single ruggedized housing. The radio housing shall be constructed of high impact material. It shall protect the internal circuitry from dust and moisture. The housing shall meet or exceed EIA drop test requirements.

- Portable radios shall be available with an option for being intrinsically safe.
- List of optional equipment/accessories for portable radios.
- All portable radios shall be furnished with an emergency button.
- All portable radios shall be capable of operating with a noise-cancelling remote speaker/microphone.
- The portable radio shall be capable of sustain DAQ 3.4 in a high noise environment.
- All portable radios shall also be capable of operating with differing configurations of accessories (such as covert operation accessories, hazmat operation accessories, etc.).

Additional Required Features:

- Individual call
- Display alphanumeric voice group ID
- Display alphanumeric caller ID
- Display caller alias
- (OPTIONAL) AES Voice multi-key encryption
- Single unit battery charger
- Group call alert
- Call alert decode
- Call alert encode
- Selective radio inhibit
- Out of range indicator
- Radios shall be flash programmable for adding future software enhancements.
- The same programming software should be used for all radio tiers proposed by vendor.
- (OPTIONAL) Internal GPS
- Bluetooth
- Silent emergency activation

Each subscriber shall be warranted for one (1) year from date of network acceptance. The following minimum features and accessories shall be priced:

- Belt clips
- Leather swivel cases
- Synthetic swivel cases
- Leather belt cases
- Shoulder strap for leather belt case with speaker/ mic or speaker/ mic/ antenna clip
- Speaker/ microphones
- Noise cancelling speaker mics
- Spare batteries. Provide pricing for standard and intrinsically safe spares.
- A complete line of headsets and surveillance accessories shall be available
- Multiple unit battery charger

10.11 Control Stations

Vendor shall furnish and install Control Station radios for operation in the trunked radio system from various fixed locations within the system, including antennas and transmission lines. Control Station packages shall include microphone, external speaker, cables, fusing, mounting hardware, and lightning arrestors for the transmission lines and surge suppressors for the power lines for all installations. All Control Station Radios shall be properly grounded and bonded in accordance to applicable Grounding and Bonding standards.

All radio equipment shall be FCC type accepted under Part 90 of the FCC Rules and Regulations.

Control Station radios shall have the same features and capabilities as mobile radios specified in Section 10.9, as appropriate for fixed station operation. Control Station installations shall comply with FCC regulations for FX1 authorized radios.

10.12 Subscriber Programming System

The Vendor shall provide programming cables and current versions of programming and maintenance software for each subscriber radio, base station repeater, and any other system components in need of programming. To the extent possible, the Vendor shall standardize programming cables and software.

10.13 Encryption System Management System (Optional)

Vendor shall furnish and install one (1) complete Key Management System for programming all encryption capable device purchase by the County, including not only subscriber equipment, but dispatch console equipment. The Key Management System shall include the Key Management Facility (KMF) hardware and software to facilitate Key generation, Key distribution with variable loader (KVL), Key storage, Key destruction, and Key maintenance.

Vendor shall supply multiple encryption keys and key loader with keys preloaded, which shall become the sole property of the COUNTY following the initial deployment of equipment. Vendor shall provide all necessary training on how to administer a highly effective KMF.

11 Site Improvements

11.1 General

All work necessary to install radio base stations and/or microwave sites shall meet all COUNTY engineering inspections and approvals. Vendor shall provide the necessary antenna mounting structures, cable support hardware.

The Vendor shall be responsible for a complete and fully operable installation in accordance with the latest version of the National Electrical Code, local building codes, environmental laws, zoning and planning regulations or ordinances, land use restrictions, Federal Aviation Administration and Federal Communications Commission rules and regulations. Materials furnished by the Vendor shall be new and of first quality as defined in industry standards. The Vendor shall not make substitutes unless prior approval has been obtained from the County project manager.

Each Vendor (prior to submitting a proposal) shall attend mandatory site visits and examine the sites so as to fully understand all the existing conditions relating to the work.

The Vendor shall assume full responsibility for materials and equipment employed in construction of the project and agrees to make no claims against the County for damages to such materials and equipment except for that which is caused by the County, its employees or agents. The Vendor shall be responsible for storage of all materials purchased and turned over to him by the County and shall receive all delivered items by suppliers at the job site or at a staging area to be furnished by the Vendor.

The Vendor shall clean up and remove from the work site on a daily basis (or sooner if directed by the County project manager) all rubbish and construction debris, resulting from his own work in the building. Upon completion of all work, the entire job site areas shall be left clean and free of trash, debris, mud, dirt, dust, scrap materials and excess materials. Floors in radio equipment shelters and rooms shall be mopped and polished to the satisfaction of the County project manager upon completion of installation and construction work.

The Vendor shall coordinate the work of all the trades under his responsibility to insure that interferences between electrical conduits, cable support trays, grounding wire, structural, and radio system work shall be avoided so that the project is completed within budget and schedule.

The Vendor shall keep up-to-date marked-up prints of the Project Drawings. Markings indicating changes to the drawings shall be red or green and clearly visible. Two (2) sets of "As- Built" drawings (reproducible on the most updated AutoCAD Release) shall be furnished to the County project manager at the completion of the project. Project Drawings shall also be supplied on disk.

11.2 General Site Requirements

The COUNTY's Project Manager will work with the Vendor to obtain permission to access facilities where required. The subsections below include the County's estimation of the work needed to be performed by the Vendor, however, the Vendor shall submit their own detailed SOW based on the field survey results. The final SOW may differ from the estimated SOW's provided in the subsections below.

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11.5.1 Grounding, Bonding, Lightning Protection, & Wiring

(Optional) Pricing to bring all Sumner County tower sites and buildings to R-56 grounding standards. See Table 2 for locations 4.9.1

11.5.2 Electrical/Electronic Wiring

All wiring shall be sized in accordance with applicable prevailing code requirements.

All outlet boxes shall be surface mounted metallic and suitable for the quantity of devices enclosed. Faceplates shall match the outlet boxes. The outlet boxes shall be marked with the associated circuit numbers.

Radio equipment having 120 VAC circuits from UPS power panel shall contain separate identifiable white neutral conductors that connects to site equipment. Common or shared neutrals for these loads are unacceptable.

Each receptacle shall have the electrical box or cover plate permanently marked with the circuit number and appropriate breaker identification.

Each half of every duplex outlet shall have its own dedicated individual 20-ampere branch circuit, provided the connecting tabs on the receptacles are removed.

All AC powered equipment to be installed in equipment shelters or rooms shall be equipped with a surge arrestor, MOV/gas tube combination, in addition to any surge protection equipment that may be installed across the shelter/room power mains.

All Electrical outlets shall be 120-volt, 20-ampere (NEMA 5-20R) capacity receptacles with ground shall be provided.

Electrical equipment such as UPS, Transfer Switches, HVAC, etc. shall be wired in accordance with manufacturers wiring diagrams furnished with the equipment.

11.5.3 Antenna Cable Conduit Entry

A solid bulkhead entry panel shall be supplied to accommodate coaxial transmission lines between 1/2-inch and 1 5/8-inch diameter transmission lines and/or elliptical waveguides. Wall/Roof feed-through shall provide a minimum of 4, four-inch ports with room for at least 25% future growth.

