Jackson County, Georgia

Public Safety Communications

Request for Proposal 200013

Project-25 Trunked Radio System

August 2020

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tusa Jackson County, Georgia

Part I

Jackson County Board of Commissioners

67 Athens Street
Jefferson, Georgia 30549
Phone: (706) 367-6309
Fax: (706) 708-2505
Email: myarbrough@jacksoncountygov.com

TO: Project 25 Public Safety Radio Vendors

DATE: August 17th, 2020

SUBJECT: Request for Proposal for Project-25 700/800 MHz simulcast trunked radio network

You are invited to submit a proposal to the Jackson County Board of Commissioners, Jefferson, Georgia for a turnkey project to provide Jackson County with a new Project-25 700/800 MHz simulcast trunked radio network.

Attached hereto are the general conditions, technical specifications, and submittal format.

The written requirements contained in this Request for Proposal (RFP) shall not be changed or superseded except by written addendum from Jackson County Purchasing Department. Failure to comply with the written requirements for this RFP may result in disqualification of the submittal by Jackson County.

Submittals are to be sealed, marked with the vendor's name and address and labeled:

"RFP 200013", "Project-25 trunked radio network" and delivered to:

Jackson County Board of Commissioners

Attention: Purchasing Manager

67 Athens Street

Jefferson, GA 30549

not later than **October 30th, 2020 at 4pm EST**

A qualified interpreter for the hearing impaired is available upon request at least 10 (ten) days in advance of the proposal receipt date. Please call (706) 367-6312 for more information for the hearing impaired. This service is in compliance with the Americans with Disabilities Act (ADA).

Jackson County reserves the right to reject any and all submittals, to waive any technicalities or irregularities and to award contracts based on the highest and best interest of Jackson County.

Inquiries regarding this Request for Proposal (RFP) should be made to:

Myrna Yarbrough
Purchasing Manager
Phone (706) 367-6309
Fax (706) 708-2505
email myarbrough@jacksoncountygov.com

SUBMISSIONS ARE DUE AT THE ADDRESS SHOWN BELOW NO LATER THAN

October 30th, 2020 at 4pm EST

JACKSON COUNTY BOARD OF COMMISSIONERS

ATTENTION: PURCHASING MANAGER

67 ATHENS STREET

JEFFERSON, GA 30549

RFP # 200013

THE RESPONSIBILITY FOR SUBMITTING A RESPONSE TO THIS RFP ON OR BEFORE THE STATED DATE AND TIME WILL BE SOLELY AND STRICTLY THE RESPONSIBILITY OF THE OFFEROR.

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SECTION 1 - TERMS AND CONDITIONS

1.0 Request for Proposal Overview

1.1. Purpose

This Specification encompasses a turnkey project to provide Jackson County with a new Project-25 700/800 MHz simulcast trunked radio network capable of meeting both the current and future communication needs, both reliably and functionally.

1.2. Information to Vendors

1.2.1. Proposal Timetable

Release of Request for Proposal	August 17, 2020 at 4pm EST
Mandatory Pre-Proposal Conference	September 14, 2020 at 9am EST, lasting through September 15, 2020 until all visits are complete.
Deadline for Submission of Questions	October 2, 2020 at 4pm EST
Answers Provided Through Addendum No Later Than	October 9, 2020 at 4pm EST
Proposal Due Date and Time	October 30, 2020 at 4pm EST

1.2.2. Pre-RFP Conference

This RFP constitutes the full scope of the information requested. An RFP mandatory proposal conference will be conducted approximately four weeks after the release of these Specifications to the Public The place and time of the pre-proposal conference will be at 1869 County Farm Road, Jefferson, GA 30549 on September 14, 2020 at 9am EST.

1.2.3. Premises Visits

1.2.3.1. Responders, before submitting an RFP Response, may desire to visit existing County radio infrastructure site premises in order to gain familiarity with conditions which may affect the work or planned solution(s). The County, its designated local representative or the Consultant will coordinate access and escort to the various sites.

1.2.3.2. If more than one visit to a site is requested and time allows, the County will support the necessary arrangements. Site Visits will take place immediately following the Pre-Proposal Conference. Due to the large number of sites, site visits could possibly continue the following day.

1.2.3.3. RFP Responders must indicate any special requirements, i.e., architectural, mechanical, electrical, civil or structural modifications, that their equipment may need at either County-owned or non-County-owned locations that are intended to be utilized in the offered solutions.

1.2.3.4. Estimated costs for these special requirements shall be disclosed in the RFP Submittal.

1.2.4. Definitions as used herein:

1.2.4.1. Responder, Proposer: Any organization, company, vendor, or supplier responding to this RFP Specification.

1.2.4.2. Contractor: The Proposer to whom a contract is awarded.

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

1.2.4.4. Jackson County, Georgia, or Network Owner/Customer: Jackson County, Georgia Board of Commissioners.

1.2.4.5. Consultant: Tusa Consulting Services

1.2.5. RFP Submission

1.2.5.1. This RFP Specification is a complete document and must be returned intact with vendor responses provided in a point-by-point fashion. The RFP Authorization Form (See Attachments) must be completed. All responses and attachments should be placed into the RFP Response immediately behind the area in which the information was requested i.e., a point-by-point response.

1.2.5.2. If supplementary materials are inserted, each inserted page must be labeled in the bottom margin with the number of the Specification page behind which it is being placed. If more than one page is inserted behind a particular RFP Specification page, then each must be labeled with the appropriate page number plus a letter designator, e.g. 121a, 121b, 121c, etc.

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

1.2.5.4. The Proposal Response shall be divided into two sections:

Section 1 – Technical.

Section 2 – Infrastructure Pricing and User Equipment Pricing.

1.2.5.5. The following documents are to be submitted:

Four (4) copies each of the Technical Proposal.

One (1) electronic searchable copy of the Technical Proposal.

Four (4) copies each of the Infrastructure and User Equipment Pricing Proposal.

One (1) electronic searchable copy Pricing Proposal.

1.2.5.6. Responders shall provide detailed price breakdown submittals for infrastructure and subscriber equipment items, network integration/project management and installation/engineering services. It is not acceptable to lump category costs.

1.2.5.7. Proposers must provide sufficient detail in their pricing proposals whereby it is possible to identify equipment types and services groupings. The format of the price submittal shall follow that as indicated by RFP Section 16 of the Technical Specifications.

1.2.5.8. The Pricing Proposal (including electronic copy) shall be separated from the Technical Proposal (including electronic copy) and independently sealed. Do NOT put the pricing proposal with the technical proposal or it will be disqualified.

1.2.5.9. Each Proposal Response shall be submitted in standard 8 1/2" x 11" three ring binders. The entire Proposal package must be submitted in a sealed container stating on the outside, the vendor's name, address, State Contractor's License Number, the **RFP Number 200013** and title (**Project-25 trunked radio network**) to:

Jackson County Board of Commissioners
Attention: Purchasing Manager
67 Athens Street
Jefferson, GA 30549

1.2.5.10. Hand delivered copies may be delivered to the above address, with receipt requested, ONLY between the hours of 8:30 a.m. and 4:30 p.m. ET, Monday through Friday, excluding holidays observed by the Jackson County Government.

1.2.5.11. Vendors are responsible for informing any commercial delivery service, if used, of all delivery requirements and for ensuring that the required address information appears on the outer wrapper or envelope used by such service.

1.2.5.12. A cover letter transmitting the Proposal must accompany the package. All Proposals become property of the Jackson County.

1.2.5.13. The Submittal must be signed by a company officer who is legally authorized to enter into a contractual relationship in the name of the vendor.

1.2.6. Contacts

1.2.6.1. To clarify any part of the RFP requirements, all questions that arise prior to the DEADLINE FOR QUESTIONS due date shall be directed to the contact person in writing, via facsimile, or email. Any unauthorized contact shall not be used as a basis for responding to this RFP and also may result in the disqualification of the vendor's submittal.

1.2.6.2. Vendors may not contact any elected official or other County Employee to discuss the proposal process or proposal opportunities. Contact of this nature will result in immediate disqualification of the vendor.

1.2.6.3. All contact and inquiry concerning this RFP Specification shall be directed to:

Myrna Yarbrough, Purchasing Manager
(706) 367-6309
Fax (706) 708-2505
myarbrough@jacksoncountygov.com

1.2.6.4. Technical points of contact for Tusa Consulting Services:

Alan Talkington
1232 SE Warren Dr
Lee's Summit, MO. 64081
(913) 735-4173
Alan.Talkington@tusaconsulting.com

Jeff McNally
20243 Lamar Avenue
Bucyrus, KS 66023
(913) 620-6077
Jeff.McNally@tusaconsulting.com

1.2.7. RFP Questions, Additional Information/Addenda

1.2.7.1. Jackson County will issue responses to inquiries and any other corrections or amendments it deems necessary in written addenda issued prior to the due date. Vendors should not rely on any representations, statements or explanations other than those made in this RFP or in any addendum to this RFP. Where there appears to be a conflict between the RFP and any addenda issued, the last addendum issued will prevail.

1.2.7.2. ***Vendors must acknowledge any issued addenda by including the Addenda Acknowledgement Form with the submittal. Proposals which fail to acknowledge the vendor's receipt of any addendum will result in the rejection of the offer if the addendum contains information which substantively changes the Owner's requirements.***

1.2.8. Late Submittal, Late Modifications and Late Withdrawals

Submittals received after the due date and time will not be considered. Modifications received after the due date will not be considered. Jackson County Government assumes no responsibility for the premature opening of a proposal not properly addressed and identified, and/or delivered to the proper designation.

1.2.9. Rejection of Proposals

1.2.9.1. Jackson County Government may reject any and all submittals and reserves the right to waive any irregularities or informalities in any submittal or in the submittal procedure. Acceptance of any Response will not place the County under any obligation to purchase any equipment, system or services.

1.2.9.2. ***Submittals received after said time or at any place other than the time and place as stated in the notice will not be considered.***

1.2.10. Minimum RFP Acceptance Period

Valid submittals shall not be withdrawn for a period of 90 days from the date specified for receipt of submittals.

1.2.11. Non-Collusion Affidavit

1.2.11.1. By submitting a response to this RFP, the vendor represents and warrants that such proposal is genuine and not a sham or collusive or made in the interest or in behalf of any person not therein named and that the vendor has not directly or indirectly induced or solicited any other vendor to put in a sham proposal, or any other person, firm or corporation to refrain from submitting and that the vendor has not in any manner sought by collusion to secure to that vendor any advantage over any other vendor.

1.2.11.2. By submitting a proposal, the vendor represents and warrants that no official or employee of Jackson County Government has, in any manner, an interest, directly or indirectly in the proposal or in the contract which may be made under it, or in any expected profits to arise there from.

1.2.12. Cost Incurred by Vendors

All expenses involved with the preparation and submission of the RFP to the Jackson County Board of Commissioners, or any work performed in connection therewith is the responsibility of the vendor(s).

1.2.13. Americans With Disabilities Act (ADA)

A qualified interpreter for the hearing impaired is available upon request at least ten (10) days in advance of the proposal due date. This service is in compliance with the Americans with Disabilities Act (ADA). Please call (706) 367-6312 for more information for the hearing impaired.

1.2.14. RFP Opening

The process of opening and evaluating this RFP is described in section 2.8. Proposal Evaluation and Final Selection.

1.2.15. Taxes

Selected vendor will be provided with Jackson County's Sales and Use Tax Certificate of Exemption number upon request.

1.2.16. Vendor Information

All submissions shall include a current W-9. Vendors whose place of business is other than the State of Georgia may be required to provide the Purchasing Manager with copies of your state's regulations and/or laws concerning the application of certain vendor preference requirements to vendors whose place of business is in the applicable state. Failure to provide this information will result in the disqualification of the vendor from submitting a proposal.

1.2.17. Selected Vendor Insurance

1.2.17.1. The selected vendor shall be responsible for any and all loss of material connected with the construction due to unexplained disappearance, theft or misappropriation of any kind or nature. The foregoing provisions shall not operate to relieve the Contractor and any Subcontractors of responsibility for loss or damage to their own or rented property or property of their employees of whatever kind or nature, including but not limited to tools, equipment, forms, scaffolding and temporary structures including their contents.

1.2.17.2. Jackson County shall in no event be liable for any loss or damage to any of the aforementioned items or any other property of Contractor and any Subcontractors, which is not included in the permanent construction. The Contractor and any Subcontractors hereby waive any right of recovery they may have against Jackson County for damage or destruction of property of whatever kind or nature whether it is their own property or property of their employees.

1.2.17.3. The Contractor shall procure and maintain for the duration of the Contract the following insurance policies as mandated by and with minimum limits set by the County's Procurement Policy with coverage for occurrences and claims that may arise from or in connection with the performance of the obligations hereunder by the Contractor, its agents, employees, representatives and subcontractors:

1.2.17.3.1. The contractor shall maintain in full force and effect throughout the term a commercial automobile liability (owned, non-owned, hired) coverage of at least $1,000,000 (one million dollars) combined single limit per occurrence for comprehensive coverage including bodily and personal injury, sickness, disease or death, injury to or destruction of property, including loss of use resulting therefrom. The Insured Parties (defined below) shall be additional insureds.

1.2.17.3.2. The contractor shall also maintain workers' compensation insurance as required by law, and employers' liability coverage of at least $1,000,000. Jackson County will consider proposals offering reasonable exceptions to the requirements stated above. All polices shall be issued by an insurer of substantial size and financial stability.

1.2.17.3.3. The contractor shall also maintain workers' compensation insurance as required by law, and employers' liability coverage of at least $1,000,000. Jackson County will consider proposals offering reasonable exceptions to the requirements stated above. All polices shall be issued by an insurer of substantial size and financial stability.

1.2.17.4. The policy ; and shall name cover Jackson County and its employees and officers (collectively the “Insured Parties”) as an additional insureds with respect to liability arising out of activities performed by or on behalf of the Contractor, as well as products and completed operations of the Contractor.

1.2.17.5. Contractor's insurance coverage shall be primary noncontributing insurance with respect to any other insurance or self-insurance available to the Insured Parties. Any insurance or self-insurance maintained by the Insured Parties shall be in excess of Contractor's insurance and shall not contribute with it.

1.2.17.6. The policies or certificates evidencing the coverage provided above shall be submitted at a Pre-Construction Conference prior to commencing any work or County issuance of a formal Notice to Proceed. Such policies or certificates shall provide that insurance will not be materially altered or cancelled without thirty (30) days prior written notice to Jackson County.

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

1.2.17.8. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Insured Parties.

1.2.17.9. Coverage shall state that Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to limits of insurance provided.

1.2.17.10. Coverage shall be provided on a "pay on behalf" basis, with defense costs payable in addition to policy limits. There shall be no cross liability exclusion.

1.2.17.11. The insurer shall agree to waive all rights of subrogation against the Insured Parties for losses arising from work performed by Contractor for the County.

1.2.17.12. Policies shall include an endorsement incorporating the indemnification obligations assumed by Contractor under the terms of the contract.

1.2.18. Indemnity

Indemnity shall be negotiated with the apparent responsive and best Proposer as part of Contract negotiations.

1.2.19. Warranty of Network Performance

1.2.19.1. The selected vendor will warrantee the product/service for a period of one year from the date of the final inspection and acceptance by the County.

1.2.19.2. In submitting their RFP Response, the Proposer acknowledges that it has carefully reviewed the functional requirements and warrants that the proposed P-25 radio network solutions shall function according to equipment specifications, industry standards and the minimum operative characteristics specified in Part II - Technical Specifications.

1.2.19.3. This warranty shall supersede any limitation on support, including any limitation on software support, offered by the Proposer.

1.2.20. Delivery; Title and Risk of Loss

Title to, and risk of loss to, any equipment purchased by County will pass to County upon final project acceptance. The Contractor will be responsible for packing all equipment and any freight charges.

1.2.21. Termination

Federal, State, and other Local government agencies may terminate this Agreement in the event funds are not appropriated for it in future periods; provided, however, that funds are also not appropriated for equipment or services that replace those contracted for under this Agreement. Customer shall be obligated for any future annual period if Company is not notified in writing at least thirty (30) days prior to the beginning for the annual period for which non-appropriation is being claimed.

1.2.22. Anti-Discrimination

By submitting a response to this RFP, all perspective contractors certify to Jackson County that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended.

1.2.23. Illegal Immigration Reform and Enforcement Act of 2011

Vendors submitting a response to this RFP must complete the Contractor Affidavit under O.C.G.A. §13-10-91(b)(1) which is provided with the RFP package to verify compliance with the Illegal Immigration Reform and Enforcement Act of 2011.

1.2.23.1. The form must be signed by an authorized officer of the contractor or their authorized agent.

1.2.23.2. The form must be notarized.

1.2.23.3. The contractor will be required to have all subcontractors and sub-subcontractors who are engaged to complete physical performance of services under the final contract executed between the County and the contractor complete the appropriate subcontractor and sub-subcontractor affidavits and return them to the County a minimum of five (5) days prior to any work being accomplished by said subcontractor or sub-subcontractor. Format for this affidavit can be provided to the contractor if necessary.

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2.0 General Conditions

2.1. Purpose

This Specification encompasses a turnkey project to provide Jackson County with a new Project-25 700/800 MHz trunked radio network capable of meeting both the current and future communication needs, both reliably and functionally.

2.2. Contract Period

2.2.1. Any contract resulting from this RFP shall not exceed a period of 18 months from the time the notice to proceed is provided until completion of the project unless agreed to in writing by both parties. Proposers who are unable to commit to completing the project within that time frame shall so state in their Proposal.

2.2.2. The project will not be deemed completed until a fully-compliant Project-25 infrastructure has been installed; all network functionality, audio quality and mandatory coverage testing has satisfactorily been completed in accordance with the Contract's Acceptance Test Plan; receipt of as- built documentation has occurred; and a certificate of substantial completion has been issued by the Consultant for any remaining punch list items.

2.3. Project Scope

The scope of this project is defined in Section II - Technical Specifications.

2.4. Property Description

The work for this project will occur primarily in Jackson County, GA

2.5. Purchase Payment Schedule

2.5.1. The following payment schedule shall apply:

10% - at contract execution.

30% - at delivery of and inventory by the County designee of network Infrastructure components to the County designated location(s).

20% - upon infrastructure installation completion.

15% - upon satisfactory completion of audio quality and range coverage testing.

15% - upon issuance of subscriber equipment and satisfactory completion of all training.

10% - upon Final Network Acceptance.

2.5.2. Payment of invoices shall be made on a “net 30” basis from the date of invoice.

2.5.3. As the intended contract will include a blended combination of goods, technical services, and physical installation work, the Contractor acknowledges and accepts that to the maximum extent permitted by law the County does not intend to treat the contract as "construction" or "public works" contract. The Contractor acknowledges that the payment schedule set forth above shall be in lieu of any monthly progress payments for installation work, notwithstanding that progress payments are required for certain public works construction contracts under the law. The County shall not withhold retainage and Contractor shall waive and agree not to assert any claim under "prompt payment" construction laws or claim for monthly progress payments. To the extent progress payments are required to be made under law, the Contractor agrees that any amounts prepaid at contract execution and delivery of inventory will be deemed prepayment of monthly progress payments.

2.6. Indemnity and Release

2.6.1. The Contractor shall defend, indemnify and hold harmless County and County's elected and appointed officials, officers, boards, commissions, employees, representatives, consultants, servants, agents, attorneys and volunteers, from and against any and all claims, suits, actions, judgments, injuries, damages, losses, costs, expenses and liability of any kind whatsoever, including but not limited to attorney's fees and costs of defense ("Liabilities"), to the extent Liabilities are caused by or result from the negligence, recklessness, or intentionally wrongful conduct of the Contractor or other persons employed or utilized by the Contractor in the performance of the contract.

2.6.2. Contractor shall be liable to County for damages to tangible property resulting from negligence by County or any of Contractor's employees, contractors, or subcontractors in providing installation or other services at County's sites. When such damage is alleged, Contractor shall have the opportunity to make proper and reasonable investigation to determine whether damage to the work site(s), or other property belonging to County or under County's custody and control, resulted from negligence by Contractor or any of Contractor's employees, contractors, or subcontractors. After such opportunity for investigation is provided, and once it is reasonably determined that the damage did result from negligence by Contractor or any of Contractor's employees, contractors, or subcontractors, Contractor shall be responsible for repairing damage to the work site(s), or other tangible property belonging to County.

2.7. Procedures and Miscellaneous Items:

2.7.1. All questions shall be submitted in writing (e-mail is acceptable) and shall be communicated to all firms responding to this RFP.

2.7.2. All materials submitted in connection with this RFP will be public documents and subject to the Open Records Act and all other laws of the State of Georgia, the United States of America and the open records policies of the Jackson County Board of Commissioners. All such materials shall remain the property of the Jackson County Board of Commissioners and will not be returned to the respondent.

2.7.3. All respondents to this RFP shall hold harmless the Jackson County Board of Commissioners, and any of their officers and employees from all suits and claims alleged to be a result of this RFP. The issuance of this RFP constitutes only an invitation to present a proposal. The Jackson County Board of Commissioners reserves the right to determine, at its sole discretion, whether any aspect of a respondent's submittal meets the criteria in this RFP. The Jackson County Board of Commissioners also reserves the right to seek clarifications, to negotiate with any vendor submitting a response, to reject any or all responses with or without cause, and to modify the procurement process and schedule. In the event that this RFP is withdrawn or the project canceled for any reason, the Jackson County Board of Commissioners shall have no liability to any respondent for any costs or expenses incurred in connection with this RFP or otherwise.

2.7.4. The RFP is subject to the provisions of the Jackson County Purchasing Ordinance and any revisions thereto, which are hereby incorporated into this RFP in their entirety except as amended or superseded herein.

2.7.5. Failure to submit all the mandatory forms from this RFP package shall be just cause for the rejection of the qualification package. However, Jackson County reserves the right to decide, on a case by case basis, in its sole discretion, whether or not to reject such a bid as non-responsive.

2.7.6. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment less than 30 days, however. Payment will be made via ACH.

2.7.7. In case of failure to deliver goods in accordance with the contact terms and conditions, Jackson County, after due oral or written notice, may procure substitute goods or services from other sources and hold the contractor responsible for any resulting additional purchasing and administrative costs. This remedy shall be in addition to any other remedies which Jackson County may have.

2.7.8. By submitting a qualification package, the vendor is certifying that they are not currently debarred from bidding on contracts by any agency of the State of Georgia, nor are they an agent of any person or entity that is currently debarred from submitting bids on contacts by any agency of the State of Georgia

2.7.9. Any contract resulting from this RFP shall be governed in all respects by the laws of the State of Georgia and any litigation with respect thereto shall be brought in the courts of the State of Georgia. Then contractor shall comply with applicable federal, state, and local laws and regulations.

2.7.10. It is understood and agreed between the parties herein that Jackson County shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

2.8. Proposal Evaluation and Final Selection

2.8.1. Following review of all qualified proposals, selection of a suitable vendor, and preliminary contract negotiations, a recommendation will be made to the Jackson County Board of Commissioners by the project representative. Following Commission approval, the County will complete contract negotiations.

2.8.2. The Jackson County Board of Commissioners reserves the right to accept the response that is determined to be in the best interest of the County. The County reserves the right to reject any and or all proposals.

2.8.3. Technical and Pricing Proposals shall be evaluated separately using a weighted point system whereby out of a maximum 100% overall project score, 70% shall be allocated to the Technical Proposal, and evaluation scores with 30% being allocated and equally shared between Infrastructure and Subscriber Equipment Pricing Proposals.

2.8.4. Technical Proposals will first be evaluated for overall responsiveness and completeness to the RFP Specifications. Proposals that are determined responsive and complete will be evaluated by the Consultant.

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

Performance, compatibility, expansion capabilities and versatility (32%)

Reliability, redundancy, and warranty (20%)

Proposer qualifications, history of product support and RFP deviations (10%)

Equipment repair, installation, and implementation (10%)

Interoperability (10%)

Training (7%)

Maintenance and time limit of availability of service parts (6%)

Organization, scope, and detail of proposal (5%)

2.8.6. The scored results of this Technical Evaluation will be multiplied by 0.70, thereby yielding a weighted technical project-total score. The results of this portion of the Evaluation shall be submitted to Jackson County.

2.8.7. At the direction of Jackson County as to the suitability and acceptability of the technical evaluation results, the Consultant will next open and evaluate proposed costs for each responsive Technical Proposal.

2.8.8. The relative cost differences between responsive Cost Proposals shall be compared and evaluated. Each of the Infrastructure and Subscriber Equipment Cost Proposals received from responsive Proposers shall have their individual evaluation raw scores multiplied by 0.30 and those two portion results added together and with the Technical Evaluation score, thus yielding an overall project score for each Proposer's submitted proposal.

2.8.9. The Proposer's submittal receiving the highest overall project score shall be recommended by the Consultant as being the most responsive and best proposal. In the case of a tied overall project score, the Consultant shall recommend the Proposal having the highest Technical evaluation score.

2.8.10. The County reserves the right to evaluate total project price on the basis of initial cost and life cycle analyses. Any deviations by Proposers from the pricing requirements herein shall be approved in advance of Proposal Submittal or they will be construed as being non-conforming and the Proposal Submittal will not be given further consideration.

2.9. Contracts

2.9.1. This Specification and the Proposer's response will be an integral part of the contract. Any and all statements made in the Proposal will automatically become part of the final contract for equipment and services.

2.9.2. Inability to contractually guarantee any statement made in their Proposal will result in Proposer disqualification.

2.9.3. The County will consider working with a Proposer's "standard" contract for purposes of contracting; provided, however, that the Proposer's description of its products or services in the Proposer's RFP response shall supersede any less favorable terms in the Proposer's "standard" contract. Proposer's standard contract will not be acceptable unless suitably modified to be in compliance with this RFP and any subsequent RFP addenda.

2.9.4. Omission in the Proposal of any equipment, services or provisions herein prescribed shall not be construed so as to relieve the Contractor of any responsibility or obligation necessary to the complete and satisfactory installation of any and all systems, equipment, and services specified.

2.9.5. The network price and any optional prices quoted must include all equipment, service, features, materials, labor, etc. necessary to make all the features, services, and equipment, which are included, fully functional. The Proposer agrees that the cost of additional equipment, materials, or labor necessary to meet these requirements, which was not otherwise calculated in its Proposal, shall be solely at the Contractor's expense.

2.9.6. If there are specific items that are purposefully excluded in the Proposer's indicated price, those must be defined by the Proposer's submittal. If, however, those Proposer-excluded items are what the County and its Consultant consider to be normal and customary for a project of this type, any proposal response excluding such items will be graded as not meeting minimum requirements for the appropriate Specification category(s) that are impacted by that exclusion.

2.9.7. Each Proposal must be signed by a duly authorized officer who is empowered to contractually bind the Proposer.

2.9.8. Jackson County shall enter into contract negotiations with the apparent responsive and best Proposer. Should the County be unable to negotiate a contract with the apparent responsive and best Proposer, the County may exercise the right to enter into contract negotiations with the apparent responsive Proposer having the next- highest evaluation score.

2.10. Performance and Payment Bonds

2.10.1. A performance bond in the amount of one hundred percent (100%) of the contract price shall be provided by the Contractor in the event a contract is subsequently awarded through either a sole-source or competitive procurement process. The performance bond shall be exercised by Jackson County for failure of the Contractor to perform according to the terms of the contract, i.e., an uncured default condition that results in contract cancellation.

2.10.2. A payment bond in the amount of one hundred percent (100%) of the contract price would likewise be required. The payment bond must be from a surety company authorized to do business in (State of Georgia) with a rating of A- or better in the most current edition of the A.M. Best Insurance Report.

2.10.3. The cost of these performance and payment bonds shall be the responsibility of the Contractor.

2.11. Brokerage Fee

2.11.1. The Contractor warrants that it has not employed any person to solicit or secure the contract upon an agreement for a commission, percentage, brokerage or contingent fee. Breach of this warranty shall give Jackson County the right to terminate the contract, or, at the discretion of the County, to deduct from the contract price or consideration, the amount of such commission, percentage, brokerage or contingent fee.

2.11.2. This warranty shall not apply to commissions payable by contractors upon contracts or established commercial or selling agencies maintained by the Contractor for the purpose of securing business. No elected official or employee of Jackson County shall be permitted to share any part of this Contract or any benefit that may arise wherefrom, and any contract made by Jackson County in which such individual(s) shall be personally interested shall be void, and no payments shall be made thereon by Jackson County or any officers thereof.

2.11.3. Conflict of Interest

2.11.3.1. In the interest of ensuring that efforts of the Contractor do not conflict with the interests of Jackson County, and in recognition of the Contractor's professional responsibility to Jackson County, the Contractor agrees to decline any offer of employment if its independent professional work on behalf of the County is likely to be adversely affected by the acceptance of such employment.

2.11.3.2. The initial determination of such a possibility rests with the Contractor. It is incumbent upon the Contractor to notify the County and provide full disclosure of the possible effects of such employment on the Contractor's independent, professional work on behalf of the County.

2.11.3.3. Final decision on any disputed offers of other employment for the Contractor shall rest with the County.

2.11.4. Automatic Termination; Non-Appropriation of Funds

2.11.4.1. As required by O.C.G.A. § 36-60-13, the contract shall terminate absolutely and without further obligation on the part of the County on December 31 each calendar year of the term of the contract, but shall automatically renew on January 1 of each subsequent calendar year absent County's provision of written notice of non-renewal to the Contractor at least five days prior to the end of the then current calendar year. Title to any supplies, materials, equipment, or other personal property shall remain in the Contractor until fully paid for by Jackson County.

2.11.4.2. In the event no funds or insufficient funds are appropriated and budgeted by the County or are otherwise unavailable for fulfilling the requirements of the Contract, the obligations of the County shall terminate on the last day of the fiscal period for which appropriations are received without penalty or expense to the County of any kind whatsoever. The County will promptly notify the Contractor or its assignee of such occurrence. In the event of such termination, the County agrees to peaceably surrender possession of the equipment to the Contractor or its assignee on the date of such termination.

2.11.4.3. The Contractor will be responsible for packing all equipment and any freight charges. The County will not cancel if any funds are appropriated to it, or by it, for the acquisition, retention or operation of the equipment or other equipment performing similar functions for the current fiscal period in which the termination occurs or the next succeeding fiscal period thereafter and that it will not during the funding period give priority to other functionally similar equipment or services.

2.11.4.4. The Contractor shall covenant and agree to indemnify and hold the County harmless against any loss, damage liability, cost, penalty or expense, including attorney's fees, which it is not otherwise agreed to by the County in the equipment Contract and which is incurred and arises upon a failure of the County to appropriate funds in the manner described herein for a continuation of the Contract or exercise of the option to purchase the equipment.

2.11.5. Corporate Resolution

RFP Response submittals must contain a corporate resolution or power of attorney authorizing and identifying agents to sign their Proposal or other documents as required by this Specification. This Corporate Resolution or Power of Attorney must be certified and notarized.

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3.0 Standards

3.1. RFP Proposer Standards

3.1.1. The Proposer must have manufactured, delivered, and installed at least three radio systems of comparable technology (700/800MHz Project-25 digital trunked radio system), having comparable size and scope. These three systems shall be described with enough information that the County or its Consultant can reasonably determine their project equivalency. These submittals should include a detailed summary of the system and its significant operational features/components as well as a current customer contact including name, address, and phone number, title, department, and system responsibility.

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

3.1.3. A factory authorized service center that is fully staffed and trained to support the proposed infrastructure network, and all related subsystem equipment, must be located within a 60-minute (1-hour) response time of Jackson County, Georgia to be considered adequate to satisfy initial installation, implementation, optimization, warranty and ongoing maintenance needs. The Contractor and all envisioned subcontractors, if any, must be able to legally conduct business within the State of Georgia.

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

3.1.4.1. EIA/TIA-Electronic/Telecommunications Association

3.1.4.2. NEC - National Electric Code

3.1.4.3. NEMA - National Electrical Manufacturers Association

3.1.4.4. IEEE - Institute of Electrical and Electronic Engineers, Inc.

3.1.4.5. FCC - Federal Communications Commission

3.1.4.6. FAA - Federal Aviation Administration

3.1.4.7. NFPA - National Fire Prevention Association

3.1.4.8. Building Codes for Newton County, Georgia

3.1.4.9. OSHA - Occupational Safety and Health Administration

3.2. Workmanship

3.2.1. All proposed workmanship supportive of the RFP must conform to normal and accepted standards for the telecommunications industry. All fixed site equipment, including electronic communications infrastructure, dispatch consoles; alarm system consoles, network management consoles, electrical wiring, towers, antennas, mounts etc. are to be installed by or under the supervision of the Contractor.

3.2.2. The Contractor must completely remove and properly dispose of residue due to its work, return the site to a usable state and will be responsible for the cost of repairing all damage caused by the Contractor or its subcontractors during network installation.

3.2.3. Jackson County and its Consultant reserve the right to halt any radio equipment or civils installation process due to poor workmanship, housekeeping, scheduling, work interruptions, etc. Work halts that are the result of poor workmanship would not relieve the Contractor of their responsibility to conform to the installation time requirements as stated by Contract.

3.3. Sub-Contractors

It is intended that a single Contractor have total turnkey responsibility for the subsequent Jackson County project so as to assure a fully operational network. Therefore, any Proposer desiring to use sub-contractor(s) must include within their RFP Response a list and description of potential, qualified sub-contractor(s). The County may require documentation and references to ensure the qualification of a proposed sub-contractor.

3.4. Materials

3.4.1. All equipment, except with the express written permission of Jackson County and its Consultant, must be new and unused, meet telecommunications industry standards, and, where applicable, be registered with and approved by the Federal Communications Commission.

3.4.2. Jackson County or its Consultant reserve the right to reject and require the return, at the Contractor's expense, of any and all components that are defective or fail to comply with this RFP Specification or lack FCC type approval.

3.4.3. Such rejections and/or returns will neither validate nor invalidate the remainder of any contract. Rejections of material for cause will not provide an extension of time to the Contractor in the performance of contracted requirements.

3.4.4. Estimated costs for these special requirements shall be disclosed in the RFP Submittal.

3.5. Notification

Responders will be notified of Jackson County's desire to enter into additional discussions as well as an oral presentation of proposed solutions, if determined necessary. The County's ranking of proposals shall be published after a final award of the contract is made.

3.6. Training

3.6.1. Jackson County considers training to be of paramount importance. Administrative and dispatcher training shall be completed on-site by the Contractor's personnel. Dispatcher training shall be more extensive and will involve all designated regular and relief dispatchers employed by Jackson County at the time of system operational testing.

3.6.2. The Contractor shall provide administrative training for two communication network managers. Software training shall be provided which will enable these personnel to perform functionality/feature changes to fixed site equipment and portables/mobiles, poll the network diagnostics perform traffic and feature usage studies, etc.

3.6.3. It is the desire of Jackson County that such training is to commence within 60 days upon completion of contract negotiations and execution and be completed prior to the customer design review (CDR) meeting or a suitable time as desired by the County.

3.6.4. Additionally, the Contractor shall develop and train radio system dispatchers in the proper operation of radio console and backup control station equipment, as is necessary to operate the new P25 trunked radio system. The Contractor shall coordinate all training sessions with Jackson County. All training must be approved by Jackson County. Dispatch, maintenance personnel and network manager follow-up training shall be provided and scheduled no more than sixty (60) days after project completion for the purpose of training reinforcement.

3.6.5. All training costs, direct or indirect, such as meeting rooms, instructor travel, lodging and transportation, must be included in the final proposed price.

3.6.6. As an option, the Contractor must provide comprehensive maintenance training for one person, whereby the Jackson County service/support personnel are qualified in the proper diagnostic, maintenance and repair service skills needed to quickly resolve 700/800MHz communications equipment malfunctions as well as microwave backhaul operational problems.

3.6.7. The Contractor is required to provide operational and full maintenance training for all service/support personnel, either on site or at remote factory locations. This level of training will be essentially equivalent to the level of service training required by the Contractor for its employed maintenance providers. Additionally, the Contractor must develop and train service/support personnel in those aspects of maintenance necessary to ensure the highest availability and reliability of infrastructure and subscriber equipment resources. Preventative maintenance training should encompass all elements of proposed infrastructure equipment, inclusive of base stations, trunking controllers, network switches, microwave backhaul, standby generator equipment, battery plants, battery charging systems, tower light systems, site grounding systems, alarm systems and all other subsystems directly or indirectly related to infrastructure reliability and operations.

3.6.8. This optional maintenance training should also include a full complement of test equipment to provide the services as required by the maintenance training.

3.7. Parallel Implementation

3.7.1. In development of RFP submittals, Responders must consider that the new radio network must be installed in a parallel implementation. The current system is Jackson County's only Public Safety Voice communications system and must operate 24/7/365. No interruptions in service of any duration may be allowed without prior approval of the County or their designee. Therefore, fully duplicated voice radio systems will coexist for some period of time.

3.7.2. The period of time of parallel installation will be used to perform testing of operational functionality of the entire network, dispatch consoles, mobiles, portables, network features, and high capacity receiver-voting and simulcast transmitter operations, if used.

3.7.3. Existing dispatch console equipment will control the old system during the parallel phase, and the Contractor will be responsible for developing a plan to accommodate both existing and proposed equipment during the parallel and transitional periods of installation and implementation.

3.8. Manufacture Support

Jackson County requires a one-year comprehensive warranty on all infrastructure equipment required by the new P-25 radio network. No less than a two-year warranty is acceptable for user radio equipment. Warranty will not begin until complete system acceptance.

3.9. Parts Availability

3.9.1. All proposed backbone infrastructure components, inclusive of microwave equipment and repair parts shall be available for at least fifteen (15) years from the date of system acceptance.

3.9.2. End user equipment (i.e. portables, mobile, etc.) repair parts shall be available for at least five (5) years from the date of cessation of equipment manufacturer.

3.10. Remedies

3.10.1. Remedies shall be part of any contract awarded and negotiated with the successful Proposer. The scope of these remedies will become part of a negotiated contract and shall minimally include a graduated set of monetary penalties for unexcused late or delayed performance by the Contractor. The project schedule's indicated completion date shall be the basis for assessment of completion remedies.

3.10.2. Remedies shall be applied as follows:

3.10.2.1. Unexcused project completion delays of between 1 day and 30 days beyond the contract's indicated completion date shall be assessed a penalty of $1,000 per day. Unexcused completion delays that extend from Day 31 through Day 70 beyond the contract's indicated completion shall be assessed a penalty of $1,500 per day. Unexcused completion delays beyond 70 days shall be assessed a remedy of $2,000 per day.

3.10.2.2. Any unexcused project completion delay that exceeds 180 days from the contract's indicated completion date shall trigger an automatic default of the contract. If the Contractor is unable to cure the reason for its completion failure within 45 additional days, Jackson County will have the option to cancel the contract and initiate action against the Contractor's performance bond unless some acceptable accommodation is reached by the Contractor with the County. During the 45-day default period, remedies will be assessed at the rate of $3,000 per day.

3.10.2.3. Remedies shall also apply to warranty repair service. The RFP and its subsequent contract with the successful Proposer/Contractor include a mandatory warranty period where repair services performed in the field will be necessary. These Specifications contain response time periods within which the Contractor is required provide services and materials. A failure to perform on the part of the Contractor to meet its contracted response time requirements shall result in a financial penalty of the scope and amount indicated by these Specifications or as modified during contract negotiations.

3.11. Acceptance Testing Process

3.11.1. Acceptance testing procedures will be defined during downstream contract negotiations. These procedures would essentially test and verify the performance of hardware/software features; coverage performance; reliability and interoperability with neighboring jurisdictions.

3.11.2. The Acceptance Test shall minimally encompass:

3.11.2.1. A factory staging verification of network functionality.

3.11.2.2. An installed determination of compliance with Industry standards and published specifications of the various equipment elements provided under the contract.

3.11.2.3. Functionality of standby power systems.

3.11.2.4. Functionality and path reliability of microwave link segments and the network as a whole.

3.11.2.5. A successful completion of a set of voice quality and signal level coverage tests of sufficient scope to confirm that the outdoor, in-vehicle and in-building coverage required by the contract has been achieved.

3.11.2.6. Completion of a mandatory 30-day reliability burn in absent of any major network failures (i.e., loss of tower site, loss of 30% of network capacity, unreliable m/w functionality, etc.)