11.5.4 Cable Tray

Vendor shall install an 18-inch wide cable tray system above the equipment if needed and below the ceiling. The bottom of the cable tray shall be installed 8 feet above finished floor. All cable ladder sections shall be bonded to the interior grounding system. The cable tray shall run up to the transmission line entry and extend in two parallel trays the length of the equipment room.

11.5.5 Grounding and Bonding System

Vendor shall install interior ground system shall and shall conform to R-56 standard and consistent with all other grounding used for the installation of all systems in this RFP document.

11.5.4.2 Master Ground Bar Inside Equipment Rooms

An internal Master Ground Bar minimum dimensions 1/4" deep X 4" tall X 24" wide, Harger model TGBIT14424M2T or equivalent, shall be installed such that it is located directly beneath the transmission line entry port if none exists onsite inspections. The ground bar shall be wall-mounted on insulators. The ground bar shall be made of tinned copper, and shall be drilled with holes that provides hole spacing on the master ground bar to accommodate type "B", "C", and "D" two hole lugs. A minimum 25 foot exothermically welded #2 AWG solid copper tinned wire "tail" shall be installed on the ground bar and shall be connected to the external ground bar on the outside of the shelter. The master ground bar shall be directly connected to the Internal Perimeter Ground Bus halo using #2 AWG copper conductor.

11.5.6 Lightning & Surge Protection

It is the County's goal to reduce possible system damage and failure due to strikes or induced currents. The Vendor shall adhere to current practices in providing protection to sensitive electronic equipment. At a minimum, the Vendors shall comply with the following lightning practices.

11.5.6.1 Protection for RF Transmission Lines

Each transmit or receive transmission line shall be protected by coaxial surge/lightning protectors between the transmitter combiner output and the antenna. Lightning arrestors shall be grounded to the bulkhead panel.

Each transmission line shall be grounded at a point above the bend required to exit the tower mounted cable ladder to the ice bridge leading to the radio equipment shelter or room. These grounds shall be installed in accordance with the manufacturer's specifications, and shall be sealed against entry of moisture at any location where the outer sheath of the transmission line has been cut or removed.

11.5.6.2 Protection on AC Power Supply for Electronic Equipment

All AC powered equipment to be installed in equipment shelters or rooms shall be equipped with a surge arrestor, MOV/gas tube combination, in addition to any surge protection equipment that may be installed across the shelter/room power mains.

11.5.6.3 Protection for GPS Receivers

For GPS receivers used as frequency/time references in the simulcast system, the antenna line shall be equipped with a gas tube surge arrestor.

11.7 Uninterruptable Power Supply (UPS)

Vendor shall furnish and install new UPS for sites in the system has required by the COUNTY.

For all sites the UPS systems shall have fifteen (15) minutes of battery back-up capacity and shall incorporate single phase input and output over current protection and maintenance bypass switch.

The system shall be "on-line" Ferro resonant transformer technology or as an alternate static Pulse Width Modulated (PWM) technology. The UPS shall be UL 1778 and 1449 listed.

11.7.1 UPS Specifications

UPS shall be continuous, "On-Line, No-Break" static type employing the latest state of the art solid state components incorporating microprocessor based Pulse Width Modulated (PWM) technology or Ferro resonant transformer design. The UPS system shall consist of a rectified section, inverter section, batteries, solid state transfer switch, isolation transformer, manual synchronized make-before-break bypass switch and input and output over current protective devices. Also included are all status and alarm displays, remote interface communicator, control devices, meters, components, cabling and connectors. Alarm monitoring shall be connected and integrated with the Network Management System.

UPS load shall be determined by the Vendor for 240 volt +/- 10% single phase input and 120/240 +/- 3% single phase, three wire output, output frequency range of +/- 0.01 Hz (or better), battery back-up time of no less than fifteen (15) minutes @ full load for 0.8 (lag) P.F. computer type loads at all locations; and (15 minutes @ full load for 0.8 (lag) P.F. computer type loads at Music Mountain. Temp. 0-40 degrees Celsius, Rel. Humidity 0 - 95% non-condensing, noise level: 60 dB approx. @ 3' and noise reduction greater than 60 dB (normal mode) and 120 dB (common mode).

The capacity of the solid state rectifier section shall be sufficient to maintain the battery in a fully-charged condition and continuously supply the required load through the inverter while floating the battery.

The system offered must not include any switching device or devices that will interrupt the continuity of power in any way.

The output voltage of the UPS shall be maintained within ± 3% over the nominal output voltage under any load conditions within UPS rating and ambient temperature range specified.

The sine wave output shall have a maximum of 5% total harmonic distortion over the entire range of output voltage at any load at any power factor.

Automatic Frequency regulation shall maintain the output frequency to within ± 0.1 Hz for all combinations of temperature, input voltage variation and load variation. The output shall not follow the reference source beyond ± 0.3% Hz of nominal frequency. When input returns to normal, the UPS shall automatically synchronize to the line frequency.

The components shall be selected to provide sufficient voltage capability and ample current- carrying capacity to furnish reasonable margin for handling over-currents and minor voltage variations. In no case shall components be operated at no more than 80% of the device's maximum steady state rating.

The UPS shall be capable of withstanding without failure, short circuit currents and surges of magnitude and duration in accordance with ANSI/IEEE Standard C62.41, categories A and B.

The UPS shall be capable of carrying 100% of the rated UPS output current continuously and shall be capable of carrying 150% of rated output current for approximately 2 minutes.

The system transient response shall be ±5% from nominal peak voltage for 100% load step. Voltage recovery shall be within 4 msec. to ±3% of nominal voltage.

The battery system shall be of the lead acid maintenance-free sealed, non-gaseous type with a minimum ten (10) year life.

The rectifier shall maintain a DC output voltage regulation of ±1% with a maximum of 2% RMS ripple. Rectifier shall be of the solid-state full wave SC bridge design to limit AC wave-shape distortion on the power system.

As a minimum, over current protection (10KAIC circuit breakers or 100 KAIC C.L. Fuses) shall be provided for:

- AC Input
- Rectifier Input
- Inverter Input
- AC Output
- Battery Input

11.7.1.2 UPS Warranty

A no deductible warranty that provides for on-site service by a factory authorized service representative shall be provided. This warranty shall provide coverage against all defects in materials and workmanship for a period of one (2) years from the acceptance date of the radio communications system. The batteries shall be warranted for ten (10) years on a prorated basis from the date of shipment.

11.8.2 UPS Accessories

The following items shall be mounted on the instrument panel of the UPS cabinet via microprocessor based LED or equal display (including lights/meters) for the following characteristics:

- Mode Select Switch (UPS Normal, UPS Bypass & Battery Modes)
- Input AC Voltage
- Battery DC Voltage
- Rectifier DC Voltage
- Output AC Voltage
- Output AC Amperage
- Output AC Frequency
- Synchronizing verification
- Low Battery DC Voltage Indication
- Static Switch Position Indication

- Manual By-Pass Mode Indication
- Float-Equalize switch/timer DC Circuit Indication
- % Rated Load Indication
- Battery back-up time available in Minutes

The following conditions shall have audible and visual alarms in addition to dry contacts for use by County:

- Low & High Battery Voltage
- Automatic By-pass operation
- Emergency Operation (UPS on Battery)
- Rectifier/Inverter Failure
- Common Trip alarm (form "C")

All external power and control connections shall be terminated on terminal blocks and identified clearly on writing diagrams for the County's external connections

12 IMPLEMENTATION MANAGEMENT

Vendor shall describe their plan to satisfy all system implementation requirements. Provide a description of the project management approach to be used, and staff to be assigned to the project.

Vendor shall provide a project schedule in PERT or Gantt chart format depicting the start and stop dates for all tasks, with major project events and milestones from Contract execution to final system acceptance, including tasks, resources, task duration, task responsibilities, and milestones. Vendor shall include an estimate of the project completion date, based upon the tentative project commencement date agreed to at project contract signing. At a minimum, the following tasks shall be addressed in the project schedule and implementation plan The Successful Vendor shall provide a cutover plan that provides for continuous operation of the COUNTY’s existing radio communications, E911 telephone and computer-aided dispatch systems. No interruption of public safety or essential public services related to system installation is acceptable. Limited degradation of existing capability is acceptable with approval from the COUNTY since the new and old systems will be using the same frequencies.

Provide a detailed implementation plan, coinciding with the project schedule, which describes how the Vendor will deliver, install and meet acceptance.

12.1 Project Organization and Resource Plan

Vendors shall provide a detailed project organization plan which shall include the following:

- Project Organization Chart listing specific names, titles, and project responsibilities for every facet of the project from project kickoff to final acceptance, followed by warranty and maintenance organizational support.
- Project personnel names and resumes shall include professional project management and engineering certifications and references.
- The Project manager shall be PMP certified and assigned as a full-time resource within the vendor organization, on the COUNTY project. Vendor Project Manager shall be

assigned to this project from project initialization through final system acceptance. • The Vendor shall provide detailed references validating that the proposed Project

Manager has significant experience in managing projects of comparable size and complexity.

- Vendor shall provide address locations of all project work and/or support facilities.

12.2 Detailed Design Review

Within forty five (45) days of contract award, Vendor shall submit a Detailed System Design Document ("DSDD") which comprehensively delineates the turnkey system that shall be implemented for the COUNTY. This document shall specify all plans, designs, materials, labor, installations, training, and tests that shall be provided by the Vendor prior to final system acceptance. For proposal evaluation purposes, Vendor shall include with their proposal a detailed outline of what will be included in their DSDD.

Successful Vendor shall coordinate a DSDD review which shall be held during a two (2) week period of time with the COUNTY Project Personnel, and the COUNTY's technical consultant. Vendor shall submit and/or respond to any questions or clarifications related to complete system implementation during this review period. Vendor shall not commence with equipment orders or system implementation until Vendor receives written approval from the COUNTY Project Manager that the County is in agreement with the plans, materials, and labor necessary to deploy the contracted system.

12.3 Project Schedule

The final network acceptance and all related documentation shall be completed no later than 18 months after receipt of Notice to Proceed (NTP).

Vendors shall provide a detailed project schedule showing key tasks and milestones. The schedule shall include, but is not limited to:

- Final Design Review Date
- Network Manufacture and Integration Time Frames
- Pre-Shipment Network Integration and Staging Dates
- Factory/Staging Acceptance Test Date
- Shipping Dates
- Network Installation and Optimization Dates
- Field Acceptance Test Date
- Installation Configuration Audit Date
- Coverage Testing Dates
- Training Dates
- Cutover Dates
- Warranty Start Date

12.4 Project Management and Controls Plan

Vendor shall include in their proposal their detailed methodology for Project management and control. The Project Management and Controls Plan shall include, at the minimum, the appointment one resource within the vendor organization as the single point of contact for the COUNTY project from project initialization through project acceptance. The Project Manager shall serve as the primary point of contact between the COUNTY and the Vendor on all matters. This resource shall be responsible to provide a resource plan detailing and identifying the Vendor project team; the team hierarchy; and roles and responsibilities of each team member.

The Vendor's assigned project manager will be a certified Project Management Professional (PMP).

Project Management, Direction and Coordination shall include the following minimum skills and responsibilities:

- Project Controls and Administration (Cost and Scheduling)
- The Vendor's project manager shall use Microsoft Project as the project control tool for this project. Key project milestone tasks and sub tasks shall be identified with baseline plan dates. Baseline plan shall be saved to compare with later versions. Resources are to be identified in the project plan. The Vendor's project manager shall update and provide a copy to the COUNTY Project Manager 24 hours prior to the weekly status meeting.
- Contract Administration
- Development and Maintenance of Communication Plan that includes:
  - Weekly project status reports
  - Meeting Minutes and distribution
  - Issues Log
  - Status Reporting
  - Escalation Process for subcontractors.
- Quality Assurance Management
- Guidance to the COUNTY Project Management Staff
- Manage Vendor Training Staff
- Maintain As-Built Documentation
- Contract For Additional Engineering and/or Services as required
- Manage Subcontractor Work
- Change Control and Management
- Maintain System Files
- Third Party Users (contracts and invoicing)
- Future Planning

12.6 System Installation Plan

Vendors shall include in their proposal details on the planned installation schedule and procedures to ensure that equipment is installed in a timely logical sequence and in a workmanship like manner. This shall be provided prior to contract award. The Installation Plan shall include the plans to install the P25 Infrastructure, interface to the existing Dispatch Consoles and Microwave Network.

12.7 System ATP (SATP)

As part of the implementation plan, the Vendor shall include their proposed System Acceptance Test Plan. This plan shall form the basis for a mutually agreed upon SATP between the COUNTY and the Vendor. The SATP shall, as closely as possible, resemble the "real life" application of the equipment and shall include, but not be limited to Technical compliance of infrastructure, network, console, and subscriber equipment; and operational compliance of all user equipment.

In addition to the Vendor-provided equipment, all existing the COUNTY equipment to be modified, reallocated, or reconnected to the new system shall be tested or demonstrated to be fully functional both before and after modification, relocation, and/or reconnection.

12.8 Coverage ATP (CATP)

The COUNTY's acceptance of the RF coverage portion of the system shall be based on successful passage of the RF Coverage Acceptance Test.

- A detailed RF Coverage Acceptance Test Plan (RFC-ATP) shall be included in the Vendor's response. The RFC-ATP shall reflect the system proposed and include (at a minimum) the following items:
- A brief description of how the test shall be conducted.
- The COUNTY manpower requirements to support the testing.
- A list of mobiles and portables in the system to be supplied by the COUNTY for the actual data gathering.
- How long the test shall take (approximate time).
- An explanation of the methodology of data gathering.
- An explanation of how the results shall be tabulated and documented.
- An explanation of why the methodology of data gathering and presentation of the results to the COUNTY shall "prove" that the coverage reliability requirement of this document shall be met.