EXECUTION OF PROPOSAL

DATE: _____

The potential Contractor certifies the following by placing an "X" in all blank spaces:

___ That this proposal was signed by an authorized representative of the firm.

___ That the potential Contractor has determined the cost and availability of all materials and supplies associated with performing the services outlined herein.

___ That all labor costs associated with this project have been determined, including all direct and indirect costs.

___ That the potential Contractor agrees to the conditions as set forth in this Request for Proposal with no exceptions.

Therefore, in compliance with the foregoing **Request for Proposal**, and subject to all terms and conditions thereof, the undersigned offers and agrees, if this proposal is accepted within sixty (60) days from the date of the opening, to furnish the services for the prices quoted within the timeframe required.

_____
Business Contact Representative

_____
Operational Contact Representative

_____
Vendor's Name Federal ID #

_____
Address

_____
Phone Fax

_____
Email

_____
Authorized Signature Date

_____
Typed Name & Title

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR PROPOSAL.

ADDENDA ACKNOWLEDGEMENT

The vendor has examined and carefully studied the Request for Proposals and the following Addenda, receipt of all of which is hereby acknowledged:

Addendum No. _____

Addendum No. _____

Addendum No. _____

Addendum No. _____

_____	_____	_____
Authorized Representative/Title (Print or Type)	Authorized Representative (Signature)	(Date)

<u>Vendors must acknowledge any issued addenda. Proposals which fail to acknowledge the vendor's receipt of any addendum will result in the rejection of the offer if the addendum contained information which substantively changes the Owner's requirements.</u>

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR PROPOSAL.

Illegal Immigration Reform and Enforcement Act of 2011

CONTRACTOR AFFIDAVIT UNDER O.C.G.A. §13-10-91(b)(1)

The Jackson County Board of Commissioners and Contractor agree that compliance with the Illegal Immigration Reform and Enforcement Act of 2011 are conditions of this Agreement for the physical performance of services.

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. §13-10-91, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services on behalf of the Jackson County Board of Commissioners has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. §13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present and affidavit to the contractor with the information required by O.C.G.A. §13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____

E-Verify Employment Eligibility Verification User Identification Number

_____

Date of Authorization to Use Federal Work Authorization Program

_____

Name of Contractor

_____

Name of Project

Jackson County Board of Commissioners
Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, _____, 20___ in _____ (City), _____ (State).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE _____ DAY OF_____, 20____

_____
Notary Public

My Commission Expires: _____

tusa Jackson County, Georgia

Part II

SECTION II – RFP TECHNICAL SPECIFICATIOS

1.0 Existing Network Configuration

1.1 General

Jackson County Georgia covers an area of 343 square miles with a population of approximately 60,500 people and a population density of 122 people per square mile. Jackson County is in the northeastern part of the U.S. state of Georgia and adjacent to the Atlanta, Georgia Metropolitan Area.

Jackson County's public safety agencies and schools currently operate on a nine site UHF DMR "MotoTRBO" trunked radio system for their daily radio communications. With the Growth of residential and commercial areas throughout Jackson County, along with the FCC's Narrowband mandate creating an effective loss of coverage, has resulted in radio communication shortfalls. The DMR system lacks many features that modern radio systems have. Frequency efficiency, shared infrastructure, ubiquitous data applications, interoperability and scalability are all among the features that a modern digital trunking system can offer to the public safety entities in Jackson County.

Radio users are left using a system that has degraded coverage and increased maintenance cost creating the need for a radio system with increased portable radio coverage, audio quality, reliability, and the ability to communicate across disparate Project-25 (P25) radio systems. Propagation coverage enhancement is of importance due to the current lack of coverage.

In addition, Telecommunications Industry Association (TIA) P25 standard specifications (TIA-102) and the Industry's manufactured solutions have rapidly progressed since Jackson County's radio system was initially conceived and today's technology now embraces two open-standard modulation formats for interoperable communications, termed P25 Phase 1 (Frequency Division – Multiple Access) and more recently P25 Phase 2 (Time Division-Multiple Access). The implementation of both Phase 1 and Phase 2 formats within the new Jackson County radio system (termed System throughout this document) would allow the Jackson County system potential to double the number of voice paths at tower sites using a given set of frequencies, thus expanding overall traffic handling capacity.

This Specification encompasses a turnkey project to provide Jackson County Georgia with a new Project-25 700/800 MHz digital simulcast trunked radio network capable of meeting current and future communication needs.

1.2 Radio System Components

The existing radio system configuration consist of towers, buildings, generators, sensors, and UPS systems along with microwave radios, base station repeaters, combiners, filters, routers, switches, firewalls, other network appliances and antennas. These components make up an UHF DMR trunked radio structure utilizing nine radio infrastructure sites:

- Braselton Water Tower
- Commerce Tower
- Jackson County High School Tower
- Jackson County Jail Tower
- Maysville Water Tower
- Nicholson Water Tower
- South Jackson Tower
- Talmo Tower
- Traditions Water Tower

The FCC Part 90 License for the radio system use the following call signs,

- WQMD363
- WQPZ744

The backhaul 11 GHz microwave subsystem is licensed under the following call signs,

- WQNH299
- WQNH301
- WQNH304
- WQNH315
- WQNH317

These existing tower locations and other related information is further described by Appendix A: Jackson County Infrastructure and Backhaul Network Configuration.

Jackson County recognizes that the most important aspect of any public safety radio network is coverage reliability coupled with clearly understood audio quality delivered to users throughout their various working environments. Jackson County appreciates the need for Proposers to have adequate flexibility in these specifications such that proposed solutions can be technically optimized to meet user desires and coverage expectations. Accordingly, this RFP Specification does not define a specific 700/800 MHz antenna configuration or any minimum number of tower sites to achieve the desired coverage performance.

A study previously completed by TUSA suggests how tower sites could be conceptually added to the existing configuration to enhance radio coverage and reliability. Due to pending equipment obsolescence, it is anticipated that only Jackson County's tower structures will be available for reuse (others to be added as part of the Proposer's configuration). Other elements of the current radio system will be fully replaced by new technology as will the current configuration standby power systems and, potentially, equipment shelters. That is, these Specifications are designed to functionally describe user expectations, reliability and Jackson County's desire for EIA/TIA Project-25 infrastructure and user equipment compliance.

1.3 Current System Maintenance

Currently the maintenance on the DMR equipment is being provided through a maintenance contract with Mobile Communications America located in Gainesville, Georgia. Technicians are called out for service on an as needed basis.

The Generators are being maintained on a year to year contract with J&T Sales in Lincolnton, Georgia. Jackson County's generators were not previously on a regular maintenance cycle and this is a recent contract to perform maintenance bi-annually.

Tower work and tower light replacement is being provided to Jackson County by Qwiksite in Gainesville, Georgia on a as needed basis.

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2.0 Identified User Needs and Requirements

Please note that starting from this section, Jackson County includes Technical and Performance Requirements for which the Proposer shall provide a point-by-point and narrative response that must be met as described below. The Proposers shall clearly delineate in its point-by-point response its position with respect to the stated requirement, meaning the statement of any of the following:

- Understood – meaning that the item has been read and its direction or meaning is understood;
- Comply – meaning that the item has been read and that the Proposer agrees and accepts the requirement(s) as stated;
- Comply with Clarification – meaning that the Proposer fully accepts the requirement and is in addition providing an explanation of how it intends to adhere to the requirement(s);
- Exception – meaning that the Proposer understands Jackson County's item but cannot accept or undertake Jackson County's requirement(s).

Proposal responses that take exception to a stated RFP requirement risk being graded down in the proposal evaluation process. Proposers are encouraged to request clarification of RFP items that are unclear during the period provided within Jackson County' open procurement cycle.

2.1 General

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

2.1.2 The Vendor shall be responsible to conduct tower and foundation structural analysis and reinforcement as necessary to any of the existing towers in use by Jackson County. Vendors are required to propose a comprehensive set of equipment and services that satisfy this RFP's minimum requirements and are encouraged to describe specific areas within their proposal solutions that materially exceed these minimum objectives. Since the existing radio system exhibits a lack of reliable portable in-building coverage, a number of completely new tower sites (in addition to the existing locations) must be proposed to satisfy the coverage requirements listed within this document.

2.1.3 Section 11 Site Work Requirements provides for specific workmanship standards for communications facilities that must be met by the Contractor in the course of constructing the System. This RFP contains specifications that provide a baseline of technical requirements coupled with functional objectives that must be considered by responding Vendors. The RFP allows flexibility in the selection of sites and antenna placements by responding Vendors such that their response fully addresses the coverage reliability/audio quality requirements contained in RFP Section 6 Coverage Criteria.

2.2 Current Usage Requirements

A comprehensive radio system study has been previously undertaken and is included with this RFP. A summarized detail of user needs, and expectations follows:

2.2.1 Improved Coverage

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

County desires the coverage to be improved to meet public safety best practices. A complete list of the coverage requirements can be found in Section 6.0 Coverage Criteria, of this RFP.

2.2.2 Current Operable Aspects

All of Jackson County's public safety agencies, municipal departments, and schools utilize the Motorola MotoTRBO DMR radio system for daily communication needs. Due to the proprietary nature of the current technology, interoperability with neighboring agencies and the choice of radio models operable on this platform are limited. Growth in the number of vendors now manufacturing latest-generation P25 user radios has ushered in multiple tiers of equipment that, on the lower end of options, are becoming cost-comparable to conventional, non-P25 devices.

2.2.3 Typical Current Radio User Configuration

Most users are equipped with hand-carried portable radios. These radios are operated on-hip with an accessory speaker-microphone device installed by most of those interviewed. While a leather carry case is generally used, most simply clip the radio to their belts. This configuration allows good positioning flexibility yet exposes the radio to more physical damage as compared to radios holstered into leather carry cases.

Most agencies currently lack a comprehensive preventative maintenance program for user equipment. This causes degraded user equipment functionality accumulating over time. The net result can be complaints about radio coverage or performance, with focus placed on tower sites, whereas the problem may be with the user's actual radio device.

Radio ergonomics are important to users, which is one reason why an electrically shortened antenna configuration for portable radio units has been defined in Section 6 Coverage Criteria.

2.3 New-System General Objectives

2.3.1 Talk Paths

Each of the agencies operable within the current DMR radio system utilize individual talk paths that are used for existing operations. Additionally, these user agencies share several

mutual aid conventional channels that allow for some interoperability between outside jurisdictions during special events and emergencies.

The Vendor shall ensure the P25 radio talk path needs for the System will follow those of the existing configuration, plus a net 25% expansion potential of actual in-service talk paths. The current radio configuration's talk-group structure is described by Appendix B.

2.3.2 Call Privacy

Jackson County's current radio system is intrinsically open to transmission monitoring with radio equipment operable on those frequencies (i.e., trunk-tracking scanning receivers, etc.). Accordingly, the replacement P25 System shall include voice-layer encryption (described later). This provision must offer sufficient flexibility such that the desirable features of monitoring can be retained while permitting privacy to conversations that are potentially confidential.

While current P25 standards do not now provide for encryption of trunked system control channels, such technology is likely to be adopted as these standards continue to evolve. The new network should be software-configurable to support the P25 control channel encryption standard being developed by TIA.

The Vendor shall describe the scope and operation of such provisions inherent or planned within their solution that prevents the types of undesired radio monitoring discussed above.

2.3.3 Voice Encryption

2.3.3.1 Digital voice 256-bit AES encryption, using Advanced Multi-Band Excited +2 (AMBE+2 or newer) vocoder technology coupled, shall be included in the System.

2.3.3.2 Three modes of encrypted digital voice operation expected are:

2.3.3.2(a) Unit-to-unit, where conversations transacted in an encrypted talk group are secure. These cannot be monitored at a dispatch or control point;

2.3.3.2(b) Dispatcher-to-unit, where conversations between Jackson County's dispatch center(s) and field units;

2.3.3.2(c) P25 Smartphone Application call transactions (via commercial cellular and FirstNet) to typical field/dispatcher operations within the System.

2.3.3.3 The enhanced P25 System shall provide encrypted transmission functionality so that user radio access delays are equal to those in the clear mode, in accordance with published TIA P25 standard specifications. Encrypted transmissions shall not degrade the operation of clear-voice features nor lengthen system access or audio transport delays to other users. Encryption shall not degrade the range or coverage to any level less than that for normal P25 clear-mode digital performance.

2.3.4 End User Equipment

In general, public safety/local government communications needs have shifted from car based, with equipment fixed within vehicles, to user-based where portable radio equipment is assigned to individual users.

This migration to portable units, with that equipment's reduced output power level and often-degraded antenna performance, has placed greater technical demands on radio communications network infrastructures.

The coverage needs for mobile-based systems are relatively straightforward as the available effective radiated power from a mobile unit can closely approach that of a base station. Talk-in/talk-out balance can thus be easily achieved with simple backbone system configuration.

Jackson County's current tower site configuration currently does benefit portable radio operations in needed locations coupled with the age of the fixed site infrastructure. Portable radio coverage problems are further compounded by the fact that users often respond to incidents within propagation-resistant areas such as warehouses, office buildings, apartment structures, hospitals, and single-family dwellings.

The subscriber equipment must be:

2.3.4.1 Small, light-weight and easy to operate.

2.3.4.2 The antenna should be physically short and in keeping with the size of the radio package.

2.3.4.3 Radio unit battery packs are expected to operate to provide sufficient power for a full twelve-hour work period.

2.3.4.4 A range of accessories is expected to be available to support in-field battery charging.

2.3.4.5 The battery packs should provide a reasonably long-life (i.e., two years) within the typical operational profile of 5% transmit, 5% receive and 90% standby/on.

2.3.4.6 While most radio users operate in the clear, unencrypted mode, a need for standards-based voice encryption is necessary.

2.3.4.7 The Vendor shall provide documentation, and demonstrate P25 operational compliancy with, minimally, BK Technologies (RELM), EF Johnson/Kenwood, Harris, Motorola, & Tait portable, mobile, and control station radios. These radios must have been tested and certified to function on its proposed P25 infrastructure technology.

2.3.4.8 The Vendor shall also describe those processes and methods it employs to confirm where infrastructure software releases and hardware changes to its P25 network/site controllers, base station, and gateway products are verified for continued compatibility with P25 equipment manufactured and offered for purchase by others.

2.3.4.9 The portable radio package, itself, is expected to be compact, light-weight, simple to operate and have a minimum of operator controls or feature selections.

2.3.4.10 Radios contain a microphone, speaker, talk group selector, volume control, power switch, emergency button, and normal transmit push-to-talk button. These input/output devices are subject to near-constant physical abuse within a public safety environment and affect overall equipment reliability.

2.3.4.11 The user is expected to be able to disable message authorization tones, when necessary.

2.3.4.12 The volume control is expected to be fully adjustable from zero to maximum audio output level.

2.3.4.13 Unit is expected to be extremely rugged to withstand shock and vibration typical of public safety operations. For some agencies, other features are needed such as Intrinsically Safe operation and the ability for the equipment to survive short term water submersion.

2.3.4.14 Units are expected to be operable, within the coverage requirements of Section 6.0, using the smallest unity-gain flexible antenna available.

2.3.4.15 Radio units are expected to be equipped with alphanumeric displays to readily identify selected talk groups and operating modes, i.e. clear voice, encrypted voice, etc.

2.3.4.16 Radios are expected to be capable of operation with traditional speaker/microphones as well as sub-miniature radio surveillance accessories.

2.3.4.17 In addition to the specific desired features indicated above, all furnished equipment is expected to meet minimum equipment requirements identified in Section 4.0.

2.3.5 User Equipment Training

2.3.5.1 A comprehensive training program must be established by the Vendor in its Technical Submittal, to be implemented if selected as the Contractor. This program would include not only user familiarization with physical features and functions of assigned radio equipment, but also instruction pertinent to the System's talkgroup structure and how the System's infrastructure establishes local, wide-area and outside interoperable call transactions.

2.3.5.2 The Contractor's training program must include the necessary graphics, visual simulations, and printed media tools to establish an appropriate training process for users. Training videos must be available to users on a private web-based portal, thereby allowing for individual refresher training.

2.3.5.3 The Contractor must also supply technical assistance during the initial warranty period that allows for ongoing modifications to these training resources, to keep them in-step with additions and changes to the operable and interoperable resources within the System.

2.3.5.4 The Vendor shall provide a detailed description of its proposed user/infrastructure training program. Examples of training tools developed for similar P25 regional trunked and conventional radio configurations shall be provided within the Vendor's Technical Proposal Submittal.

2.3.5.5 Jackson County must approve all training curriculum prior to training.

2.3.5.6 The Vendor must provide resumes of professional training staff that will train the user on how the radio operates on the proposed system.

2.3.6 Gateway and ISSI Interfaces

2.3.6.1 The utilization of gateway technology in necessary for the System and provides a useful and important function in the integration of outside trunked and non-trunked radio systems such as those operated by Walton County, Henry County, Rockdale County, Morgan County, Jasper County, Butts County, and the State of Georgia.

Not only is it important for Jackson County to have integrate communications with neighboring agencies and systems, but also specifically interface with the following systems.

- Hospital Emergency Administrative Radio System (H.E.A.R).
- Georgia State Patrol Dispatch
- Georgia Statewide Car to Car

The proposed System must be capable of:

2.3.6.2 Base Station Gateway technology shall be provided to interface both analog and digital land mobile radio base stations, on a talkgroup or channel basis, within the P25 trunked solution. By so doing, it would then be possible for radio users equipped with P25 radios operable on the System to select, monitor and individually control these various link-radio resources.

2.3.6.3 Broadband Gateway functionality shall be provided within the System to permit selected outside third-party Smartphone users equipped with the appropriate application software to communicate with users/agencies via allowed System talkgroups.

2.3.6.4 Inter RF Sub-System Interface (ISSI) technology shall be provided which allows P25 core controllers of disparate radio systems to transact communications across systems/technologies.

2.3.6.5 Jackson County requires the implementation of each of these gateway technologies as part of the Vendor's proposed configuration as further described by RFP Section 5 Minimum Equipment Requirements.

2.3.7 User Roaming

It is required that the Vendor's new radio communication solution support seamless agency user roaming across jurisdictional boundaries via ISSI connections. Functionally, a field user who initiates and is in communication with dispatchers or others on a specific talkgroup within a specific P25 radio system must remain affiliated with those parties while driving across the coverage footprint of ISSI-linked P25 systems. This roaming feature must operate automatically and without the need for field users to physically change systems/talkgroups while traversing across tower site/system coverage zones.

The Vendor shall describe user roaming functionality within its proposed configuration. This description shall include an explanation of the process used by user radios to determine when to transition onto the next system, in conjunction with an explanation of radio availability while this ongoing adjacent-system availability determination is underway. **The need for a user to manually transition between tower site/system coverage zones within a Vendor's proposed network configuration is unacceptable and will be graded down during the proposal evaluation process.**

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3.0 Infrastructure System Configuration

3.1 General

Jackson County has valid UHF and 11 GHz licenses for its current radio and microwave network, as outlined in Appendix E FCC License. The Contractor will be required to undertake necessary FCC license modifications, as required, to accommodate the modernized/expanded System. Any frequency modifications and site additions will be coordinated with the Region 10, Georgia State RPC.

3.2 System Configuration

3.2.1 The Vendor is required to provide a comprehensive functional and technical solution for an expanded P25-compliant System. The new digital radio configuration shall utilize the necessary number of infrastructure sites, as determined by the Vendor, to meet Jackson County's expressed coverage requirements as described by Section 6.0. Coverage Criteria.

3.2.2 The System must be designed and deployed to utilize both P25 Phase 1 FDMA & P25 Phase 2 TDMA modulation formats.

3.2.3 In addition, the System shall include a five-channel 800MHz NPSPAC analog conventional mutual aid subsystem having the capability of being electronically patched to the System's 800MHz talkgroups via conventional base station gateway interfaces.

3.2.4 The proposed System shall utilize both existing and Vendor-recommended radio infrastructure sites and shall include, minimally, a primary and secondary/redundant network controller. These network controllers shall be located at Jackson County's 911/Dispatch center and a second location to be determined between the Vendor and Jackson County.

3.2.5 The Vendor shall indicate a guaranteed level of portable and mobile area coverage and delivered audio quality indicative of their designed solution. Jackson County recognizes that portable radio coverage to the same degree as required for mobile operations increases system complexity. These requirements are outlined in Section 6.0. Coverage Criteria

3.2.6 Physical plant modifications to newly-proposed tower sites, rental sites or existing County-owned sites as necessary to accommodate the Vendor's proposed System configuration shall be the responsibility of the Contractor and must be factored into the Vendor's Response Submittal Cost Proposal. **The Vendor's failure to disclose physical plant modifications (and cost) is contrary to Jackson County's turnkey project requirement and shall result in an unfavorable grade of the Vendor's Submittal.**

3.2.7 The Vendor shall provide all pertinent information concerning their equipment, relative to electrical, mechanical, structural and physical space requirements. The Vendor must consider enhanced physical security, cyber security and environmental issues in preparing their Response.

3.2.8 It shall be the responsibility of the Contractor to provide a turnkey System and to install Industry-accepted standard electrical grounding systems and lightning protection devices to protect proposed equipment from damage due to electrical transients on antenna systems, power, telephone and/ or control cables.

3.2.9 Sites determined by the Vendor to be potentially prone to flooding must be so noted in the Technical Response Submittal. Engineering remedies must be based on 100-Year Flood Plain data. Remedies are to include elevated equipment shelters as needed to ensure such new equipment is no less that 24-inches above FEMA-predicted 100-year flood plain levels.

3.2.10 The delivery and installation of: equipment shelters, security systems, standby and emergency power systems, towers, antenna systems, electrical grounding systems, lightning protectors, transmission lines, cable attachment hardware, transmission line shields, tower-to-building cable tray hardware and all necessary permitting is part of this project and must be furnished by the Contractor.

3.2.11 All transmit/receive site-related equipment is to be backhaul-connected via digital microwave linkages to be supplied by the Contractor. This microwave backhaul layer shall be configured as a monitored hot-standby loop-protected ring(s) that encompass radio tower sites, simulcast control points, dispatch centers and network controller locations. The new microwave backhaul layer shall operate principally at 6GHz. 11GHz microwave link segments are permissible only for path segments that are less than 4-miles in length.

3.2.12 The Contractor shall furnish and install all radios, antennas, wiring, wiring hardware, interface electronics and materials necessary, and at no additional cost than that identified in their Contract, to complete the successful implementation and operation of this System and its related equipment groupings.

3.3 System Planning and Capacity

The System shall support Jackson County's current user capacity plus no less than a 25% growth in net traffic. Please refer to Appendix B Existing Talkgroup Structure for details.

3.3.1 The Contractor shall utilize best engineering practice in modifying the System's frequency plan to maximize the effectiveness of channel resources. This frequency plan must ensure that frequencies installed at sites cause no adverse receiver desensitization because of intermodulation products and, further, that the Contractor's frequency plan complies with FCC regulations with respect to co-channel and adjacent-channel interference protection criteria.

3.3.2 The Vendor's Technical Response must fully describe its frequency engineering process and must include an initial frequency plan for its proposed configuration (if differences between the Vendor's plan and the existing-system's frequency plan are anticipated). The Vendor must describe its best-practice approach to the monitoring of noise floor levels/degradation at radio tower sites and the steps it would undertake to identify and resolve interference issues, both internal to the radio system's infrastructure, as well as external.

3.4 Major System Equipment Groupings

The Vendor shall provide and describe, minimally, the following major equipment groupings:

3.4.1 Radio Network Controller (Primary and Secondary)

3.4.2 Console Electronics/ Audio Controller (Primary/Secondary)

3.4.3 P25 Tower/Shelter Sites

3.4.4 Conventional Mutual Aid Subsystem (800MHz)

3.4.5 Microwave Backhaul Network

3.4.6 Redundant local area network (LAN) routers/switches

3.4.7 Battery Plant & Charger Systems

3.4.8 Auxiliary power generators

3.4.9 Interoperability Link Base Stations

3.4.10 ISSI Gateways

3.4.11 Base Station Gateways

3.4.12 Broadband Device Gateways

3.4.13 The Contractor shall furnish and install all wiring hardware, cable trays, interface electronics, terminal blocks, and materials necessary to complete the successful implementation and operation of this site and its equipment groupings. Infrastructure equipment proposed for the Control Point must meet the minimum requirements specified by Section 5. Minimum Equipment Requirements.

3.4.14 The Vendor is required to incorporate a dual primary / redundant network control point design into its proposed infrastructure solution. This submittal requirement is mandatory and a Response Submittal failing to include such a dual-site redundancy configuration will be considered as being unresponsive to these Specifications. This redundancy requirement also applies to the simulcast control point.

3.4.15 The Vendor shall describe its network controller and simulcast control point redundancy configuration scheme and, if virtualized controller/control point configurations are proposed, the number of such configurations allowable within the proposed solution.

3.4.16 The Vendor shall describe the method used to automatically transition to such backup configurations and the transitional latency such transitions apply to the radio network, in seconds or milliseconds.

3.5 Typical Infrastructure Site Deployment

The Vendor is required to supply a turnkey solution to include: all technical support, equipment, material and labor necessary to develop each proposed infrastructure radio site into a functional P25 digital radio facility, fully incorporated.

3.5.1 A typical P25 radio infrastructure site equipment shelter shall contain, minimally, the following major equipment groupings:

3.5.1.1 800MHz P25 Phase 1/Phase 2 Base Stations

3.5.1.2 GPS-Disciplined Frequency Standard (Redundant)

3.5.1.3 Transmitter Combiner System

3.5.1.4 Transmitter Antenna Systems

3.5.1.5 Receiver Multi-Coupler System

3.5.1.6 Receiver Antenna System

3.5.1.7 Remote Site MPLS Microwave Linkage

3.5.1.8 Local Area Network Equipment

3.5.1.9 800MHz Mutual Aid Subsystem

3.5.1.10 Mutual Aid Antenna System

3.5.1.11 Conventional Base Station Gateway

3.5.1.12 Site Alarm Equipment

3.5.1.13 Battery Plant & Charger Systems

3.5.1.14 Standby Generator Transfer Switch

Infrastructure equipment proposed for all radio sites must meet or exceed the minimum requirements specified by Sections 4.0. Minimum Operative Characteristics, and 5.0. Minimum Equipment Requirements.

3.5.2 Tower Site Equipment Configuration

3.5.2.1 The P25 simulcast configuration and conventional radio base stations shall operate from a 48 VDC battery-based power source, sized for no less than 8-hours of uninterrupted operation.

3.5.2.2 The battery system shall utilize sealed, long-life lead-calcium, or similar modern cells and 100% redundant battery charger components rated for telecommunication service.

3.5.2.3 An automatic, low voltage disconnect device shall be provided to protect the battery plant from discharge-related damage.

3.5.2.4 Electrical power switching/disconnect capability shall exist at all sites such that rectifiers, batteries as well as commercial power sources may be separately isolated in a way each component may be serviced safely.

3.5.2.5 This switching/disconnect capability shall be designed and configured such that radio network operation is otherwise unimpaired and uninterrupted during any repair or maintenance cycle.

3.5.2.6 Base stations shall be housed in open equipment racks. Racks shall be free standing and incorporate drilled rails to accept standard 19” rack panels.

3.5.2.7 A minimum of six, but no more than eight DC-operated base stations should be located within a single equipment rack.

3.5.2.8 Each equipment rack shall incorporate a circuit-breaker power distribution panel incorporating protection for power amplifier, exciter and receiver groupings.

3.5.2.9 Individual base station ventilation fan(s), if required, shall be DC powered, thermostatically controlled, internally installed, and shielded.

3.5.2.10 Each equipment rack shall be protected by a DC-power circuit breaker, sized for nominal load plus 35% overload factor.

3.5.2.11 The primary battery chargers, low-voltage disconnect equipment and a primary DC circuit breaker panel shall be installed in a freestanding enclosed cabinet unit.

3.5.2.12 Likewise, the network’s primary/backup controllers and related LAN switch/router devices shall be housed in freestanding equipment racks like those used for repeater stations.

3.5.2.13 Auxiliary tower site electrical loads essential to proper system operation, i.e. tower top preamp, redundant GPS reference oscillators and receiver multi-coupler shall be interconnected directly to the site's battery system.

3.5.3 Infrastructure Functionality

The System shall:

3.5.3.1 Utilize the TIA specified P25 Common Air Interface (CAI) digital control channel scheme, in which user-initiated feature requests and talk group/working channel assignments are processed digitally over site-specific control channels.

3.5.3.2 Ensure the remaining channels at sites shall operate as working channels for digital voice traffic.

3.5.3.3 Utilize an interference-monitored control channel scheme with a level of redundancy that is sufficient to meet the overall requirements and intent of this specification for a no-break, life-critical radio communications System.

3.5.3.4 Ensure the control channel configuration will automatically rotate to other channels, in sequence, should an abnormal number of carrier hits occur on the pre-set control channel.

3.5.4 Failover scenario equipment descriptions

The Vendor shall furnish a description of the effect each of the below listed failure modes would have on their proposed P25 System configuration. The Vendor shall also describe appropriate mitigation/restoration steps to return the System to full operational capability in response to each of the below listed failure conditions, and the time required to achieve restoration.

3.5.4.1 Loss of transmitter(s) operation

3.5.4.2 Loss of receiver(s) operation

3.5.4.3 Failure of dispatch console terminal(s)

3.5.4.4 Failure of console/audio interface

3.5.4.5 Failure of tower site controller

3.5.4.6 Commercial power failure

3.5.4.7 Site generator failure

3.5.4.8 Failure of entire tower site

3.5.4.9 Loss of Control Channel(s)

3.5.4.10 Loss of Control Point

3.5.4.11 Loss of Primary Network Controller

3.5.4.12 Loss of Redundant Network Controller

3.5.4.13 Loss of single/multiple microwave path connectivity

3.5.4.14 Loss of ISSI, Base Station or Broadband Gateway Devices

3.5.5 Tower Site Antenna Systems

The Contractor shall:

3.5.5.1 Furnish and install antenna systems designed to meet the coverage requirements and objectives described by Section 6.

3.5.5.2 Equip all antenna transmission lines with gas tube lightning arrestor devices (Polyphaser or equivalent).

3.5.5.3 Ensure all coaxial cable elements used as interconnecting jumpers for outdoor-mounted equipment or indoor transmitter/receiver components are 1/2" Andrew FSJ4-50B or equal.

3.5.5.4 Furnish and install hot dip galvanized side mount hardware sufficient to extend the transmitter and receiver antennas a minimum of 60-inches from the nearest tower-structure element.

3.5.5.5 Ensure transmission lines are grounded at the antenna, at 200-foot tower intervals, at the top most part of the tower location, at the midpoint (for all towers greater than 200-feet in height), at the location where the transmission lines enter the cable bridge and at the equipment shelter's transmission line copper entry port.

3.5.5.6 Utilize only manufacturer-approved grounding strap kits for the type of transmission line installed.

3.5.5.7 Ensure all connecting hardware will be a snap-in type of a size designed for the cable. No tie wraps or electrical tape will be allowed for attaching cables to towers.

3.5.5.8 Utilize antenna system mounting brackets, components and associated transmission line attachment hardware that are either stainless steel or hot-dipped galvanized steel.

3.5.6 Network/Audio Control Scheme

The Vendor shall provide detailed descriptions of how the System incorporates high levels of redundancy to assure continued trunked system operation. To provide the highest level of trunked reliability, site/system control schemes shall be IP-based, fully redundant and utilize distributed processor technology to the maximum extent possible.

Primary/Redundant Network and Site control schemes must include protected, redundant power supply units so that the loss of a single power supply will not interrupt control scheme operations.

Radio site controllers shall minimally provide the following features:

3.5.6.1 Working channel assignment.

3.5.6.2 Verification of user identification.

3.5.6.3 Assignment of call priority.

3.5.6.4 Electronic tracking of call type, caller/ called, call time, channel assignment, etc.

3.5.6.5 Monitor/control of special system features.

3.5.6.6 Ability to disable/enable call access to specific field units.

3.5.7 Radio Network Alarm System

The Contractor shall furnish and install an automatic alarm system to monitor and alert, as a minimum, operational status (per site) for the following parameters:

3.5.7.1 Major Alarm Conditions (Defined as a condition that could lead to equipment failure in less than 2 hours)

3.5.7.1(a) Primary Network Controller Failure

3.5.7.1(b) Redundant Network Controller Failure

3.5.7.1(c) Site Channel Failure

3.5.7.1(d) Control Channel Failure

3.5.7.1(e) Console/Audio Controller Failure

3.5.7.1(f) ISSI/Base Station Gateway Failure

3.5.7.1(g) Receive Multicoupler Failure

3.5.7.1(h) AC Power Failure

3.5.7.1(i) High Reflected Power -TX Antenna

3.5.7.1(j) Battery Charger Failure, Major

3.5.7.1(k) Generator Failure/Shutdown

3.5.7.1(l) Tower Light Failure

3.5.7.1(m) Over/Under Temperature Alarm (HVAC failure)

3.5.7.1(n) Low Transmitter Output (each transmitter)

3.5.7.2 Minor Alarm Conditions (Defined as a condition that has little, to no risk of leading to equipment failure prior to arrival of technical staff)

3.5.7.2(a) Door Alarm

3.5.7.2(b) Tripped DC Breakers(s)

3.5.7.2(c) Battery Charger Failure, Minor

3.5.7.2(d) Low Fuel

3.5.7.3 System Alarm Monitoring

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

In addition, the Contractor shall provide:

3.5.7.3(a) A summed major/minor alarm indication should be displayed on each alarm system terminal position.

3.5.7.3(b) These alarm positions will be located at both network controller locations and the County dispatch location.

3.5.7.3(c) This alarm indication should appear as a flag at a conspicuous area on the flat-screen display field.

3.5.7.3(d) Determination of specific alarm point conditions shall be obtainable from any dedicated alarm system terminal position.

3.5.7.3(e) These alarms must be capable of email or other common messaging alert to County-designated personnel.

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

3.6 Regional Interoperability

Currently, the City of Atlanta as well neighboring Barrow, Hall, and Clark Counties have migrated onto open-standard 800MHz P25 technology. Jackson County has a frequent need to communicate with these counties or Banks County which now operates a hybrid radio system based on Kenwood's Nextedge technology. Jackson County is structuring its replacement radio configuration as P25 Phase 1 and 2 compliant.

Seamless interoperability between these P25 digital voice radio networks, of various manufacture, is a desired goal. In preparation of such regional interoperability, the County requires the following:

3.6.1 ISSI Gateway

3.6.1.1 Vendors shall describe how the proposed System can be interfaced to other regional P25 radio networks now in operation, under development or procurement planning. Further, the Vendor shall describe each operational feature that is supported by its proposed ISSI technology.

3.6.1.2 A minimum of three ISSI connections with twenty talk paths each shall be provided and installed by the Contractor as part of this project's implementation.

3.6.1.3 Vendors shall propose as an option a redundant gateway configuration that will automatically become operable should the primary gateways sustain an electronic/functional failure. The Vendor shall describe its planned ISSI redundancy scheme and functionality.

3.6.2 Base Station Gateway

It is important for Jackson County to include effective interoperability linkages to outside radio systems operated by federal, state and other non-public safety agencies.

The Vendor shall provide:

3.6.2.1 Base Station Gateway devices shall be located at the radio tower sites and allow the interconnection of legacy analog, and other digital radio systems onto the new radio network. The location of the gateways should be part of the vendor's design and located to best serve the interoperability requirements of Jackson County.

3.6.2.2 The Base Station Gateway shall additionally facilitate appropriate Radio-to-IP interfaces and Four-Wire 'Ear and Mouth' (4W E/M) interfaces that are compatible with new radio system's infrastructure and dispatch center configuration.)

3.6.2.3 The furnished Gateway shall provide the below-listed functionality:

3.6.2.3(a) Base Station Gateway shall allow System users to initiate and drop appropriate control link/base stations via talk-group selection on appropriately-programmed System user radios.

3.6.2.3(b) Users shall be able to monitor traffic on the outside radio systems, via the Base Station Gateway device.

3.6.2.3(c) Jackson County radio dispatchers shall have the ability to patch the System's Base Station Gateway channel traffic onto other P25 network talkgroups, on an ad-hoc basis.

3.6.3 Broadband Gateway

The ubiquitous use of commercial broadband Smartphone devices presents new opportunities for providing P25 radio access to those entities having only an occasional need for communications with Jackson County's user agencies.

Vendors shall:

3.6.3.1 Furnish and install a Broadband Gateway designed to support connectivity with outside cellular device users.

3.6.3.2 The Broadband Gateway shall be located in conjunction with both the primary and redundant Network Controllers.

3.6.3.3 Each Gateway shall, as an option, be configured as an "automatic-protected" from whereas if the primary Broadband Gateway at a Network Controller site should fail, the equipment would "self-heal" and automatically transition to the backup, redundant Gateway device.

3.6.3.4 The Vendor shall identify the provided software applications/licensing for Smartphone users. The Vendor shall provide the capability and quantity of users that are included with the design. The quantities for additional user licensing and increments shall also be provided.

3.6.3.5 The Broadband Gateway shall support normal P25 voice radio user functionality, inclusive of AES 256-bit encryption.

3.6.3.6 The Vendor shall provide a functional description of its proposed Broadband Gateway platform, inclusive of automatic failure-recovery modes and alarm notification processes.

3.6.3.7 This Broadband Gateway shall be required to interface with FirstNet as well as other cellular carriers now utilized by the various agencies.

3.7 System Voice Encryption

The number and tiers of radios requiring encryption has been provided in Section 16~~7~~.0 Pricing Considerations.

3.7.1 Each of the network's P25 trunked digital RF channels shall be equipped to support voice encryption using the Advanced Multiband Excited +2 (AMBE+2) or newer vocoder.

3.7.2 Encrypted mobile and portable units shall be of the same physical size and general configuration as non-encrypted units.

3.7.3 Accessory equipment shall be compatible with both types of units.

3.7.4 Proposed Phase 1, or Phase 2, radio coverage throughout Jackson County, in the digital encrypted mode, shall be equal to that in the digital clear mode.

3.7.5 The System shall be configured and include both Over-the-Air-Programming (OTAP) and Over-the-Air-Rekeying (OTAR) of user radio equipment.

3.8 NPSPAC 800MHz Mutual Aid Sub-System

The vendor shall describe in detail the construction of its NPSPAC 800MHz Mutual Aid subsystem that is optimized to provide mobile radio coverage and conforms to the following requirements:

The mutual aid subsystem will be comprised of five duplex channels that conform to the National Plan, as follows:

8CALL90	851/806.0125MHz
8TAC91	851/806.5125MHz
8TAC92	852/807.0125MHz
8TAC93	852/807.5125MHz
8TAC94	853/808.0125MHz

All channels use CTCSS 156.7Hz

The Contractor shall interconnect these various mutual aid base stations into the P25 trunked radio network via site-located conventional base station gateway devices. Radio dispatchers shall be capable of monitoring each of these various mutual aid channels.

The Vendor shall provide a description of its proposed mutual aid subsystem configuration, inclusive of coverage maps depicting VHF, UHF and 800MHz mobile coverage. Further refinement of the mutual aid subsystem is anticipated and may be undertaken by Jackson County as part of the project's design review meeting process.

3.9 Physical Security

The Vendor shall propose a comprehensive set of physical and cyber security safeguards to protect the integrity of the new System. The physical portion of the furnished communications network shall include:

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

3.9.2 An electronic door-access subsystem for each of the remote tower site facilities.

3.10 Cyber Security

The System likewise includes potential "back door" entry points via ISSI/CSSI gateway connections to external radio communications facilities operated by others as well as accessibility of the radio system to field technical and engineering resources via the Internet. Each of these points must be appropriately secured using firewalls, data encryption, and other means to prevent intentional hacking of critical information or the installation of viruses and malware that could inhibit or disrupt mission-critical communications.

The Vendor shall provide within its Technical Response Submittal, a detailed description of the various cyber security measures it would employ to protect the proposed new System, both initially and throughout the prescribed warranty period.

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4.0 Minimum Operative Characteristics

4.1 General

In this Section, channel usage characteristics for agencies now operable on Jackson County's legacy radio system are presented. From this information, the Vendor can better determine the channel capacity (and subsequently the channel plan) needed to satisfy talk group structure requirements for this project.