12.9 Operational Transition Plan

The Vendor is to describe in this response a cutover plan. This plan shall include a chronological chart (Gantt-type format) with the tasks to be accomplished and the time for achievement of each task shown. A smooth operational transition from the existing systems to the new P25 Trunked Simulcast radio system and digital microwave system is the goal. The selected Vendor shall be required to implement the plan as part of the written procurement contract.

The Vendor shall provide an updated detailed cutover plan for each user agency 60 days prior to equipment installation. Cutover cannot be phased; the existing systems must remain operational until completion of the P25 Simulcast System project. The plan shall be approved by the COUNTY before commencement of installation.

The detailed cutover plan shall include a narrative description of the sequential cutover steps and a clear delineation of which tasks are the responsibility of the Vendor and which tasks are the responsibilities of the COUNTY.

The existing communications system shall remain operational during the cutover phase. The Vendor shall provide a phased implementation plan that will ensure that no current dispatch function is negatively impacted or impaired during system cutover to the new communications system.

13 FACTORY STAGING ACCEPTANCE TESTING

13.1 General Requirements (Staging Concept, Cabling, Labeling, Documentation, Staging ATP)

As part of this proposal, the Vendor shall provide staging of the offered equipment at or near the Vendor's primary facility. This will include ALL new components, sub-networks, and ancillary equipment required to construct and perform a Factory Acceptance Test of the proposed network. As part of the proposal the Vendor shall develop a preliminary Factory Acceptance Test Plan (FATP) document for sub network component testing and integration testing, to test the interface among the sub network equipment.

13.2 Minimum Staging Requirements

Factory staging acceptance tests shall demonstrate the fully integrated land mobile radio system functionality. Failure scenarios shall be demonstrated to the COUNTY representatives. These tests shall be monitored by the Network Management Subsystem (NMS) for the purpose of testing the NMS equipment.

A final matrix of all the tests to be performed and descriptions of each test shall be provided by the Successful Vendor not later than 30 working days prior to the demonstration date for the COUNTY's approval.

At the successful completion of the staging demonstration, the COUNTY representative will approve the shipment of the equipment to the COUNTY's sites for installation. If the demonstration or staging fails to meet the COUNTY's expectations, another date will be set to repeat the event at the expense of the Vendor. No system equipment, sub-system, or components shall ship from the staging facility without the COUNTY's written approval.

At a minimum, the following components shall be tested at staging:

- Trunked System central controllers; and/or master site equipment if applicable to the product
- Equipment to be interfaced to the existing Console(s) and all other console equipment
- RF subsystem
- Antenna Combining & Multicoupler systems
- Network Management System
- Microwave System
- Subscriber Equipment

13.5 Staging Participation

The Staging Area/Testing Site shall permit the COUNTY representatives to become familiar with the system, and test the system features.

13.6 Equipment Pre-Assembly for Shipping

AS part of the Staging process the site equipment of the System shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming and equipment configurations shall be completely integrated in their final configuration prior to shipment. Upon arrival at their final destination, the hookup of racks, external power, grounding, LAN/WAN and antennas to the site equipment should complete the physical integration of the sites and allow them to be "on-air" ready. No additional work should be needed to ready the site for operation. It is understood that additional optimization (level setting, power adjustment, etc.) may be required to meet the technical requirements of this specification.

13.7 Post Staging Documentation & Shipment

Vendor shall create or update the following documents of network staging at FATP facility:

- Baseline network design documents
- Interconnection charts
- Interconnection cable description and inventory
- Printout of equipment parameters
- Inventory with serial numbers and installation reference
- Software/firmware version numbers

14 SHIPPING, WAREHOUSING, INVENTORY

The Vendor is responsible for the packing, shipping, unloading, warehousing (if necessary), local shipping (if necessary), inventory, and installation of all equipment proposed. The following paragraphs further delineate the Vendor's responsibilities.

14.1 Pre-Assembled Shipments

The Vendor is responsible for providing safe transportation and delivery of all material defined by this RFP from the place of origin to the Vendor designated locations. No equipment shipments to the COUNTY owned, or leased locations, or to the locations of system participants shall be made without the written approval of the COUNTY.

All packaging of material shall conform to good packing practices to protect against any possible shipping damages.

The choice of the method of delivery shall be made by the Vendor to ensure that the system is installed to meet the COUNTY's critical dates as defined in the final implementation schedule.

The Vendor shall advise the COUNTY Project Manager how equipment or systems will be delivered, i.e. identify the carrier and destination. The Vendor shall provide the COUNTY Project Manager 48 Hour Advance Notification of the shipping dates. The COUNTY's Project Manager shall be promptly provided confirmed notification of any changes in shipping dates that result from delays in transit.

Title to and ownership of the equipment for the entire system shall remain with the Vendor until the equipment is delivered, successfully installed, and operational at the radio site as determined by the Acceptance Test Plan.

Vendors costs are to be inclusive of all costs associated with additional freight, express freight, or shipping, cartage, packing or crating, offloading, storage, or unpacking.

Every package, bill of lading, shipping memorandum, and invoice shall be marked with the purchase order number issued by the COUNTY for this procurement.

An itemized delivery ticket, bearing the COUNTY purchase order number shall be left with the goods to document their receipt by a designated COUNTY representative. If a carrier makes delivery, an itemized delivery ticket shall be attached to the outside of the package.

14.2 Shipment

Vendor shall be responsible for shipping and/or warehousing of system equipment, as well as transport to their final installation locations.

14.3 Equipment Inventory

The Vendor shall provide an itemized list of all subscriber and fixed infrastructure equipment provided by site including serial numbers to assist the COUNTY with asset tracking and inventory.

15 SYSTEM INSTALLATION

The Vendor shall develop an Installation plan that shall take every precaution necessary and anticipate every potential possibility of system disruption so as to minimize and avoid as much disruption as possible.

The plan shall address the transition and migration of the existing users to the new network. The plan shall include the deployment, at a minimum, of each of the networks below:

- P25 Trunked Infrastructure Installation.
- Microwave Network Installation
- Existing Console System Interface Installation
- Subscriber Equipment Installation

Unless otherwise stated in other sections, the following applies to all Vendor installations:

- The Vendor shall employ R56 Installation Standards, or approved equal, for all fixed station and site equipment installations and follow best practices for mobile installation.
- The Vendor shall identify the facilities where the major network items will be delivered and stored prior to installation.
- The Vendor shall provide all necessary hardware, tools, equipment and other supplies, and transportation for the successful installation of all new network equipment.
- The Vendor shall be responsible for optimization, troubleshooting, and adjustment of each sub-network.
- The Vendor shall install equipment in a neat and workmanlike manner, in accordance with best practice, using technicians or mechanics specified and approved by the COUNTY.
- The Vendor shall ensure that adjustment or alignment of any transmitter or receiver shall be performed by factory certified technicians.
- All external equipment inter-cabling, whether RF, AC, Audio or Control cables and/or wiring, shall be labeled with pre-printed adhesive wire markers. Markers shall be placed at each end, adjacent to the connector, plug or terminus. For cables and/or wiring within a shelter, markers shall be placed at five (5) foot intervals along the length of the cable and/or wiring. This data shall be recorded in the installation documentation.
- All cable/wiring bundles exiting the equipment shall exit through the top of the racks.
- All equipment cables or cable bundles, to the greatest extent feasible, shall be neatly tied by means of lacing string or approved straps and secured by clamps to flat surfaces.

- Splicing of antenna, power, audio and/or control cables/wiring shall be unacceptable.
- All rubbish and debris associated with site preparation; unpacking of shipping materials; and/or the installation of equipment or networks related to this project shall be removed from the premises every day by the Vendor.
- A site is deemed ready for Vendor equipment installation only after mutual agreement by the COUNTY and the Vendor that the site has adequate room in an existing building or shelter to accommodate the equipment to be installed, and electrical service and internal distribution in place. In addition, the COUNTY provided circuits shall have been satisfactorily tested.

16 TRAINING

Vendor shall include in their proposal a comprehensive training plan. Following contract award, Vendor shall submit a detailed plan for all training for approval by the COUNTY at least 60 days prior to the communications system installation.

16.1 User Training

Concurrent with the installation and prior to the performance period of the communications system, the Vendor shall provide multiple on-site orientation and training sessions for the COUNTY's dispatch and field radio personnel as to all aspects of the operation and functioning of the new communications system. Vendor shall prepare training for up to (12) dispatchers and up to 30 train the trainer staff. Personnel shall be trained in all available routine features and functions as well as in the following areas:

- The configuration of the new system and its operational modes, and differences between the new system, and the existing system.
- Operational theory of control consoles, base repeater, voting system, RF control stations, mobile and portable equipment, and digital, conventional, and failure modes of operation.
- Hands-on familiarization with all communications control functions and equipment.
- Proper radio technique.
- Basic mobile/portable/dispatcher operator maintenance and diagnostic troubleshooting techniques.
- System manager terminals and report generation.
- The COUNTY reserves the rights to video tape all training at its expense to provide a permanent training record and system operations record.
- The Vendor shall provide all training materials and supplies. A copy of any and all training material shall become the property of the COUNTY.
- The training sessions shall be scheduled at times and locations designated by the COUNTY.
- The COUNTY will provide space where training can be conducted.
- Vendor trainers shall be on-site for each shift for the first three days of go-live.
- The Vendor shall specify the time required to train the COUNTY's personnel within a time frame commensurate with system implementation.
- The Vendor shall specify the number of training sessions required. This information shall be supplied with the training plan and must be approved by the COUNTY.

16.2 System Manager Training

Vendor representatives shall provide training to selected COUNTY supervisor and management personnel who will be responsible for making database entries, setting up user files, and administering services with the communications system. This training shall include intensive instruction on all aspects of tasks necessary to operate the system. Training shall include comprehensive instruction on the utilization of Subscriber Programming Software used to program all radios delivered to the County as part of this procurement. The training class shall consist of approximately three (3) people.

17 ACCEPTANCE TESTING

The Vendor shall verify system performance to the COUNTY prior to beginning the Performance Period. System performance shall be demonstrated by equipment/system tests and verifications.

The Vendor shall provide all necessary technical personnel and test equipment to conduct the tests. The Vendor shall coordinate with the COUNTY in regard to scheduling of the tests and provide at least two weeks' notice prior to performing the tests.

It is recognized that a variety of testing procedures and equipment may be utilized to verify a particular specification. Therefore, the Vendor shall be afforded latitude in this regard provided the methods proposed are regarded as acceptable in the industry, as determined by the COUNTY and the COUNTY's technical consultant. All test results shall be recorded in a standardized format to be determined by the Vendor. The format to be used for recording of test program data shall be submitted to the COUNTY for approval 30 days prior to testing. All recorded test program data shall be dated, witnessed, and signed by the Vendor Project Manager as well as the County Project Manager.

17.1 System ATP

After field installation of the fixed infrastructure, Vendor shall perform those checks and tests that are critical network parameters and functions tested during the initial FATP tests will be rechecked and re-tested for verification purposes.

Prior to the commencement of this activity, Vendor shall deliver a final field test plan to the COUNTY for review, modification, if necessary, and approval.

At the conclusion of the field tests, Vendor shall present to the COUNTY written certification that the tests performed were in accordance with the approved test plan, the tests were successful and the actual results of the tests as recorded.

The COUNTY shall attend the field tests.

17.2 Performance Verification Tests

This test shall be performed to demonstrate that the COUNTY Radio Network and related sub-networks have been properly configured and optimized; and that they will operate fully, and properly, without a major network failure.

This test shall be performed after all the tests and inspections defined earlier in this section have been accepted, and before network cutover.

During the test, all network features and functions shall be fully operational and accessible to the test users. The COUNTY shall approve the selection of test users.

The Operational System Test shall consider, at a minimum, the following items:

- All P25 Trunked System Features shall be included but not limited to the following:
  - Automatic unit identification.
  - Emergency alarm function.
  - Digital and Analog Channel Mode selection (mobile, portable, control station, console networks).
  - Repeater failure.
  - Router or Switch Failure
  - Frequency standard
  - Simulcast optimization equipment.
  - Operation of equipment alarm functions.
  - Links between sites.
  - Base Repeater Functions including, but not limited to:
  - Transmit frequency and authorized transmission mask.
  - Output and reflected power. ○ Receiver sensitivity.
  - Receiver selectivity.
  - Receiver multi-coupler gain.
  - Receiver preamplifier gain.
  - Frequency domain reflectometry of transmission line.
  - Transmitter combiner loss.
  - Alarm functions.
  - Voting IP network function
  - Proper operation of frequency standard.

- Test of Existing Dispatch Console Functions including, but not limited to:

  - Proper operation of channel access.
  - Proper operation of all signaling functions.
  - Proper operation of volume and mute controls.
  - Proper operation of cross patch functions.
  - Proper operation of cross mute functions.
  - Proper operation of preprogrammed simulcast or group control functions.
  - Proper operation of automatic unit identification and emergency identification functions.

- Antenna and transmission line tests:

  - All antennas and transmission lines shall be tested from the interior of the equipment buildings using Frequency Domain Reflectometry (FDR) and a FDR unit capable of producing a hard copy of the results. This method of measurement shall indicate any impedance discontinuities in the transmission line/antenna system. Additionally, the VSWR shall be determined at the input connector of the transmission line.
  - The Vendor shall provide suitable documentation of the test results. At a minimum, the FDR (photograph, thermal printout, or graphic drawing) test data shall be provided.

- Select Subscriber radios

  - Transmit frequencies.
  - Transmitter deviation/transmit bandwidth (normal speech).
  - Forward and reflected power at transmitter output.
  - Receiver frequencies.
  - Receiver threshold sensitivity.

- Network Monitoring and Control System

    - RTU alarm monitoring points shall be tested using local display.
    - Verify reporting of alarm remote terminals to workstation terminals.
    - Verify performance of controls to remote terminals.
    - Master terminal station shall be verified for proper programming, redundant switching, reporting, and report generation.
    - Workstation terminals shall be demonstrated for proper operation and presentation of graphics and text displays.