4.2 Minimum System Performance

The Vendor should assume that the current talkgroup assignment/usage will be replaced with a P25 digital radio overlay having a similar trunked radio talkgroup structure. Appendix B contains a detail of the current talk group structure now being utilized.

The Vendor can use this information and other statistics or information to structure capacity studies and related technical considerations necessary to develop a radio frequency channel/capacity plan for the System.

The minimally-acceptable Quality of Service Objective for the System shall be a call blocking rate of no more than 1%, with the delay for such calls that are queued to be no greater than 0.5 seconds.

4.3 The Vendor shall describe in its response submittal:

4.3.1 Typical call setup times for trunked radio calls, which in no case shall exceed 0.5-seconds.

4.3.2 Typical audio processing delays, due to vocoding and digital signal processing, within the Vendor's specific radio technology solution. These delays shall be described for Emergency Calls, Group Calls, Patched Calls, ISSI Calls, Base Station Gateway Calls and Broadband Gateway Calls.

4.3.3 The various levels of call transaction priority as assigned to: Emergency Calls; Group Calls; Fleet Calls; Patched Calls; ISSI Calls; Base Station Gateway Call transactions and Broadband Gateway Calls.

4.3.4 In what way these various call transaction delays may potentially impact site capacity loading and how is this mitigated by the Vendor in its design process.

4.4 Intermodulation Study Requirement

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

An IM study shall be required to be provided by the Contractor prior to the project's Customer Design Review (CDR) meeting, and subsequent meetings, as the new radio network is deployed. This study shall investigate the impact of both trunked system channels as well as those channels utilized by the conventional mutual aid and interoperability subsystem.

The Vendor, as part of its Technical Response, shall fully describe the methodology it intends to use in developing and completing these necessary noise and IM studies. The Vendor is required to submit a representative sample of its noise and IM reporting documentation of sufficient scope and detail to support the methodology, as provided in its Technical Response Submittal.

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5.0 Minimum Equipment Requirements

5.1 General

This Section describes minimally-acceptable requirements for mobile, portable, control station, and fixed-site radio equipment. All radio equipment installed or provided by the Contractor shall be FCC type accepted under Part 90 of the FCC Rules and Regulations. All supplied equipment shall be in current production and shall meet or exceed the requirements of this Section. User equipment devices (i.e. portable, mobile and control station radios) shall conform to TIA-603-D – *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards* and TIA-102.CAAB-D (or current) – *Land Mobile Radio Transceiver Performance Recommendations Project 25*.

Base station/repeaters shall support P25 Phase 1 and Phase 2 modulation formats and shall support narrowband (9.6kb/s) P25 trunked data technology.

The stated minimum requirements, below, for end-user equipment will not necessarily be required on all individual units assigned to non-public safety user agencies. Subscriber Radio Requirements contain those user radio configurations needed for user agency. This listing of users will require radio equipment having varying levels or complexity (termed *tiers*) in this RFP. The Pricing section contains further information on those equipment configuration breakdowns.

5.2 Mobile Radio Equipment

All mobile P25 radios proposed shall:

5.2.1 Meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety 700/800MHz digital trunked radio systems. Furnished equipment must be operable on both Phase 1 and Phase 2 infrastructures.

5.2.2 Incorporate heavy-duty construction, weather-sealed enclosures and weather-sealed controls to meet Military Standard 810 C, D, E, F and G for water, shock, vibration, dust, humidity and high/ low temperature performance.

5.2.3 Allow operation on P25 trunked systems with priority scan of talkgroups.

5.2.4 Front mount and rear mount, dual control-head with single rear mount radio and dual radios with single control-head configurations must be available to meet the needs of the different public safety users. Rear mount radios may require weatherproof control heads, speakers, microphones and other accessories (specific for fire operations).

5.2.5 Include emergency button on mobile radio control panels to initiate an emergency call.

5.2.6 Support special services, i.e. encrypted voice, Computer Aided Dispatch (CAD), and Automatic Vehicle Location (AVL).

5.2.7 Be capable of an external alarm dry-contact closure to provide activation of a horn, light, etc. whenever the radio unit is individually called.

5.2.8 Be capable of providing 9.6kb/s data-messaging transmission capabilities.

5.2.9 Offer digital voice encryption, using an Advanced Multi-Band Excited +2 (AMBE+2) or newer P25 Phase 1 and Phase 2 vocoder technology, DES-OFB and federally approved 256-bit AES coding to provide security during transmission and reception of sensitive communications.

5.2.10 Ensure radio operating information is contained in an electrically erasable memory device. Unit will be fully programmable from a laptop/desktop computer.

5.2.11 Include a transmit time out timer to warn the user of excessive transmission length. Time out timer should automatically disable the radio's transmitter after a pre-determined period.

5.2.12 Ensure mobile radios in the 800MHz band must be operable on 800MHz NPSPAC frequencies as well as 700/800MHz conventional and trunked frequencies.

5.2.13 Mobile radios operable also in the VHF band (if multi-band radios are required by user agencies) must operate from 136 – 174 MHz

5.2.14 **<u>Electrical Specifications</u>** are as follows:

5.2.14.1 Primary Input Voltage: 11 to 16 VDC, negative ground

5.2.14.2 Battery Drain:

5.2.14.2(a) Standby: 1.5 amperes, max.

5.2.14.2(b) Receive: 4.0 amperes, max.

5.2.14.2(c) Transmit: 15.0 amperes, max.

5.2.14.3 Environmental: MIL-STD 810 C, D, E, F and G for shock, vibration, humidity and high/low temperature.

5.2.14.4 Temperature Range: -30 °C to +60 °C

5.2.14.5 Humidity: 95% relative humidity at 50 °C

5.2.14.6 Talk Group Selection: Rotary-knob style

5.2.15 **Transmitter** specifications are as follows:

5.2.15.1 Frequency Range:	764 to 870MHz
5.2.15.2 Channel Capacity:	500 channels (Single band radio), 700 channels (Multi-band radio)
5.2.15.3 Talk Group Capacity:	16 minimum, per system
5.2.15.4 RF Output Impedance:	50 ohms
5.2.15.5 Output Power:	30 W (700MHz)/35W (800MHz) (Single band radio); 50 W (VHF) (Single Band Radio); 35 W (Multi-band radio)
5.2.15.6 Channel Spacing:	12.5/6.25 KHz/NPSPAC
5.2.15.7 Spurious/Harmonic:	At least 64 dB below carrier
5.2.15.8 Frequency Stability:	1.5 PPM from -30°C to 60°C
5.2.15.9 Frequency Spread:	24MHz (700MHz)/18MHz (800MHz)
5.2.15.10 Emission:	16K0F3E; 11K0F3E; 8K10F1D; 8K10F1E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission.
5.2.15.11 Modulation Deviation:	+/- 2.5KHz for 12.5KHz Channel; +/- 3KHz for NPSPAC
5.2.15.12 Audio Distortion:	Less than 5% at 1KHz
5.2.15.13 Audio Response:	+/-3dB of a 6dB/octave pre-emphasis characteristic from 300Hz to 3KHz
5.2.15.14 Hum and Noise:	-45dB
5.2.15.15 Duty Cycle:	Transmitter 20%

5.2.16 **Receiver** specifications are as follows:

5.2.16.1 Frequency Range:	764 to 870MHz
5.2.16.2 Channel Capacity:	500 channels (Single band radio), 700 channels (Multi-band radio)
5.2.16.3 Channel Spacing:	12.5KHz/6.25KHz; NPSPAC
5.2.16.4 Digital Sensitivity	0.25 µV 5% Bit error Rate (BER):
5.2.16.5 Adjacent Channel	Rejection: -60dB

5.2.16.6	Frequency Stability:	1.5 PPM from -30° to 60°C
5.2.16.7	Frequency Spread:	24MHz (700MHz); 18MHz (800MHz)
5.2.16.8	Intermodulation	-75dB (Single band radio)
5.2.16.9	Rejection:	-80dB (Multi band radio)
5.2.16.10	Spurious Response Rejection:	-75dB (Single band radio) -80dB (Multi band radio)
5.2.16.11	Audio Output:	10 W (Single band radio), 12 W (Multi-band radio)
5.2.16.12	Audio Distortion:	No more than 2% at 1KHz
5.2.16.13	Duty Cycle:	Receiver 100%

5.3 Portable Radio Equipment

All portable P25 radios proposed shall:

5.3.1 Meet APCO minimum recommendations and EIA/ TIA standards for P25 Public Safety 700/800MHz digital trunked radio systems. Furnished equipment must be operable on both Phase 1 and Phase 2 infrastructures.

5.3.2 Include heavy duty construction and weather-sealed cases to meet Military Standards 810 D, E, F and G for shock, vibration, dust, humidity, high/low temperature and blowing rain.

5.3.3 Allow operations on P25 trunked systems with priority scan of talk groups.

5.3.4 Include top mounted rotary controls with positive stops for volume and channel selection. Control placement must allow gloved hand operation, as is typically needed by the fire service.

5.3.5 Incorporate electronic, alphanumeric (minimum eight character) backlit display to provide visual indication of system availability, channel/talk group selected, incoming user ID, call alerts and operational status such as scan, transmit or low battery.

5.3.6 Include transmit time out timer to warn the user that the radio may be transmitting longer than a predetermined time limit and then disable the transmitter.

5.3.7 Contain no protruding push-to-talk switch, thereby preventing accidental transmitter operation or potential damage to the switch caused by impact.

5.3.8 Include a protected emergency button to allow easy access when needed but incorporating an ergonomic design in which the emergency function could not be accidentally activated.

5.3.9 An accessory receptacle shall be provided for the connection of external devices such as remote microphones or combination remote speaker/microphone units (with or without antenna), vehicular adapters, and mobile data computer equipment.

5.3.10 Radio operating information shall be contained in an electrically erasable memory device. Unit will be fully programmable from a laptop/desktop computer, via the accessory receptacle.

5.3.11 Portable radios, batteries and accessories must be configurable as intrinsically safe for use in hazardous environments.

5.3.12 Carrying case options should include leather carrying case with swivel mounts, as well as chemical resistant cases (nylon or similar plastic material) for use by hazardous material groups.

5.3.13 Optional surveillance accessories such as miniature microphones, earpieces and remote microphones and headset speaker microphones must be available for the proposed radios.

5.3.14 Offer digital voice encryption, using an Advanced Multi-Band Excited +2 (AMBE+2) or newer P25 Phase 1 and Phase 2 vocoder, DES-OFB, and federally approved 256-bit AES coding to provide enhanced security during transmission and reception of sensitive communications.

5.3.15 Provide single-unit 120VAC rapid charger capable of fully charging a discharged high capacity battery pack within a one-hour period. Provide optional single-unit 12VDC rapid charger for vehicular operation. Provide optional 120VAC multi-bank chargers with a minimum of 6 slots. Provide optional 12VDC multi-bank chargers with a minimum of 6 slots.

5.3.16 Battery shall operate the proposed radio equipment a minimum of twelve-hours using a duty cycle of 5% transmit, 5% receive and 90% standby.

5.3.17 Portable radios in the 800 MHz band must be operable on 800MHz NPSPAC frequencies as well as 700/800 MHz conventional and trunked frequencies. Dual band units shall operate on VHF (136-174MHz) as well as 700/800MHz.

5.3.18 User programmable audio alert in the event of loss of control channel (must be a standard feature in present and all future proposed public safety models).

5.3.19 **<u>Electrical specifications</u>** as follows:

5.3.19.1 Primary Power:	Battery pack (further defined in RFP)
5.3.19.2 Environmental:	MIL-STD 810 C, D, E, F and G for shock, vibration, humidity and high/low temperature.
5.3.19.3 Temperature Range:	-30°C to +60°C
5.3.19.4 Humidity:	95% relative humidity at 50°C

5.3.19.5 Talk Group Selection: Rotary-knob style

5.3.20 **Transmitter** specifications are as follows:

5.3.20.1 Frequency Range: 764 to 870 MHz

5.3.20.2 Channel Capacity: 500 channels (Single-band radio), 700 channels (Multi-band radio)

5.3.20.3 RF Output Impedance: 50 ohms

5.3.20.4 Output Power: 3 W 700/800MHz

5.3.20.5 Frequency Stability: 1.5 PPM from -28°C to +58°C

5.3.20.6 Modulation Deviation: +/-2.5KHz for 12.5KHz channel; +/-3 KHz for NPSPAC;

5.3.20.7 Emissions: 16K0F3E; 11K0F3E; 8K10F1D; 8K10F1E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission.

5.3.20.8 Audio Response: +/-3 dB of a 6 dB/octave

5.3.20.9 Audio Distortion: Less than 2% at 1 KHz

5.3.20.10 Spurious/Harmonic: -50 dB

5.3.20.11 Hum and Noise -35 dB

5.3.20.12 Duty Cycle: Intermittent

5.3.21 **Receiver** specifications are as:

5.3.21.1 Frequency Range: 764 870MHz

5.3.21.2 Channel Capacity: 500 channels (Single band radio), 700 channels (Multi-band radio)

5.3.21.3 Channel Spacing: 12.5/6.25 KHz/NPSPAC

5.3.21.4 Adjacent Channel Rejection: -60dB (Single band radio), -65dB (Multi band radio)

5.3.21.5 Digital Sensitivity 5% BER: 0.25 µV

5.3.21.6 Intermodulation Rejection: -72 dB (Single band radio)
-74 dB (Multi-band radio)

5.3.21.7 Spurious Response Rejection: -72 dB (Single band radio)
-70 dB (Multi-band radio)

5.3.21.8 Frequency Stability: 1.5 PPM from -30° to +60°C

5.3.21.9 Audio Output: 1.5 W

5.3.21.10 Audio Distortion: No more than 2% at 1 KHz

5.4 Control Station Equipment

All control station P25 radios proposed shall:

5.4.1 Be available either as an integrated 120VAC powered desktop radio rack or a remotely located, AC powered radio package with separate remote-control unit.

5.4.2 Control station and control unit shall have an optional provision to operate from standby 12VDC source upon failure of AC power.

5.4.3 Options shall be provided for local and remote-control operation of the control station.

5.4.4 Must meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety 700/800MHz digital trunked radio systems. Furnished equipment must be operable on both Phase 1 and Phase 2 infrastructures.

5.4.5 Allow operations on P25 trunked and conventional (analog/P25) systems with priority scan of talk groups or channels.

5.4.6 Offer digital voice encryption, using an Advanced Multi-Band Excited +2 (AMBE+2) or Newer P25 Phase 1 and Phase 2 vocoder, DES-OFB and federally approved 256-bit AES coding to provide enhanced security during transmission and reception of sensitive communications.

5.4.7 Incorporate electronic, alphanumeric displays (minimum of eight characters) to provide visual indication of system availability, channel/talk group selection, incoming user ID, call alerts and operational status such as scan and channel busy.

5.4.8 Include transmit time out timer to warn the user that the radio may be transmitting longer than a predetermined time limit and then disable the transmitter.

5.4.9 Control station packaging shall incorporate sufficient electromagnetic shielding of radio and power supply components to allow multiple control stations to be located at the same site without causing unit-to-unit interference.

5.4.10 Minimum electrical specifications as follows:

5.4.10.1 Primary Input Voltage: 120 VAC, 60 Hz, single-phase with 3 conductor grounded line cord.

5.4.10.2 Optional Battery: 12 VDC designed for 8 hrs. of operation

5.4.10.3 Environmental: MIL-STD 810 C, D, E, F and G for shock, vibration, humidity and high/low temperature.

5.4.10.4 Temperature Range: -30 °C to +60 °C

5.4.10.5 Humidity: 95% relative humidity at 50 °C

5.4.10.6 Talk Group Selection: Rotary-knob style

5.4.11 **Transmitter** specification are as follows:

5.4.11.1 Frequency Range: 764 to 870 MHz

5.4.11.2 Channel Capacity: 500 channels

5.4.11.3 Talk Group Capacity: 16 talk groups per system/tier, minimum

5.4.11.4 Talk Group Capacity: 16 talk groups per system/tier, minimum

5.4.11.5 RF Power Output: 18 W (700 MHz); 30 W (800 MHz)

5.4.11.6 RF Output Impedance: 50 ohms

5.4.11.7 Channel Spacing: 12.5/6.25 KHz, NPSPAC

5.4.11.8 Spurious/Harmonic: At least 70 dB below carrier

5.4.11.9 Frequency Stability: 1.5 PPM from -25 °C to 60 °C

5.4.11.10 Emission: 16K0F3E; 11K0F3E; 8K10F1D; 8K10F1E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission.

5.4.11.11 Modulation Deviation: +/-2.5KHz for 12.5KHz channel, +/-4 KHz NPSPAC

5.4.11.12 Audio Distortion: Less than 2% at 1 KHz

5.4.11.13 Audio Response: +/-3 dB of a 6 dB-per-octave pre-emphasis, characteristic, 300Hz to 3KHz.

5.4.11.14 Duty Cycle: Transmitter 20-80%

5.4.11.15 Hum and Noise -35dB

5.4.12 **Receiver** specifications are as follows:

5.4.12.1 Frequency Range: 764 to 870 MHz

5.4.12.2 Channel Capacity: 500 channels

5.4.12.3 Channel Spacing: 12.5/6.25 KHz/NPSPAC

5.4.12.4 Adjacent Channel Rejection: -63 dB

5.4.12.5 Digital Sensitivity 5% BER: 0.35 µV

5.4.12.6 Frequency Stability: 1.5 PPM from -25 °C to 60 °C

5.4.12.7 Intermodulation Rejection: -75 dB

5.4.12.8 Spurious Response Rejection: -75 dB

5.4.12.9 Audio Output: Not less than 3W

5.4.12.10 Audio Distortion: No more than 2% at 1 KHz

5.4.12.11 Duty Cycle (EIA): Receiver 100%

5.5 Base/Repeater Stations

All Base/Repeater P25 radios proposed shall:

5.5.1 Meet APCO minimum recommendations and EIA/TIA standards for P25 Public Safety digital trunked/conventional radio systems (depending upon application within sites).

5.5.2 Furnished equipment must be capable of operation as a combined Phase 1 and Phase 2 infrastructure.

5.5.3 Be designed for 100% continuous-duty operation at full manufacturer specification.

5.5.4 In P25 multi-site and simulcast configurations, base stations shall utilize linear RF power amplifiers and function in a linear simulcast mode that minimizes to the greatest extent possible destructive time-delay interference within site coverage-overlap regions and minimizes digital modulation distortion, termed modulation fidelity.

5.5.4.1 Modulation fidelity, for this Specification, is a measurement of the degree of closeness that the transmitted modulation matches the ideal theoretical modulation for P25 Phase 2 waveforms.

5.5.5 Incorporate site monitor and infrastructure alarm systems having the ability to report major/minor infrastructure functionality alarms on multiple dispatch-located alarm console display devices. Additionally, the alarm reporting system shall have the capability of being remotely accessed for the monitoring and remote-interrogation of field/site related alarms, using a laptop configuration from any node within the network.

5.5.6 Utilize the proposed 48VDC battery backup subsystem.

5.5.7 Include a "Fail-over / Fail-Soft" trunking scheme designed to maintain network performance as critical site components fail. System must be fault tolerant with redundant levels of computer hardware/software, as necessary, to maintain trunked operation during equipment failures.

5.5.8 Support special services, i.e. encrypted voice, data transmission, multiple Computer Aided Dispatch (CAD) system interfaces, Automatic Vehicle Location (AVL) interfaces, audio recording of talk groups, and collection of system operational data.

5.5.9 7/800MHz P25 Repeater station specifications are as follows:

5.5.9.1 General Specifications:

5.5.9.1(a) Frequency Range:	764-776MHz, 851 to 870MHz
5.5.9.1(b) Number of Frequencies:	One transmit; one receive
5.5.9.1(c) Channel Spacing:	25/12.5KHz
5.5.9.1(d) Channel Capacity:	1
5.5.9.1(e) Input Voltage:	48VDC operation
5.5.9.1(f) Temperature Range:	-30°C to +60°C
5.5.9.1(g) Humidity:	90 % relative humidity @ 50°C (typical)

5.5.9.2 **<u>Transmitter</u>** specifications are as follows:

5.5.9.2(a) Output Impedance:	50 Ohms
5.5.9.2(b) Power Output:	100 watts
5.5.9.2(c) Frequency Stability:	0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.
5.5.9.2(d) Emission:	8K30F1W; 8K70D1W; 9K80F1D; 11K2F3E; 9K80F1D, 9K80D7W or comparable Phase 2 Emission.
5.5.9.2(e) Modulation Deviation:	+/-2.5KHz (12.5KHz), +/- 4KHz (NPSPAC)
5.5.9.2(f) Channel Spacing:	25KHz; 12.5 KHz
5.5.9.2(g) Audio Distortion:	2% at 1KHz
5.5.9.2(h) Audio Response:	Within +1, -3db of 6dB/octave per EIA

5.5.9.2(i) Spurious/Harmonic: -65dB

5.5.9.3 **Receiver** specifications are as follows:

5.5.9.3(a) Frequency Range: 792-825MHz

5.5.9.3(b) Modulation Acceptance: 1KHz off channel

5.5.9.3(c) Selectivity: -70dB

5.5.9.3(d) Sensitivity: 0.25uv

5.5.9.3(e) Intermodulation: -80dB

5.5.9.3(f) Spurious/Image: -85dB

5.5.9.3(g) Frequency Stability: 0.01-PPM (GPS standard)

5.5.9.3(h) Channel Spacing: 12.5KHz

5.5.9.3(i) Audio Distortion: 2% at rated audio line level (600-Ohm)

5.5.9.3(j) Audio Response: Within +1/-3dB of 6dB/octave per EIA

5.5.9.3(k) Duty Cycle (EIA): Receiver 100%

5.5.10 Minimum 800MHz Analog Base/Repeater station specifications are as follows:

5.5.10.1 General Specifications:

5.5.10.1(a) Frequency Range: 806 to 869MHz

5.5.10.1(b) Number of Frequencies: One transmit; one receive

5.5.10.1(c) Channel Spacing: 25/12.5KHz

5.5.10.1(d) Channel Capacity: 10, minimally

5.5.10.1(e) Input Voltage: 48VDC operation

5.5.10.1(f) Operating Temperature: -30°C to +60°C

5.5.10.1(g) Humidity: 90 % relative humidity @ 50°C (typical)

5.5.10.2 **<u>Transmitter</u>** specifications are as follows:

5.5.10.2(a)	RF Output Impedance:	50 Ohms
5.5.10.2(b)	Power Output: 100 watts	
5.5.10.2(c)	Frequency Stability:	0.01 PPM from -30 °C to +60 °C ambient, when referenced to site-based GPS-disciplined frequency standard.
5.5.10.2(d)	Modulation Deviation:	0 to +/- 5KHz (25KHz), 0 to +/- 4KHz (NPSPAC)
5.5.10.2(e)	Modulation Type:	Analog FM 16K0F3E
5.5.10.2(f)	Channel Spacing:	25KHz; 12.5 KHz
5.5.10.2(g)	Audio Distortion:	2% at 1KHz
5.5.10.2(h)	Audio Response:	Within +1, -3db of 6dB/octave per EIA
5.5.10.2(i)	Spurious/Harmonic:	-65dB

5.5.10.3 **<u>Receiver</u>** specifications are as follows:

5.5.10.3(a)	Frequency Range:	806-825MHz
5.5.10.3(b)	Modulation Acceptance:	1KHz off channel
5.5.10.3(c)	Selectivity:	-70dB (-80db for 25KHz channel)
5.5.10.3(d)	Sensitivity:	0.25uv
5.5.10.3(e)	Intermodulation:	-80dB
5.5.10.3(f)	Spurious/Image:	-85dB
5.5.10.3(g)	Frequency Stability:	0.01-PPM
5.5.10.3(h)	Channel Spacing:	12.5KHz
5.5.10.3(i)	Audio Distortion:	2% at rated audio line level (600-Ohm)
5.5.10.3(j)	Audio Response:	Within +1/-3dB of 6dB/octave per EIA
5.5.10.3(k)	Duty Cycle (EIA):	Receiver 100%

5.6 Fixed Microwave Equipment Requirements

5.6.1 The microwave network shall adhere to Jackson County's network management plan as defined in Appendix G: Network Management Requirements.

5.6.2 Digital voice/data technology shall be used to minimize audio-phase delays and/or incompatibility of audio levels within the proposed network solution.

5.6.3 Where VoIP techniques are used to interconnect infrastructure sites, in lieu of traditional PCM multiplex channel schemes, a robust means shall be provided thereby assuring that the highest priority possible is given to voice packet delivery.

5.6.4 Redundant transmit, receive and base band equipment for each site, configured for automatic hot standby operation, shall be provided by the Vendor. This redundant equipment will automatically switch to the hot standby component(s) upon failure of the primary equipment.

5.6.5 A Microwave Alarm System shall be provided by the Contractor to monitor microwave site functions and to provide alarm status of abnormal operational parameters of equipment associated with the microwave system. Microwave major alarms shall be integrated within the radio alarm packaged supplied by the Contractor.

5.6.6 An orderwire channel with individual site handsets will be provided to link all microwave locations for testing and troubleshooting.

5.6.7 A separate 48VDC microwave standby battery system will be provided and sized for 48-hours of continuous microwave equipment operation at each infrastructure site.

5.6.7.1 An automatic low-voltage disconnect system will be employed to protect the battery plant from deep-cycle discharge damage.

5.6.8 The microwave system shall have no less than one gigabit (1 Gb) of bandwidth.

5.6.8.1 Band width required for the trunked radio system will be protected to prevent derogation in the quality of service.

5.6.8.2 All remaining bandwidth not utilized by the trunked radio system will be made available for Jackson County.

5.6.8.3 Virtual LANs will be provided at each MPLS server location.

5.6.9 Microwave system availability shall be no less than 99.999%. 6GHz path segments longer than 12-miles must utilize space-diversity. The system shall be loop-configured with hitless directional switching.

5.6.10 11GHz path segments, if any, shall be no longer than 4-miles in length. The use of 11GHz and higher is discouraged, except in the instance where required by the FCC.

5.6.11 Microwave antennas, radomes, and antenna mounts supplied and installed will be capable of surviving wind speeds of up to 150mph and maintaining reliable operations during sustained storm force winds of up to 125mph. Each furnished antenna system will be equipped with dual stiff arms/ruggedized mounts to limit antenna vibration and flexing during high wind events.

5.6.12 Minimum operational service parameters of each microwave link are as follows:

5.6.12.1 Unfaded Bit Error Rate (BER):	Not Less Than 10^{-10}
5.6.12.2 Calculated RF Link Fade Margin:	Not Less Than 40dB
5.6.12.3 Link Outage Level:	To coincide with 10^{-3} BER, to occur at a signal level not less than 3db in excess of the calculated RF link fade margin.

5.6.13 Microwave system shall incorporate a quadrature amplitude modulated adaptive protocol that automatically adjusts protocol to maintain critical communications during abnormally faded conditions. This technique is intended to extend the microwave system's functionality to beyond that of the normal 40db flat fade margin.

5.6.14 Proposers shall use high-power amplifiers (i.e., 36dBm to 39dBm), as may be necessary, to achieve the best balance between antenna size versus the 40db flat fade margin requirement.

5.6.15 In no case should antennas larger than 8ft. in diameter be considered for this project unless high-performance antennas are required due to interference mitigation requirements as noted by the Frequency Coordinator.

5.6.16 The Contractor shall be responsible for the engineering and filing costs for microwave system frequency coordination, prior coordination notification, FCC license application preparation and submittal of necessary microwave licensing documents on behalf of Jackson County.

5.7 Additional Submittal Requirements:

The Vendor is not required to present a detailed path design of the proposed microwave subsystem for the purpose of its Technical Submittal, as such work is dependent upon exact antenna placements that will be resolved by the Contractor during the various design review meetings to be held prior to System construction.

The Vendor shall provide the following information as part of its Technical Proposal Submittal:

5.7.1 Technical specification literature for its proposed microwave radio, antenna and related equipment.

5.7.2 A sample path profile analysis indicative of the scope to be used during the actual microwave analysis process.

5.7.3 A sample test and alignment verification process, to be used during the commissioning of the new microwave subsystem.

5.7.4 The Vendor may not reuse/reconfigure Jackson County's existing microwave equipment as this equipment is no longer supported and is expected to have no operational value within the new System's deployment.

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6.0 Coverage Criteria

6.1 General

The System's P25 digital trunked radio network shall be designed to support portable hand-carried radio equipment, operated on street, at physical locations throughout Jackson County. The Vendor must fully identify and guarantee the coverage predicted for its solution, per the functional and operational requirements of this Specification. The Vendor shall provide within its proposal response a sample Coverage Test and Acceptance Plan that encompasses the elements described below:

6.2 Coverage parameters

The Vendor must consider the following operating parameters in the development of their coverage guarantee:

6.2.1 Shoulder/microphone units without antennas will be used with portable radio units in most instances and shall be the normal configuration considered for coverage design. Body and obstruction losses must therefore be considered in the proposed network design for both talk-in/talk-out coverage analyses.

6.2.2 Flexible, **quarter wavelength antennas** shall be required for portable units. Coaxial-skirt type or ½ wave antennas are not acceptable due to size and other mechanical/ergonomic limitations.

6.2.3 Mobile unit configurations shall utilize 3db 700/800MHz antennas. These antennas shall be located on the vehicle's trunk, having an average base level height of 3.5ft.

6.3 Noise Floor & Interference

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

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

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

6.4 Service Area

6.4.1 Portable radio on-street, on the hip coverage must extend throughout no less than 95% of that area within the land region encompassed by Jackson County and one-mile outside of Jackson County.

6.4.2 The system shall support mobile coverage throughout the County and one mile outside of the County at 97% coverage/DAQ4.0.

6.4.3 Portable radio coverage within buildings is required. The System shall support no less than 95% coverage/DAQ-3.4 within residential structures throughout all areas of Jackson County. In addition, portable radio to this same or greater reliability and audio quality is required within a specific set of critical building locations, as described herein and Appendix D Critical Building List.

6.4.3.1 The system shall support no less than 95% coverage within 20dB structures throughout the following cities.

- Arcade
- Braselton
  - Shall support no less than 95% coverage within 20db structures throughout the city of Braselton, GA and one mile outside the city of Braselton. This includes any areas in the surrounding counties that the city of Braselton occupies.
- Commerce
- Jefferson
- Maysville
- Nicholson
- Pendergrass

6.4.4 Coverage is defined as the minimum usable signal necessary to provide a clearly readable voice signal without repetition (no syllables lost) from locations outdoors, at street level, within the defined service area. Using the Delivered Audio Quality representations described in TIA TSB-88D, the delivered audio quality throughout the service area shall be no less than DAQ 3.4 for mobile and portable operations.

6.4.5 All references to coverage reliability in this Specification refer to statistical area reliability. For example, the phrase "95% coverage" indicates that the total area described shall exhibit at least 95% statistical probability that coverage areas, if tested, would be found to support electrical performance which equals or exceeds that minimum signal level necessary for that Contracted delivered audio quality.

6.4.5.1 It will not be acceptable to provide a coverage guarantee which includes a relatively large number of failed points within any single vicinity, while still meeting the overall goal of 95% coverage.

6.4.5.2 It will not be acceptable to have a failure of six or more contiguous test points.

6.5 Propagation Analysis

The Vendor shall provide written descriptions of the processes and propagation models used to calculate proposed area coverage objectives.

Coverage maps and other pertinent calculations must be submitted with the following minimum information clearly defined for each map or submittal:

6.5.1 Transmitter site power output.

6.5.2 Antenna gain and type (Include transmission line losses).

6.5.3 Effective signal level necessary, at both infrastructure and user radio antenna ports, to produce DAQ 3.4 delivered audio quality in the typical land mobile radio environment (inclusive of noise floor degradation, if any).

6.5.4 Antenna height.

6.5.5 Portable unit effective radiated power.

6.5.6 Portable unit effective receiver sensitivity.

6.5.7 Transmitter site talk out range, individual site as well as composite coverage.

6.5.8 Portable unit talk-in range, individual sites as well as composite coverage.

6.5.9 A statement defining the percentage of land area covered shall be provided for each submitted map configuration.

6.5.10 Okamura modeling should be used for propagation projection.

6.6 Coverage Acceptance Criteria

Verification of the installed system's coverage is a component part of the Test and Acceptance criteria described in Section 14.0, Phasing and Implementation.

6.6.1 Vehicular coverage testing (performed within a road vehicle during terrestrial coverage testing or watercraft when performing river or lake coverage testing) shall be done with computer-controlled test equipment.

6.6.1.1 This equipment shall automatically record the position of the test vehicle (by means of GPS positioning) at the time of a reading and records the signal strength of at least 200 signal samples over a 40-wavelength period for each reading taken within a test grid. Signal strength measurements shall be made continuously along the drive route.

6.6.2 Test grid sizes within urban areas shall utilize grid sizes no greater than 1320 feet x 1320 feet. Grids sizes within rural areas shall be 1-mile.

6.6.3 A minimum number of accessible grids, sufficient to provide statistical accuracy of results in the order of 0.25% or less, shall be tested.

6.6.4 Jackson County and the Contractor shall mutually determine the size/location of grids and a suitable drive route that encompasses the entirety of accessible grids. This testing shall apply to any area capable of being traversed by a 4x4 vehicle. Inaccessible grids will be excluded from the coverage result calculations.

6.6.5 Field strength test results obtained throughout the coverage area, in accordance with minimally required reliability percentages, shall be of sufficient level to produce a Delivered Audio Quality (DAQ) rating of 3.4 or higher (see Figure 1 below) throughout the predicted service area to be considered passing.

DAQ	DESCRIPTION
5	Reception is very clear, and the message is perfectly readable. No background noise is present, and every word is understood.
4	Reception is clear, but with slight background noise. Message is readable and every word is understood.
3.4	Reception is clear, but with slight background noise. Message is readable and understood with few/occasional missing syllables.
3	Background noise is evident. Message is readable and understood even with missing syllables.
2	Background noise is prevalent. Message is readable with difficulty and requires repetition.
1	Evidence that transmission being made. Voice message is barely discernible, and no words are understood. Unusable.
0	No transmission is heard. No activity on the channel is evident.
CPC is set to the midpoint of the Range. SINAD values are NOT to be used for system performance assessment.	

Figure 1

6.6.6 Mobile radio signal strength measurements shall be made from either a terrestrial (land) vehicle moving at approximately 35 mph, or a watercraft (river) vehicle traveling at approximately 20-knots.

6.6.7 The device used to measure field intensity shall be stable and have a dynamic range suitable for the conditions under test.

6.6.8 Prior to the execution of these test activities, all test equipment and data gathering equipment to be used shall be fully certified by an independent testing laboratory having calibration tools traceable to the National Institute of Standards and Technology. These certification documents shall be presented to Jackson County's project staff prior to coverage testing.

6.6.9 The test output shall be retained by a laptop computer or an equivalent computer device. The Contractor shall submit a written and/ or graphical report containing an analysis of the test results to Jackson County daily, and a formal report at the end of the test.

6.6.10 The Contractor's analysis shall include maps of the coverage area divided into grids, with the test results for drive tests displayed in each grid on a separate map.

6.6.11 All test data, in its raw form, shall be made available for independent inspection.

6.6.12 Jackson County reserves the right to reject any instrumentation or procedures.

6.6.13 During these tests, the System's P25 transmitter(s) output power shall be monitored by Jackson County and no adjustments shall be made to the transmitter(s), portable/mobile radio units or test instrumentation after appropriate calibration of all involved equipment.

6.6.14 Should Jackson County reject any portion of the test, the Contractor shall correct the errors and omissions as defined by Jackson County at no additional cost.

6.7 Audio Quality Test Process

In addition to the signal level collection method describe above, the Contractor shall be required to conduct a voice audio quality test of the System.

6.7.1 The P25 digital portion of the new radio system shall encompass an automated BER Test for both in-bound and outbound transmission pathways.

6.7.2 The Contractor shall, as part of its Acceptance Test, produce a BER Test Report that correlates actual BER to predicted results.

6.7.3 Of those accessible grids evaluated because of the field-testing process, no fewer than 97% shall achieve a BER that is directly correlated to DAQ-3.4, as defined by EIA/TIA TSB-88D, as depicted by Figure 1 below. A call transmission failure in either direction shall be considered a failure of the tested grid.

6.7.4 The BER test shall encompass the same grid structure are devised for the signal level test process.

6.7.5 A manually-conducted voice quality test simulating in-residence portable radio operations shall also be conducted.

6.7.5.1 In conducting portable voice quality testing, vehicular-mounted mobile radios will be utilized in Contractor-equipped vehicles, but with appropriate transmission line attenuators installed to replicate outdoor portable radio operations.

6.7.5.2 Jackson County's service area shall be comprised of test grids equal to those used in BER testing.

6.7.5.3 Test calls for each grid will be transacted, vehicle-to-base and base-to-vehicle, with the results for each call segment scored as per TSB-88D recommendations.

6.7.5.4 No fewer than 95% of the total number of grids tested in this manner shall be ranked as achieving DAQ-3.4 audio quality, or higher.

6.7.5.5 A failure in either call direction shall be considered as a failure of the tested grid.

6.7.6 The following voiced audio quality verification process shall apply:

6.7.6.1 The portable radio voice quality testing shall be performed using a minimum of ten phonetically balanced phrases, to be supplied by the Contractor.

6.7.6.2 A successful test measurement shall be one which requires no repetition to understand the spoken phrase and with a DAQ of 3.4.

6.7.6.3 A successfully tested grid is defined as one in which communications from a dispatch console to a field radio unit, as well as for the reverse path, are not less than DAQ 3.4 as described above.

6.7.7 Jackson County shall designate the test team(s) to participate in coverage testing.

6.7.8 All test vehicles shall be provided by the Contractor and be off-road capable. Where boats are required, these shall be provided by Jackson County.

6.7.9 Testing shall commence daily at 8:00 AM and will cease at 4:30 PM. At least three teams will conduct the tests in the interest of timely completion.

6.7.10 Failure of Contractor test equipment shall not be considered as an acceptable reason for a Contract time extension.

6.7.11 Jackson County will not pay for retesting caused by delays or equipment failures.

6.7.12 Testing will proceed through weekends and during peak foliage until concluded.

6.7.13 Final System Acceptance shall not be achieved until the constructed System successfully equals or exceeds the coverage performance guaranteed by the Contract.

6.8 Critical Building Coverage Test Process

6.8.1 Coverage shall be no less than 95% inside of the listing of representative buildings contained in Appendix D. It is desired that most of these building structures shall be supported by the proposed fixed infrastructure (tower sites). However, the Vendor shall exercise good judgment in balancing the proliferation of costly infrastructure tower sites with the number of building sites. The use of building amplifier systems, while necessary in some instances, shall likewise be minimized to the most practical and fiscally responsible extent possible

6.8.2 The Vendor shall specifically identify those buildings from that list that are likely to require building amplifier systems.

6.8.3 If any of these representative buildings fail to demonstrate 95% reliable coverage (DAQ 3.4 Audio Quality), the following procedure will be followed:~~the following procedure will be followed:~~

~~6.8.3~~6.8.3.1(a) The vendor must propose a testing method showing how the failed building will be tested to verify that it does or does not meet the in building coverage criteria.

~~6.8.3.1(a)~~ ~~Measurements will be made from every failed test point to determine if in-building loss exceeds 20dB for that specific test point.~~

~~6.8.3.1(b)~~ ~~If penetration loss exceeds 20dB, that specific test point will be omitted from reliability calculations.~~

~~6.8.3.1(c)~~ ~~If penetration loss is equal to or less than 20dB, that specific test point will remain included in the reliability calculations.~~

~~6.8.3.1(d)~~ ~~After determining which (if any) test points are omitted, reliability calculations will be repeated. At that time, reliability of less than 95% for the structure represents a failure for the building.~~

~~6.8.3.1(e)~~6.8.3.1(b) If insufficient coverage is identified from that previously predicted, the Contractor will be responsible for modifying the System, at no additional cost to Jackson County, as may be necessary to achieve the required reliability within the failed building. This may include any or all the following approaches:

- Bi-directional amplifier (BDA) system installed in the building.
- Passive repeater systems installed in the building.
- Satellite receiver systems in or near the building.
- Modifying/adjusting repeater site antenna systems.