- Microwave Radio Tests

    - Net path loss shall be measured and recorded for each RF path.
    - Received carrier power for each end of each path.
    - Calculation of flat fade margin.
    - Ethernet BER
    - TDM (DS1) Error rate
    - Loop Reversal or Redundant Radio Tests

17.3 Site Audits

After installation of the fixed infrastructure, Vendor shall perform field inspections to verify that equipment installations have been completed in accordance with the COUNTY's Specifications, Vendor's installation practices and standards, and the COUNTY's expectations that the workmanship will be neat and professional.

Prior to the commencement of this activity, Vendor shall deliver a final field inspection plan to the COUNTY for review, modification, if necessary, and approval.

At the conclusion of this activity, Vendor shall present to the COUNTY written certification that the field inspections performed were in accordance with the approved plan, and that the results of the inspections were satisfactory.

The COUNTY shall attend these inspections.

17.4 Coverage ATP

The COUNTY's acceptance of the RF coverage portion of the system shall be based on successful passage of the RF Coverage Acceptance Test.

A detailed RF Coverage Acceptance Test Plan (RFC-ATP) shall be included in the Vendor's response. The RFC-ATP shall reflect the system proposed and include, at a minimum, the following items:

- A brief description of how the testing shall be conducted.
- The COUNTY's manpower requirements.
- A list of testing instrumentation to be supplied by the Vendor for the actual data gathering.
- How long the test shall take (approximate time).
- An explanation of the methodology of data gathering.
- An explanation of how the results shall be tabulated and documented.

The RF coverage performance tests shall be performed in all accessible geographic areas of the COUNTY hereinafter referred to as the service area.

Consistent with TSB-88 requirements for coverage testing of simulcast RF systems, talk out testing shall be performed utilizing Bit Error Rate (BER) testing and both talk out and talk back testing shall be performed utilizing Digital Audio Quality (DAQ) testing.

Testing shall not commence until the Vendor has installed and activated all infrastructure equipment provided in response to this RFP, and testing shall occur while the system is operating in digital simulcast mode.

Data for the BER and DAQ tests may be collected simultaneously, but must be analyzed and evaluated independently. Rain shall not delay the scheduled testing.

System acceptance will occur after successful completion of the BER, DAQ and critical infrastructure coverage tests. The required BER, DAQ and critical infrastructure testing procedures are detailed in the next three sections.

17.4.1 Bit Error Rate Testing

The Vendor shall perform an automated BER test to evaluate system talk out. The test evaluation team shall consist of a minimum of one COUNTY representative and one Vendor representative, who must be present and verify the testing process.

In order to perform this test the service area shall be divided into uniformly sized grid squares, consistent with TIA/EIA/TSB88-C, in order to yield a 95 percent or higher confidence level. The maximum allowable grid size shall be 1 mile on any side. An automated BER test shall be performed in each grid where a portion of that grid is within the service area boundary. Testing points within each grid shall be randomly chosen. All randomly chosen test points must be within the service area.

This automated coverage test shall incorporate critical time constraints for UHF RF coverage testing. A method of correlating the location and the BER measurement, such as a GPS receiver, shall be employed to assist with the subsequent coverage performance analysis. The testing instrumentation shall be configured to allow use both in a vehicle, and shall simulate a portable radio, worn at hip level, for all grids covering any portion of the COUNTY. The testing instrumentation shall be verified by an independent means acceptable to the COUNTY both before and immediately following the test.

Test route(s) shall be developed by the Vendor that address the entire accessible service area of the COUNTY. All test routes will be approved by the COUNTY. If possible, any grids not accessible to the test vehicle(s) shall be identified while planning the route. Required data shall be recorded at each grid throughout the test route. Transportation shall be provided by the COUNTY to any test locations not generally accessible by car that require testing.

The COUNTY and Vendor shall test coverage in all accessible test grids. Grids that cannot be accessed will not be counted in the reliability calculation.

Successful completion of the BER test shall occur when 95 percent or more of the total grids yield a BER of 2% or less.

17.4.2 Delivered and/or Digital Audio Quality (DAQ) Testing

The Vendor shall perform a DAQ test to evaluate system talk out and talk-back. The test evaluation team must consist of a minimum of two COUNTY representatives and one Vendor representative, who must be present to conduct this test.

In order to perform this test the service area shall be divided into uniformly sized grid squares with sides as determined in TIA/EIA/TSB88-C to yield a 95 percent or higher confidence level. The maximum allowable grid size shall be 1 miles on any side. A DAQ test shall be performed in each grid where a portion of that grid is within the service area. A test point within each grid will be selected by the COUNTY, with the understanding that selected points shall not cluster adjacent grid test points together. All selected test points must be within the service area.

The testing instrumentation shall be configured to allow use in a vehicle, and shall simulate a portable radio, worn at hip level for all grids covering any portion of the COUNTY. The testing instrumentation shall be verified by an independent means acceptable to the COUNTY both before and immediately following the test.

The COUNTY will provide test messages representing commonly used dispatch language for the Fire and Police Departments. The Vendor and the COUNTY must mutually agree on the test messages. The test messages will be no longer than 10 seconds in length. Test messages will be drawn at random, read and evaluated.

If a majority of the evaluation team believes that the test message met a minimum DAQ of 3.4 on the first transmission, the grid passes.

If a test point is evaluated on-street utilizing the configured test instrumentation, and a majority of the evaluation team believes that test message did not meet a minimum DAQ of 3.4 on the first transmission, the grid fails.

If a test point is evaluated in-building utilizing a portable radio, and a majority of the evaluation team believes that the test message did not meet a minimum DAQ of 3.4, a building penetration loss level must be determined. The definition of DAQ 3.4 is listed in the table below.

Subjective Performance Description

1	Unusable. Speech present but unreadable
2	Understandable with considerable effort. Frequent repetition due to
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
3.4	Speech understandable with repetition only rarely required. Some
4	Speech easily understood. Occasional Noise/Distortion
4.5	Speech easily understood. Infrequent Noise/Distortion
5	Speech easily understood.

The definition of rarely as it applies to the definition of 3.4 DAQ will be based upon the determination of the test evaluation team. The test evaluation team shall be provided with the definition of 3.4 DAQ and audio tape examples of 3.4 DAQ. In the final analysis it shall be up to the test evaluation team to determine if the 3.4 DAQ has been achieved.

Successful completion of the DAQ test shall occur when 95 percent or more of the total grids achieve a minimum DAQ of 3.4 or better for both talk out and talk back.

However, the DAQ test shall be considered failed if any four (4) adjacent or contiguous grids, in any horizontal, vertical or diagonal combination, fail to achieve a minimum DAQ of 3.4.

17.4.3 Coverage Performance

The Vendor shall guarantee RF coverage performance in accordance with the requirements in this RFP. If the RF coverage performance of the system supplied by the Vendor does not meet the RFP requirements, the Vendor shall modify or otherwise cause the system to meet the requirements of this document at no cost, either direct or indirect to the COUNTY.

The Vendor shall submit a plan to meet such requirements that is satisfactory to the COUNTY, at the COUNTY's sole discretion.