The determination to utilize a BDA within any structure will be engineered as a part of a comprehensive system design. BDA systems shall not be installed in structures in such a manner or proliferation that creates interference with the overall System's operation.

If any changes are made to the fixed sites (such as re-orienting antenna patterns) in order to resolve building coverage failures, then a complete re-test of coverage shall be required at no additional cost to Jackson County.

7.0 Dispatcher Console Requirements

7.1 General

It is a requirement that Jackson County's existing/legacy radio configuration remain operationally available during the installation and acceptance phases of the P25 System. Jackson County will permit the co-location of new dispatch console equipment with this legacy equipment during the project's user migration phase and until project acceptance.

7.2 Radio Console Locations

7.2.1 Jackson County currently utilizes one dispatch center for 911, Law, Fire, EMS, and other public safety agencies within the county. The dispatch center is an attachment to the Jackson County Jail and Sheriff's office building located at 555 Stan Evans Dr, Jefferson, GA 30549. There is a quantity of nine (9) consoles at this location.

7.2.2 Jackson County is in the process of identifying a location for a new back up dispatch center. This backup location will have four (4) additional new consoles. The new location will include a monopole tower if required, microwave connectivity to the P25 radio system, and DC battery backup for the microwave.

7.3 Console Installation Requirements

In proposing a console solution, the Contractor shall:

7.3.1 Replace all existing radio dispatch consoles at Jackson County's dispatch center(s) with an IP-based solution and have seamless integration with the newly proposed System radio network.

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

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

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

7.4 Desired Functionality

Due to the critical nature of the communications services provided by these public safety dispatch facilities, a high degree of reliability for the new radio dispatch console subsystem is required.

7.4.1 General Operations

The console subsystem, to the greatest extent possible, shall:

7.4.1.1 Be automatically self-correcting.

7.4.1.2 Provide continuous and automatic self-testing and diagnosis.

7.4.1.3 Alert the operator in the event of component or sub-system failure.

7.4.1.4 Allow continued operation of the remaining consoles in the event of failure to a specific console, through isolation of the defective console device.

7.4.1.5 Be of a design that eliminates single points of failure.

7.4.1.6 Utilize packet-based, in lieu of traditional circuit-switched, technologies.

7.4.1.7 Modularity is likewise envisioned to reduce the number of sub-systems affected by a single component failure. Repair of sub-systems without totally disabling multiple radio console positions shall be required, as continued console operation is necessary during repair.

7.4.2 Diagnostics

7.4.2.1 The new dispatch console subsystem shall be equipped with several self-diagnostic elements that continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics, and between the console electronics and the System.

7.4.2.2 Diagnostic capability shall be distributed among independent and redundant subsystems and shall not rely on one central diagnostic circuit.

7.4.3 Power Supply

It is a critical requirement that power loss or surges shall not affect radio dispatch operations.

7.4.3.1 Power loss or surges shall not alter the system software or operating parameters at the radio dispatch positions.

7.4.3.2 External power to each console shall be supplied by a nominal 120VAC, 60Hz, single-phase power source.

7.4.3.3 All dispatch console equipment, in each dispatch facility, shall be connected to an outlet on a circuit that is protected by a UPS and supported by the site's emergency power generator. Emergency Backup power at each dispatch site is not the responsibility of the Vendor.

7.4.4 Flat Panel Display

7.4.4.1 A state-of-the-art color, non-interlacing minimum 22-inch display shall be provided.

7.4.4.2 Each operator shall have the ability to change screen displays to suit operator preferences.

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

7.4.5 Headset Jack Configuration

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

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

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

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

7.4.6 Footswitch

7.4.6.1 The Contractor shall supply and install a switch for each console.

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

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

7.4.7 Master Time Source

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

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

7.4.8 Dispatcher Headsets

Each position shall be provided with Plantronics model CA12CD wireless headset hardware for connectivity into the proposed radio console headset jack hardware.

7.4.9 Digital Fixed Station Interface

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

7.4.10 Dispatch Console Positions

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

Each console position shall contain as a minimum:

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

7.4.10.2 Unselect speaker – for audio from unselected channels/ talk groups, with volume control.

7.4.10.3 Resource selectable speaker – Minimum of 8 additional speakers which allow for console audio resources to be dynamically assigned by the operator.

7.4.10.4 Transmit Function – a color-coded transmit function to control the push to talk (PTT) function for the selected transmitter(s) and/ or talk group(s).

7.4.10.5 CTCSS Monitor or Disable Function – shall disable the receiver CTCSS decoder of selected conventional base station(s) operating on conventional channels for monitoring purposes.

7.4.10.6 Clock – shall display time in twenty four-hour formats and shall be synchronized with the time server.

7.4.10.7 VU Meter or Audio Level Display.

7.4.10.8 Keypad or screen representation of a keypad for numeric data entry.

7.4.10.9 Microphone – desktop microphone type. This microphone shall be resistant to interference, such as transmitting hum from lights, cathode ray monitors, or other devices used in the proximity of the console.

7.4.10.10 Dual Headset Jack – a dual headset jack shall be provided which will allow for use of a headset equipped with RJ-327 type plug with modular adapter. Separate headset volume controls for radio and telephone audio output shall be provided.

7.4.10.11 Intercom – intercom between operator positions shall be provided. A visual display shall be provided to identify both the calling and called parties by console name. Multiple simultaneous intercom conversations between individual consoles shall be possible.

7.4.10.12 ID Display on the channel window for standard calls and emergency calls with a minimum of eight alphanumeric characters.

7.4.10.13 All Receiver Mute Function – a function, which will mute the received audio from all unselected channels, shall be provided. This muting function shall be programmable in predetermined increments.

7.4.10.14 Simultaneous Select and Instant Transmit Function – controls shall be provided that allows the operator to manually select any combination of console controlled base stations for simultaneous transmissions. Three selectable combinations shall be allowed at the discretion of the dispatcher.

7.4.10.14(a) The patch shall utilize a single trunked channel when patching more than one talk group.

7.4.10.15 Emergency/ Reset

7.4.10.15(a) Consoles shall receive emergency alerts from the trunked radio system regardless of the status of the channel control window.

7.4.10.15(b) Emergency messages shall be indicated by a flashing ID, and emergency ID character and an audible alert.

7.4.10.15(c) Dispatcher acknowledgment of the message shall silence the audible alert and stop the flashing display.

7.4.10.15(d) Multiple emergency messages shall be queued in the display stack and the emergency ID character shall continue to flash until all messages have been viewed and subsequently cleared by the dispatcher.

7.4.10.16 Alert Tones
the console shall be provided with three distinct tones used for alerting purposes over the air. Each alert tone shall be immediately broadcast, when activated, on the selected radio channel.

The following selections shall be available as a minimum:

7.4.10.16(a) Alert 1 – Steady Alert Tone – shall generate a nominal 1000 Hz steady tone.

7.4.10.16(b) Alert 2 – Warbling Tone – shall generate a warbling tone.

7.4.10.16(c) Alert 3 – Pulsed Alert Tone – shall initiate an automatic sequence, consisting of a nominal 1000 Hz tone, for a period of two (2) seconds.

7.4.10.17 Paging Encoders – Each console shall include a multi-tone paging/signaling encoder that is accessible, minimally, through the data entry keyboard.

7.4.10.18 Call Indication – a color-coded status call indicator shall be provided for each receiver in a channel control window on the display screen.

7.4.10.19 Individual Volume Adjust – shall be provided for each channel on the console. Associated color-coded status indicators shall continuously show whether the channel is in the full or adjustable volume control shall be automatically bypassed when a channel is placed in select status.

7.4.10.20 Talk group/Channel Cross Patch

7.4.10.21 Channel/Group Name – designated channel/ group control modules shall include a minimum of eight-character alphanumeric display symbols to identify the channel/group.

7.4.10.22 Talk Group/Channel Busy Indication

7.4.10.23 NENA interface – Connectivity to existing E911 and future NG911/IP telephony system (provided by others) for single headset operation.

7.5 Video Display Installation

7.5.1 The installation of the Video Display(s) used for the radio dispatch positions shall be desk mounted on furniture.

7.5.2 Contractor-furnished cabling shall be neatly installed and protected from physical damage. Installation plans will be approved by Jackson County prior to physical installation.

7.5.3 Cable raceways shall be used where possible.

7.5.4 No cabling shall create a safety or mobility problem for dispatch personnel.

7.6 Console Electronics Description

7.6.1 Console electronic circuitry shall be housed in an equipment rack/enclosure specific for each dispatch console position.

7.6.2 When installed by the Contractor, sufficient space for front and rear servicing of this equipment shall be provided.

7.6.3 The use of a centralized console electronic bank that supports audio and control signaling between multiple dispatch console positions is non-compliant and will be rejected.

7.6.4 Console electronic enclosures shall contain the various microprocessors, console interfaces, auxiliary function interfaces and other interfaces needed for radio dispatch operations.

7.6.5 If multiple circuit cards are required within the Vendor's enclosure solution, these shall be of plug-in design and shall be able to be inserted and/or removed with power applied and the location's other dispatch positions/equipment remaining on-line.

7.6.6 System Interfaces

7.6.6.1 The digital voice network's radio dispatch subsystem shall include the circuitry required to operate remotely-controlled base stations and the System repeaters as described by this Specification.

7.6.6.2 At a minimum, each base station interface shall consist of a plug-in circuit card (or the software equivalent) containing VoIP-related circuitry, line driver amplifiers, two-wire and four-wire receive amplifiers, digital automatic level adjustment circuitry and fault-diagnostic circuitry.

7.6.6.3 The interface shall also be capable of remotely controlling base stations via E/M multiplex-channel, and 2175Hz tone-burst signaling, as may be needed for legacy equipment.

7.6.7 Auto Diagnostics/Self-Healing and Diagnostic Features

7.6.7.1 The radio dispatch subsystem shall be equipped with many self-diagnostic capabilities that shall be configured to continuously monitor and verify the correct operation of each distributed microprocessor, each audio path in the console electronics and between the electronics and each radio network base station site.

7.6.7.2 In the case of voice transactions using the Internet Protocol, specialized coding shall be used to assure the timely delivery of audio packets to destinations such that recovered or transmitted audio is absent of noticeable voice delays or audio truncation.

7.6.8 Console Auxiliary I/O Functions

7.6.8.1 All external auxiliary input and/or output (Aux I/O [logic or relay]) functions shall be controlled through an auxiliary interface module.

7.6.8.2 These functions shall be controlled from the console position as required.

7.6.8.3 The Aux I/O shall be capable of operating a 3-light status light/alert system, supplied by the vendor, to indicate each position is operating a radio transmission, or telephone call, on each console position.

7.7 Fallback Control Stations

7.7.1 Each dispatch and supervisory position shall be equipped with a P25 trunked control station to permit radio dispatch operations to continue in the event of radio console equipment or connectivity failures.

7.7.2 These control stations, in addition to the minimum requirements specified by Section 5.3, must contain an alphanumeric display to provide information on talk group selection and emergency call alerts.

7.8 Recorder Interface[1]

[1] When Client requires an audio recording system make sure to determine the number of analog and VoIP connections that must be supported. Also describe the instant call recorder needs, if any.

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

In addition, the recorder shall include:

7.8.1 Capability to record from a Viper 5.1, revision 59 office PBX, via IP recording.

7.8.2 At least twenty-four (16) channel analog recorder inputs for telephone lines, and other analog audio sources.

7.8.3 At least twenty-two (22) channel VOIP recorder inputs for telephone lines.

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8.0 General Equipment Shelter Requirements

8.1 Shelter Design Considerations

Equipment shelters shall be of a skid-mounted, bullet-resistant, prefabricated concrete aggregate type designed to house radio communications, the standby power generator/transfer switch, and sensitive electronic equipment:

8.1.1 The interior wall measurements shall be no less than 10ft high, 12ft wide and 30ft long. Exterior dimensions shall include nominal wall, roof and skid dimensions, to be determined by Contractor.

8.1.2 Equipment shelters must provide an interior climate suitable for the operation of sensitive electronic equipment, that is, it must be dust proof, watertight and airtight.

8.1.3 The shelter shall include a separate power generator equipment area that includes a separate access doorway and a fire-barrier separator that isolates the generator area from the HVAC-conditioned radio equipment space.

8.1.4 This generator equipment area shall also be equipped with a ceiling mounted, thermostatically controlled, electrical heater.

8.1.5 Each equipment shelter shall be supported by a concrete pad with attachment devices appropriate for securing the building assembly to survive hurricane force (no less than 150-mph) winds.

8.1.6 In the case of sites determined by FEMA 100-Year Flood maps as requiring elevation due to potential flooding, the affected equipment shelter shall be set on concrete piers or a galvanized steel framework.

8.1.6.1 The finished length of piers/framework shall extend, minimally, four feet above ground level but otherwise in accordance with FEMA's 100-Year flood plain elevation height plus an 18-inch contingency margin.

8.1.7 Skid components, attachment hardware, cross-braces and lifting eyes shall be hot-dipped galvanized after fabrication.

8.2 Shelter Configuration Details

8.2.1 The exterior wall finish shall be exposed aggregate. Seeding of aggregate for an exposed aggregate finish is not acceptable. Exterior walls must be bullet resistant as defined below.

8.2.2 The roof shall be a flat, tapered type having a minimum slope of 1/2" per foot from the roof centerline.

8.2.2.1 The roof shall be designed to support a minimum of 100-lbs/sq. ft. distributed load.

8.2.2.2 A roof shield shall be provided and installed by the Contractor, above the equipment shelter and of sufficient size to adequately protect the shelter and personnel from falling materials via the nearby radio site's tower.

8.2.3 All exterior wall, floor and roof joints shall be sealed using a compressible, resilient sealant. There shall be no exposed roof-to-wall or wall-to-floor joints.

8.2.4 Cement used in concrete shelters shall be standard Portland cement conforming to the requirements of the "Standard Specification of Portland Cement", ASTM Designation C150. Concrete aggregate shall conform to the requirements of the "Specifications for Concrete Aggregates" ASTM C33 and "Specifications for lightweight aggregates for structural concrete" ASTM C330.

8.2.5 Exterior concrete surfaces shall be sealed with a minimum of two coats of Thoroglaze H Sealer or equal.

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

8.2.6.1 The subfloor shall be designed to support a minimum of 200 lbs. / sq. ft. distributed floor load, while on foundation, or as needed to support proposed equipment.

8.2.7 Walls shall have a minimum thermal insulation factor of R11.

8.2.8 The shelter's roof shall have a minimum thermal insulation factor of R19.

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

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

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

8.2.11 Two 36"W x 72"H x 3" thick insulated bullet-resistant steel doors (i.e., one door entry each for the radio equipment space and generator space), equipped with a three-point latch, shall be provided. All door hardware shall be stainless steel and incorporate three external hinges having non-removable hinge pins. Doors shall open outward to maximize internal building utilization.

8.2.11.1 The term 'bullet-resistant" is defined, for this Specification, as unable to be penetrated by a .30-06 or .308 commercial cartridge firing a lead tipped, 160-grain projectile, at not more than 2600 fps muzzle velocity. The projectile will be test-fired at a range of 100 yards. The structure/material must not be completely penetrated at that distance.

8.2.12 Fiberglass exterior awnings shall be provided to protect the door entrances and air-conditioner units.

8.2.13 All hardware used on the exterior surfaces of this shelter shall be either hot-dipped galvanized or stainless steel. Wafer or particleboard wood products are not an acceptable construction material for this project.

8.2.14 Contractor shall provide detailed fabrication drawings for the concrete foundation (or steel frameworks), designed to adequately support the proposed building structures and wind loads.

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

8.2.14.2 Building, and foundation detail drawings and related calculations must be reviewed and approved by a State of Georgia-registered professional engineer.

8.3 Shelter Electrical Requirements

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

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

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

8.3.1.3 Trays shall be bonded to the interior ground halo.

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

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

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

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

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

8.3.7 Two 240VAC electrical circuits shall be provided for the HVAC system. Sizing of these circuits shall be determined by the Contractor.

8.3.8 Install twelve (12), properly grounded with home run grounds, quad 120VAC convenience outlets, two each on the two longest walls and one each on each of the remaining walls; four outlets shall be installed within the generator space.

8.3.9 Twelve (12) 120VAC ceiling mounted outlet boxes shall be provided, each with one (1) duplex receptacle and home run ground.

8.3.10 The Contractor shall furnish and install one circuit breaker panel board. Panel board shall be sized for all the indicated branch circuits, equipment loads plus a fifty percent growth factor.

8.4 Electrical/Transient Grounding System

8.4.1 The Contractor shall furnish and install an interior and buried exterior electrical grounding system and power surge protection for each location, as follows:

8.4.1.1 A single #2AWG copper conductor ground halo shall be installed on all four interior walls, spaced approximately six inches below ceiling level. The halo shall include a twelve-inch gap/break at the furthest point from the single-point ground attachment, which shall coincide with the RF transmission line entrance.

8.4.1.2 Ground halo shall be mounted on six-inch standoffs, located on twelve-inch centers. It shall be affixed to the transmission line ground entry-port buss bar.

8.4.1.3 This ground entry-port buss bar must be equipped with an Alarm, connected to the network's alarming system, to indicate ground failure, tamper, or theft.

8.4.1.4 All equipment cabinets, racks, transmission line entrance and cable trays shall be individually bonded to the halo using #6AWG copper conductors with approved compression fittings.

8.4.1.5 Interior halo shall be bonded to an exterior, buried ground network using low impedance copper conductors.

8.4.1.6 Electrical transient protectors shall utilize MOV and avalanche clamp devices such as the Transector Systems Model 1101-808 series or equivalent. This device shall be installed on the commercial power feed as well as the standby generator feed to the power transfer switch.

8.4.1.7 A single, stranded #00AWG copper exterior ground system shall be installed about the building and tower perimeter, located below the frost line, as identified locally, and exothermically bonded to the building frame, interior halo, transmission line ladder, generator system, ice shields, and radio tower legs. All site grounding practices and methods shall meet a recognized telecommunications standard such as IEEE, Motorola R56 or the current revision of Harris AE/LZT 123 46181/1.

8.5 Shelter Lighting Requirements

8.5.1 Install 4-foot, 2-bulb, 80-watt fluorescent light fixtures as necessary to provide effective illumination for each equipment rack, and within the generator room.

8.5.2 Install emergency exit and interior lighting as required by fire code.

8.5.3 Exterior lights above the doors and area lights on each of the exterior shelter corners shall be controlled by, at a maximum, two light switches located just inside the main door opening on the side away from the hinges at shoulder height.

8.5.4 No LED lights are permitted on exterior walls without prior approval by Jackson County.

8.6 HVAC Requirements

8.6.1 The Contractor shall furnish and install a dual, wall-mounted heating and air-conditioning system appropriately sized for each shelter/equipment heat load.

8.6.2 Each HVAC unit shall incorporate circuitry to ensure that both compressors do not attempt to restart at the same time.

8.6.3 HVAC configuration must include timer circuits to rotate use of the air conditioner units on a weekly basis.

8.6.4 The HVAC configuration shall include appropriate sensors to cause both air conditioners to run simultaneously as needed to more rapidly reduce the internal temperature to a safe operating level.

8.6.5 Equipment shall be furnished with compressor anti-cycle circuitry to prevent short-cycle starts against high compressor head pressure.

8.6.6 Equipment shall be furnished with a compressor hot gas bypass (or its equivalent) to minimize electrical power surges because of compressor cycling.

8.6.7 Design of HVAC system shall take into consideration the following environmental conditions:

8.6.7.1 Desired Interior Temperature:	70 degrees F
8.6.7.2 Maximum Outdoor Temperature:	105 degrees F
8.6.7.3 Minimum Outdoor Temperature:	-30 degrees F
8.6.7.4 Transmitter Power Dissipation:	8,000 watts (24 RF channels)
8.6.7.5 System Controller:	850 watts
8.6.7.6 Battery Charger/Inverter:	2,000 watts

8.6.7.7 Lighting: 750 watts (Intermittent)

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

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

8.6.8.2 A second fan system of this type shall be installed within the generator space.

8.7 Shelter Alarm Systems

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

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

8.7.3 The Contractor shall furnish and install single-loop smoke/ fire alarm system.

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

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

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

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

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

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9.0 LPG Generator Equipment Requirements

9.1 A standby power generator system shall be furnished by the Contractor for each infrastructure site. For its proposed infrastructure sites, the Vendor shall include:

9.1.1 The necessary labor and materials, as required, to furnish and install LPG fuel tanks, automatic transfer switches, manual-operated auxiliary generator connector facilities, alarm functionality and electrical wiring services to provide fully operational standby power systems.

9.1.2 A generator housed within the provided equipment shelter, in accordance with the manufacturer's specifications for shock and vibration mounting, ventilation, fuel supply and electrical connections.

9.1.3 The radiator air inlet shall incorporate a baffle to protect the radiator core from exterior wind-blown debris damage.

9.1.4 It shall be the responsibility of the Contractor to provide, install and test a complete and operable standby power generator with automatic transfer switch.

9.1.5 Equipment shall be new, factory tested at 0.8 power factor for 3-hours and shall be installed within the required equipment shelters, in accordance with local area building and electrical codes.

9.1.6 The following documentation shall be supplied by the Contractor for the generator set and transfer switch supplied:

9.1.6.1 Specification and data sheets for the exact type and model generator and transfer switch supplied pursuant to this procurement, including all options and accessories included.

9.1.6.2 Manufacturer's certification of prototype testing.

9.1.6.3 Manufacturer's warranty documents.

9.1.6.4 Shop drawings showing plan and elevation views of the equipment.

9.1.6.5 Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.

9.1.6.6 Manufacturer's installation instructions.

9.1.6.7 Operator's and maintenance manuals that outline routine maintenance and troubleshooting procedures.

9.1.6.8 Transfer switch manual and wiring diagram.

9.1.7 Start-Up Service shall be included with the following requirements:

9.1.7.1 A factory authorized service representative shall provide initial start-up service and shall conduct on site acceptance testing.

9.1.7.2 The representative must remain until site acceptance is completed, as witnessed by Jackson County.

9.1.7.3 Load test records for the installed generator system shall be furnished to Jackson County.

9.1.8 The following type of engine configuration will be used:

9.1.8.1 The generator package shall include an LPG configured engine coupled with low reactance, brushless 120/240vac single-phase, 60Hz generator.

9.1.8.2 The generator package shall be equipped with:

9.1.8.2.1 A temperature compensated automatic voltage regulator;

9.1.8.2.2 Under/over-speed protection function;

9.1.8.2.3 A control panel;

9.1.8.2.4 Engine block heater;

9.1.8.2.5 High ambient-temperature cooling system.

9.1.9 The generator shall have the following ratings:

9.1.9.1 Output power rating of the generator shall be sized for the full calculated load of the affiliated site, inclusive of a 50% excess load factor.

9.1.9.2 In no instance shall the proposed generator be configured for less than 45KW output.

9.1.9.3 The generator shall also be capable of continuous 24-hour operation, full single-phase output at 1.0 pf.

9.1.9.4 The following specifications shall also apply:

9.1.9.4.1 Voltage Regulation: Maintained with +/- 2% of rated voltage for constant load between no load and full load.

9.1.9.4.2 Frequency Regulation: Maintained within 0.5% from steady state no load to steady state rated load.

9.1.9.4.3 Single-Step Load Pickup: 100% of rated output power, less applicable derating factors, with the engine generator at operating temperature.

9.1.10 The generator shall have the following Set Controls:

9.1.10.1 The generator shall be a remote-start type compatible with the automatic transfer switch to be supplied pursuant to this procurement.

9.1.10.2 Manual starting and stopping shall be provided from the control panel.

9.1.10.3 Cranking control: Shall provide a minimum of three cranking cycles of at least 15-seconds before lockout and activation of an over-crank alarm condition.

9.1.10.4 The generator shall automatically shut down and lock out upon:

9.1.10.4.1 Failure to start (over-crank)

9.1.10.4.2 Over speed

9.1.10.4.3 Low lubricating oil pressure

9.1.10.4.4 High engine temperature

9.1.10.4.5 Low Coolant level

9.1.10.4.6 Other factors that may be harmful to the generator

9.1.11 Alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre-warning, high coolant temperature pre-warning, low coolant temperature, low fuel and an alarm indication when the generator set is running.

9.1.11.1 These alarm contacts shall be wired into, and shall be reported by, the radio network alarm system.

9.1.12 Meters shall be provided and located both at the generator and within the equipment shelter, to indicate output voltage, output current, running time, and frequency/RPM.

9.1.13 An AC rheostat (or electronic equivalent) shall be supplied for fine tuning of the generator's output voltage.

9.1.14 These devices shall be mounted either on the transfer switch door or a separate, remote panel.

9.1.15 Each generator must have the capability to communicate to a central control software terminal, via the IP network, to allow for remote start and other diagnostic capabilities.

9.1.16 Each LPG-Generator shall have the following Fuel Supply requirements:

9.1.16.1 The Contractor shall supply a new, corrosion-proof, 1,000-gallon LPG storage tank to be installed on a concrete or elevated steel foundation, as dependent upon site flood plain conditions.

9.1.16.2 The fuel tank shall provide sufficient fuel to provide six days of continuous operation of the generator set, at full load under low ambient temperature.

9.1.16.3 The fuel tank shall have a shield installed above to prevent debris from the nearby tower puncturing or damaging the tank shell.

9.1.16.4 The tank shall be refilled after the conclusion of radio network acceptance tests.

9.1.16.5 Fuel lines shall be buried below the frost line, as determined by the location. At any point at which the fuel line exits above grade, the line shall be insulated to reduce condensation at the regulator.

9.1.16.6 A low fuel level alarm shall be provided.

9.1.16.7 All fuel supply lines will be sized accordingly for the generator running at full load.

9.1.16.8 All necessary regulators, drip pots, piping, meters, or other supplies needed for installation that meets local fire and building codes shall be furnished and installed.

9.1.16.9 Contractor shall supply a full fuel tank at time of System Acceptance.

9.1.17 A residential-grade exhaust silencer shall be installed on the generator.

9.1.18 Battery and Charger specifications are as follows:

9.1.18.1 A lead acid starting battery, rated for the engine type to be supplied, shall be furnished and installed with the generator package.

9.1.18.2 This battery shall be float charged by a 10-ampere, voltage-regulated charger which is powered by a protected 120VAC source.

9.1.18.3 Float, taper and equalize charge settings shall be provided.

9.1.18.4 Battery charger shall be physically located within the generator transfer switch enclosure.

9.1.18.5 Battery and charger must be able to operate in, as low as, 0 degrees F.

9.1.18.6 Form-C charging system alarm contacts shall be provided and connected to the network's alarm system to report loss of AC power, low battery voltage and excessively high battery charging current.

9.1.19 The following Cooling System components are required:

9.1.19.1 A radiator-cooled engine is required.

9.1.19.2 The radiator shall be filled with a water/coolant mixture in accordance with the engine manufacturer's recommendations.

9.1.19.3 A thermostatically-controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations.

9.1.20 The Generator Base shall have the following characteristics:

9.1.20.1 The generator set shall be mounted on a heavy-duty steel base which is anchored to a Contractor-furnished building foundation.

9.1.20.2 The base shall maintain alignment between generator set components and shall include vibration isolators.

9.2 The Generator Transfer Switch

9.2.1 An automatic transfer switch which provides switching of the equipment shelter electrical load between commercial power and generator power shall be supplied and installed for each Vendor proposed standby generator.

9.2.1.1 Each transfer switch shall be completely factory assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources.

9.2.1.2 Permanently attached manual handles shall also be installed on the transfer switch.

9.2.1.3 The switch shall provide positive mechanical and electrical interlocking, and mechanically-held contacts.

9.2.1.4 Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.

9.2.1.5 Each transfer switch shall be installed in a key locking, UL listed, NEMA rack to be mounted on a wall within the radio equipment shelter.

9.2.1.6 The switch shall be fully wired and integrated with the engine generator set in accordance with local electrical and fire codes.

9.2.1.7 A manually-operated transfer switch, as well as appropriate power connectorization, shall be provided to allow the interconnection of an auxiliary, trailered generator set should the permanently-located generator fail in operation, utilizing an Appleton plug.

9.2.1.8 All transfer switches and accessories shall be U.L. listed and labeled, tested per U.L. Standard 1008 and CSA Approved.

9.2.1.9 Transfer switches shall be double-throw electrically and mechanically interlocked and mechanically-held in both positions.

9.2.1.10 Main switch contacts shall be high-pressure silver alloy.

9.2.1.11 Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent inter phase flashover.

9.2.1.12 Form-C contacts shall be provided in each main switch position for alarm reporting purposes.

9.2.1.13 These contacts shall be connected to the network's alarm system for reporting transfer status.

9.2.1.14 Each transfer switch shall be continuously rated for operation in ambient temperature ranges of -40 to +50 degrees Celsius.

9.2.1.15 Transfer switches shall be rated, minimally, to carry the generator's full rated output, inclusive of the 50% added capacity over calculated equipment loading.

9.2.1.16 The Line-In, Generator-In and Load side terminations for the automatic transfer switch shall be protected from lightning transients using a combination of Metal Oxide Varistor (MOV) and avalanche Zener diode technologies.

9.2.1.17 All alarm and instrumentation wiring from the generator, that enters the equipment shelter, must likewise include appropriate lightning surge protection in the form of solid-state, fast-acting voltage clamp devices whose clamping voltage is closely matched to normal individual-alarm signal amplitudes.

9.2.1.18 Transfer switch control shall be solid state and designed for a high level of immunity to power line surges and transients.

9.2.1.19 The device shall be tested in accordance with IEEE Standard 587-1980 (or latest revision).

9.2.1.20 Controls shall have optically isolated logic inputs, and isolation transformers for AC inputs.

9.2.1.21 Relays shall be installed on all outputs.

9.2.1.22 Solid state under voltage sensors shall simultaneously monitor all phases of the standby power source and the commercial power source.

9.2.1.23 Pick up and drop out voltage settings shall be adjustable.

9.2.1.24 Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase.

9.2.1.25 Controls shall be provided with solid state over voltage sensors, adjustable from 100-130% of nominal input voltage to monitor the source.

9.2.1.26 An adjustable time delay shall be provided.

9.2.1.27 Automatic controls shall signal the engine generator to start upon signal from normal source sensors.

9.2.1.28 A time delay start, variable from 0 to 5 seconds, shall be provided to avoid nuisance startups.

9.2.1.29 Battery voltage starting contacts shall be gold, dry type contacts which have been factory wired to a field wiring terminal block.

9.2.1.30 The switch shall transfer when the emergency source reaches the set point voltage and frequency.

9.2.1.31 A time delay shall be provided for transfer that shall be continuously variable from 0 to 120 seconds.

9.2.1.32 The switch shall retransfer the load to commercial power after a delay.

9.2.1.33 This time delay shall be variable (adjustable) from 0 to 30 minutes to avoid short engine run times.

9.2.1.34 The retransfer time delay shall be immediately bypassed if the emergency generator fails.

9.2.1.35 A control shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting upon return to commercial power.

9.2.1.36 Power for transfer operation shall be from the source to which the load is being transferred.

9.2.1.37 Diagnostic indicators shall be provided to allow the last successful step in the sequence of control functions to be pinpointed.

9.2.1.38 The present status of the control functions shall also be indicated.

9.2.1.39 These functions, at a minimum, shall include:

9.2.1.39.1 Source 1 OK

9.2.1.39.2 Start generator set

9.2.1.39.3 Source 2 OK

9.2.1.39.4 Transfer timing

9.2.1.39.5 Transfer complete

9.2.1.39.6 Retransfer timing

9.2.1.39.7 Retransfer complete

9.2.1.39.8 Timing for stop

9.2.2 A key-operated Front Panel selector switch shall be provided which will provide the following functions:

9.2.2.1 Test to simulate commercial power loss to allow testing of the generator set with or without transfer of the load.

9.2.2.2 Normal - leaves the transfer switch in its normal operating position.

9.2.2.3 Retransfer a momentary position which will provide an override of the retransfer time delay and cause immediate return to the commercial power source (if available).

9.2.3 An Exerciser Clock setting shall be included which allows setting the day, time and duration of a generator set exercise/test period. Tests under load or with no load shall be selectable.

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10. Tower Requirements

10.1. Basic Design

10.1.1. The basic standard for the design of newly required steel antenna towers, wave guide bridges and supporting structures, shall be ANSI/EIA-222H.

10.1.2. Towers shall be triangular shaped, solid-rod structure having an overall height to be determined by the Contractor, based on the requirements of area coverage and availability of unobstructed microwave paths for site connectivity. Limits of available space in certain areas may dictate the use of self-support towers.

10.1.3. Each tower shall be designed for a minimum sustained 150-mph wind speed with the full complement of necessary antennas and required lights and other Federally-required equipment.

10.1.4. Antenna loads shall be as determined by Contractor; however, the design shall include a minimum 30% growth factor in the top 1/3 of the tower, inclusive of microwave antennas.

10.1.5. All fabricated tower assemblies and parts shall be hot-dipped galvanized after fabrication per ASTM Standard A123. Hardware shall be galvanized per ASTM Standard A153 and B695. Other types of zinc coating or plating are not acceptable.

10.1.6. Towers shall be supplied with a full-length transmission line ladder(s) designed to accept transmission lines needed for the proposed design plus a 30% growth factor.

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

10.1.7.1. This device shall not interfere with the ease of climbing from one rung of the ladder to the next.

10.1.7.2. There must be at least two sources of climbing safety belts compatible with the safety climb anti fall system, as supplied with the tower.

10.1.8. Tower lighting shall conform to FAA Advisory Circular AC 70/7460-1L, or current revision, Obstruction Marking and Lighting. VHF, UHF and 800 MHz radio equipment may be operational/co-located at the various trunked radio sites. Therefore, it is imperative that only shielded, RFI-conditioned lighting devices be provided.

10.1.9. The Vendor shall provide detailed lighting equipment specification literature in its Submittal package sufficient in scope where Jackson County can determine the suitability of the proposed lighting system with respect to planned or anticipated radio operations.

10.1.10. Lighting system controls shall be installed on a temporary fixture adjacent to the tower, operate on a photocell and provide a Form-C contact to the alarm panel. (Note: This controller device is to be relocated within the site's equipment shelter once fully constructed. Please factor sufficient lighting control cable into the installation to allow the control equipment to be relocated.

10.1.11. Antennas, tower top pre-amps and transmission lines as specified by the licensed frequencies and Contractor's system design, shall be provided and installed by the Contractor.

10.1.12. A site's Electrical Grounding System shall be furnished and installed by the Contractor in accordance with the following minimum practices:

10.1.12.1. Install a ground ring around the base of the tower, consisting of 10'x 5/8" ground rods driven to a depth necessary to meet the required resistance measurement of the specifications, adjacent to the foundation of the tower at each leg.

10.1.12.2. Ground rods are to be interconnected by a minimum #00AWG stranded copper wire, which is to be exothermically welded to the top of each ground rod.

10.1.12.3. Copper wire and ground rods are to be installed in a trench below the local frost line.

10.1.12.4. Maximum spacing between rods shall not exceed twice the length of the ground rod.

10.1.12.5. Each tower leg shall be bonded to the ground ring using #00AWG stranded tinned copper cable, which has been exothermically welded to a flat, 4-inch square solid steel tab located near the base of each tower leg.

10.1.12.6. Each cable lead will run to the closest ground rod through an insulated sleeve to minimize wire damage.

10.1.12.7. The upper end of the sleeve should be sealed with a non-shrinking compound such as RTV to prevent water from collecting within the sleeve.

10.1.12.8. The Contractor shall avoid making any acute bends as the ground wire transitions from the foundation.

10.1.12.9. Bends should be a minimum of 9-nches in radius.

10.1.12.10. To complete the exothermic welding process, attachment area on the tower tab shall be cleaned and coated with a cold galvanizing compound.

10.1.12.11. A tower-mounted lower ground bar, to be located approximately two feet above the transmission line/ice bridge, will be supplied with a #00AWG ground wire lead that is extended and exothermically welded to the tower ground ring.

10.1.12.12. The ground bar must be tamper and theft resistant. The wire lead must be sleeved so that it is protected from physical damage.

10.1.12.13. Like above, the upper end of the sleeve shall be sealed with a non-shrinking compound like RTV to prevent water from entering and collecting within the sleeve.

10.1.12.14. This ground wire lead shall be installed at the time the tower ground ring is installed.

10.1.12.15. The ground rod/ring system shall extend around the perimeter of the equipment shelter, transmission line copper entrance port into the shelter and to the perimeter fence.

10.1.12.16. Ground system ring around the tower base shall be located a minimum of 36 inches away from the tower foundation.

10.1.12.17. The tower ground system ring shall be connected to the equipment shelter ground ring in at least two places, on the closest corners of the shelter ring.

10.1.12.18. The Contractor shall electrically bond all transmission line outer shields to the structure at the top of the tower immediately below the antenna and at the line midpoint if the tower's height is over 200-feet.

10.1.12.19. Likewise, bond all transmission line shields near the bottom segment of the tower, approximately one-foot above the bend made to enter the waveguide-bridge and again at the shelter's antenna entry port/panel.

10.1.12.20. Use only transmission line grounding kits approved by the manufacturer for use on the type and diameter of transmission lines provided. All installed grounding kits shall be weather sealed.

10.1.12.21. Fencing shall be grounded to the ground ring via #2AWG solid copper wires, bonded via exothermic welding at each fence post.

10.1.12.22. Exothermic welds shall be cleaned and protected with a minimum two coats of cold galvanize material. Gates shall utilize braided, flexible straps.

10.1.12.23. The shelter's interior halo ground and transmission line copper inside entrance port (buss bar) shall exothermically bond to the outdoor ground.

10.1.12.24. A ground test well shall be provided at a minimum of two locations along the ground loop.

10.1.12.25. One test well shall be located adjacent to the tower and the other at the far side of the equipment shelter loop.

10.1.12.26. Each test well shall consist of a minimum 6-inch diameter PVC material that extends down to the depth of two feet and shall allow the attachment of a test wire to measure ground resistance.

10.1.12.27. A screw on or drop on cover that is easily removable to allow testing shall be provided.

10.1.12.28. Grounding system resistance shall be measured to be 3-ohms or less between any point on the ground system and earth ground.

10.1.12.29. Measurement shall be done with a 4-point ground resistance tester and not by a clamp on resistance tester.

10.2. Guy Wires

10.2.1. Galvanized guy strand shall conform to the minimum requirements of ASTM Standard A475 Extra High Strength (EHS) or equivalent recognized standard.

10.2.2. Preformed guy grips and dead-ends shall be designed specifically for the length, size and type of cable being used. This shall include the size, number, and lay of the wires and electrochemical compatibility of the material.

10.2.3. An adequate bend radius shall be provided, as per the manufacturer's recommendations, at the inside of cable attachments consisting of a thimble.

10.2.4. Shackles used to connect guy assemblies shall be forged from AISI grade 1035 or 1045 steel or equivalent and suitably heat-treated (quenched and tempered, normalized or annealed).

10.2.5. Turnbuckle devices shall be installed at the anchor end of the guy assembly for adjusting the guy tension. In initial installations, the minimum take-up adjustment available after the structure is plumb and the guy tensions are set shall be 6 inches for guys with normal diameter of 0.5-inches and 10-inches for guys with normal diameter greater than 0.5 inches.

10.2.6. All guy wires shall be bonded to ground rods using, minimally, a #2AWG solid, tinned copper wire. Bonding shall include use of guy wire grounding clamps that are tin-plated bronze (or similar type material) to prevent electrolysis. Grounding attachment clamps shall be installed above the guy wire turnbuckle.

10.2.7. Guy wire anchor plates are to be grounded using, minimally, a #2AWG solid, tinned copper wire that is exothermically welded to the anchor plate. Welds shall be cleaned and treated with cold galvanized coatings to prevent rusting.

10.2.8. All guy wires shall include ice clips ahead of the preforms. Turnbuckle safety cables must use a "Figure 8" configuration.

10.3. Required Tower Submittals

10.3.1. The Contractor shall furnish wind-load stress, geotechnical reports and foundation calculations used in the design of the proposed tower structure. Existing towers shall be evaluated for structural, electrical grounding and foundation stability, inclusive of identification/resolution of corrosion within tubular members and the suitability to support additional antenna loads as necessary to accommodate the newly added Contractor- furnished equipment.

10.3.2. The Contractor shall furnish documentation approved by a registered professional engineer, licensed in the State of Georgia certifying that the proposed new tower(s) and foundation(s), as well as required modifications to be made to existing towers, meet the requirements of TIA-222H

10.3.3. Prior to initial design review, Contractor shall perform soil pH value testing at all proposed new tower sites.

10.3.4. The Contractor shall furnish written certification that all installed tower components on both new and existing towers have been properly constructed and hot-dipped galvanized.

10.3.5. The Vendor shall furnish documentation as to any special condition or restriction applied to the use of materials, products or equipment contained in their Response Submittal.

10.3.6. Contractor shall provide to Jackson County, a minimum of two sets of completed “as-builts” on each tower and shelter installed or modified in this project. In the case of new structures, this shall include engineering and design documentation from the tower and shelter manufacturer.

10.3.7. Installed structural members or welded structural assemblies, except for standard hardware, shall have a part number. The part numbers shall correspond with the Contractor’s assembly drawings. Part numbers are to be permanently attached (stamped, welded lettering, and/or stamped on a plate that is welded to the member, etc.) to the member before all protective coatings are applied. Attached/affixed part numbers shall have a minimum character height of 0.50 inches.

10.3.8. The Contractor shall provide a detailed report of electrical ground resistance measurements of the completed, as-installed, electrical grounding system, on a per-site basis with field drawings to indicate the measurement at a specific location.

11.0 Site Work Requirements

11.1 Site Preparation and Sub-grading

11.1.1 General

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

11.1.2 Dewatering of the Site

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

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

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

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

11.1.3 Soil Compaction

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

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

11.1.3.3 Achieve minimum densities specified as references to:

11.1.3.3(a) Cohesive soils - 95 percent maximum density at optimum moisture, AASHTO T99.

11.1.3.3(b) Cohesionless Soils – 70 percent of maximum relative density.

- ASTM, STP 479 Bunnister method.
- USBR - E12 relative density.
- Relative density, ASTM D2049

11.2 Drilled Pier Foundations

11.2.1 General

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

11.2.2 Performance

11.2.2.1 Quality Assurance will be met with a field inspection of the Jackson County's quality control designee.

11.2.2.1(a) Jackson County's Project Representative will be designated to be responsible for field inspection of the drilled pier foundations. The representative will transmit, in writing, to the consultant and contractor any materials or methods observed that do not conform to this specification and, if required, will not be considered for payment. Jackson County's Project Representative must inspect each drilled pier.

Specific responsibilities of the County's Project Representative will be:

- Observe drilling excavation of drilled pier foundations. Ensure the placement of anti-caving physical barriers or the use of special drilling mud to prevent excessive cavitation.
- Inspect material and equipment used in construction of drilled piers.
- Inspect bearing elevation of drilled piers.
- Observe placement of concrete and rebar within the drilled pier foundation to match design specification. Ensure that no excessive earth contamination occurs. Contamination of poured concrete is sufficient to cancel the pour and request engineering inspection.
- Jackson County's representative shall photograph or film all foundation excavation and pouring activities Contractor's Qualifications

11.2.2.1(b) The Contractor's qualifications must be minimum of two-year's experience in drilled pier construction, including experience with similar subsurface material, water conditions, shaft sizes, and special techniques as required.

11.2.2.2 Drilled Pier Details

11.2.2.2(a) Drilled pier shaft dimensions and top elevations shall be in accordance with foundation design calculations and drawings.

11.2.2.2(b) The drilled pier shaft bearing, or bottom elevation shall be at the elevation indicated, unless it is determined by the County that the bearing elevation should be adjusted.

11.2.2.2(c) The excavate pier shaft shall be drilled to required dimensions and elevations as indicated. Sidewall stability will be maintained during drilling and extend excavation to suitable material.

11.2.2.2(d) Inspection of each pier will be by the County's Project Representative and Contractor to determine suitability of supporting material for drilled piers.

11.2.2.2(e) Remove from bottom of drilled piers, loose material or free water in quantities sufficient to cause settlement or affect concrete strength as determined by Jackson County.

11.2.2.2(f) Install temporary casing, where required, to prevent caving of drilled pier sides or excessive seepage.

11.2.2.2(g) Dewater all drilled pier excavations prior to cleaning, inspection, and placing concrete.

11.2.2.2(h) Each drilled pier must be inspected and approved by Jackson County's Project Representative before any concrete may be placed.

11.2.2.2(i) Dispose of any excavated material at locations approved for that purpose.

11.2.2.3 Reinforcing Steel

11.2.2.3(a) Place reinforcement for drilled piers in accordance with foundation design documents.

11.2.2.3(b) Place bars as shown on foundation drawings with concrete cover of not less than 3-inches where exposed to soil.

11.2.2.3(c) A reinforcing cage shall be designed as a structural element and braced to retain its configuration throughout the placing of concrete and the extraction of the casing (if used) from the shaft.

11.2.2.3(d) Dewater drilled piers and maintain the excavation free of water prior to placing concrete.

11.2.2.3(e) Place concrete immediately after final inspection.

11.2.2.3(f) Place concrete immediately after completion of excavation and after Jackson County's Project Representative has completed his inspection. Do not leave uncased excavations open overnight.

11.2.2.3(g) Free fall concrete (not over 6 feet) may be used provided it is directed through a hopper, or equivalent; such that fall is vertical down center of shaft without hitting sides. Vibrate concrete only after casing, if used, has been pulled.

11.2.2.3(h) Place concrete in pier in one continuous pour operation from bottom to top.

11.2.2.3(i) Jackson County's Project Representative will provide inspection during the removal of casing and placing of concrete. Withdraw casing, if used, only as shaft is filled with concrete. Always maintain an adequate head of concrete to balance outside soil and water pressure above the bottom of the casing during withdrawal. Specific procedures that the Contractor will follow to accomplish this objective shall be submitted for approval.

11.2.2.3(j) Where the casing is removed, provide specifically designed concrete with a minimum slump of 5-inches and with a retarder to prevent arching of concrete (during casing pulling) or setting concrete until after casing is pulled. Check concrete level prior to, during, and after pulling casing. Pull casing before slump decreases below 5-inches as determined by testing.

11.2.2.3(k) During casing extraction, upward movement of the reinforcing steel shall not be permitted. Downward movement should not exceed 2-inches per shaft length.

11.2.2.3(l) Remove all water and concrete contaminated with soil, or water before resuming concrete placement.

11.2.2.3(m) Center reinforcing cages in the drilled pier excavation and suspend them in an approved manner prior to placement of concrete to the cutoff elevation.

11.2.2.3(n) Leave forms on pier for a period of three days.

11.2.2.3(o) Set anchor bolts to the manufacturer's required tolerances, using substantial templates or other approved method.

11.3 Concrete, Forms and Reinforcement

11.3.1 General

This Specification includes concrete, forms, and steel reinforcement. This includes drilled pier foundations with square caps for steel structures, concrete pads for transformers and breakers, equipment shelter and tower foundations, and cable trenches.

11.3.2 Quality Assurance and Applicable Standards

11.3.2.1 American Concrete Institute (ACI)

11.3.2.1(a) ACI 304 - Recommend Practice for Measuring, Mixing, and Placing Concrete.

11.3.2.1(b) ACI 305 - Committee Report on Hot-Weather Concreting.

11.3.2.1(c) ACI 306 - Committee Report on Cold-Weather Concreting.

11.3.2.1(d) ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.

11.3.2.1(e) ACI 318 - Building Code Requirements for Reinforced Concrete.

11.3.2.2 American National Standards Institute (ANSI)

11.3.2.2(a) B 1 8.2.1 - Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Screws, and Lag Screws.

11.3.2.2(b) B 1 8.2.2 - Square and Hex nuts.

11.3.2.3 American Society for Testing and Materials (ASTM)

11.3.2.3(a) A36 - Structural Steel.

11.3.2.3(b) A82 - Cold-Drawn Wire.

11.3.2.3(c) AI 85 - Welded Steel Wire Fabric for Concrete Reinforcement.

11.3.2.3(d) A307 - Low-Carbon Steel Externally and Internally Threaded Standard Fasteners.

11.3.2.3(e) A615 - Deformed Billet Steel Bars for Concrete Reinforcement.

11.3.2.3(f) C31 - Making and Curing Concrete Compression and Flexure Test Specimens in the Field.

11.3.2.3(g) C33 - Concrete Aggregates.

11.3.2.3(h) C39 - Compressive Strength of Cylindrical Concrete Specimens.

11.3.2.3(i) C94 - Ready-Mixed Concrete.

11.3.2.3(j) C 143 - Slump of Portland Cement Concrete.

11.3.2.3(k) C 150 - Portland Cement.

11.3.2.3(l) C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

11.3.2.4 Midwest Concrete Industry Board (MCIB)

11.3.3 Equipment and Materials

11.3.3.1 Concrete Materials

11.3.3.1(a) Cement must conform to ASTM C 150. Portland cement Type 1.

11.3.3.1(b) Water shall be clean and free from injuries amounts of oil, acids, alkaline, or other deleterious substances. Any potable drinking water will be acceptable.

11.3.3.1(c) Fine Aggregates such as Clean natural sand. Manufactured sand may be used upon written approval of Jackson County's designee. They shall Conform to ASTM C33.

11.3.3.1(d) Coarse aggregates such as Clean crushed stone or processed gravel, not containing organic materials shall conform to ASTM C33.

11.3.3.1(e) 4-6 percent air shall be used in all concrete.

11.3.3.1(f) Water reducing admixture shall conform to ASTM C494, Type A.

11.3.3.2 Concrete Mix

11.3.3.2(a) Ready-mixed Concrete shall meet requirements of ASTM C94, and of materials and proportions specified.

11.3.3.2(b) Ready-mixed concrete plant shall be subject to approval of Jackson County's Project Representative.

11.3.3.3 Form materials

11.3.3.3(a) Exterior grade plywood minimum 5/8 inch thick.

11.3.3.3(b) Approved wood fiberboard.

11.3.3.3(c) Dressed lumber, free of loose knots.

11.3.3.3(d) Form tires shall be approved break-back type.

11.3.3.4 Steel Reinforcement

11.3.3.4(a) Reinforcement bars shall conform to ASTM A615, Grade 60 for all bars No. 4 or larger.

11.3.3.4(b) Tie and-all No.3 bars shall conform to ASTM A615, Grade 40.

11.3.3.4(c) Welded wire fabric shall conform to ASTM A185, using bright basic wire conforming to ASTM A82. Wire gauge No. 11 or smaller shall be galvanized.

11.3.3.5 Anchor Bolts

11.3.3.5(a) All anchor bolts required for complete installation shall be provided.

11.3.3.5(b) Anchor bolts and accessories shall conform to ASTM A307 using A36 steel.

11.3.3.5(c) Use hexagonal bolts and nuts conforming to ANSI B 1 8.2.1 and B 1 8.2.2.

11.3.3.5(d) All exposed area of anchor bolts and nuts, plus a minimum of three inches of embedded area, shall be hot-dipped galvanized.

11.3.3.5(e) Install as indicated on foundation drawings.

11.3.4 Performance

11.3.4.1 Field Testing

Field testing of concrete and making of the concrete test cylinders will be performed by an independent testing laboratory approved by Jackson County's Permit Department.

11.3.4.2 Laboratory Testing

11.3.4.2(a) Laboratory for testing shall be selected and paid by the Vendor.

11.3.4.2(b) Laboratory will furnish cylinder molds with cap seals or adequate means of identification.

11.3.4.2(c) Cylinders shall be tested conforming to ASTM C39. Average strength of two test cylinders (at 28 days) shall be used as result of the test. Break one test cylinder after 7-days curing, one after 14-days, and two after 28-days.

11.3.4.2(d) Results shall be provided to the Project Representative in a formal report. A copy shall be provided to the Consultant and Contractor.

11.3.4.3 Low Strength Concrete

Low strength is defined as concrete whose 7-day and 14-day test (average of 2 cylinders) is less than 70% and 85%, respectively, of the specified minimum 28-day compressive strength.

11.3.4.3(a) Concrete shall remain accessible with no other work performed that relates to or depends upon the questionable concrete until a formal decision as to the disposition of the concrete is given by Jackson County's Project Representative.

11.3.4.3(b) Low strength concrete shall be removed and replaced if requested by Jackson County's designee.

11.3.4.4 Preparation and Placing of Concrete

11.3.4.4(a) Clean bonding surfaces free from laitance and foreign materials.

11.3.4.4(b) Place concrete on property prepared and unfrozen sub grade and only in dewatered excavations.

11.3.4.4(c) Do not deposit partially hardened concrete or concrete contaminated by foreign materials.

11.3.4.4(d) Placing the concrete shall Conform to ACI 304.

11.3.4.4(e) Place concrete within 60 minutes after mixing, except Jackson County's designee may extend the period to 90 minutes (maximum) dependent upon weather conditions.

11.3.4.4(f) Place in horizontal layers not exceeding 18-inches.

11.3.4.4(g) Vibrate concrete to produce solid mass without honeycomb or surface air bubbles.

11.3.4.5 Curing of Concrete

11.3.4.5(a) Cure with liquid membrane-forming compound conforming to ASTM C309, Type I. Apply per manufacturer's recommendations.

11.3.4.5(b) Apply curing compound to all exposed surfaces immediately after removing form or after finishing concrete.

11.3.4.5(c) Keep formwork wet until stripped.

11.3.4.6 Placing Concrete in Cold Weather

11.3.4.6(a) Conform to the practice recommended in ACI 306 when the temperature is below 40-degrees F or is likely to fall below 40-degrees F during a twenty-four-hour period after placing.

11.3.4.6(b) Protect pier caps and other concrete from freezing using insulating blankets.

11.3.4.7 Placing Concrete in Hot Weather

11.3.4.7(a) Conform to practices recommended in ACI 305 when temperature is 90-degrees Fahrenheit or above or is likely to rise above 90-degrees Fahrenheit within a twenty-four-hour period after placing.

11.3.4.8 Concrete Construction Joints

11.3.4.8(a) Locate where indicated. Conform to AC 318.

11.3.4.8(b) Clean and break laitance or other foreign material from bonding surface. Bed with 1-inch of grout for bonding in horizontal joints.

11.3.4.9 Concrete Surface Float Finish

11.3.4.9(a) Compact, accurately screed, and wood float all slabs to a true uniform surface.

11.3.4.9(b) Test surface with straightedge and eliminate high and low spots of more than 1/8-inch in 10 feet.

11.3.4.9(c) Use this finish in addition to the finishes specified below for all surfaces as indicated.

11.3.4.9(d) Use a final finish for footing slabs not exposed.

11.3.4.10 Concrete Hand-troweled Finish

11.3.4.10(a) Finish surface as in Float Finish and in addition, trowel and steel trowel to obtain a smooth dense finish after concrete has hardened to ring under the trowel.

11.3.4.10(b) Use this finish on all floors, slabs, and equipment bases not specifically designated for a different finish.

11.3.4.11 Concrete Broom Finish

11.3.4.11(a) Finish surface as in Float Finish and, in addition, draw a stiff bristled broom across the previously floated surface.

11.3.4.11(b) Corrugations shall be uniform in appearance, not more than 1/16-inch in depth and shall be perpendicular to direction of traffic.

11.3.4.11(c) Use this finish on all outdoor slabs subject to vehicular or pedestrian traffic and areas to receive grout.

11.3.4.12 Concrete Burlap Finish

11.3.4.12(a) Apply burlap surface treatment to exposed edges of slabs, curbs and foundations.

11.3.4.12(b) Wet and fill all voids using mortar with the same sand-cement ratio as original concrete. Use approximately 20 percent white cement to match concrete color.

11.3.4.12(c) Strike off all excess mortar flush with the surface using a burlap or canvas cloth with a circular motion.

11.3.4.12(d) Remove all rough spots and rub with cloth to leave a surface of uniform texture and appearance.

11.3.4.12(e) Finish shall result in a coating of mortar that will fill all small voids and air holes leaving a smooth surface.

11.3.4.12(f) Cure as specified under Curing Concrete.

11.3.4.13 Defective Concrete Surface Treatment

11.3.4.13(a) After removal of forms, remove all fins, projections and form ties.

11.3.4.13(b) Grout and cure all voids, damaged areas, and tie holes.

11.3.4.14 Concrete Forms

11.3.4.14(a) Treat forms with an approved oil or lacquer prior to placing reinforcement.

11.3.4.14(b) Wet forms with clean, clear water prior to placing concrete.

11.3.4.14(c) Adequately brace and stiffen forms to prevent deflection and settlement.

11.3.4.15 Steel Reinforcement

11.3.4.15(a) Place accurately, tie at intersection, and support on chairs. Conform to ACI 318.

11.3.4.15(b) Tie securely with 16 gauge or larger annealed iron wire

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

11.3.4.15(d) Splice plain bars not less than twice that for deformed bars.

11.3.4.15(e) Lap welded wire fabric not less than the length of one mesh.

11.3.4.15(f) No.3 bars to be Grade 40, with all others to be Grade 60.

11.3.4.15(g) Provide ¾-inch chamfer for all exposed edges of concrete, vertical and horizontal.

11.4 Fences and Gates (Chain-Link Security Type)

11.4.1 General

11.4.1.1 Quality Insurance and Applicable Standards

11.4.1.1(a) Federal specification RR-F-191 - Fencing, wire and post, metal and gates, chain-link fence fabric, chain-link and accessories.

11.4.1.1(b) RR-F-191 - Fencing, wire and post, metal and gates, chain-link fence fabric, chain-link and accessories.

11.4.1.1(c) RR-F-221 - Fencing, wire, barbed wire, woven-wire and netting, fence post and accessories.

11.4.2 Requirements

11.4.2.1 Manufacturer's standard materials where such materials conform to these specifications or have been approved by Jackson County.

11.4.2.2 Conform to FS RR-F-191 except as indicated or specified otherwise.

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

11.4.2.4 Gate widths as indicated on layout drawings.

11.4.2.5 Finish for fence framework and appurtenances (excluding fabric) – Galvanized with minimum weight for zinc per square foot as follows:

11.4.2.5(a) Pipe – 1.8 ounces.

11.4.2.5(b) Hardware and accessories – conform to FS RR-F-191.

11.4.2.5(c) Barbed wire – 0.80 ounce.

11.4.2.6 Finish for Fence Fabric

11.4.2.6(a) Galvanized per ASTM A392, Class-2 with 1.8-ounce, minimum weight, for zinc per square foot or, aluminum coated per ASTM A491, Class-2 with 0.40- ounce, minimum weight, for aluminum per square foot.

11.4.2.7 All fence and gates to have 3-strand barbed wire at top.

11.4.2.8 All materials furnished shall comply with the above requirements.

11.4.3 Fence Fabric

11.4.3.1 No.9 gauge, 2-inch diamond mesh chain-link fabric.

11.4.3.2 Top and bottom selvage twisted and barbed.

11.4.3.3 Fabric fastenings of 9-gauge galvanized wire ties.

11.4.4 Post, Top Rail, and Braces

11.4.4.1 Post

11.4.4.1(a) End, angle, corner or pull posts – 3-inches O.D. at 5.79 pounds per foot.

11.4.4.1(b) Line posts – 2.5-inches O.D. at 3.65 pounds per foot.

11.4.4.2 Top Rail

11.4.4.2(a) 1.625-inch O.D. standard weight steel pipe.

11.4.4.2(b) 18-foot minimum length of each section.

11.4.4.3 Expansion Type Coupling for Each Joint.

11.4.4.3(a) Diagonal truss rods 3/8 inch in diameter equipped with truss tightened.

11.4.4.3(b) Horizontal braces – 1.660-inch O.D. at 2.27 pounds per foot.

11.4.4.4 Post tops shall be designed as a weather tight closure cap for tubular post.

11.4.4.5 Top Rail Expansion Type Coupling for Each Joint.

11.4.4.6 Malleable Iron or Pressed Steel Barbed Wire Supporting Arms

11.4.4.6(a) Single arm at 45-degrees with vertical, sloping to outside of fence.

11.4.4.6(b) Constructed for attaching three rows of barbed wire to each arm and designed as a weather tight closure cap for tubular posts.

11.4.4.6(c) Designed for 200-pound minimum pull-down load.

11.4.4.6(d) Attached to steel posts or integral with post top.

11.4.4.6(e) Provided with openings to receive top rail

11.4.4.7 Malleable Iron or Pressed Steel Stretcher Bars

11.4.4.7(a) One-piece, full height of fabric.

11.4.4.7(b) 3/6-inch x ¾-inch, galvanized.

11.4.4.7(c) Bands of galvanized steel or malleable iron.

11.4.4.8 Malleable Iron or Pressed Steel Bolts

11.4.4.8(a) Zinc coated.

11.4.4.8(b) Conform to FS FF-B-575.

11.4.5 Barbed Wire

11.4.5.1 Two-strand, l2½ gauge wire with 4-point barbs 5 inches O.C.

11.4.5.2 Conform to FS RR-F-221, Type 1, Style 2.

11.4.5.3 Three rows required on all fence and gates.

11.4.6 Gates

11.4.6.1 Framing

11.4.6.1(a) Frames of tubular members, 2-inch O.D. at 2.72 pounds per foot.

11.4.6.1(b) Intermediate horizontal and vertical members for proper gate operation and for attachment of fabric, hardware and accessories.

11.4.6.1(c) Frames assembled by welding or watertight galvanized steel rigid fittings.

11.4.6.1(d) Diagonal cross bracing of 3/8 inch diameter adjustable truss rods to provide frame rigidity.

11.4.6.1(e) Diagonal cross bracing of 3/8 inch diameter adjustable truss rods to provide frame rigidity.

11.4.6.2 Gate hardware hinges shall be of pressed or forged steel, or malleable iron, non-lift- off type, 1 to 1.2 pair per leaf.

11.4.6.3 Latches and Gate stops – Double Leaf.

11.4.6.3(a) Plunger-bar type latch, full gate height, designed to engage gate stop of flush-plate type with anchors.

11.4.6.3(b) Locking device and padlock eyes an integral part of latch.

11.4.6.3(c) Keeper to automatically engage gate leaf and secure free end of gate in full 90-degrees open position.

11.4.6.4 Latches – Single Leaf

11.4.6.4(a) Forked type to permit operation from either side of gate.

11.4.6.4(b) Padlock eye as integral part of latch.

11.4.7 Performance and Fence Installation

11.4.7.1 Follow general contour of ground and properly aligned.

11.4.7.2 Fence Post

11.4.7.2(a) Set in concrete retaining wall. Trowel finish tops of footings and dome to direct water away from posts.

11.4.7.2(b) Install plumb and in straight alignment.

11.4.7.2(c) Temporarily brace until concrete in bases has set.

11.4.7.2(d) Spaced 10 feet center-to-center, maximum.

11.4.7.3 Post Bracing

11.4.7.3(a) Installed at each end, at the gatepost, and on each side of corner posts.

11.4.7.3(b) Install after the concrete in post base has set.

11.4.7.3(c) Install so posts are plumb when diagonal rod is under tension.

11.4.7.4 Top Rails

11.4.7.4(a) Run continuously through post caps or barbed wire supporting arms.

11.4.7.4(b) Install expansion coupling at each joint.

11.4.7.5 Tension wire shall be weaved through the fabric and tie to each post with minimum 6-gauge galvanized wire.

11.4.7.6 Fabric

11.4.7.6(a) Stretch taut with equal tension on each side of line posts.

11.4.7.6(b) Fasten to top rail and steel posts with wire ties.

11.4.7.6(c) Space wire ties at 12-inches O.C. maximum on posts and at 24-inches O.C. maximum on top rail.

11.4.7.7 Stretcher Bars

11.4.7.7(a) Thread through or clamp to fabric 4-inches on center.

11.4.7.7(b) Secure to posts with metal bands spaced 15-inches on center maximum.

11.4.7.7(c) Install at each gate, pull and end post, and each side of corner post.

11.4.7.8 Barbed Wire

11.4.7.8(a) Attach three rows to each barbed wire supporting arm. Pull wire taut and fasten securely to each arm.

11.4.7.8(b) Install four rows above fabric and on extended gate end members of gates.

11.4.7.9 Gates

11.4.7.9(a) Install plumb, level, and free swinging through full opening without interference.

11.4.7.9(b) Install all hardware, including keepers, ground set items and flush plate in concrete to engage gate stop.

11.4.7.9(c) Furnish and install gate alarms.

11.4.7.10 Repairing Damaged Coatings

11.4.7.10(a) Repair any damaged coating in the shop or field by recoating with compatible and similar coating.

11.4.7.10(b) Apply per manufacturer's recommendations.

11.4.7.11 Furnish and install Danger signs as approved by Jackson County's designee.

11.5 Crushed Rock Surface

This section includes crushed rock surface and method of depositing for the placement of permanent crushed rock surfacing in equipment shelter areas.

11.5.1 Applicable Standards

11.5.1.1 American Society for Testing and Materials

11.5.1.1(a) C117– Test for Materials Finer than No. 200 Sieve in Mineral Aggregate by Washing.

11.5.1.1(b) C131– Test for Abrasion of Coarse Aggregates by Use of Los Angeles Machine.

11.5.1.1(c) C136 – Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

11.5.1.1(d) D423 – Test for Liquid Limit of Soils.

11.5.1.1(e) D75 – Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials.

11.5.1.2 American Association of State Highway and Transportation Officials (AASHTO)

11.5.1.2(a) T99–Test for the Moisture Density Relations of Soils Using a 5.5-Pound Rammer and a 12-Inch Drop.

11.5.1.3 Sample and Testing

11.5.1.3(a) Test to determine conformance with all requirements for material quality and properties specified herein will be performed by an independent laboratory approved by Jackson County and compensated by the Contractor.

11.5.1.3(b) Obtain representative samples of material in accordance with ASTM D75 for testing. Furnish Jackson County's designee sufficient materials for testing from each sample at the time obtained.

11.5.1.3(c) Furnish specific schedule for sampling to provide Jackson County's designee the opportunity to observe sampling.

11.5.1.4 Submittals. Includes, but not limited to, the following:

11.5.1.4(a) Test result reports from testing laboratory indicating conformance with the specifications.

11.5.1.4(b) Certification of conformance with the specifications.

11.5.2 Materials

11.5.2.1 Crushed rock surface shall consist of ¾-inch aggregate placed on top of a 6-mil polyvinyl barrier.

11.5.2.2 Aggregate shall consist of Crushed limestone or crushed natural gravel, free from lumps or balls of clay or other objectionable matter, and reasonably free from thin and elongated pieces of dirt. Aggregates shall consist of angular fragments, durable and sound, and shall be reasonably uniform in density and quality.

11.5.3 Performance and General Requirements

11.5.3.1 Stockpiles

11.5.3.1(a) Only with approval of Jackson County's designee in specified locations.

11.5.3.1(b) Clear and level storage sites prior to stockpiling.

11.5.3.1(c) Place in a manner and at locations designated by Jackson County, providing separate stockpiles for materials from separate sources.

11.5.3.2 Preparation of Sub-Grade

11.5.3.2(a) Clean off all foreign substances.

11.5.3.2(b) Correct any ruts, depressions, or soft yielding spots and areas with inadequate compaction.

11.5.3.2(c) Treat all sub-grade areas with soil sterilant.

11.5.3.2(d) Jackson County's Project Representative will inspect, prior to placing crushed rock surface, for adequate compaction and surface tolerances.

11.5.3.3 Grade Control

11.5.3.3(a) Establish and maintain by means of grade stakes, properly spaced so string lines may be stretched between stakes.

11.5.3.4 Placing of Materials

11.5.3.4(a) Deposit and spread material in a uniform lift/layer and compact to the thickness indicated and as specified. Spread material uniformly on the prepared sub-grade from moving vehicles or spreader boxes.

11.5.3.4(b) Level material to the required contour and grades.

11.5.3.4(c) Remove those portions of the layer, which became segregated or mixed with sub-grade material in spreading and replace with new material as required by Jackson County's designee.

11.5.3.4(d) Remove and repair sub-grade areas damaged during application of the crushed rock surface.

11.5.3.5 Shaping and Compacting Materials

11.5.3.5(a) Compact layers no less than 3-inches or more than 6-inches thick.

11.5.3.5(b) Roll to specified compaction requirements throughout full depth of layer with power rollers, rubber-tired rollers or combination.

11.5.3.5(c) Shape and smooth by blading and rolling with power roller, rubber-tired roller, or both.

11.5.3.5(d) Hand tamp in places not accessible to rolling equipment.

11.5.3.5(e) Base compaction on weight per cubic foot of material passing ¾-inch sieve and compact to at least 100 percent of maximum density at optimum moisture.

11.5.3.5(f) Determine and control compaction in accordance with AASHTO T99.

11.5.3.5(g) Surface shall show no deviation in excess of 3/8-inch in any 10 feet when tested with a 10-foot straightened applied parallel with and at right angles to the center lines of the paved area.

11.5.3.5(h) Correct any deviation specified in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by Jackson County's designee.

11.6 Herbicide Applications

11.6.1 Equipment and Materials

11.6.1.1 Sprayers and applicators shall be suitable for intended use.

11.6.1.2 Mix herbicide per manufacture's recommendations.

11.6.1.3 Herbicide shall be Krover (1) as manufactured by DuPont, Inc., or approved equal.

11.6.1.4 Do not apply herbicide if it is too windy or where other adverse weather conditions exist.

11.6.1.5 Apply at a rate of 10 pounds of product per acre, or in accordance with manufacturer's recommendations.

11.6.2 Performance

11.6.2.1 Apply only after final sub-grade has been established.

11.6.2.2 Apply before installation of vegetation barrier cloth and placement of crushed rock.

11.6.2.3 Follow manufacturer's recommendations on timing of application with respect to weather and barrier/crushed rock placement.

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12.0 System Configuration/Parts Support

12.1 System Fleet/Talkgroup Requirements

12.1.1 Contractor shall assist Jackson County and various user agencies in determining user identification and talk path assignments.

12.1.2 Contractor shall program all portable, mobile and control station radios, all System or site controllers and all other equipment to operate on the FCC-licensed operating frequencies and determined talk path profiles. This includes existing equipment that is capable, and may operate on the System, at the time of cutover, supplied by other P25 subscriber manufacturers.

12.1.3 Contractor shall prepare and furnish to Jackson County "as programmed" records for each radio (infrastructure & subscriber) placed on the System.

12.1.4 Contractor shall provide training for System/Network Managers sufficient to permit the Jackson County's prime agencies to add users, create new, or delete obsolete talk paths and to access all other System software-controlled features.

12.1.5 Provisions shall be incorporated into the system to allow the Contractor, from its Home Office to remotely interrogate the operating system and provide software assistance if requested by Jackson County.

12.1.6 Contractor must provide 4 sets of radio and equipment programming software, appropriately equipped laptop/desktop computers, and all other support equipment and special cables necessary to program each type of user equipment supplied by the Contractor.

12.2 Spare Parts Support

12.2.1 Contractor must provide and maintain a stock of spare parts, as determined necessary by the Contractor, to maintain all components of the System's infrastructure for the warranty period. These spare parts shall be located either at selected System radio infrastructure sites or at the Contractor's local maintenance service facility. A list of these spare parts determined to be necessary by the Contractor shall be provided to Jackson County.

12.2.2 As spare parts are consumed during routine or repair maintenance, the Contractor shall immediately replenish its stock of locally housed spare parts, where necessary. A report of the utilization frequency and rate of all spare materials shall be made available. If at any time the Contractor is aware of any equipment repair or recall notifications, the Contractor shall notify Jackson County by electronic and routine mail. Trends of unusual System or component failure shall be brought to the attention of Jackson County by the Contractor.

13.0 Installation Guidelines

13.1 Contractor Project Management

13.1.1 The Contractor shall appoint a Project Manager (PM) for the full duration of the project's contracted term.

13.1.2 The Contractor's PM shall conduct an initial Design Review Meeting whereby the project's order of task progression, site/facility layout details, tower engineering studies, coverage design and related items will be presented to Jackson County for review, comment and approval for the Contractor to proceed with production tasks.

13.1.3 During the period prior to the Design Review Meeting, the Contractor will initiate monthly progress meeting with Jackson County whose purpose is to update on progress made in preparation for the Design Review Meeting

13.1.4 The Contractor's Project Manager is responsible for developing and maintaining an updated Project Time Line.

13.1.4.1 Project Time Line updates/revisions, commencing with Jackson County's official Notice to Proceed to the Contractor, shall be submitted by the PM on the last day of each project-month for review and approval by Jackson County**.**

13.1.4.2 The monthly Project Time Line submittal shall depict:

- Progress made per task in the preceding 30-day period;
- Work/tasks to be accomplished in the next 30-day period;
- Identification of critical path items and;
- Work/tasks to be undertaken by Jackson County (if any).

13.1.4.3 Coincident with production of the updated Project Time Line, the Contractor's PM shall identify any known or anticipated issues that will cause a delay to the project's implementation schedule that **are not** within the Contractor's control. Failure by the Contractor's PM to identify such issues in advance will negate any opportunity for schedule relief to the Contract's specified Project Completion Date.

13.1.5 Failure by the Contractor to produce a monthly updated Project Time Line within the period specified herein will result in an **automatic 7-day reduction** of the Contract's specified Project Completion Date (or that Project Completion Date as previously modified by Jackson County's executed Change Order, if any.

13.2 Engineering Drawings

13.2.1 Contractor shall furnish detailed drawings at the project's initial Design Review Meeting and updated drawings prior to installation of each major portion of the System as follows:

13.2.1.1 Transmitter Site(s)

13.2.1.2 Receiver Site(s)

13.2.1.3 Site Antenna and Grounding System(s)

13.2.1.4 Receiver Voter Equipment

13.2.1.5 System Controller Equipment

13.2.1.6 Dispatcher Console Equipment

13.2.1.7 Fiber Optic Equipment Terminal(s)

13.2.2 Drawings shall, as a minimum, illustrate:

13.2.2.1 Relative rack/rack locations

13.2.2.2 Equipment power wiring (primary and emergency)

13.2.2.3 Equipment interconnection wiring (signal and control)

13.2.2.4 RF component interconnection details i.e. transmitter, combiner, antenna, etc.

13.2.2.5 Appropriate signal/voltage levels to facilitate alignment of level-sensitive components.

13.2.3 Civil drawings showing location details of equipment to be placed in existing or new facilities shall be provided by Contractor.

13.2.4 Contractor shall provide a comprehensive test record of alignment levels, settings and software versions installed within both infrastructure and user equipment. Contractor shall provide service manuals infrastructure and subscriber equipment.

13.2.5 In addition, the Contractor shall conduct baseline noise floor site measurements and shall develop, plan and resolve any determination of site/system-induced noise degradation as caused by the Contractor’s design or work.

13.2.6 The scope and detail of the comprehensive equipment test and acceptance plan shall be completed prior to Contract Execution with the Contractor.

13.2.7 Prior to commencement of acceptance testing procedures, the Contractor shall ensure that all installed equipment has been furnished with the latest software releases available for those equipment items/groupings.

13.2.8 Contractor shall supply true copies of Final Project Record Documents which will include the Engineering Drawings, software releases and alignment details listed above, but amended to show system and equipment "as built" at the time of acceptance by the County.

13.2.9 The documentation package shall include in this document submittal a Permissible Exposure Study, as required by the FCC, for each radio infrastructure site.

13.2.10 The total number of documentation sets to be provided shall include one site-specific set for each infrastructure site and three comprehensive System documentation sets for Jackson County use.

13.2.11 Final Project Record Documents must be submitted to Jackson County within thirty days after system acceptance testing has been successfully concluded.

13.2.12 Submissions shall also include electronic versions of all documents submitted.

13.2.13 Final payment for Contracted services shall not be released by Jackson County until this documentation submittal has been successfully completed by the Contractor and reviewed and approved by Jackson County.

13.3 Workmanship

13.3.1 All workmanship shall be in accordance with Industry-accepted best practices and the National Electric Code.

13.3.2 Work areas shall be maintained in a neat, orderly fashion.

13.3.3 Work sites shall incorporate Contractor-provided trash containers and residue of the work shall be discarded as the work is underway.

13.3.4 All sites will be cleaned up at the end of each work day, swept clean, tools picked-up, and walkways free of obstacles and obstructions.

13.3.5 The installation of audio, signal, data and control cables within equipment racks, enclosures, racks and cable trays must be properly routed such that wires/cables do not cross over each within cable bundles.

13.3.6 Cables must be properly labeled, routed and secured.

13.3.7 To the maximum extent possible, cables carrying AC power, low-level audio, RF and digital signals must be grouped separately.

13.3.8 All DC wiring, particularly those areas where battery terminals and power distribution bus bars are located, must incorporate insulation barriers to prevent the accidental short-circuiting of otherwise exposed conductors.

13.3.9 Jackson County shall have the ability to temporarily stop work progress by the Contractor if workmanship falls below acceptable levels and shall have the authority to require the Contractor to remove and/or correct all observed instances of poor wiring practice, inappropriate use of installation materials and other obvious installation defects because of apparent poor workmanship.

13.3.10 Approval to resume installation work activities shall be provided to the Contractor once agreement is reached in resolving observed workmanship defects.

13.3.11 The determination of Contractor workmanship acceptability, as well as the suitability of any proposed rework plans offered by the Contractor, shall remain with Jackson County.

13.4 Equipment Storage

13.4.1 The Contractor shall provide the necessary storage space and skilled labor needed to receive, inventory and maintain supplies and consumables throughout the term of the contract. Jackson County reserves the right to inspect and inventory equipment at any time.

13.5 Factory Staging

13.5.1 Jackson County shall require a full factory staging of the Contractor's radio configuration within the manufacturing facilities used by the Vendor/Contractor.

13.5.1.1 The Contractor shall install, configure and conduct a pre-test of the manufactured equipment and subsystems prior to inviting Jackson County to participate in functional test processes on the configured System's equipment.

13.5.2 The Contractor shall provide a detailed description of functional tests to be undertaken as part of the factory staging process. These tests shall be pre-approved by Jackson County prior to the conducting of any on-site System verification.

13.5.3 The factory staged equipment shall not be shipped to Jackson County and the Contractor's staging area until the most recent levels of software version has been properly installed in the System's various components and that all portions of the functional staging test have been successfully completed and approved by Jackson County.

13.5.4 Wiring and construction anomalies, if observed during staging, must likewise be fully resolved and corrected prior to shipment of the equipment.

13.5.5 The Vendor shall, as part of its Technical Response, submit a sample staging test plan representing those functional tests anticipated for a project of this scope and complexity.

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14.0 Phased Implementation

14.1 Transition Planning

14.1.1 As part of the Response Submittal, the Vendor must prepare and submit a preliminary migration plan that will prevent disruption of communication on the existing radio network and provide a smooth transition to the proposed System:

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

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

14.1.1.3 These required proposal submittals will be used by Jackson County to evaluate the Vendor's ability and understanding of Specification requirements to perform this work in a manner that offers no disruption to ongoing public safety communications operations.

14.1.2 Upon contract award, the Contractor shall provide:

14.1.2.1 A detailed time schedule for the training of system managers, dispatchers, radio managers and other personnel.

14.1.2.2 Contractor will supply time schedules for the orderly transfer of departments onto the System and the estimated time-period when the transfer could be completed.

14.1.2.3 A detailed repair maintenance training plan for Jackson County's in-house technical staff members.

It shall encompass all operational elements of the System to include:

14.1.2.3(a) Network Controllers

14.1.2.3(b) Base Stations Gateways

14.1.2.3(c) Microwave Subsystem

14.1.2.3(d) Alarm System

14.1.2.3(e) Dispatch Consoles

14.1.2.3(f) Radio Control Stations, related appurtenances, and all third-party equipment.

14.1.2.4 This training shall be completed prior to the System's Acceptance Testing activity and is to be performed in within Jackson County. Training locations and dates will be determined between Jackson County and the contractor.

14.1.2.5 All curriculums for the training plan must be approved by Jackson County prior to the commencement of training. The Contractor must provide training and identify necessary tools, to include test equipment and software, to Jackson County's technical staff, as they would to their internal or contracted technical staff.