This plan shall become an enforceable part of the written contractual agreement between the COUNTY and the Vendor.

17.5 Thirty (30) Day System Reliability Plan

The system shall be accepted by the COUNTY upon completion of a successful performance period for each phase of the project as described below:

- The equipment shall be individually tested and a performance verification test report shall be completed for each major equipment category. This shall be accomplished after equipment delivery, installation and optimization.
- The performance verification shall be accomplished with the COUNTY's point of contact or his designee present and participating in the testing for compliance. The COUNTY shall make available test compliance persons within seven (7) calendar days of notification by the Vendor.

- System performance shall be tested when all fixed equipment is completely constructed.
- A performance period of thirty (30) consecutive calendar days of successful operation after installation and performance verification shall constitute a successful performance period.

Successful operation is defined as the absence of any major failure of equipment or equipment function. Minor failures, such as operational problems and adjustments normally encountered during implementation of a new system, shall not constitute a failure in achieving successful operation.

The following is a listing of items that define a major failure (which resets the 30 System Reliability Plan). Malfunctions that cause:

- Two or more channel resources down.
- A simulcast failure affecting one or more sites or two or more channels.
- Loss or failure of system configuration database.
- Any failure of this equipment that affects either the police or fire operations or prevents communications on the system will constitute a major failure.

The following is a listing of items that define a minor failure (which resets the 30 System Reliability Plan on that piece of equipment):

- Failure of no greater than one repeater channel, provided that such failures are corrected within the maintenance response time required by the RFP.
- Failure of any equipment that does not cause the interruption of operation or wired console dispatch functionality, provided that redundant equipment automatically switches into operation in accordance with the RFP.
- Failure of a site frequency standard provided that redundant equipment automatically switches into operation in accordance with the RFP.
- Momentary (ten seconds) system outages during switching to redundant control equipment.
- Minor errors in the subscriber equipment database affecting fewer than 25 radios.

During the performance period, the Vendor shall provide replacement parts and materials and qualified personnel to service the fixed equipment at the sites of work, within 2 hours after notification of a major equipment failure as reported to Vendor's service facility. The Vendor shall have sufficient personnel and parts available to maintain the equipment so that the equipment can be repaired within eight hours after notification of equipment failure. This provision shall apply on a working hour basis of 24 hours per day, seven days per week (including holidays).

During the performance period, the Vendor shall establish and maintain the following documentation:

- Prepare and maintain a service/repair record system.
- Prepare and maintain a failure reporting system to insure that all failures are reported properly to the COUNTY. A failure log shall be available for inspection by the COUNTY at all times. In addition, a formal failure report shall be submitted to the COUNTY on a monthly basis and shall show for each failure: (1) the original complaint; (2) the problem actually found; (3) repairs performed; (4) itemized list of parts replaced; (5) technician's name; and (6) any FCC required measurements made due to repairs.
- The documentation shall be maintained on a common electronic database, the database shall permit sorting by field to facilitate the analysis of maintenance records.

18 WARRANTY & UPGRADES

The COUNTY desires to ensure ongoing system operation, to maintain all current functionality, to prolong the useful life of the communication system, and to accomplish preventative and remedial maintenance through an ongoing maintenance agreement with the Vendor.

18.1 Maintenance & Repairs during Warranty Period

The Vendor shall be responsible for preventative and remedial maintenance of all items provided as part of this RFP for a period of one (1) year following acceptance of the system by the COUNTY. The Vendor shall provide the necessary labor, parts, supplies, transportation, test equipment, and facilities to maintain the equipment and software to the level of current factory specifications. The warranty shall cover preventive maintenance, repair due to malfunction, repairs due to normal usage, and emergency maintenance. All warranty services shall be provided as part of the communications system without additional charge to the COUNTY. Vendor shall be able to monitor system for alarms and malfunctions on a 24hour/365 days per year. Vendor must notify County immediately of any alarms and malfunctions.

18.2 Software or Firmware Updates During Warranty Period

Upon system acceptance, the firmware and/or software for the entire system shall be of the latest system release with updates to include all third party supplied equipment. The Vendor shall supply all technical resources and labor to install and activate any new system software or firmware release during the year for all Vendor and third party equipment. These updates must continue through the life of the warranty period at no additional cost to the County.

18.3 On-going System Management Plan

The Vendor shall include optional annual pricing for continued preventative and remedial maintenance for years two through five and up to ten years. The annual maintenance contract shall begin on the date of warranty expiration. All maintenance requirements and conditions provided by the maintenance contract shall be identical to the warranty period coverage described above with the exception of subscriber maintenance which shall be priced as an option. Local service vendor must be within 25 miles of the County. The Vendor shall provide a Total Cost of Ownership (TOC) for the system over a 15 year period, inclusive of all necessary hardware, software and maintenance costs over this period of time.

18.3.1 Maintenance Personnel

The Vendor shall provide competent, experienced personnel to execute all required maintenance tasks. All maintenance personnel shall be trained and experienced in standard communications industry practices as well as Vendor equipment practices. Personnel who perform maintenance on the system shall have completed all required manufacturer-approved training for that equipment. Said training, or appropriate refresher courses, shall have been completed within the previous year and evidence thereof shall be provided to the COUNTY. It is required that the maintenance personnel have in their possession all of the required diagnostic equipment for the system and subsystem proposed. The expense of this equipment will be the responsibility of the Vendor.

18.4 Service Facilities

The Vendor shall maintain one or more properly stocked, equipped, and staffed service facilities to maintain the equipment supplied under this RFP in close proximity to the COUNTY, such that the Maintenance Response Time requirements specified herein can be met.

18.5 Service Maintenance Response Time

The Vendor shall provide for on-site response by qualified service personnel for all reported non-subscriber equipment maintenance, repairs or failures.

For all service calls, responding qualified service personnel must arrive on-site within two (2) hours with the required test equipment, replacement parts and materials to diagnose and repair equipment problems and failures.

Fixed equipment shall not be out of service in excess of twenty-four (24) hours after notification of equipment failure. Eighty percent (80%) of the time, non-fixed equipment repair periods shall meet a three-day (3 day) turn around period.

This warranty period maintenance shall be on a working hour basis as follows:

- Fixed equipment: Twenty-four (24) hours per day, seven (7) days per week.
- Non-fixed equipment: Nine (9) hours per day (0700 to 1700 hours), five (5) days per week.

18.6 Subscriber Equipment Repair

Mobile and portable radio repairs may be accomplished on site, or repaired at the Vendor's central repair facility. Vendor must ensure two week repairs turn around for all covered subscriber repairs, and any shipping cost must be paid by the Vendor. Also, pickup and delivery of repaired units to the County.

18.7 Existing Subscriber Radio Upgrades to P25

The County currently owns 70 of Kenwood mobile, portable and control station radios that will require a flash upgrade to P25. Vendors are to include this cost in the RFP response.

18.8 Availability of Replacement Parts and Spares

The Vendor shall certify that they maintain a stock of replacement parts for each item included in their RFP response and are capable of replacing such parts, assemblies, modules, and devices for all equipment included in the purchase as well as updating all appropriate software. The Vendor shall also certify that a stock of replacement parts for each critical component to be supplied as part of the communications system shall be immediately available at all times during the warranty and maintenance periods. These parts shall be either in the Vendor's stock and available for timely transfer to the communications system site to meet maintenance criteria, or stored at the sites.