14.1.2.6 Coordinate the orderly transfer of services to the System network only after having successfully concluded equipment alignment and installation procedures, successful completion of the project's acceptance test, and completion of manager, dispatcher, user, and staff training programs.

14.1.3 Contractor must not dismantle or modify the existing trunked radio system without prior approval of Jackson County.

14.1.4 Some portions of the existing system may remain operational after acceptance of the new system.

14.1.5 Jackson County will notify the Contractor when elements of the old infrastructure equipment may be reallocated to meet interoperability needs or otherwise can be decommissioned.

14.1.5.1 It is the Contractor's responsibility to remove or relocate all the old infrastructure equipment.

14.1.5.2 Jackson County desires a trade in value on any exiting portable, mobile and infrastructure equipment that is part of current communications system.

14.1.5.3 Any infrastructure equipment that is not be accepted by the vendor for trade in value is to be moved by the vendor to a storage facility provided by Jackson County.

14.1.6 Contractor shall assist Jackson County and current radio user agencies in preparing user talkgroups, initial priority levels and shall complete the necessary user equipment installation, programming and record keeping, as required. This activity must be completed prior to service cutover.

14.1.7 All talkgroup structure documentation will be provided to Jackson County by the Contractor.

14.1.8 As part of contract negotiations with the Successful Vendor, Jackson County and Successful Vendor will jointly develop a final comprehensive test and acceptance plan that addresses, minimally, the following major functionality and operability issues:

14.1.8.1 Microwave Network

14.1.8.1(a) Provide RF power and Receive measurements for the microwave;

14.1.8.1(b) Test path fade loss for each direction on each path of the microwave network.

14.1.8.1(c) Test for proper frequency, modulation, digital signaling and stability.

14.1.8.1(d) Verify data integrity on the microwave system including network components utilizing BER Testing;

14.1.8.2 Transmitter Equipment

14.1.8.2(a) Provide RF power stage measurements at different levels of the transmitter system such as transmitter, filters, combiner, cable, antenna, etc.;

14.1.8.2(b) Test RF components for specified insertion loss (i.e., transmission line return loss);

14.1.8.2(c) Test for proper frequency, modulation, digital signaling and stability;

14.1.8.2(d) Test and report of delivered audio quality and signal margins throughout proposed service area.

14.1.8.3 Receiver Equipment

14.1.8.3(a) Test of compliance to specifications of equipment provided;

14.1.8.3(b) Provide log of signal gain or loss to equipment within the receiver system such as antenna, cable, preamp, splitter, or receiver antenna port;

14.1.8.3(c) Test of audio quality and level (reciprocal of that required for the transmit path) of system balance;

14.1.8.4 Console Audio/ System Controllers

14.1.8.4(a) Test of compliance to manufacturer's published specifications of equipment proposed;

14.1.8.4(b) Test of audio quality and level;

14.1.8.4(c) Verification of network failure modes in response to forced failures of individual communications/ control lines and complete site failures complete written explanation is required;

14.1.8.4(d) Verification of compliance to TIA/EIA P25 ISSI/CSSI Standards that allow for seamless interoperability with P25 radio networks fielded by other manufacturers;

14.1.8.4(e) Bit error-rate and voiced audio quality testing of System infrastructure, backhaul and site-specific local area networking infrastructure;

14.1.8.4(f) Fade margin verification of microwave link segments as used to interconnect radio sites, network controllers and radio dispatch facilities;

14.1.8.5 Dispatch Centers

14.1.8.5(a) Provide written results of testing of operational features per dispatch position;

14.1.8.5(b) Test system operation during simulated failures of system components i.e. console electronics, power loss, etc.

14.1.8.6 Third Party Vendor Equipment

14.1.8.6(a) Provide functional testing and verification of any third party equipment used;

14.1.8.7 Contractor shall provide all test equipment, diagnostic services, documentation, software, personnel, vehicles and other items as necessary to test the delivered and installed radio network in accordance with the Contracted Test and Acceptance Plan, inclusive of operational features, to complete a total system functional test.

14.1.8.8 The Vendor shall disclose test procedures and equipment that will be used to verify radio system coverage as specified in Section 6.0.

14.1.8.9 The Vendor shall submit within their Response Submittal a sample test and acceptance plan that is representative of the scope and complexity of the proposed System radio network infrastructure.

14.2 Implementation

14.2.1 Contractor is responsible for the provisions and cost of warehousing, insurance, storage and security of radio network infrastructure and user equipment prior to and during the construction and installation phases of the project.

14.2.2 Contractor will assign a Project Manager as a single point of contact between Jackson County and the Contractor. Contractor's Key Personnel shall be approved by Jackson County prior to assignment. Jackson County reserves the right to require replacement of the Contractor's Key Personnel at any time during the project. Contractor's Project Manager must conduct regularly scheduled meetings, as defined by Jackson County, for the term of the Contract's period.

14.2.3 Prior to installation of any portion of system, Jackson County must approve Contractor furnished detail drawings as specified in Section 13.0. Installation Guidelines.

14.2.4 Each portion of the P25 System must follow those technical parameters specified in the approved Testing and Acceptance Plan.

14.2.5 Contractor must supply comprehensive training on user operation of portable radios, mobile radios, control stations, and other user equipment as required. Contractor must also supply comprehensive training for system diagnostics, management systems, preventative and routine maintenance and system operation for System Managers and designated Jackson County staff.

14.2.6 Contractor is responsible for any site modifications required to accommodate infrastructure equipment proposed for location in Jackson County-owned, as well as in non-Jackson County-owned properties.

14.2.7 Contractor shall provide technical support/engineering as required to modify existing FCC licenses or to acquire additional licenses required to facilitate operation of the System. This activity shall include all FCC licensing application development, frequency coordination and engineering fees. Any frequency work will be coordinated with the State of Georgia Region 10 Frequency Coordinator.

14.2.8 Any modification or relocation of existing equipment will require prior approval by Jackson County. Contractor shall supply "as built" drawings and complete written and electronic documentation of modifications or relocation to existing systems to facilitate maintenance of this equipment in the future.

14.2.9 The Contractor's Project Manager shall develop, monitor, and adapt/update the project's implementation schedule. The schedule shall be presented using Jackson County-approved project task-maintenance software such as Microsoft Project. Schedule updates must be submitted by the Contractor on regular dates that are approved by Jackson County, or sooner if implementation issues require more frequent schedule updates.

14.2.10 The Contractor's Project Manager shall, in addition to Item 14.2.9, prepare and submit, on regular dates approved by Jackson County, a project status report that details the anticipated accomplishments, work to be completed and risks for the period depicted by the revised, updated schedule.

14.2.11 Specific attention should be made to those items and due dates to be met by Jackson County to facilitate the unimpeded completion of the work.

14.2.12 The Contractor's System Engineer shall develop and submit appropriate block and level diagrams, site-specific configuration drawings, field technician workbooks and other related technical materials necessary for the accurate, timely completion of the work. The Contractor's Project Manager shall present the Contractor's internal Quality Control/Quality Assurance plan that depicts the steps and safeguards being undertaken to eliminate field issues with respect to hardware and software quality. This material and process shall be orally presented by the Contractor as part of its Design Review Meeting with Jackson County, prior to the commencement of any field installation activities by the Contractor.

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15.0 Warranty and Maintenance Guidelines

15.1 Warranty

15.1.1 Equipment Warranty

The following conditions shall apply for equipment Warranty:

15.1.1.1 The proposer will provide post warranty maintenance and services that are comparable to the same services proposed for the warranty period.

15.1.1.1(a) All warranty and post warranty services will be clearly identified and provided in a matrix.

15.1.1.1(b) All post warranty services will include all the provided manufacturer's and third-party equipment. This includes any services that were provided to integrate the proposed system.

15.1.1.1(c) The customer can remove any post warranty services as determined by the customer's need to provide in-house or subcontract any of these respective services.

15.1.1.2 The Vendor shall warrant all provided network equipment furnished as part of the Contract and associated radio infrastructure, subscriber and related user equipment and software for a period of not less than one year, after the date of total System acceptance. This includes, but is not limited to, both the P25 Trunking and Mutual-Aid portions of the Contract.

15.1.1.3 Warranty will commence at the time of total System acceptance and the Contractor shall provide all labor and parts for maintenance and repair, including preventative maintenance, of all equipment provided in the proposed network.

15.1.1.4 All cost for the one-year warranty will be borne by the Contractor.

15.1.1.5 Replacement parts must be of new or current manufacture and meet or exceed the specifications of the original supplied equipment (OEM).

15.1.1.6 Post-warranty replacement parts service for emergency infrastructure equipment repair, not available locally, shall be shipped out on the first available flight. Any parts required for non-emergency repair that are not available locally should be shipped out for next day delivery.

15.1.1.7 Contractor shall have factory trained technicians and system engineers available by telephone 24/7/365. The technicians or system engineers must respond by telephone within thirty (30) minutes of observed or reported service outage and be on-site, in response to a reported service outage, within two (2) hours.

15.1.1.7(a) Contractor shall be required to provide a list of certified factory trained technicians performing maintenance on the system including all sub systems and equipment.

15.1.1.7(b) Documentation that supports the current certifications of factory train technicians must be provided. It is the Contractors responsibility to keep any certifications required to maintain the system current and up to date.

15.1.1.8 Service providers responding to emergency service outages must provide continuous non-stop support until the problem is resolved.

15.1.1.9 Non-critical service requests response will be within one (1) working day.

15.1.1.10 When a critical system failure occurs, more stringent requirements shall be met by the Contractor.

15.1.1.10(a) A critical system failure is defined as a significant reduction in the ability to communicate. Examples of such failures are: Site off the air, Dispatch console failure at a location with no backup console available, Primary and Secondary Network Controller failure such as the system does not have the ability to operate on trunked calls, site link failure due to network equipment, or 50% or more failed base/repeaters at a radio site.

15.1.1.11 In the event of a critical system failure, Contractor will notify the County of the failure.

15.1.1.12 Critical failures will be restored in six hours or less from the time of notification to the Contractor, via County notifying the Contractor, or monitored software notification.

15.1.1.13 Major communications equipment manufacturer shall have a fully qualified, staffed and equipped service facility positioned and capable of meeting this Specification's response time criteria during the warranty and maintenance agreement periods. Any subcontractors used during the warranty and maintenance period, must be approved by the County prior to any work performed.

15.2 Repair response default remedies:

In the event of default on the response time to reported service outages, the Contractor agrees to pay the County the following response remedies:

15.2.1 Contractor shall pay $250 for each occasion that it fails to meet the response time obligation for a reported infrastructure service outage.

15.2.2 Contractor shall pay $500 per twenty-four-hour period in which a defective infrastructure site is not restored to operational status.

15.2.3 Should any specific equipment item (such as a specific portable radio, repeater station, station circuit board, power amplifier, etc.) be submitted for repair three times during the warranty period, Contractor will replace that equipment item with a new item and warranty the replacement for one additional year from the time of replacement.

15.2.4 The Contractor must make available replacement parts for all Contractor-manufactured components of the digital radio infrastructure for 15 years following acceptance.

15.2.5 The Contractor must identify life cycle and part availability of all third party equipment proposed.

15.2.6 Post-warranty replacement parts service for emergency infrastructure equipment repair, not available locally, shall be shipped out on the first available flight.

15.2.7 Any parts required for non-emergency repair that are not available locally should be shipped out for next day delivery.

15.2.8 Contractor must guarantee the System's operating software, inclusive of user equipment software, for a one-year period following acceptance.

15.2.9 The Contractor shall provide all software updates, at no additional cost, for the entire period under which the County has committed for Contractor-provided after-warranty maintenance services.

15.2.10 Contractor shall fix by either update or upgrade, all known software "bugs" to installed software even if such warranty period has expired.

15.3 Maintenance

15.3.1 During the initial warranty period, the Contractor shall be responsible for:

15.3.1.1 Preventative maintenance of all proposed equipment and any supplied end-user equipment;

15.3.1.2 Repair maintenance of infrastructure equipment, inclusive of antenna systems;

15.3.1.3 Repair maintenance of subscriber and related user equipment;

15.3.1.4 Installation of mobile-mounted radio equipment.

15.3.2 Contractor-provided maintenance during the warranty period will be monitored by the County.

15.3.3 The Contractor must supply monthly service logs listing the site(s) where service is performed, the equipment involved and service details.

15.3.4 Failure of individual units, subassemblies and/or components must be reported in writing to the County. This report must, as a minimum, include unit identification (description and serial number), explanation and cause of failure, and corrective action taken.

15.3.5 Contractor is responsible for all actions of its employees or subcontractors. Any equipment failure(s) caused by any act or omission of Contractor's employee or subcontractor shall be the responsibility of the Contractor.

15.3.6 The Contractor shall submit a maintenance work plan that identifies the tasks required in accordance with Section 14.2, a listing of Contractor supplied personnel and identification of a single 24/7/365 contact point responsible for Contractor maintenance issues.

15.3.7 All required service logs and repair reports must be submitted to the County.

15.4 Service/Maintenance Software

The Contractor shall provide:

15.4.1 A suite of software applications for the County to be able to view and monitor all alarms and faults on the System, both non-critical and critical.

15.4.2 An electronic ticketing system which gives the Contractor and County the ability to submit and track tickets and assets associated with the System as defined in Section 17.0 additional requirements.

15.4.3 Software capable of decoding an encrypted control channel in real time, over the air, should encrypted control channels be utilized at system acceptance, or a later time during the period of this contract.

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

15.4.5 It is the intention of the County to utilize outside contract labor for maintaining its infrastructure equipment and subscriber equipment. With respect to outside contractor needs, the term of this extended maintenance service shall be as long as fifteen years, structured into three 5-year optional service intervals. Proposers shall provide a detailed description of services (as well as any service exclusions) to be provided for this extended maintenance service, inclusive of infrastructure software updates, hardware updates required to support newer software, defective parts replacements, and spare parts.

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16.0 Pricing Considerations

16.1 General Pricing Information

This infrastructure and subscriber equipment-pricing portion of this Specification is developed as a guide for the Vendor so that the necessary information is provided to Jackson County for it to conduct an accurate assessment of proposed cost. This information is illustrative of the detail required for each infrastructure site, inclusive of sites having only dispatch-related equipment.

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

16.2 Site Modification Costs

16.2.1 For equipment to be installed at Jackson County-owned sites which have requirements for site preparatory work involving architectural, mechanical, electrical, civil or structural construction modifications, a description and cost of the modifications required must be provided by the Vendor for each individually named site.

16.2.2 For newly-added sites, the cost provided by the Vendor shall include services normal and customary for the development and commissioning of a new site, exclusive of access roadway development. Site access roadways will be provided by Jackson County if the property is Jackson County-owned.

16.3 Lifecycle Costs

16.3.1 Jackson County retains the right to perform life-cycle analysis in determining the best price-value. One important component of such as analysis involves knowledge of the life cycle of the various major equipment elements making up a Proposer's solution. The production age of equipment families, and the platform as a whole, affects the downstream ability to source spare parts and software support and is a key factor in determining the operational life of a technology or product.

16.3.2 Proposers shall disclose as part of their Pricing Proposal when base stations, network controllers, P25 interface gateways, user equipment families and the operational software for the technology was first released for sale to the Public. proposed product elements is likely to be discontinued and when parts/software support will cease to be available. These services will be the same as the services provided during the warranty period.

16.3.3 Proposers shall disclose as part of their Pricing Proposal when was first released for sale to the Public. requires the proposer to add life cycle for any proposed. Proposers shall also provide a life-cycle roadmap, referenced by year and so depicts when any third party equipment is likely to be discontinued and when parts/software support will cease to be available.

16.4 Warranty and Maintenance Costs

16.4.1 Costs for the initial warranty and extended maintenance service, inclusive of infrastructure software updates, hardware updates required to support newer software, defective parts replacements, and spare parts, shall be included as part of the Vendor's cost proposal.

16.4.2 The proposer will provide detailed pricing for all services proposed under the post warranty timeframe.

16.4.3 These post warranty services will replicate all services that were provided during the proposed warranty period.

16.4.4 Include optional pricing to replace subscriber replace every seven to eight years (7-8) years at discretion of the vendor.

16.4.5 Include optional pricing to subscriber batteries every three (3) years.

16.5 Pricing Summaries

16.5.1 Pricing Summaries for Infrastructure and Subscriber equipment shall be provided as part of the Response Submittal. All summary information will be supported by detailed cost information as detailed further in this Section. Pricing Summaries include;

16.5.2 Infrastructure Equipment

16.5.3 Project Management, Engineering, & Installation Services

16.5.4 Subscribers

16.5.5 Subscriber Programming and Installation Services

16.5.6 Infrastructure Discount

16.5.7 Subscriber Discount

16.5.8 Turnkey Discount

16.5.9 System Maintenance

16.5.10 Subscriber Maintenance

16.5.11 Total Cost of Ownership at 5, 10, & 15 years

16.5.12 Optional Requests

16.6 Future Purchase Considerations

16.6.1 It is the intent of Jackson County to operate this new radio communications network for, minimally, the next twenty years. It is important that Jackson County receive reasonable safeguards regarding future Vendor equipment/services pricing.

16.7 Immediate Future Discounts

16.7.1 For all purchases within five (5) years after the System's acceptance date, the discount percentage received by Jackson County will be identical to the discount percentages derived from list-price unit equipment costs and Vendor-submitted unit costs as contained in its Proposal.

16.8 Purchase Price Discount Years 6 - 10

16.8.1 For years six (6) through ten (10) after the System's acceptance date, Jackson County's discount from the manufacturer's published equipment list price, as delivered to their authorized sales agents, shall be as follows:

Fixed Site Equipment	_____%
Antenna Related Equipment	_____%
Console Equipment	_____%
Control Station Equipment	_____%
Subscriber Equipment	_____%
Accessories	_____%
Spare Parts	_____%

16.9 Price Discount Years 11 - 15

16.9.1 For years eleven (11) through fifteen (15) after the System's acceptance date, Jackson County' discount from the manufacturer's published equipment list price as delivered to their authorized sales agents, shall be as follows:

Fixed Site Equipment _____%

Antenna Related Equipment _____%

Console Equipment _____%

Control Station Equipment _____%

Subscriber Equipment _____%

Accessories _____%

Spare Parts _____%

16.10 Price Discount Years 16 - 20

16.10.1 For years sixteen (16) through twenty (20) after the System's acceptance date, Jackson County's discount from the manufacturer's published equipment list price as delivered to their authorized sales agents, shall be as follows:

Fixed Site Equipment _____%

Antenna Related Equipment _____%

Microwave Equipment _____%

Console Equipment _____%

Network Equipment _____%

Control Station Equipment _____%

Subscriber Equipment _____%

Accessories _____%

Spare Parts _____%

16.11 Infrastructure Pricing Analysis Worksheets

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

Primary/Redundant Site (individual submittals required)

Equipment Description	Number Req'd	List Unit Cost	Unit Cost	Extended Cost	Maintenance
Transmitters	_____	$_____	$_____	$_____	$_____
Transmitter Antenna Systems	_____	$_____	$_____	$_____	$_____
Combiner Package(s)	_____	$_____	$_____	$_____	$_____
Receiver Antenna	_____	$_____	$_____	$_____	$_____
Mutual Aid Subsystem	_____	$_____	$_____	$_____	$_____
Multicoupler	_____	$_____	$_____	$_____	$_____
Receivers	_____	$_____	$_____	$_____	$_____
Gateway Control Stations	_____	$_____	$_____	$_____	$_____
Base Station Gateway	_____	$_____	$_____	$_____	$_____
ISSI	_____	$_____	$_____	$_____	$_____
M/W Interface Equipment	_____	$_____	$_____	$_____	$_____
Standby Generator System	_____	$_____	$_____	$_____	$_____
Battery/Charger System	_____	$_____	$_____	$_____	$_____
Broadband Gateway	_____	$_____	$_____	$_____	$_____
Site Civil Modifications	_____	$_____	$_____	$_____	$_____
Equipment Shelter	_____	$_____	$_____	$_____	$_____
Tower	_____	$_____	$_____	$_____	$_____
Shelter Installation	_____	$_____	$_____	$_____	$_____
Project Management	_____	$_____	$_____	$_____	$_____
System Engineering	_____	$_____	$_____	$_____	$_____
Subtotal Equipment				$_____	
Subtotal Labor				$_____	
Total Equipment/Labor				$_____	
Total Annual Maintenance Cost.				$_____	

Radio Site (one submittal per location)

Equipment Description	Number Req'd	List Unit Cost	Unit Cost	Extended Cost	Maintenance
Transmitters	_____	$_____	$_____	$_____	$_____
Transmitter Antenna Systems	_____	$_____	$_____	$_____	$_____
Combiner Package(s)	_____	$_____	$_____	$_____	$_____
Receiver Antenna	_____	$_____	$_____	$_____	$_____
Mutual Aid Subsystem	_____	$_____	$_____	$_____	$_____
Multicoupler	_____	$_____	$_____	$_____	$_____
Receivers	_____	$_____	$_____	$_____	$_____
Base Stations/Interop	_____	$_____	$_____	$_____	$_____
	_____	$_____	$_____	$_____	$_____
	_____	$_____	$_____	$_____	$_____
M/W Interface Equipment	_____	$_____	$_____	$_____	$_____
Standby Generator System	_____	$_____	$_____	$_____	$_____
Battery/Charger System	_____	$_____	$_____	$_____	$_____
	_____	$_____	$_____	$_____	$_____
Site Civils Modifications	_____	$_____	$_____	$_____	$_____
Equipment Shelter	_____	$_____	$_____	$_____	$_____
Tower	_____	$_____	$_____	$_____	$_____
Shelter Installation	_____	$_____	$_____	$_____	$_____
Project Management	_____	$_____	$_____	$_____	$_____
System Engineering	_____	$_____	$_____	$_____	$_____

Subtotal Equipment	$_____
Subtotal Labor	$_____
Total Equipment/Labor	$_____
Total Annual Maintenance Cost.	$_____

16.12 Subscriber Equipment Pricing

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

16.12.2 The Vendor shall develop cost proposals for low, mid and high-tier radio products using the following general format:

16.12.2.1 High-Tier Portable

16.12.2.1(a) At least 500 modes/talk groups/channels

16.12.2.1(b) 700/800MHz operation (optional multiband operation)

16.12.2.1(c) Multi-line 12 character minimum, alpha-numeric LCD text display

16.12.2.1(d) Radio/network status icons

16.12.2.1(e) 256-bit AES voice encryption

16.12.2.1(f) AMBE+2 vocoder, or newer

16.12.2.1(g) Emergency button

16.12.2.1(h) Programmable option buttons

16.12.2.1(i) Talk group scan

16.12.2.1(j) System scan

16.12.2.1(k) Intrinsically safe (option)

16.12.2.1(l) Integrated voice/data capability (option)

16.12.2.1(m) GPS receiver

16.12.2.1(n) OTAP

16.12.2.1(o) OTAR

16.12.2.1(p) Wide range of optional accessories

16.12.2.2 Mid-Tier Portable

16.12.2.2(a) At least 250 modes/ talk groups/ channels

16.12.2.2(b) 700/800MHz operation

16.12.2.2(c) Multi-line 12 character minimum, alpha-numeric LCD text display

16.12.2.2(d) Radio/network status icons

16.12.2.2(e) 256-bit AES voice encryption

16.12.2.2(f) AMBE+2 vocoder, or newer

16.12.2.2(g) Emergency button

16.12.2.2(h) Programmable option buttons

16.12.2.2(i) Talk group scan

16.12.2.2(j) System scan

16.12.2.2(k) Intrinsically Safe (option)

16.12.2.2(l) Integrated voice/data capability (option)

16.12.2.2(m) GPS receiver

16.12.2.2(n) OTAP

16.12.2.2(o) OTAR

16.12.2.2(p) Wide range of optional accessories

16.12.2.3 Low-Tier Portable

16.12.2.3(a) At least 48 modes/talk groups/channels – Rotary Selector

16.12.2.3(b) 700/800MHz operation

16.12.2.3(c) Single line, 8 character minimum, alpha-numeric LCD text display

16.12.2.3(d) Radio/network status icons

16.12.2.3(e) AMBE+2 vocoder, or newer

16.12.2.3(f) Emergency Button

16.12.2.3(g) Programmable option buttons

16.12.2.3(h) Limited list of optional accessories

16.12.2.4 High-Tier Mobile Radio

16.12.2.4(a) At least 500 modes/talk groups/channels

16.12.2.4(b) 700/800MHz operation (optional multiband operation)

16.12.2.4(c) Remote control head/rear mount/dash mount configurations

16.12.2.4(d) Multi-line alpha-numeric LCD text display

16.12.2.4(e) Radio/network status icons

16.12.2.4(f) 256-bit AES voice encryption

16.12.2.4(g) AMBE+2 vocoder, or newer

16.12.2.4(h) Emergency button

16.12.2.4(i) Programmable option buttons

16.12.2.4(j) Talk group scan

16.12.2.4(k) System scan

16.12.2.4(l) Integrated voice/data capability (option)

16.12.2.4(m) OTAP

16.12.2.4(n) OTAR

16.12.2.4(o) GPS receiver

16.12.2.4(p) Wide range of optional accessories

16.12.2.5 Mid-Tier Mobile Radio

16.12.2.5(a) At least 250 modes/talk groups/channels

16.12.2.5(b) 700/800MHz

16.12.2.5(c) Remote control head/rear mount configuration

16.12.2.5(d) Multi-line alpha-numeric LCD text display

16.12.2.5(e) Radio/network status icons

16.12.2.5(f) 256-bit AES voice encryption

16.12.2.5(g) AMBE+2 vocoder, or newer

16.12.2.5(h) Emergency button

16.12.2.5(i) Programmable option buttons

16.12.2.5(j) Talk group scan

16.12.2.5(k) System scan

16.12.2.5(l) Integrated voice/data capability

16.12.2.5(m) OTAP

16.12.2.5(n) OTAR

16.12.2.5(o) GPS receiver

16.12.2.5(p) Wide range of optional accessories

16.12.2.6 Low-Tier Mobile Radio

16.12.2.6(a) 700/800MHz operation

16.12.2.6(b) Front mount/dash mount package

16.12.2.6(c) At least 48 modes/talk groups/channels – Rotary Selector

16.12.2.6(d) Two-line alphanumeric display

16.12.2.6(e) Network/radio icons

16.12.2.6(f) AMBE+2 vocoder, or newer

16.12.2.6(g) Programmable option buttons

16.12.2.6(h) Emergency button

16.12.2.6(i) Limited range of optional accessories

Appendix C: Subscriber Radio Requirements, illustrates the quantities, types and tiers of subscriber equipment required.

16.12.3 Additionally, the Vendor shall prepare a detailed optional equipment catalog that describes the full range of options available for all Tiers and indicated portable and mobile radio configurations. The submitted catalog shall include list prices and the proposed discount percentage-reduced initial purchase price.

17.0 Additional Requirements

17.1. Fire Paging System

Jackson County requires a fire paging solution to alert volunteer fire personnel throughout the county.

17.1.1. The fire paging solution must provide a compact lightweight device that can be worn directly clipped to a belt, or in a carrying case attached to a belt.

17.1.2. Operate using the proposed P25 radio system.

17.2. Fire Station Alerting System

Fire Departments within Jackson County will be considering the upgrade of the following nine fire stations (9), and six (6) EMS stations to implement a fully-functional, turn-key, scalable Fire Station Alerting System (FSAS) that can be integrated with current or future data transport systems.

Commerce Fire Department: 1491 S Elm St, Commerce, GA 30529

Harrisburg Fire Department: 52 Thyatira Community Chu Rd, Jefferson, GA 30549

Jackson Trail Fire Department: 3345 Jackson Trail Rd, Jefferson, GA 30549

Jefferson Fire Department: 129 Athens St, Jefferson, GA 30549

Jefferson Fire Department Station 2: 2690 US-129, Jefferson, GA 30549

Nicholson Fire Department: 5462 US-441, Nicholson, GA 30565

Plainview Fire Department: 4346 Plainview Rd, Maysville, GA 30558

West Jackson Fire Department: 69 W Jackson Rd, Braselton, GA 30517

Future West Jackson Fire Department: Intersection of New Liberty and Ednaville

EMS Station 1: 677 South Elm Street, Commerce, GA 30529

EMS Station 2: 86 Gordon Street, Jefferson, GA 30549

EMS Station 3: 11917 Lewis Braselton Boulevard, Braselton, GA 30517

EMS Station 4: 5460 Highway 441, Nicholson, GA 30565

EMS Station 5: 4285 Plainview Road, Maysville, GA 30558

EMS Station 6: 528 Crooked Creek Road, Athens, GA 30607

This may include the need for software and the necessary hardware to support the FSAS. The overall goal is to have a state-of-the-art FSAS that meets the needs of the Department, both today and well into the future.

17.2.1. The proposed solution will use IP based connectivity to each station, while the P-25 radio network serves as a backup solution that provides the functionality of minimally alerting, activate station lights, using station PA system, and provide acknowledgement.

17.2.2. The P-25 radios system can be used as the primary network if IP connectivity is not available.

17.2.3. The proposed solution for the Fire Alerting system should have capabilities to interface to the Jackson County's Computer Aided Dispatch (CAD) system by Tyler technologies .

17.2.4. The proposed FSAS should also minimally provide:

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

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

17.2.5. Transfer from the LAN based to radio based alert transport cannot take place unless the alerting system is aware of a LAN outage.

17.2.5.1. This either requires that the alerting system poll the fire stations to see if a communication path exists and/or require an acknowledgement from the stations to assure that an alert has been received.

17.2.5.2. With LAN based systems, multiple attempts to send an alert are automatically made. If after a programmed number of attempts occur and acknowledgement of the alert is not received, an alerting system alarm is created.

17.2.5.3. Since this alarm may go unnoticed. It is imperative that the alerting system have the ability to transfer the station alert to an alternate path in order to assure that the alarm has been received. This action should take place without human intervention.

17.2.6. Transfer from the LAN based to radio based alert transport cannot take place unless the alerting system is aware of a LAN outage.

17.2.6.1. This either requires that the alerting system poll the fire stations to see if a communication path exists and/or require an acknowledgement from the stations to assure that an alert has been received.

17.2.6.2. With LAN based systems, multiple attempts to send an alert are automatically made. If after a programmed number of attempts occur and acknowledgement of the alert is not received, an alerting system alarm is created.

17.2.6.3. Since this alarm may go unnoticed. It is imperative that the alerting system have the ability to transfer the station alert to an alternate path in order to assure that

the alarm has been received. This action should take place without human intervention.

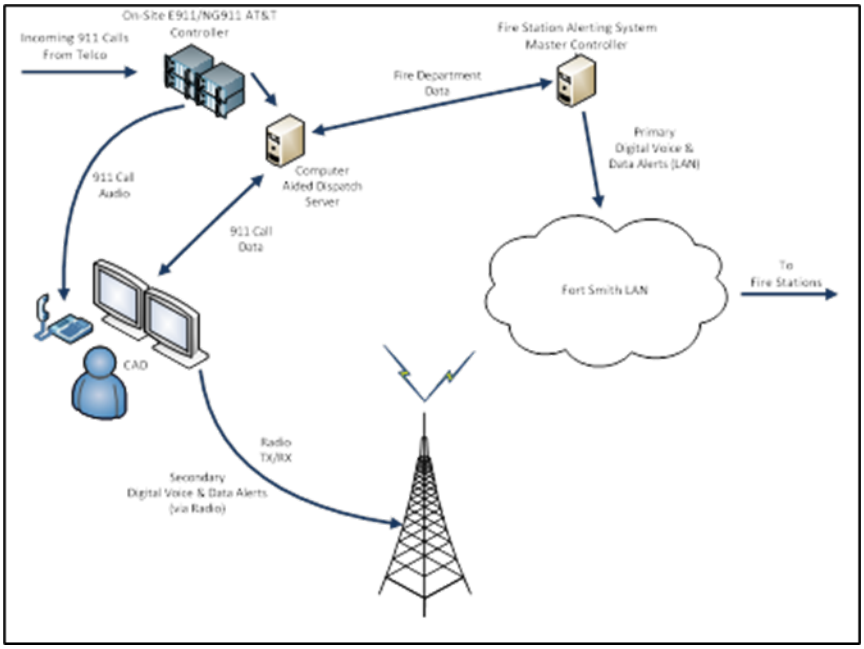
17.2.7. One secondary alerting path can utilize a trunked radio system.

17.2.7.1. The P25 trunked radio system currently being proposed should provide the means for alerts to be sent to the fire stations should the primary LAN system fail. This alternative will require that an appropriate trunked radio is present in each station and is connected to the local alert controller.

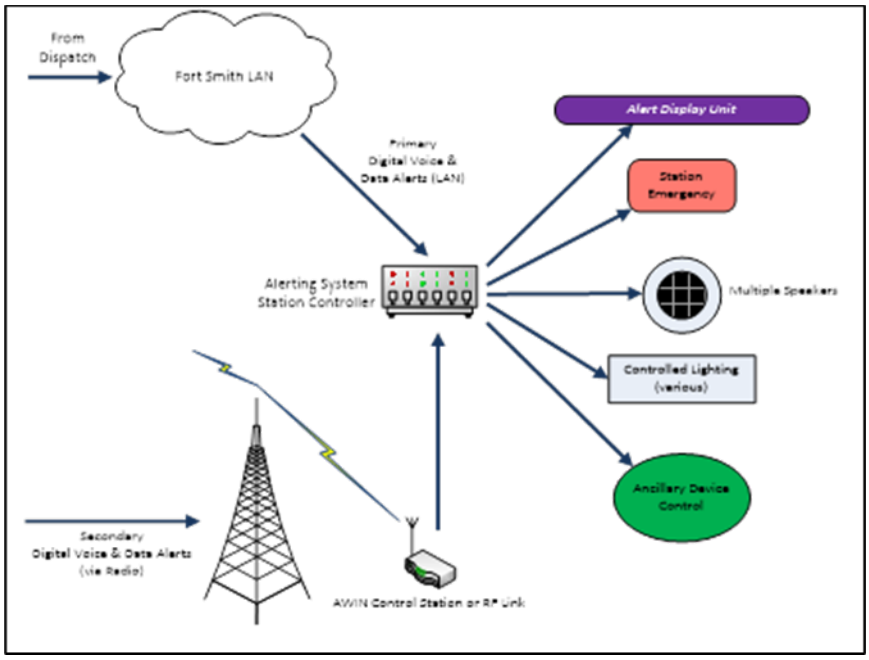
17.2.7.2. This solution presents a challenge as interconnection with the local alert controller is possible but will vary depending on which alert system vendor is chosen. As such, the alert system must have multiple means of connectivity for alert signals.

17.2.8. It must be noted that to utilize the P25 trunked radio for alerting, some additional equipment or radio configurations may be required. The costs for the radio and the radio configuration are considered within the scope of this project.

17.2.9. The following diagrams demonstrated example of the basic Fire Alerting primary and secondary network for this proposal.



Primary LAN Base Fire Alert Network



Secondary RF Control Station Fire Alert

17.2.10. The following infrastructure equipment will be necessary:

17.2.10.1. Centralized gateway or portal server (redundant for non-single point failure) to interface with the Tyler technologies CAD system.

17.2.10.2. Master alerting controller to distribute alerts to all current and future fire stations.

17.2.10.3. System management console and software for configuring the alerting system interfaces, functions, capabilities and reporting various alarm conditions.

17.2.10.4. One or more local alerting controller(s) within each fire station.

17.2.10.5. Local alerting controller(s) to digitally interconnect with ancillary data or display equipment located within each fire station using standard TIA/EIA 568 Cat 5 cabling or optionally by using a wireless access point.

17.2.10.6. Indoor and outdoor speakers with independent volume adjustments, dry contact alarm points and other auxiliary control devices are typically connected with copper cabling.

17.2.10.7. Manual alerting equipment to provide station alerting functions if the CAD system fails or is offline.

17.2.11. Capabilities, features, and functions identified should include the following:

17.2.11.1. Time synchronization with the Jackson Co LAN system

17.2.11.2. System Controller powered by AC or DC power supplies

17.2.11.3. Fire Station alerts sent via IP network

17.2.11.4. Ability for fire station alerts to be sent via P25 radio

17.2.11.5. Alerting system managed in real-time

17.2.11.6. Alert event database

17.2.11.7. CAD interface

17.2.11.8. Station audio from digital voice or fire call taker

17.2.11.9. Dispatch console interface

17.2.11.10. Automated voice dispatching

17.2.11.11. Outside audio control (on/off, level)

17.2.11.12. Dual mode alert lighting

17.2.11.13. Dormitory alerting (visual and audible)

17.2.11.14. Pre-alert tone capability

17.2.11.15. Preset day and night volume levels inside and outside each fire station

17.2.11.16. Alerting system with multiple audio inputs and outputs

17.2.11.17. Firmware/configuration upgraded remotely via network

17.2.11.18. Ability to segment a Fire Station into separate areas or zones

17.2.11.19. Alert system monitoring and alarms should failures occur

17.2.11.20. Automatic station alert reset after a programmed or predetermined elapsed time

17.2.11.21. Ability to support NG911 technology

17.2.11.22. Operating system based on standard software operating system

17.2.11.23. System hardware configuration database

17.2.11.24. Secondary alert messages sent to fire station by Fire Dispatch

17.2.11.25. Emergency alert switch for in-station emergencies

17.2.11.26. Fire station test switch to check local alerting system integrity and function

17.2.11.27. Egress lighting

17.2.11.28. Alerting of specific personnel not in a fire station

17.2.11.29. Control of secondary devices

17.2.11.30. Alert acknowledgement switch

17.3. Asset Management

17.3.1. Proposals will include an asset management system to allow for effective and efficient management of the growing and fluid inventory of communication assets that make up a complex P-25 radio system- both subscriber and infrastructure assets.

17.3.2. The solution must be a Commercial Off-The-Shelf system, configurable by the end user and the provider shall do all conversion/importing of existing and new inventory data necessary to roll out the solution.

17.3.3. A hosted, cloud-based offering is preferred, and the system should be installed in at least 5 state and local government agencies for comparable use of managing a radio system.

17.3.4. In addition to basic asset management requirements (asset #, serial #, location, personnel assignment, vehicle assignment, status, etc.), the solution should have the optional capability to track the assignment of multiple radio IDs to each subscriber asset record, as well as manage the configuration of each subscriber and infrastructure asset.

17.3.5. Configuration management is important and should include, but not be limited to, the following:

17.3.5.1. Programming template / personality version tracking with file attachment capability

17.3.5.2. Software versions (i.e. firmware, flash code)

17.3.5.3. Radio / unit ID assignments by system and range

17.3.5.4. No duplication of radio / unit ID

17.3.5.5. Lock down ID ranges by user group

17.3.5.6. Allow for multiple radio / unit IDs to be assigned as needed

17.3.5.7. Track radio options and accessories

17.3.5.8. Allow for custom fields by asset type

17.3.6. The solution will also include a work order management application that can manage both planned and unplanned work requests such that service efforts, preventative maintenance schedules, and related asset modifications can be identified and reported on demand.

17.3.7. Work orders should be linked directly to asset records and alerts should be created for work to be done based on time or change based events, such as preventative maintenance dates.

17.4. Storm Warning System

17.4.1.

17.4.2. Jackson County currently operates 29 severe weather sirens. All these sirens are Whelen Vortex except for four of the sirens that are old civil defense sirens.

17.4.3. The sirens are currently activated by implementing a group call from dispatch on the County's DMR system to a mobile radio. The mobile radio then uses an output to create a relay closure on the siren interface.

17.4.4. The vendor shall provide all needed radio and hardware to interface to the existing emergency sirens.

17.4.5. The sirens are to be activated utilizing a the P25 network by making a call to each individual siren.

17.5. GPS and AVL

Jackson County requires a GPS/AVL solution to identify the real time location of users and vehicles.

17.5.1. Mobile and portable subscriber radios need to be GPS capable GPS data. Jackson County will define the quantities needed in Appendix C: Subscriber Radio Requirements.

17.5.2. The vendors GPS/AVL solution will include all needed servers, equipment and infrastructure need to support the following requirements.

17.5.2.1. Interface to Jackson County's current CAD system.

17.5.2.2. Provide web-based interface that will allow vehicles to be viewable by the public. For example, school bus and other publicly use County vehicles**. Note: that this system is intended to be shared with the County School Districts. The proposal should take all considerations with security and other precautions.**

17.5.2.3. The proposed solution must have the ability to select or not select specific vehicles for public web-based viewing.

17.5.2.4. The proposed system should be able to provide location on PTT, Emergency press, and regularly timed intervals.

17.5.2.5. Define capability to utilize GIS or Google Maps / Earth interface.

17.5.2.6. The vendor must state if the proposed GPS/AVL solution is proprietary or follows the P25 standard. It must be defined how the GPS/AVL works within the P25 standard.

17.6. Optional Shared System Infrastructure

17.6.1. General

Jackson County is sensitive to the costly nature of P25 systems. Therefore, vendors are encouraged to submit creative additional proposals that may utilize any or all capabilities, software, and hardware of other systems that are already being provided by the vendor. This may include systems that are currently under construction but can

be modified to accommodate additional equipment added for the purposes of this RFP, or systems that are complete and in normal operation (Further referenced as "existing system").

17.6.2. Optional system configuration technical requirements

17.6.2.1. Any proposed optional configuration must meet all technical requirements outlined within this RFP. If an optional configuration will not support all technical requirements listed in this RFP, each item not supported must have detailed explanation for why it cannot be supported. Any unsupported requirement risks being graded down or found non-compliant. Furthermore, an optional system configuration will not be considered if the primary response to this RFP is graded as noncompliant.

17.6.2.2. Optional configurations must have redundant network connection points into the existing system. Additionally, the proposed optional configuration must be able to continue regular trunking operations and communications in the event of network connectivity failure to the existing system. This includes dispatch consoles having direct network access into the remaining RF sites, or RF connectivity.

17.6.3. Optional system configuration pricing requirements

17.6.3.1. Within the pricing proposal of the optional system configuration, key cost differences (whether savings or additional cost) shall be identified and marked as such for comparison purposes. An example of this is if a specific item is needed in a stand-alone system, but already exists with the optional solution, the vendor shall highlight this cost savings.

17.6.4. Optional system configuration submittal requirements

17.6.4.1. Any optional system configuration proposal must follow all dates and guidelines as prescribed in this RFP, including the separation of its pricing from the technical proposal.

17.6.4.2. Additionally, any optional system configuration that requires joining an existing system or site, must include written authorization from the owner of the existing system or site. This authorization must be included within the technical proposal submittal for the Optional system configuration.

17.7. Dispatch Console Furniture

Public Safety/911 Emergency Communication Centers have unique challenges and demands; conventional office furniture does not provide an acceptable level of function, technology integration, user ergonomics features, nor durability. When specifying furniture for an Emergency Communications Center, it is important to recognize that furniture should meet minimum requirements to support key performance requirements:

17.7.1. Primary Dispatch Center will consist of nine (9) furniture positions.

17.7.2. Consoles are utilized 24 hours per day/ 7 days per week by different employees with different physical sizes and needs; this is more than five times the average use and wear of conventional office furniture annually.

17.7.3. Consoles must house and power extensive technology support including multiple monitors - in-line, stacked and/or combined with large-format screens models.

17.7.4. Console furniture must provide additional storage for ancillary rack mount electronics.

17.7.5. Consoles must provide no less than ten (10) years of 24/7 use which is required for the expected 80,000 hours of use over the course of a console's lifetime.

17.7.6. Conventional office furniture systems will not be considered for emergency communications center applications. The following categories have been identified for critical compliance and should be met by Dispatch Console furniture manufacturers and providers.

17.7.7. Consoles should be designed and manufactured to meet the following industry standard, and third party tested, guidelines for safety, strength, durability, and a healthy workplace:

17.7.7.1. CSA (Canadian Standards Association) C22.2#68.

17.7.7.2. SCS Global Services Indoor Air Advantage Gold SCS-EC10.3-2014 v3.0 certified for protecting indoor air quality by minimizing volatile organic compound chemical off gassing through design engineering and materials selection.

17.7.7.3. CARB (California Air Resources Board) compliant for reduction of formaldehyde emissions, identified as an airborne toxin.

17.7.7.4. FCC eCFR Title 47, Part 15 Radio Frequency Devices, Subpart B: Unintentional Radiators.

17.7.7.5. ICES (Interface Causing Equipment Standard) -003: Informational Technology Equipment.

17.7.7.6. Textiles compliance with CA TB 117 (California Technical Bulletin) Flammability Standard Requirements for Upholstered Furniture products.

17.7.8. Technical Requirements

The console furniture must be similar or like the following technical requirements.

17.7.8.1. Stability – Function

17.7.8.1.1. The console furniture is designed specifically for 24/7 operations in an emergency communications center environment.

17.7.8.1.2. The console furniture is modular in design so as to be easily reconfigured and upgraded.

17.7.8.1.3. Technology storage and personal storage units stand free from the main console body so they can be field removed or replaced without deconstruction on the console unit.

17.7.8.1.4. Sit-to-stand legs are bolted into the console undercarriage and to the underside of the input support surface creating maximum proportional stability; free-standing leg and feet systems will not be acceptable.

17.7.8.1.5. There are no obstructions side-to-side obstructions within the console footprint that will inhibit movement by the user, a critical component in order to provide on-going training of users and technology. Knee space must span a minimum of 70% of the console's overall width.

17.7.8.1.6. Horizontal work surfaces are supported by a formed steel sub-frame for maximum durability.

17.7.8.1.7. Horizontal work surfaces must be strong and rigid and able to meet all required standards for furniture construction as outlined by ANSI/BIFMA X5.5-2008, Desk Products.

17.7.8.2. Input support surface

17.7.8.2.1. The input support surface must lower to at least 24.5" from the floor.

17.7.8.2.2. The input support surface must raise to 50" above the floor to accommodate the 99th percentile standing male per ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.2.4.3.

17.7.8.2.3. The height-adjustability must be engineered so as to provide infinite adjustment throughout the entire adjustment range, a critical function to meet ergonomic standards and reduce repetitive strain injuries and carpal tunnel syndrome.

17.7.8.2.4. The input support surface must be a level platform that is wide enough to accommodate multiple input including keyboards, mice, and writing surface; the input platform surface area should be a minimum of 1300 sq. inches.

17.7.8.2.5. The input support surface must have enough surface area to accommodate input devices within a primary and a secondary work zone and to meet ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.4.1 standards.

17.7.8.2.6. The input support surface must allow the user to maintain elbow angles between 70 and 135 degrees to meet ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.1.1 standards.

17.7.8.2.7. The electronic adjustment must be independent of the monitor support; other adjustment methods will be deemed unacceptable.

17.7.8.2.8. The electronic adjustment must be controlled through a digital read-out to ensure precise user-preferred replication.

17.7.8.2.9. The electronic adjustment controls must be mounted in a location that meets ADA standards for accessibility.

17.7.8.2.10. Top mounted adjustment controls will be deemed not acceptable.

17.7.8.2.11. The input support surface must adjust simultaneously with the monitor support in order to retain relative positioning between both surfaces when changing from sitting to standing. This promotes ergonomic alignment and a timely and controlled shift from sitting to standing work postures.

17.7.8.2.12. The input support surface must allow adjustment of the line-of-sight viewing distance between the eyes and front surface of the viewable display area within the range of 19.7" and 39.4" to meet ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.4.2. The entire surface and all environmental controls shall move with the input surface to maintain preferred and ergonomic settings.

17.7.8.2.13. The input support surface must have a static load capacity of 1200 lbs. and an equipment load capacity of 500 lbs to accommodate multiple models and quantities of various input devices.

17.7.8.2.14. Lifting columns for the input surface should be integrated into the storage cavities for increased stability; leg set bases should not be exposed.

17.7.8.2.15. The input support surface legs must have integrated anti-collision software to promote user safety, detect obstacles and prevent damage to console or equipment.

17.7.8.2.16. A minimum safety clearance of 1.25” shall be required between all moving surfaces per ANSI-HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.1.2.

17.7.8.2.17. There shall be no entrapment zones, as defined by UL 962.

17.7.8.2.18. The input surface must have a welded steel sub-frame for increased structural integrity.

17.7.8.2.19. The position of the input support surface relative to the lifting legs and ancillary enclosures needs to be positioned so as to provide unobstructed knee clearance for users in the seated operating position and in accordance with ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.2.1.

17.7.8.2.20. The input support surface should be controlled through the use of 24 VDC motors. All powered components must be UL 962 listed and should be CSA (Canadian Standards Association) certified.

17.7.8.2.21. Must utilize a dual brake for stability and prevention of binding. Braking system must lock surface into place when the brake is released.

17.7.8.2.22. There should be surface-mounted, user-configurable, user-accessible voice and data connections (RJ12, RJ45 USB, 3.5mm Audio) available and accessible from the front of the console.

17.7.8.2.23. All moveable components of the console's input support surface and lifting mechanisms shall be designed and tested to at least 40,000 cycle full range adjustments.

17.7.8.3. Monitor Viewing Support

17.7.8.3.1. The console design must include adjustment of monitors so that the gaze angle to the center of the screen ranges between 15° and 20° below horizontal eye level per ANSI-HFES 100-2007 Human Factors Engineering of Computer Workstations 5.2.4.3.

17.7.8.3.2. The console design must accommodate use of up to (5) 21" widescreen LCD flat panel monitors on a single tier, and up to (10) 21" widescreen LCD flat panel monitors in a stacked configuration and provide independent angle adjustment for each.

17.7.8.3.3. The monitor mounting array should allow for concurrent focal depth movement of at least four monitors at once.

17.7.8.3.4. Monitor viewing support controls must be mounted in a location that meets ADA standards for accessibility; top mounted adjustment controls will be deemed unacceptable.

17.7.8.3.5. Monitor viewing support must be controlled through the use of 24 VDC motors. All powered components must be UL 962 listed and should be CSA certified.

17.7.8.3.6. Monitor viewing support must be independently adjustable.

17.7.8.3.7. All moveable components of the console's monitor viewing support system shall be designed and tested to at least 40,000 cycle full range adjustments.

17.7.8.4. Support Adjustments

17.7.8.4.1. All mechanical and powered support adjustment mechanisms shall operate at a speed approximately 1" per second.

17.7.8.4.2. Input surface support adjustment mechanisms must be controlled through a digital read-out to ensure precise replication for individual users who share a single console workstation.

17.7.8.4.3. All mechanical and powered support adjustment controls must be mounted in a location that meets ADA standards for accessibility; top mounted adjustment controls will be deemed unacceptable

17.7.8.4.4. All mechanical and powered support adjustment mechanisms including “lifting systems” must operate quietly with a maximum sound level of 50db.

17.7.8.5. Equipment Enclosures - Console Technology Storage

17.7.8.5.1. Console technology storage enclosures must be accessible from both the front and the rear.

17.7.8.5.2. Console technology storage enclosures must not attach directly to the primary work surface.

17.7.8.5.3. Console technology storage enclosures must be available in 24” and 30” heights.

17.7.8.5.4. Console technology storage enclosures must be available in 30”, 42” and 50” widths.

17.7.8.5.5. Enclosures must be engineered to support stacking storage components atop the units to allow for additional technology storage or personal storage without taking up added floor space.

17.7.8.5.6. Console technology storage enclosure rear access doors must offer cooling by a minimum of 2 each 50 CFM axial cooling fans.

17.7.8.5.7. Console technology storage enclosure front access doors must utilize a vented plenum system to draw cool air into the enclosure.

17.7.8.5.8. All console technology storage enclosure must have an active cooling system to ensure that cabinets are kept at the optimum temperature for peak technology performance.

17.7.8.5.9. Console technology storage enclosures must have horizontal cable management systems.

17.7.8.6. Cable Management Rail

17.7.8.6.1. There should be a horizontal cable management rail for running cabling from one side of the console to the other.

17.7.8.6.2. The wood cable management rails should be constructed of 42 lb. density particle board panel with THERMALLY FUSED MELAMINE (THERMALLY FUSED LAMINATE) on both sides.

17.7.8.6.3. All steel components within the wood cable management rail must be powder coated for durability; enamel paint is not sufficiently durable and will are considered unacceptable.

17.7.8.6.4. Internal cable management channel must be able to house a minimum of 40 each Cat-6 cables and one each 1” flexible conduit.

17.7.8.6.5. Internal cable management channels must contain fastening points to prevent unintentional movement and disconnection of cabling during active service.

17.7.8.6.6. The wood cable management rail must have a locking option to prevent unauthorized personnel access to internal cabling.

17.7.8.6.7. The wood cable management rail must be available in both single access and dual access configurations to allow maximum flexibility and future reconfiguration.

17.7.8.7. Enclosures - Personal Base Storage

17.7.8.7.1. Personal base storage enclosures must be available in 24” and 30” heights.

17.7.8.7.2. Personal base storage enclosures must be available in 30”, 42” and 50” widths.

17.7.8.7.3. Personal base storage enclosures must have optional filing storage sized at 20” wide.

17.7.8.7.4. Personal base storage enclosures must be available in a 24” depth.

17.7.8.7.5. Personal base storage enclosures must be available in single and dual sided configurations.

17.7.8.7.6. Personal base storage enclosures must be available in combinations including open-drawer-door, open bookcase, and closed-door configurations.

17.7.8.7.7. Enclosures must be engineered to support stacking storage components atop the units to allow for additional personal storage without taking up added floor space.

17.7.8.8. Materials

17.7.8.8.1. Storage Enclosures

- Wood parts should be constructed of 42 lb. density particle board with THERMALLY FUSED MELAMINE (THERMALLY FUSED LAMINATE) on both sides.

- Steel parts should be manufactured from 14-gauge cold rolled steel for maximum strength and durability.

17.7.8.9. Surfaces

- All monitor and input surfaces should be 42 lb. density, 3/4” thick wood core material, pressure bonded with a high-pressure horizontal grade laminate top and sealing horizontal grade backing sheet of laminate on the underside to prevent deflection.

17.7.8.9.1. Edge Material

- All storage enclosures, including fixed or mobile pedestals, must have edges finished with 1.5mm thick thermoplastic polypropylene extrusion with self-healing properties for maximum durability.
- All input support surfaces must use a 3mm thick thermoplastic polypropylene extrusion edging with self-healing properties for maximum durability.
- All input surface edging must have a minimum 3mm radius on front edge so as to comply with ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations 8.3.1.4.

17.7.8.9.2. Laminates

- High pressure laminate must meet ANSI/ASME A 17.1; 1986 requirements for Class “B” laminate and ASTM D523-89, providing a non-glare matte finish.
- All monitor and input surfaces must be .0625” thickness horizontal grade laminate on the top surface and on the backing sheet, to prevent deflection.
- Thermally fused laminate must meet NEMA LI-1-1998; low pressure laminate is not acceptable.

17.7.8.9.3. Textiles/Fabric

- All textiles must be abrasion resistant to meet ASTM D-3597 MVPTS-198 standard.
- All textiles must meet flammability requirements in accordance with ASTM E-84 (Tunnel Test) Class A, or 1, and the State of California Technical Bulletin 117 Sec. E (SC-191-53) standards.

17.7.8.9.4. Powdercoat

- Powdercoat must meet ASTM D3359-09 adhesion standard for durability.

- Powdercoat must meet PCI #8 Solvent Cure Test for durability.

17.7.8.9.5. Electrical Requirements

- Every console will have (2) Power Distribution Units (PDU) of 15A. Each PDU Unit must provide (13) NEMA 5-15R outlets and a NEMA 5-15P input. PDU unit must include a 15-foot cord. PDU must be UL listed and CSA rated.
- The total power draw for an individual console may not exceed 13.3 amps; this includes the console lifting system and all environmental controls.
- The console should comply with UL standard 962 ensuring the highest standard of electrical and physical safety.
- The console should be rated to comply with FCC Title 47 Part 15 subpart B/ICES-003 for Radiated and Conducted emissions.
- The console should operate with 120 VAC, 60Hz.

17.7.8.9.6. Wire and Cable Management

- The console must include two cable access drops with energy chains for vertical cable management from the input support surface to the equipment enclosures so as to comply with UL 962 standards.
- The console must include energy chains for horizontal cable management between the moving surface and adjacent fixed surface to preserve optimal and secure operation of cords and cables during the console's active use.
- A quick connect user-accessible interface with accommodations for up to 10 configurable ports must be available and must include ports, jacks and cables for: USB-A, RJ45, RJ11/12, and 3.5mm stereo audio connection kits; the quick connect interface must also provide cable management for the equipment it serves.
- The console infrastructure must support cable management from the user's position to the CPUs inside the console.
- The console must have a horizontal cable raceway for unencumbered and easily serviceable runs.
- The console must have a horizontal cable raceway that is easily accessible and allows drop-in cable runs to accommodate easy technology updates and service access.

- Cables routed within the walls of a furniture panel system will not be acceptable.

17.7.8.9.7. Environmental Control System

- The control panel for all environmental settings (task lighting, heating controls, and air distribution) must be integrated with the console body.
- The control panel must be easy to clean and sanitize.
- The height for the input support surface must be shown on a digital read-out to ensure total replication of console positioning for all employees; the digital readout for the input support surface shall display inches from the floor.
- ADA Compliance
- There must be an optional electronic adjustment control located within reach of a wheelchair to meet ADA requirements.

17.7.8.9.8. Lighting Levels

- The console must integrate LED lighting solutions.
- The console must have integrated ambient lighting.
- The console must have flexible gooseneck style task lighting to allow proper placement of light over work area.
- All integrated lighting on the console shall be mechanically fastened to the console to prevent removal; lights should be removable for maintenance.

17.7.8.9.9. Experience & References

- The manufacturer of the console furniture being proposed must have a proven record of product longevity and customer service in a 24-hour operating environment for public safety dispatch centers of similar size to this request.
- The manufacturer of the console furniture being proposed must have a minimum of 5 years' experience in designing, manufacturing, and servicing ergonomic console furniture will be considered.
- The manufacturer of the console furniture being proposed must provide references for similar sized projects that were installed within the last 5 years; include the agency name, location, number of positions, and contact.

17.7.8.9.10. Space Planning & Console Specifics

- Perspective drawings are required with the response submission and must include height, width, and depth dimensions in order to determine compliance with the specifications.
- All accessories being proposed should be shown in the drawings.

17.7.9. Console Furniture Warranty, Service and Maintenance Agreement

17.7.9.1. The bidder and manufacturer must provide at least one-year warranty coverage for all product, delivery, and installation; no costs associated with replacement or repair of any portion of the product or installation will be passed on to the customer during the first year of warranty.

17.7.9.2. The bidder and manufacturer must provide Lifetime warranty on all structural components. After one year, labor and installation expenses associated with the product replacement under the warranty will be assessed on a case by case basis. Products not covered for life include electrical components, monitor arms, and the input platform mechanisms.

17.7.9.3. The bidder and manufacturer must provide an optional service and maintenance agreement that can be quoted upon request, to mitigate hidden expenses associated with product replacement after the initial warranty period. The optional service and maintenance agreement must cover additional required installation and regularly scheduled service that may occur after the initial warranty period expires. This maintenance should be quoted for 14 years after warranty.

17.7.10. Installation

17.7.10.1. The manufacturer must provide lead times and identify date of order and proposed final installation at each location.

17.7.10.2. The manufacturer must include a shipping estimate for direct, inside delivery to the facility.

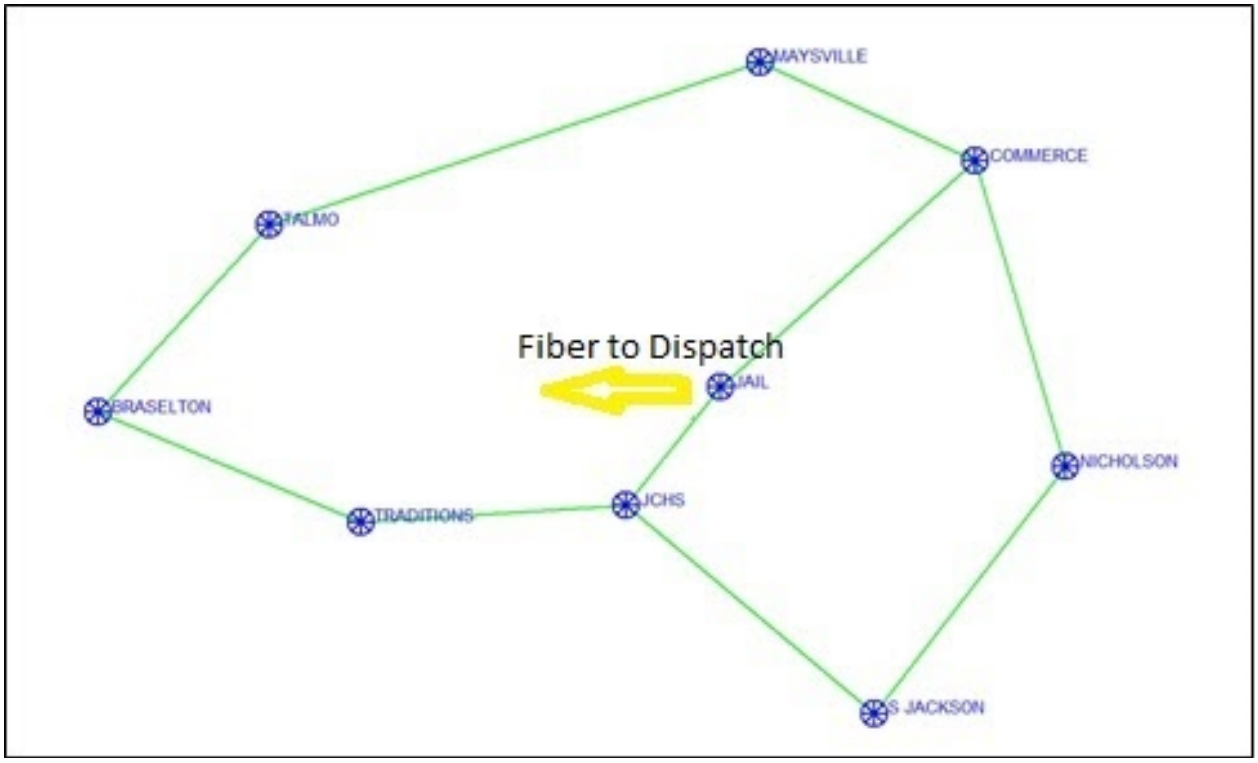
17.7.10.3. Only the manufacturer's factory installers or their trained and authorized designees experienced with the working environment of a public safety dispatch center shall assemble and install the console furniture; documentation must be provided for the installation foreman.

17.7.10.4. Training all users and support staff in the proper use of all adjustment controls, ergonomic functions, and technical access must be provided.

17.7.10.5. The manufacturer must provide user manuals.

Appendix A: Current Infrastructure and Backhaul Network Configuration

Jackson County and its Cities currently utilize a nine (9) site Motorola MotoTRBO IP Site Connect UHF DMR system. The Tower sites are interconnected with 11GHz microwave links. The microwave connectivity provides a loop configuration that will reroute the data traffic if there is a failure between any two of the sites. A fiber link between the Jail radio tower site and the Sheriff's Office provides connectivity to the county's dispatch consoles and equipment. The following figure illustrates the connectivity between the radio sites.



Jackson County Microwave Interconnection

All the repeaters in the MotoTRBO IP Site Connect DMR radio system are Motorola MTR3000 base-stations. The interconnecting microwave links utilize PTP-800 Microwave equipment. At the time of purchase, this microwave equipment produced by Motorola. Since then it Motorola microwave division has become "Cambium Networks", and the PTP-800 line has been discontinued.

The nine tower sites and their locations that are used for the Jackson County radio system are listed in the table below.

Jail Tower Site	34°08'28.99"N, 83°33'37.98"W
Jackson County High School Site	34°06'17.00"N, 83°35'47.29"W
South Jackson Site	34°02'26.20"N, 83°30'80.40"W
Nicholson Water Tower Site	34°07'00.70"N, 83°25'48.10"W
Commerce Tower	34°12'40.50"N, 83°27'51.10"W
Maysville Water Tower Site	34°14'19.70"N, 83°33'02.10"W
Talmo Tower Site	34°11'30.00"N, 83°43'53.60"W
Braselton Water Tower Site	34°08'01.00"N, 83°47'43.00"W
Traditions Water Tower Site	34°5'59.60"N, 83°41'46.20"W

There are additional tower sites that are being utilized by Jackson County for fire paging and other communication needs. These tower sites are listed in the table below.

Gordon Street Tower Site	34°06'56.5"N, 83°34'17.6"W
Jefferson Fire Station 2 Tower Site	34°09'02.4"N, 83°37'26.0"W

Jackson County's 9-1-1 Dispatch Center uses the AVTEC radio consoles that are hardwired to the current DMR system. The county currently operates from 10 total dispatch positions located at the 911 PSAP center. The PSAP phones and console traffic are currently recorded using an Eventide Next Log Communications Recorder.

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Appendix A: Existing Talk Group Structure

This section contains the existing talk group list of Jackson County's current DMR radio system.

Talkgroup	Talkgroup Alias	Agency
1	GW$1	
2	SO Dispatch	
3	Patrol	
4	Jail	
5	Civil	
6	Court House	
7	Investigations	
8	Jail Admin	
9	Patrol Admin	
10	S/O Tac 9	
11	Command	
12	S/O Admin	
20	SRO SCHOOL	JCSO SP OP
100	PD Disp 1	
101	PD Disp 2	
102	PD Tac 4	
103	PD Tac 5	
104	PD Tac 6	
105	PD Tac 7	
106	Arcade PD	
107	Braselton PD	
108	Commerce PD	
109	Jefferson PD	
110	Maysville PD	
111	Pendergrass PD	
500	Fire/EMS Disp	
501	Fire Command	
502	Fire Tac 2	
503	Fire Tac 3	
504	Fire Tac 4	
505	Fire Tac 5	
506	Fire Tac 6	
507	Aracde FD	
508	Commerce FD	
509	Harrisburg FD	
510	Jackson Trial FD	
511	Jefferson FD	
512	Maysville FD	
513	Nicholson FD	
514	Plainview FD	

Talkgroup	Talkgroup Alias	Agency
515	N Jackson FD	
516	S Jackson FD	
517	W Jackson FD	
518	JCCI FD	
519	BJC Hosp	
520	Athens Reg	
521	NEGMC	
522	Mutual Aid	
523	Fire Tac 7	
524	Fire Tac 10	
601	JCHS EAST	
602	JCHS WEST	
603	JCHS BUS ADM	
604	JCHS ADM	
605	JCHS SCH ALL	
606	JCHS BUS TRAINING	
607	JCHS CENTRAL	
608	JCHS MAINT ALL	
609	BENT ELEM	
610	SJ ELEM	
611	MAYS ELEM	
612	EJ MIDDLE	
613	EJ HIGH	
614	GUM SPR ELEM	
615	NJ ELEM	
616	WJ ELEM	
617	WJ MIDDLE	
618	JCHS	
619	EJ ELEM	
701	COMM SCH	
801	JEFF CITY SCH	JEFF CITY SCH
802	JEFF SCH ADM	JEFF CITY SCH
803	JEFF SCH CENT	JEFF CITY SCH
804	JEFF BUS ADM	JEFF CITY SCH
805	JEFF BUS TRAIN	JEFF CITY SCH
806	JES ADM	JEFF CITY SCH
807	JES ALL	JEFF CITY SCH
808	JA ADM	JEFF CITY SCH
809	JA ALL	JEFF CITY SCH
810	JMS ADM	JEFF CITY SCH
811	JMS ALL	JEFF CITY SCH
812	JHS ADM	JEFF CITY SCH
813	JHS ALL	JEFF CITY SCH
1000	EOC	
1001	911	

Talkgroup	Talkgroup Alias	Agency
1002	PS Admin	
1003	PS Event 10	
1004	EMS	
1005	EMA	
1500	JCCI	
1501	JCCI Admin	
2000	County Admin	
2001	County Ops	
2002	Code Enforcement	
2003	County Tac13	
2004	County Tac15	
2005	County Tac16	
2006	County Tac10	
2400	JACKSON ROAM	
2500	JCWSA1	
2501	JCWSA2	
2502	ARCADE1	
2503	ARCADE2	
2504	BRASELTON1	
2505	BRASELTON2	
2506	COMMERCE1	
2507	COMMERCE2	
2508	JEFFERSON1	
2509	JEFFERSON2	
2510	MAYSVILLE1	
2511	MAYSVILLE2	
2512	BEAR CREEK	
2513	Waste Management	
3000	GSP	
3001	EMS Paging	JCPS
3002	Weather Alert Paging	JCPS WEATHER SIREN
8000	Radio Shop-1	
8001	Radio Shop-2	
9500	County Wide All	
9501	Public Safety All	
9502	Public Works All	
9503	LE All	
10000	County MG	
16776415	GW$16776415	

Appendix C: System Subscriber Radio Requirements

This section contains the require quantities of subscriber equipment and accessories.

	Total	Sherriff / Dispatch	Cache Radios	EMA	EMS	Rec Department	Nicholson	Arcade	West Jackson	Jackson Trail	Harrisburg	Mosquito Control	North Jackson	Sounth Jackson	Jail	Corrections	Police	Jefferson Police	Jefferson	Pendergrass Police	Commerce Police	Commerce Fire	Commerce City	Roads / Public Works	Fleet Maintenance	County Schools	Commerce Schools	Jefferson Schools
Mobile																												
Mid-tier Remote Mount P25 Single Band	**333**	130		4	15		12	6	12	7	7		10	7	0	3	30	25	9	7	30	10	9					
Mid-tier Dash Mount P25 Single Band	**0**																											
Low-tier Dash Mount P25	**221**					12																			4	175	15	15
High-tier Dash Mount P25 Multiband	**0**																											
High-tier Remote Mount P25 Multiband	**0**																											
Portable																												
Mid-tier Portable P25 Police/EMS	**596**	156	20	20	30		30	20	40	35	30		20	15			30	21	30	8	28	35	28					
Mid-tier Portable P25 Fire	**35**																					35						
Low-tier P25	**278**					12									100	32							28	25	4	45	20	12
High-tier Portable P25 Multiband	**20**	5	1	1	1		1	1	1	1	1		1	1			1	1	1	1	1							
Carrying Case/Belt Clip	**776**	156		21	31	12	31	21	41	35	31		21	16	100	32	31	21	30	9	31			25	4	45	20	12
Desk Charger	**807**	156		21	31	12	31	21	41	35	31		21	16	100	32	31	21	30	9	28	8	26	25	4	45	20	12
Multi-Unit Charger	**88**	10		2	4	1	4	3	5	3	4		2	2	12	4	4	3	4	1	2	2	3	3	1	6	2	1
Speaker Mic	**749**	156	21	21	31		31	21	41	35	31		21	16	100	32	31	21	21	9	28	35	18	25	4			
Control Stations (non-dispatch)																					1	1						
Control Station	**33**	9																			1	1		1		11	5	5
Antenna System	**33**	9																			1	1		1		11	5	5
Pagers																												
P25 Pager	**180**			20	30		15	10	20	15	15		10	10					35									

Appendix D: Critical Buildings List

This section provides a listing of buildings and areas identified by Jackson County as critical coverage and shall meet the coverage test process defined in section 6.8 Critical Building Coverage Test Process.

1. Critical Buildings Requiring Extended Coverage

The following buildings or locations require 100 percent coverage throughout the building regardless if the loss of the building exceeds 20 db.

Transportation Office (Bus Shop)	1660 Winder Highway Jefferson, Ga. 30549
Jackson County Jail / Sherriff's Office	555 Stan Evans Dr, Jefferson, GA 30549

2. Critical Buildings

The following buildings must meet the criteria and testing defined in Section 6.8 Critical Building Coverage Test Process.

Building, Structure or Area	Location
SK Battery	1523 Steve Reynolds Blvd, Commerce, GA
Civic Center	110 State St, Commerce, GA
Town Border Station	South Broad St Extension, Commerce, GA
Jefferson Rd at Country Club Ln	Commerce, GA
Steve Reynolds Industrial Parkway and Ridgeway Church Rd	Commerce, GA
Transco Tap Station	US441 at Bob Homan Rd, Commerce, GA
US Hwy 441 at Hwy 334	Commerce, GA
Waterworks Rd at Woodland Terrace	Commerce, GA
Wheeler Rd at Hwy 334	Commerce, GA
Diana Foods	Diana Way, Commerce, GA
City Hall	27 Sycamore St, Commerce, GA
Northridge Medical Center	70 Medical Center Dr, Commerce, GA
Commerce Primary	395 Minish Dr, Commerce, GA
Commerce Elementary	825 Lakeview Dr, Commerce, GA
Commerce Middle School	7690 Jefferson Rd, Commerce, GA
Commerce High School	272 Lakeview Dr, Commerce, GA
Southeast Toyota	451 Hwy 441, Commerce, GA

Huber	1442 Hwy 334, Commerce, GA
Old Southeast Toyota	648 Hwy 334, Commerce, GA
Old Oxford Building	71 State St, Commerce, GA
Ollie's Distribution Center	1523 Steve Reynolds Blvd, Commerce, GA
Tanger Outlets	800 Steven B Tanger Blvd, Commerce, GA
Old Pottery	100 Pottery Rd, Commerce, GA
Tractor Supply	2250 Homer Rd, Commerce, GA
Seymore's Wrecker	2909 Ila Rd, Commerce, GA
South Jackson Elementary	1630 New King Bridge Rd, Athens, GA
East Jackson Elementary	1531 Hood Mill Rd, Commerce, GA
Maysville Elementary	9270 Hwy 82 Spur, Mayville, GA
East Jackson Middle School	1880 Hoods Mill Rd, Commerce, GA
East Jackson Comprehensive High School / College & Career Academy	1435 Hoods Mill Rd, Commerce, GA
Jackson County Comprehensive High School & College and Career Academy	1668 Winder Hwy, Jefferson, GA
West Jackson Middle School	400 Gum Springs Rd, Jefferson, GA
West Jackson Elementary School (2 levels)	391 East Jefferson St, Hoschton, GA
Gum Springs Elementary School	600 Gum Springs Rd, Jefferson, GA
(2 levels)	
North Jackson Elementary School	1880 Old Gainesville Hwy, Talmo, GA
Gordon Street Center	441 Gordon St, Jefferson, GA
Jackson County High School	Hwy 332 and Skelton Rd, Jefferson, GA
Academy Church	721 Academy Church Rd, Jefferson, GA
American Legion	309 Lee St, Jefferson, GA
Barberitos	1681 Old Pendergrass Rd - Suite 100, Jefferson, GA
Beef O Brady's	1679 Old Pendergrass Rd, Jefferson, GA
Boys and Girls Club of America	412 Gordon St, Jefferson, GA
Burger King	5388 State Hwy 11, Jefferson, GA
Carriage House Restaurant	1235 Athens St, Jefferson, GA

China Garden	846 Gordon St, Jefferson, GA
China Panda	1681 Old Pendergrass Rd- Suite 140, Jefferson, GA
Crawford W Long Museum	28 College St, Jefferson, GA
Cream & Shuga	140 Mahaffey St, Jefferson, GA
Crossroads Church	25 Hawkins Ln, Jefferson, GA
Dairy Queen	545 Panther Dr, Jefferson, GA
Domino's Pizza	1460 Winder Hwy, Jefferson, GA
El Hausteco Mexican Restaurant	1875 Winder Hwy, Jefferson, GA
Evans Funeral Home	1350 Winder Hwy, Jefferson, GA
Faith Baptist Church	2081 US-129 BUS, Jefferson, GA
Faith Baptist Church Gym	2081 US-129 BUS, Jefferson, GA
First Baptist Church	246 Washington St, Jefferson, GA
First Baptist Church of Jefferson Annex	81 Institute Ave, Jefferson, GA
First Christian Church	104 Lee St, Jefferson, GA
First Presbyterian Church of Jefferson	245 Washington St, Jefferson, GA
Friends Restaurant	30 Sycamore St, Jefferson, GA
Great Wall	1030 Washington St, Jefferson, GA
Gringos Mexican Restaurant	1248 Washington St, Jefferson, GA
Hardees	1700 Old Pendergrass Rd, Jefferson, GA
Hope Crossings Church	2106 Old Pendergrass Rd, Jefferson, GA
Hwy 11 Auctions	1965 Winder Hwy, Jefferson, GA
Inland Realty	22 South Public Square, Jefferson, GA
Jackson County Agricultural Center	1689 County Farm Rd, Jefferson, GA
Jackson County Board of Commissions	67 Athens St, Jefferson, GA
Jackson County Court House	5000 Jackson Pkwy, Jefferson, GA
Jackson County First Baptist Church	139 Spinner Dr, Jefferson, GA
Jackson County Historic Courthouse	85 Washington St, Commerce, GA
Jackson County Sheriff's Office and Jail	555 Jackson Pkwy, Jefferson, GA
JCCHS Ag Building	1668 Wonder Hwy, Jefferson, GA
JCCHS Black Box Theater	1668 Winder Hwy, Jefferson, GA

JCCHS Gym	1668 Winder Hwy, Jefferson, GA
JCCHS Performing Arts Center	1668 Winder Hwy, Jefferson, GA
Jefferson Community Church	834 Gordon St, Jefferson, GA
Jefferson City Pool	231 Memorial Dr, Jefferson, GA
Jefferson Civic Center	65 Kissam St, Jefferson, GA
Jefferson Clubhouse	302 Longview Dr, Jefferson, GA
Jefferson Community Church	1357 Washington St, Jefferson, GA
Jefferson Field House	325 Memorial Dr, Jefferson, GA
Jefferson Fitness	1361 Washington St, Jefferson, GA
Jefferson House Restaurant	682 Athens St, Jefferson, GA
Jefferson Lanes	1018 Lee St, Jefferson, GA
Jefferson Pizza Kitchen	834 Gordon St, Jefferson, GA
Jefferson Public Library	1000 Washington St, Jefferson, GA
Jefferson United Methodist Church and Fellowship Hall	188 Martin St, Jefferson, GA
JHS Announcers Stand	235 Memorial Dr, Jefferson, GA
JHS Arena	575 Washington St, Jefferson, GA
JHS Baseball/Softball Building	100 Horace Jackson road, Jefferson, GA,
JHS Performing Arts Center	575 Washington St, Jefferson, GA
Jim Joiner Recreation Complex	2495 Old Pendergrass Rd, Jefferson, GA
Kays Vintage Pantry	42 W Public Square, Jefferson, GA
Taco Bell/KFC	4821 US-129, Jefferson, GA
Kingdom Culture Church	308 Cobb St, Jefferson, GA
Little Caesars	1681 Old Pendergrass Rd, Jefferson, GA
Los Vaqueros	840 Gordon St, Jefferson, GA
McDonalds	4875 US-129, Jefferson, GA
New Salem Baptist Church	787 New Salem Church Rd, Jefferson, GA
Papa John's	689 suite A Sycamore St, Jefferson, GA
Pizza Hut	1345 Washington St, Jefferson, GA
Railroad Street Apartments	Railroad St, Jefferson, GA

Revival Hall Taproom	16 South Public Square, Jefferson, GA
Sardis Presbyterian Church	652 Gordon St, Jefferson, GA
St. Paul's Church	573 Gordon St, Jefferson, GA
Subway	42 East Public Square, Jefferson, GA
Subway	5210 US-129, Jefferson, GA
Sweets & Ice	95 Lee St, Jefferson, GA
Swirlee's	98 North Public Square, Jefferson, GA
The Jefferson Church	267 Mahaffey St, Jefferson, GA
The Jefferson Church (Old)	287 Mahaffey St, Jefferson, GA
The Mill Event Venue	505 Lynn Ave, Jefferson, GA
Uncle Chet's BBQ	3185 Winder Hwy, Jefferson, GA
Unity Lodge #36 F&AM	369 Borders St, Jefferson, GA
Victory Baptist Church	261 Cobb St, Jefferson, GA
Waffle House	4897 US-129 , Jefferson, GA
Wendy's	5270 US-129, Jefferson, GA
Dragon Academy	21 Nelson Dr, Jefferson, GA
Bright Beginnings	1988 Washington St, Jefferson, GA
Bright Beginnings Too	1812 Washington St, Jefferson, GA
Academy of Jefferson	695 Lynn Ave, Jefferson, GA
Gordon Street Center	441 Gordon St, Jefferson, GA
Jackson County Comprehensive High School	1668 Winder Hwy, Jefferson, GA
Jefferson 5th Grade Academy	99 Dragon Dr, Jefferson, GA
Jefferson Elementary School	415 Hoschton St, Jefferson, GA
Jefferson High School	575 Washington St, Jefferson, GA
Jefferson Middle School	100 Dragon Dr, Jefferson, GA
STEAM center	379 Old Pendergrass Rd, Jefferson, GA
5 Star Roll Form	5786 Henry D Robinson Blvd, Suite J, Jefferson, GA
ACB Manufacturing	203 M L K Ave, Jefferson, GA
Airgas	1629 Valentine Industrial Pkwy, Pendergrass, GA