The Vendor shall certify that infrastructure equipment parts will be available for a minimum of seven (7) years after final product manufacturing date.

The Vendor shall certify that subscriber equipment parts will be available for a minimum of five (5) years after final product manufacturing date.

Vendors shall recommend a list of essential spare parts to be purchased and maintained by the COUNTY to assure rapid restoration of systems operations in the event of component failure. The vendor shall also provide a list of "critical components" that should be kept on site. Critical components are

those parts, modules and assemblies which upon failure will cause a system outage. All spare equipment shall be uniquely noted and itemized by line item unit independent of the primary system/equipment pricing matrices.

Stocking of spare parts shall remain the responsibility of the local maintenance provider.

Parts for system repair and future expansion shall be available for shipment on an expedited handling basis within twenty-four (24) hours, 365 days per year including weekends and holidays. The Vendor shall provide a twenty-four (24) hour, seven (7) day per week hotline telephone number for the handling of such orders.

All spare parts, modules and assemblies, test equipment, tools, and fixtures furnished by the Vendor shall be new and in current production at the time of delivery.

The cost for replacement and critical spare parts shall be quoted as part of the Vendor's proposal. Parts pricing shall be in the form of a discount off of manufacturer's list pricing, similar to those discounts provided to dealers for the purpose of self-maintenance. This discount shall be part of the attached pricing sheets.

Optional Pricing for (1) Digital Radio Test Set

Must meet or exceed the Aeroflex 8800SX

8800SX-139942 8800SX Radio Test Set
8800Opt04-113337 P25 Conventional
8800Opt05-138895 P25 Phase II
8800Opt10-113339 Tracking Generator
8800Opt11-113340 Occupied Bandwidth
8800Opt12-113309 Internal Precision Power Meter (Includes both In-Line Power Meter + 5017D Sensor)
8800OPT21-139837 SINAD Selectable Notch Filters
8800OPT102-138526 Kenwood 5X20 P25 Series Auto-Test
8800Opt103-138527 Motorola APX Series Autotest / Alignment
8800Opt105-139315 Motorola ASTRO 25 XTS/XTL Autotest/Alignment
114478 Soft-Sided Carrying Case
114475 Antenna Kit
114348 Precision DTF / VSWR Accessory Kit for 8800
62404 DC Power Cord / Cigarette Adapter
AC25014-67411 Scope Probe Kit
W8800/203C-114483 Extended Standard Warranty 36 Months w/ Sched. Calibration
141707 Accessory,8800 Bal to Unbal Adptr

19 AS-BUILT DOCUMENTATION

Vendor 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 the COUNTY review and detailed documentation of as-built conditions.

Vendor shall provide complete as-built documentation within 90 days of final system acceptance detailing all aspects of the installation including:

- P25 Trunked RF Infrastructure
- Console Subsystem
- Fire Station Alerting System
- Microwave System
- Network Management System
- Subscribers

Purchasing Office
1500 Airport Road
Gallatin, TN 37066

COMPANY NAME _____

ADDRESS _____

_____

TELEPHONE _____

EMAIL _____

AUTHORIZED COMPANY REPRESENTATIVE _____*SIGNATURE*

AUTHORIZED COMPANY REPRESENTATIVE _____*PRINTED*

DATE _____

BID TITLE 20190108-CO Communications System for Sumner County
DEADLINE January 8 ,2019 @ 9 :00 a.m. local time

BID AMOUNT: $_____

BID VALID THRU _____

ATTACHMENT 1

STATEMENT OF NON-COLLUSION

The undersigned affirms that they are dully authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other respondent, and that the contents of this proposal as to prices, terms or conditions of said proposal have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this proposal.

Company _____

Address _____

_____

_____

Phone _____

Fax _____

Respondent (Signature) _____

Respondent (Print Name and Title) _____

Authorized Company Official (Print Name_____

ATTACHMENT 2

DRUG-FREE WORKPLACE

The Sumner County Government is committed to maintaining a safe and productive work environment for its employees and to providing high quality service to its citizens. The goal of this policy is for Sumner County employees and contractors to remain, or become and remain, drug-free. Abuse and dependency on alcohol and/or drugs can seriously affect the health of employees, contractors and citizens, jeopardize personal safety, impact the safety of others and impair job performance.

Drug-Free Workplace Act of 1988 – Sumner County Government is governed by the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D).

Omnibus Transportation Employee Testing Act of 1991 – Sumner County Government is governed by the Omnibus Transportation Employee Testing Act of 1991 (Pub. L. 102-143, Title V).

Right to an Alcohol and Drug-Free Workplace - Employees have the right to work in an alcohol and drug-free environment and to work with persons free from the effects of alcohol and/or drugs.

Required Alcohol and Drug Tests - Alcohol and drug testing for safety sensitive employees shall be in accordance with the provisions contained in the Sumner County Alcohol and Drug Policy adopted by departments which have safety sensitive positions.

Contracts – Any contractors providing goods or services to Sumner County Government must comply with all State and Federal drug free workplace laws, rules and regulations and so certify this compliance by completion of the DRUG-FREE WORKPLACE AFFIDAVIT (attached page 2).

DRUG-FREE WORKPLACE AFFIDAVIT (page 2)

STATE OF _____

COUNTY OF _____

The undersigned, principal officer of _____, an employer of five (5) or more employees contracting with Sumner County Government to provide goods or services, hereby states under oath as follows:

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company") and is duly authorized to execute this Affidavit on behalf of the Company.
2. The Company submits this Affidavit because it shall be receiving pay pursuant to a contract with the state or any local government to provide goods or services.
3. The Company is in compliance with all State and Federal Laws, Rules and Regulations requiring a drug-free workplace program.

Further affiant saith not.

Principal Officer:_____

STATE OF _____

COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence) and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____, 20____.

_____
Notary Public

My commission expires: _____

ATTACHMENT 3

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The prospective participant certifies, to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in transactions under federal non-procurement programs by any federal department or agency;

2. Have not, within the three year period preceding the proposal, had one or more public transactions (federal, state, or local) terminated for cause or default; and

3. Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) and have not, within the three year period preceding the bid, been convicted or had a civil judgment rendered against it
    A. For the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state, or local) or a procurement contract under such a public transaction;

    B. For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or

    C. For the commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

I understand that a false statement on this certification may be grounds for the rejection of this proposal or the termination of the award. In addition, under 18 U.S.C. § 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to five years, or both.

_____
Name of Participant Agency

_____
Name and Title of Authorized Representative

_____
Signature of Authorized Representative Date

_____ I am unable to certify to the above statement. Attached is my explanation.

ATTACHMENT 4

CERTIFICATION BY CONTRACTOR

I, the undersigned, certify that on behalf of Contractor, I am authorized to attest and obligate the above certification and to legally bind Contractor to these terms, conditions and obligations.

_____ Title

_____Name

_____ Date

_____Witness