Aldi Distribution Center	1597 Dry Pond Rd, Jefferson, GA
Amazon Fulfillment Center	808 Hog Mountain Rd, Jefferson, GA
American Synthetic Fiber	312 South Holland Dr, Pendergrass, GA
Atlantic Plywood	540 Hog Mountain Rd, Jefferson, GA
Buhler Yarns	1881 Athens Hwy, Jefferson, GA
Central Cremation Services	115 Enterprise Dr, Suite G, Pendergrass, GA
CHEP	6110 US-129, Jefferson, GA
Choice Equipment Company	5974 US-129, Suite O, Pendergrass, GA
Commercial Steel Company	278 Apex Dr, Jefferson, GA
Double D Truss	1121 Airport Rd, Jefferson, GA
DSM	495 Jackson Concourse, Pendergrass, GA
Ernest Concrete	220 New Salem Church Rd, Jefferson, GA
Foam Fabricators	82 Galilee Church Rd, Jefferson, GA
Grove River Mills	326 Jackson Concourse, Pendergrass, GA
Harris Door & Mill Work	5786 H D Robinson Blvd, Suite A, Jefferson, GA
Hubble Lighting	350 Logistics Center Pkwy-Suit 100, Jefferson, GA
Hyundai Mobis	545 Logistics Center Pkwy Suit 100, Jefferson , GA
Jackson County Water and Sewer	2359 Winder Hwy, Jefferson, GA
Jefferson Mill Building G	940 Possum Creek Rd, Jefferson, GA
Jefferson Sewer Dept.	775 Peachtree Rd, Jefferson, GA
Jefferson Tractor Trailer Repair Inc.	110 Boy Scout Trail, Pendergrass, GA
Jefferson Water Department	320 Kissam St, Jefferson, GA
Jim Whitehead Tire	115 Enterprise Dr, Suite D, Pendergrass, GA
Johns Manville /Tatsumi	85 S Holland Dr, Pendergrass, GA
Keith Porter Specialties	69 Apex Dr, Jefferson, GA
Kubota	1001 McClure Industrial Dr, Jefferson, GA
Kubota NDC	275 Orange Ct, Jefferson, GA
M&M Systems	50 M M Way, Pendergrass, GA
Martin Marietta	360 Quarry Rd, Jefferson, GA
Metal Roofing	112 Enterprise Dr, Pendergrass, GA

Mission Foods	225 John B Brooks Rd, Pendergrass, GA
Mission Foods DC	336 Henry Robinson Boulevard South Pendergrass, Jefferson, GA
Morgan Concrete	494 New Salem Church Rd, Jefferson, GA
NAK Kiln and Dryer Services	140 S Holland Dr, Pendergrass, GA
National Cement	359 New Salem Church Rd, Pendergrass, GA
Norcross Tag Company	154 Galilee Church Rd, Jefferson, GA
North Georgia Crematory	1350 Winder Hwy, Jefferson, GA
Panattoni Spec Building	355 Horace Head Rd, Jefferson, GA
Pattillo Spec Building	200 Thomas Parkway, Jefferson, GA
Pittman Asphalt	676 Academy Church Rd, Jefferson, GA
Porter Insulation	1047 Airport Rd, Jefferson, GA
ProLogics	345 Toy Wright Rd, Jefferson, GA
QuikTrip Distribution	41 Jackson Concourse, Pendergrass, GA
Regal Distribution	5974 US-129, Suite K, Pendergrass, GA
Resilux	265 John B Brooks Rd, Pendergrass, GA
Resilux	420 John B Brooks Rd, Pendergrass, GA
Ring Can Corp	335 Jackson Concourse, Pendergrass, GA
Royston	435 H D Robinson Blvd-Suite 200, Jefferson, GA
Sewn Products Equipment Company	971 Airport Rd, Jefferson, GA
Seydel Companies	244 John B Brooks Rd, Pendergrass, GA
Signature Foods-Golden Cuisine	5786 US-129, Suite N, Pendergrass, GA
Southern Fasteners & Supply LLC	5974 US-129, Suite H, Pendergrass, GA
New Spec building	940 New Salem Church Rd, Jefferson, GA
Steel Plate LLC	234 S Holland Dr, Pendergrass, GA
Sun States Steel Corp.	5786 US-129, Suite L, Pendergrass, GA
TenCate Geosynthetics	365 S Holland Dr, Pendergrass, GA
The Products Hatchery LLC	5974 US-129, Suite E, Pendergrass, GA
Thomas Concrete	993 Academy Church Rd, Jefferson, GA
Titan Tires	350 Logistics Center Pkwy-Suit 200, Jefferson, GA

Universal Forest Products	80 M L K Ave, Jefferson, GA
UPS freight	5251 US-129, Jefferson, GA
Vacant (Future)	545 Logistics Center Pkwy, Suite 200, Jefferson, GA
Vacant (Future)	435 H D Robinson Blvd-Suite 100, Jefferson, GA
Wood Tec Millwork	465 M L K Ave, Jefferson, GA
World Technology Ingredients	281 M L K Ave, Jefferson, GA
Yuhara MFG USA	5974 US-129, Suite A, Pendergrass, GA
ZKRD	2199 Athens Highway, Jefferson, GA
Kubota	1008 McClure Industrial Dr, Jefferson, GA
Bells Food Store	1325 Washington St, Jefferson, GA
Cotton Mill Consignment	515 Lynn Ave, Jefferson, GA
Cotton Mill Interiors	21 Cobb St, Jefferson, GA
JarFly Antique	47 Railroad Ave, Jefferson, GA
Kroger	1685 Old Pendergrass Rd, Jefferson, GA
Pendergrass Flea Market	5641 US Hwy 129 N, Pendergrass, GA
Gordon Street Apartments	Gordon St, Jefferson, GA
Hardin Terrace Apartments (all buildings)	51 Hardin Terrace, Jefferson, GA
Heritage Height Apartments	101 Heritage Ave, Jefferson, GA
Jefferson Heights Apartments	549 Danielsville St, Jefferson, GA
Jefferson Terrace Apartments	Jefferson Terrace, Jefferson, GA
Nelson Square Apartments	50 Nelson Dr, Jefferson, GA
Pine Street Apartments	146 Pine St, Jefferson, GA
Quality Inn	4880 US-129, Jefferson, GA
Turner Drive Apartments	92 Turner Drive, Jefferson, GA
Bentley Assisted Living	50 Sumner Way, Jefferson, GA
Jefferson Police Department	1010 Washington St, Jefferson, GA 30549
Home Goods	125 Logistics Center Pkwy, Jefferson, GA
Qt Distribution	41 Jackson Concourse, Pendergrass, GA
Toyota Industries	500 Valentine Industrial Pkwy, Pendergrass, GA
Gum Springs Elementary	600 Gum Springs Church Rd, Jefferson, GA

Carmel Retreat Center	415 Old Collins Rd, Hoschton, GA
Call to Salvation Ministries	1295 Jackson Trail Rd, Jefferson, GA
Corner Stone Baptist Church	6933 Winder Hwy, Jefferson, GA

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Appendix E: Existing FCC License

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: JACKSON CO. EMERGENCY SERVICES

ATTN: BRYAN BULLOCK
JACKSON CO. EMERGENCY SERVICES
368 CURTIS H SPENCE DR
JEFFERSON, GA 30549

Call Sign	File Number
WXC200	0009073617

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
03-07-2013	05-12-2020	06-03-2023	05-12-2020

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Area of operation**
Other:VIC:JACKSON COUNTY GA

Loc. 2 **Address:** JACKSON COUNTY CIVIL DEFENSE HEADQUARTERS
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-07-06.4 N **Long (NAD83):** 083-34-27.6 W **ASR No.:** **Ground Elev:** 219.0

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000154.28000000	MO	30		11K2F3E	110.000				
1	1	000154.40000000	MO	30		11K2F3E	110.000				
2	1	000154.28000000	FB	1		11K2F3E	110.000		40.0		
2	1	000154.40000000	FB	1		11K2F3E	110.000		40.0		

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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August 2007

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Licensee Name: JACKSON CO. EMERGENCY SERVICES

Call Sign: WXC200 **File Number:** 0009073617 **Print Date:** 05-12-2020

Control Points

Control Pt. No. 2

Address: 368 Curtis H. Spence Drive

City: Jefferson **County:** JACKSON **State:** GA **Telephone Number:** (706)612-0185

Associated Call Signs

<NA>

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: JACKSON CO. EMERGENCY SERVICES

ATTN: BRYAN BULLOCK
JACKSON CO. EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	File Number
WQY576	0009073604

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
04-29-2015	05-12-2020	07-24-2025	05-12-2020

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 2 **Address:** JACKSON CNTY MAHAFFEY TWR 100 MAHA
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-07-06.4 N **Long (NAD83):** 083-24-27.6 W **ASR No.:** **Ground Elev:** 219.0

Loc. 3 **Area of operation**
Operating within a 40.0 km radius around fixed location 2

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	1	000045.96000000	FB	1		20K0F3E	100.000		30.0		
3	1	000045.96000000	MO	75		20K0F3E	100.000				

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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August 2007

Page 1 of 2

Licensee Name: JACKSON CO. EMERGENCY SERVICES

Call Sign: WQY576 **File Number:** 0009073604 **Print Date:** 05-12-2020

Control Points

Control Pt. No. 2

Address: 368 Curtis H. Spence Drive

City: Jefferson **County:** JACKSON **State:** GA **Telephone Number:** (706)612-0185

Associated Call Signs

<NA>

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: JACKSON CO. EMERGENCY SERVICES

ATTN: BRYAN BULLOCK
JACKSON CO. EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	File Number
WZM986	0009073623

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
09-16-2014	05-12-2020	12-08-2024	05-12-2020

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Area of operation**
Other:VIC:JACKSON COUNTY GA

Loc. 2 **Address:** 223 LEE ST
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-06-22.4 N **Long (NAD83):** 083-34-43.6 W **ASR No.:** **Ground Elev:** 265.0

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000155.29500000	MO	20		11K2F3E	110.000				
1	1	000155.34000000	MO	20		11K2F3E	110.000				
2	1	000155.29500000	FB	1		11K2F3E	110.000		46.0		
2	1	000155.34000000	FB	1		11K2F3E	110.000		46.0		

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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Page 1 of 2

Licensee Name: JACKSON CO. EMERGENCY SERVICES

Call Sign: WZM986 **File Number:** 0009073623 **Print Date:** 05-12-2020

Control Points

Control Pt. No. 1

Address: 368 Curtis H. Spence Drive

City: Jefferson **County:** JACKSON **State:** GA **Telephone Number:** (706)612-0185

Associated Call Signs

<NA>

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: JACKSON COUNTY EMERGENCY SERVICES

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	File Number
WQMD363	0009068011
Radio Service YW - Public Safety Pool, Trunked	
Regulatory Status PMRS	
Frequency Coordination Number	

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
05-07-2020	05-08-2020	07-03-2030	05-12-2020

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** 3823 MOUNTAIN CREEK RD
City: PENDERGRASS **County:** JACKSON **State:** GA
Lat (NAD83): 34-11-19.2 N **Long (NAD83):** 083-43-53.4 W **ASR No.:** N/A **Ground Elev:** 304.0

Loc. 2 **Address:** 129 LAKEVIEW DR
City: NICHOLSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-07-00.7 N **Long (NAD83):** 083-25-48.1 W **ASR No.:** **Ground Elev:** 262.0

Loc. 3 **Address:** 221 INDUSTRIAL DR
City: MAYSVILLE **County:** JACKSON **State:** GA
Lat (NAD83): 34-14-19.7 N **Long (NAD83):** 083-33-02.1 W **ASR No.:** **Ground Elev:** 268.0

Loc. 4 **Address:** 657 LIBERTY CH RD
City: BRASELTON **County:** JACKSON **State:** GA
Lat (NAD83): 34-08-01.0 N **Long (NAD83):** 083-47-43.0 W **ASR No.:** **Ground Elev:** 307.0

Loc. 5 **Area of operation**
Operating within a 24.0 km radius around fixed location 1

Loc. 6 **Area of operation**
Operating within a 24.0 km radius around fixed location 2

Loc. 7 **Area of operation**
Operating within a 24.0 km radius around fixed location 3

Loc. 8 **Area of operation**
Operating within a 24.0 km radius around fixed location 4

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Fixed Location Address or Mobile Area of Operation

Loc. 9 **Address:** ON RIDGEWAY ST, 0.1 MI W OF US HWY 441
City: COMMERCE **County:** JACKSON **State:** GA
Lat (NAD83): 34-12-40.5 N **Long (NAD83):** 083-27-51.0 W **ASR No.:** 1024823 **Ground Elev:** 276.1

Loc. 10 **Area of operation**
Operating within a 24.0 km radius around fixed location 9

Loc. 11 **Address:** 1/4 MI W OF BROCK RD & HWY 129
City: ATHENS **County:** JACKSON **State:** GA
Lat (NAD83): 34-02-26.2 N **Long (NAD83):** 083-30-08.4 W **ASR No.:** 1277018 **Ground Elev:** 252.7

Loc. 12 **Area of operation**
Operating within a 24.0 km radius around fixed location 11

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000453.60000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	54.9	78.5	07-03-2011
1	1	000453.82500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	54.9	78.5	07-03-2011
1	1	000460.33750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	54.9	78.5	05-11-2012
1	1	000453.68750000	FB2	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	54.9	78.5	08-20-2014
1	1	000460.18750000	FB2	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	54.9	78.5	08-20-2014
2	1	000453.15000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	41.1	54.8	07-03-2011
2	1	000453.51250000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	41.1	54.8	07-03-2011
2	1	000453.92500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	41.1	54.8	07-03-2011

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	1	000453.81250000	FB2	1		11K0F1E 7K60FXD 7K60FXE	100.000	40.000	41.1	54.8	08-20-2014
2	1	000453.50000000	FB2	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	41.1	54.8	08-20-2014
3	1	000460.60000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.8	69.6	07-03-2011
3	1	000453.80000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.8	69.6	07-03-2011
3	1	000460.07500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.8	69.6	05-11-2012
3	1	000453.63750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.8	69.6	09-14-2013
3	1	000460.36250000	FB2	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.8	69.6	08-20-2014
4	1	000460.61250000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	55.5	71.5	07-03-2011
4	1	000460.23750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	55.5	71.5	07-03-2011
4	1	000460.43750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	55.5	71.5	07-03-2011
4	1	000453.70000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	55.5	71.5	05-11-2012

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
4	1	000453.23750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	70.000	55.5	71.5	09-14-2013
5	1	000453.60000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
5	1	000453.82500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
5	1	000458.60000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
5	1	000458.82500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
5	1	000460.33750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
5	1	000465.33750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
5	1	000453.68750000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
5	1	000458.68750000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
5	1	000460.18750000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
5	1	000460.18750000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
6	1	000458.92500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
6	1	000453.15000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
6	1	000453.51250000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
6	1	000453.92500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
6	1	000458.51250000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
6	1	000453.81250000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
6	1	000458.81250000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
6	1	000453.50000000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
6	1	000458.50000000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
7	1	000460.60000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
7	1	000453.80000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
7	1	000465.60000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
7	1	000458.80000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
7	1	000460.07500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
7	1	000465.07500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
7	1	000458.63750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-14-2013
7	1	000460.36250000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
7	1	000465.36250000	MO	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			08-20-2014
8	1	000460.61250000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
8	1	000460.23750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
8	1	000460.43750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
8	1	000465.43750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
8	1	000465.61250000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
8	1	000465.23750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			07-03-2011
8	1	000453.70000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
8	1	000458.70000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			05-11-2012
8	1	000458.23750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-14-2013
9	1	000453.28750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	89.0	123.2	09-14-2013
9	1	000453.71250000	FB2	1		11K0F3E	100.000	75.000	89.0	123.2	09-14-2013
9	1	000453.52500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	89.0	123.2	09-14-2013
10	1	000458.71250000	MO	150		11K0F3E	40.000	40.000			09-14-2013
10	1	000458.52500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-14-2013
10	1	000458.28750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-14-2013
11	1	000453.67500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	76.2	95.4	09-14-2013
11	1	000453.46250000	FB2	1		11K0F3E	100.000	75.000	76.2	95.4	09-14-2013

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQMD363 **File Number:** 0009068011 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
12	1	000458.67500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-14-2013
12	1	000458.46250000	MO	150		11K0F3E	40.000	40.000			09-14-2013

Control Points

Control Pt. No. 1

Address: 472 CURTIS H SPENCE DR

City: JEFFERSON **County:** JACKSON **State:** GA **Telephone Number:** (706)367-5202

Associated Call Signs

<NA>

Waivers/Conditions:

NONE

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH299	
File Number	
0009073223	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
Mountain Creek Road
City: Pendergrass **County:** HALL **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	TALMO-SBA	34-11-19.4 N	083-44-56.5 W	346.0	N/A
002	BRASELTON WT	34-08-01.0 N	083-47-43.0 W	322.0	
003	MAYSVILLE WT	34-14-19.7 N	083-33-02.1 W	276.5	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH299 **File Number:** 0009073223 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH299	
File Number	
0009073223	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
Mountain Creek Road
City: Pendergrass **County:** HALL **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	TALMO-SBA	34-11-19.4 N	083-44-56.5 W	346.0	N/A
002	BRASELTON WT	34-08-01.0 N	083-47-43.0 W	322.0	
003	MAYSVILLE WT	34-14-19.7 N	083-33-02.1 W	276.5	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11265.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	51.8	37.4	2.1	H	214.9	002	WQNH306
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316
11345.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	51.8	40.4	1.5	V	73.0	003	WQNH316

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Page 1 of 2

FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH299 **File Number:** 0009073223 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH301	
File Number	
0009073230	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
ON RIDGEWAY ST, 0.1 MI W OF US HWY 441
City: COMMERCE **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	GEORGIA PWR	34-12-40.5 N	083-27-51.0 W	276.1	1024823
002	MAYSVILLE WT	34-14-19.7 N	083-33-02.1 W	276.5	
003	NICHOLSON WT	34-07-00.7 N	083-25-48.1 W	268.8	
004	JAIL TWR	34-08-29.0 N	083-33-37.9 W	273.7	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	V	291.0	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	V	291.0	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	V	291.0	002	
11305.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	163.3	003	WQNH313
11305.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	163.3	003	WQNH313

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH301 **File Number:** 0009073230 **Print Date:** 05-12-2020

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
									Reflector Ht(m)xWd(m)					
11305.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	163.3	003	WQNH313
11345.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	51.8	37.4	2.1	V	228.9	004	
11345.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	51.8	37.4	2.1	V	228.9	004	
11345.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	51.8	37.4	2.1	V	228.9	004	

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH304	
File Number	
0009073288	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
190 TRADITIONS WAY
City: JEFFERSON **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	TRADITION WT	34-05-59.6 N	083-41-46.2 W	294.1	
002	JACKSON SCHOOL	34-06-17.8 N	083-35-45.0 W	249.8	
003	BRASELTON WT	34-08-01.0 N	083-47-43.0 W	322.0	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	24.4	40.4	1.5	V	292.3	003	
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	24.4	40.4	1.5	V	292.3	003	
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	24.4	40.4	1.5	V	292.3	003	
11265.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	22.9	40.4	1.5	V	86.5	002	
11265.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	22.9	40.4	1.5	V	86.5	002	
11265.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	22.9	40.4	1.5	V	86.5	002	

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH304 **File Number:** 0009073288 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH306	
File Number	
0009073315	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
NEW LIBERTY CHURCH RD
City: BRASELTON **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	BRASELTON WT	34-08-01.0 N	083-47-43.0 W	322.0	
002	TALMO-SBA	34-11-19.4 N	083-44-56.5 W	346.0	
003	TRADITION WT	34-05-59.6 N	083-41-46.2 W	294.1	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
10775.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	54.9	37.4	2.1	H	34.9	002	WQNH299
10775.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	54.9	37.4	2.1	H	34.9	002	WQNH299
10775.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	54.9	37.4	2.1	H	34.9	002	WQNH299
10815.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	54.9	40.4	1.5	V	112.2	003	
10815.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	54.9	40.4	1.5	V	112.2	003	
10815.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	54.9	40.4	1.5	V	112.2	003	

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH306 **File Number:** 0009073315 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DR.
JEFFERSON, GA 30549

Call Sign	
WQNH308	
File Number	
0009073323	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
1660 WINDER HIGHWAY
City: JEFFERSON **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	JACKSON SCHO	34-06-17.8 N	083-35-45.0 W	249.6	1225046
002	SOUTH JACKSO	34-02-26.2 N	083-30-08.4 W	252.7	
003	JAIL TWR	34-08-29.0 N	083-33-37.9 W	273.7	
004	TRADITION WT	34-05-59.6 N	083-41-46.2 W	294.1	
005	OLD 911 CENTER	34-06-56.0 N	083-34-18.0 W	218.8	
006	FIRE STATION #2	34-08-37.3 N	083-36-31.6 W	286.5	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	61.0	40.4	1.5	H	129.6	002	WQNH317
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	61.0	40.4	1.5	H	129.6	002	WQNH317
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	61.0	40.4	1.5	H	129.6	002	WQNH317

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH308 **File Number:** 0009073323 **Print Date:** 05-12-2020

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
									Reflector Ht(m)xWd(m)					
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	38.8	003	WQNH315
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	38.8	003	WQNH315
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	61.0	37.4	2.1	H	38.8	003	WQNH315
10775.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	70.1	37.4	2.1	V	266.6	004	
10775.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	70.1	37.4	2.1	V	266.6	004	
10775.0	0.00070	36M3D1D	56.400	08-04-2012	003	1	001	70.1	37.4	2.1	V	266.6	004	
17815.0	0.00100	47M1D7W	58.100	03-25-2014	004	1	001	71.6	38.6	3.1	V	62.2	005	
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
18115.0	0.00100	47M1D7W	58.100	03-25-2014	005	1	001	71.6	38.6	3.1	V	344.5	006	
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH313	
File Number	
0009073332	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
129 LAKEVIEW DR
City: Nicholson **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	NICHOLSON WT	34-07-00.7 N	083-25-48.1 W	268.8	
002	GEORGIA PWR	34-12-40.5 N	083-27-51.0 W	276.1	
003	SOUTH JACKSON	34-02-26.2 N	083-30-08.4 W	252.7	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	36.3	40.4	1.5	H	343.3	002	WQNH301
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	36.3	40.4	1.5	H	343.3	002	WQNH301
10815.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	36.3	40.4	1.5	H	343.3	002	WQNH301
10735.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	36.3	40.4	1.5	V	218.3	003	
10735.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	36.3	40.4	1.5	V	218.3	003	
10735.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	36.3	40.4	1.5	V	218.3	003	

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH313 **File Number:** 0009073332 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DR.
JEFFERSON, GA 30549

Call Sign	
WQNH315	
File Number	
0009073344	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
631 DARNELL RD
City: COMMERCE **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	JAIL TWR	34-08-29.0 N	083-33-37.9 W	273.7	1218863
002	JACKSON SCHO	34-06-17.8 N	083-35-45.0 W	249.6	
003	GEORGIA PWR	34-12-40.5 N	083-27-51.0 W	276.1	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	H	218.9	002	WQNH308
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	H	218.9	002	WQNH308
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	48.8	37.4	2.1	H	218.9	002	WQNH308
10855.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	45.7	37.4	2.1	V	48.9	003	
10855.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	45.7	37.4	2.1	V	48.9	003	
10855.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	45.7	37.4	2.1	V	48.9	003	

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH315 **File Number:** 0009073344 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH316	
File Number	
0009073348	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
221 INDUSTRIAL DR.
City: MAYSVILLE **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	MAYSVILLE WT	34-14-19.7 N	083-33-02.1 W	276.5	
002	TALMO-SBA	34-11-19.4 N	083-44-56.5 W	346.0	
003	GEORGIA PWR	34-12-40.5 N	083-27-51.0 W	276.1	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
10855.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	50.3	40.4	1.5		V	253.2	002	WQNH299
10855.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	50.3	40.4	1.5		V	253.2	002	WQNH299
10855.0	0.00070	36M3D1D	59.400	08-04-2012	001	1	001	50.3	40.4	1.5		V	253.2	002	WQNH299
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	50.3	37.4	2.1		V	111.0	003	
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	50.3	37.4	2.1		V	111.0	003	
10735.0	0.00070	36M3D1D	56.400	08-04-2012	002	1	001	50.3	37.4	2.1		V	111.0	003	

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH316 **File Number:** 0009073348 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH317	
File Number	
0009073548	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
1/4 MI W OF BROCK RD & HWY 129
City: ATHENS **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	SOUTH JACKSO	34-02-26.2 N	083-30-08.4 W	252.7	1277018
002	NICHOLSON WT	34-07-00.7 N	083-25-48.1 W	268.8	
003	JACKSON SCHO	34-06-17.8 N	083-35-45.0 W	249.6	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
									Reflector Ht(m)xWd(m)					
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH317 **File Number:** 0009073548 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	
WQNH317	
File Number	
0009073548	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
02-04-2011	05-12-2020	02-04-2021	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
1/4 MI W OF BROCK RD & HWY 129
City: ATHENS **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	SOUTH JACKSO	34-02-26.2 N	083-30-08.4 W	252.7	1277018
002	NICHOLSON WT	34-07-00.7 N	083-25-48.1 W	268.8	
003	JACKSON SCHO	34-06-17.8 N	083-35-45.0 W	249.6	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11225.0	0.00070	36M3D1D	56.400	08-04-2012	001	1	001	70.1	37.4	2.1	V	38.3	002	
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308
11305.0	0.00070	36M3D1D	59.400	08-04-2012	002	1	001	64.0	40.4	1.5	H	309.6	003	WQNH308

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQNH317 **File Number:** 0009073548 **Print Date:** 05-12-2020

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson County Emergency Services

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DR.
JEFFERSON, GA 30549

Call Sign	
WQPY411	
File Number	
0009073567	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
09-18-2012	05-12-2020	09-18-2022	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
Jefferson
City: Jefferson **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	FIRE STATION #2	34-08-37.3 N	083-36-31.6 W	286.5	1207952
002	OLD 911 CENTER	34-06-56.0 N	083-34-18.0 W	218.8	
003	HIGH SCHOOL	34-06-17.8 N	083-35-45.0 W	249.6	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
17765.0	0.00100	47M1D7W	58.100	03-18-2014	001	1	001	54.9	38.6	3.1	V	132.3	002	
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Page 1 of 2

FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQPY411 **File Number:** 0009073567 **Print Date:** 05-12-2020

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
									Reflector Ht(m)xWd(m)					
19675.0	0.00100	47M1D7W	58.100	03-18-2014	002	1	001	54.9	38.6	3.1	V	164.5	003	WQNH308
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												

Waivers/Conditions:

NONE

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Jackson Co. Emergency Services

ATTN: BRYAN BULLOCK
JACKSON CO. EMERGENCY SERVICES
368 CURTIS H. SPENCE DR.
JEFFERSON, GA 30549

Call Sign	
WQPY412	
File Number	
0009073584	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
09-18-2012	05-12-2020	09-18-2022	05-12-2020

LOCATION

Fixed Location Address or Area of Operation:
117 Athens Street
City: Jefferson **County:** JACKSON **State:** GA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	OLD 911 CENTER	34-06-56.0 N	083-34-18.0 W	218.8	1204033
002	FIRE STATION #2	34-08-37.3 N	083-36-31.6 W	286.5	
003	HIGH SCHOOL	34-06-17.8 N	083-35-45.0 W	249.6	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi) Reflector Ht(m)xWd(m)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
19325.0	0.00100	47M1D7W	58.100	03-18-2014	001	1	001	76.2	38.6	3.1	V	312.4	002	
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

FCC 601-ULSHS3
August 2007

Licensee Name: JACKSON CO. EMERGENCY SERVICES

Call Sign: WQPY412 **File Number:** 0009073584 **Print Date:** 05-12-2020

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
									Reflector Ht(m)xWd(m)					
19375.0	0.00100	47M1D7W	58.100	03-18-2014	002	1	001	76.2	38.6	3.1	V	242.2	003	WQNH308
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												
		47M1D7W												

Waivers/Conditions:

Grant of the request to update licensee name is conditioned on it not reflecting an assignment or transfer of control (see Rule 1.948); if an assignment or transfer occurred without proper notification or FCC approval, the grant is void and the station is licensed under the prior name.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: JACKSON COUNTY EMERGENCY SERVICES

ATTN: BRYAN BULLOCK
JACKSON COUNTY EMERGENCY SERVICES
368 CURTIS H. SPENCE DRIVE
JEFFERSON, GA 30549

Call Sign	File Number
WQPZ744	0009073595

Radio Service
YW - Public Safety Pool, Trunked

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005439815

Grant Date	Effective Date	Expiration Date	Print Date
09-28-2012	05-12-2020	09-28-2022	05-12-2020

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** 190 TRADITIONS WAY
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-05-59.6 N **Long (NAD83):** 083-41-46.2 W **ASR No.:** **Ground Elev:** 289.0

Loc. 2 **Address:** 1660 WINDER HIGHWAY
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-06-17.8 N **Long (NAD83):** 083-35-45.0 W **ASR No.:** 1225046 **Ground Elev:** 249.6

Loc. 3 **Address:** 552 GENERAL JACKSON DRIVE
City: JEFFERSON **County:** JACKSON **State:** GA
Lat (NAD83): 34-08-29.0 N **Long (NAD83):** 083-33-37.8 W **ASR No.:** **Ground Elev:** 264.0

Loc. 4 **Address:** Jefferson
City: Jefferson **County:** JACKSON **State:** GA
Lat (NAD83): 34-08-37.3 N **Long (NAD83):** 083-36-31.6 W **ASR No.:** 1207952 **Ground Elev:** 286.5

Loc. 5 **Area of operation**
Operating within a 24.0 km radius around fixed location 1

Loc. 6 **Area of operation**
Operating within a 32.0 km radius around fixed location 2

Loc. 7 **Area of operation**
Operating within a 40.0 km radius around fixed location 3

Loc. 8 **Area of operation**
Operating within a 40.0 km radius around fixed location 4

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

FCC 601-ULSHS1
August 2007

Page 1 of 3

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQPZ744 **File Number:** 0009073595 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000460.15000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	40.000	36.6	69.3	09-28-2013
1	1	000460.47500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	40.000	36.6	69.3	09-28-2013
2	1	000453.77500000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	82.0	87.1	09-28-2013
2	1	000453.40000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	82.0	87.1	09-28-2013
2	1	000460.26250000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	82.0	87.1	09-28-2013
2	1	000460.38750000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	82.0	87.1	09-28-2013
3	1	000453.10000000	FB8	1		11K0F1E 7K60FXD 7K60FXE	100.000	75.000	48.7	67.8	09-28-2013
4	1	000453.21250000	FB2	1		11K0F3E	100.000	75.000	43.0	83.5	09-28-2013
		Frequency 000453.21250000 Special Condition This interoperability frequency is dedicated for the express purpose of nationwide interoperability calling.									
5	1	000465.15000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
5	1	000465.47500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
6	1	000458.40000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
6	1	000465.26250000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013

.

Licensee Name: JACKSON COUNTY EMERGENCY SERVICES

Call Sign: WQPZ744 **File Number:** 0009073595 **Print Date:** 05-12-2020

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
6	1	000458.77500000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
6	1	000465.38750000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
7	1	000458.10000000	MO8	150		11K0F1E 7K60FXD 7K60FXE	40.000	40.000			09-28-2013
8	1	000458.21250000	MO	150		11K0F3E	40.000	40.000			09-28-2013

Frequency 000458.21250000 Special Condition
This interoperability frequency is dedicated for the express purpose of nationwide interoperability calling.

Control Points

Control Pt. No. 1

Address: 472 CURTIS H SPENCE DRIVE

City: JEFFERSON **County:** JACKSON **State:** GA **Telephone Number:** (706)367-5202

Associated Call Signs

<NA>

Waivers/Conditions:

NONE

Appendix F: RFP Definition of Terms

Additional Services	Service or deliverable within the scope of the Contract, but not specifically provided under any Statement of Work.
AES	Advance Encryption Standard
Agency	User operable on the County's radio communications network/System
AMBE	Advanced Multiband Excited, P25 digital voice-coder
ANSI/TIA-222H	American National Standards Institute / Telecommunications Industry Association: Structural Standard for Antenna Supporting Structures and Antennas.
APCO	Association of Public Safety Communications Officials
ATP	Acceptance Test Plan
BER	Bit Error Rate
Computer Aided Dispatch (CAD)	A computer-based system, which aids PSAP Telecommunicators by automating selected dispatching and record keeping activities.
CATP	Coverage Acceptance Test Plan
Confidential Information	All tangible and intangible information and materials, including all Personally Identifiable Information, being disclosed in connection with this Contract, in any form or medium (and without regard to whether the information is owned by the County or by a third party), that satisfy at least one of the following criteria: (i) Personally Identifiable Information; (ii) Proprietary Information; (iii) non-public information related to the County's employees, customers, technology (including databases, data processing and communications networking systems), schematics, specifications, and all information or materials derived therefrom or based thereon; or (iv) information expressly designated as confidential in writing by the County. Confidential information includes all information that is restricted or prohibited from disclosure by state or federal law.
Contract	The final version of any contractually binding agreement between Hernando County (County) and the Contractor relating to the subject matter of this RFP; references to the Contract include all exhibits, attachments, and other documents attached thereto or incorporated therein by reference.
Contract Term	The initial term of the Contract and any renewals and/or extensions.
Contracted Personnel	Contractor's employees or other personnel (including officers, agents, and Subcontractors) provided by the Contractor to perform work related to the Contract.
Contractor	A Proposer awarded a Contract.
CSSI	Radio Console Subsystem Interface
Customer Premises Equipment (CPE)	Communications or terminal equipment located in the customer's facilities – terminal equipment at a PSAP.

DAQ	Delivered Audio Quality
dB	Decibel, a unit of power
DC	Direct Current
Deliverable	All project materials, including goods, software licenses, data, and documentation created during the performance or provision of Services hereunder or identified as a Deliverable in an applicable Statement of Work of other contract documents.
Department	A public safety subdivision utilizing the County radio network/System.
DHS	United States Department of Homeland Security
Dispatch Console	A specialized computer with a software application through which calls are made to and received from radio users and radio dispatch locations.
Division	A sub-unit of a County agency
DVB	A state-certified Disabled Veteran-Owned Business
Dynamic Dual Mode	A feature of a P25 land mobile radio system whereby call requests are assigned to P25 Phase 1 or Phase 2 channels based upon the capability of the radio users participating in the call.
Effective Date	The date the contract has been fully executed by the Contractor and the County.
Emergency Services Internet Protocol Network (ESInet)	A managed Internet protocol network that is used for emergency services and can be shared by all public safety answering points. It provides the IP transport infrastructure upon which independent application platforms and core functional processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be contracted from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national, and international levels to form an IP based inter-network (network of networks).
ERP	Effective Radiated Power
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access
FEMA	Federal Emergency Management Agency
FirstNet	The independent authority within the National Telecommunications & Information Administration (NTIA) created by the Middle-Class Tax Relief and Job Creation Act of 2012 to provide emergency responders with the first nationwide, high-speed, broadband network dedicated to public safety.
Form-C	Normally-open/normally closed relay contact arrangement.
Geographic Information System (GIS)	A computer software system that enables one to visualize geographic aspects of a body of data. It contains the ability to translate implicit geographic data (such as a street address) into an explicit map location. It can query and analyze data to receive the results in the form of a map. It also can be used to graphically display coordinates on a map such as

	Latitude/Longitude from a wireless 9-1-1 call
GHz	1-billion cycles per second, Giga-Hertz (or *microwave*)
GPS	Global Positioning System
Home Run Grounds	A dedicated and continuous electrical ground wire connection (green insulated) between an electrical device and the electrical circuit breaker panel. This connection is used for personnel safety as per the National Electric Code.
HVAC	Heating, Ventilation and Air Conditioning
Hz	1 cycle per second, Hertz
ID	Radio Unit Identifier
IMBE	Improved Multiband Excited, P25 digital voice-coder
IEEE	Institute of Electrical and Electronic Engineers
Inter RF Sub-System Interface (ISSI)	An electronic gateway device used to link disparate P25 radio networks, thereby allowing radio user roaming across radio networks.
Interoperability	The ability of public safety responders to share information via voice and data communications systems on demand, in real time, when needed, and as authorized.
Key Personnel	Contracted personnel who play leading and critical roles in provided Services during the contract term.
KHz	1,000 cycles per second, Kilo-Hertz
KMF	Key Management Facility
kVA	Kilovolt-Ampere
LCD	Liquid Crystal Display
LMR	Land Mobile Radio
LTE	Long Term Evolution
MABAS	Mutual Aid Box Alarm System
Mandatory	A requirement labeled as such must be present in the proposed solution, exactly as stated, or the solution will not be considered by the County.
MBE	A state-certified Minority Business Enterprise
MHz	1,000,000 cycles per second, Mega-Hertz
Municipality	Any county, city, village, town, school district, board of school directors, sewer district, drainage district, vocational, technical and adult education district, or any other public body having the authority to award public contracts.
NCC	Network Control Center

Next Generation 9-1-1	An enhanced 9-1-1 system that incorporates the handling of all 9-1-1 calls and messages, including those using IP-enabled services or other advanced communications technologies in the infrastructure of the 9-1-1 system itself.
NMS	Network Management System
NOC	Network Operations Center
NPSTC	National Public Safety Telecommunications Council
OSHA	Occupational Safety and Health Administration
OTAP	Over the Air Programming
OTAR	Over the Air Rekeying
OTEK	Over the Ethernet Keying
P25	Project 25
P25 Phase 1	Project 25 radio system using FDMA and the IMBE voice-coder
P25 Phase 2	Project 25 radio system using TDMA and the AMBE voice-coder
Parties	The County and the Contractor, collectively
Party	Either the County or the Contractor, individually
Personally Identifiable Information	An individual's last name and the individual's first name or first initial, in combination with and linked to any of the following elements, if the element is not publicly available information and is not encrypted, redacted, or altered in any manner that renders the element unreadable: (a) the individual's Social Security number; (b) the individual's driver's license number or state identification number; (c) the individual's date of birth; (d) the number of the individual's financial account, including a credit or debit card account number, or any security code, access code, or password that would permit access to the individual's financial account; (e) the individual's DNA profile; or (f) the individual's unique biometric data, including fingerprint, voice print, retina or iris image, or any other unique physical characteristic.
Proposal	The complete response to this RFP submitted on the approved forms, in the required manner and setting forth the Proposer's prices for providing the products and services described in the RFP.
Proposer	The Vendor submitting a Proposal in response to this RFP.
PTT	Push-to-Talk
Public Information	Information that (i) is collected, assembled or maintained under a law or ordinance or in connection with the transaction of official business by a governmental body or for a governmental body; and (ii) the governmental body owns or to which it has a right of access.
Public Safety Answering Point (PSAP)	A facility to which a call on a basic or sophisticated system is initially routed for response, and on which a public agency directly dispatches the appropriate emergency service provider, relays a message to the appropriate emergency service provider or transfers the call to the appropriate emergency services provider.
Response	A Vendor's response to this RFP, also referred to as a Proposal.

RF	Radio Frequency
RFP	This Request for Proposal
SATP	Service Acceptance Test Plan
Secondary PSAP	A PSAP equipped with automatic number identification and automatic location identification displays. It receives 9-1-1 calls only when they are transferred from the primary PSAP or on an alternative routing basis when calls cannot be completed to the primary PSAP.
Services	All actions, recommendations, plans, research, customizations, modifications, documentation, maintenance, and support provided by the Contractor necessary to fulfill that which the Contractor is obligated to accomplish under the Contract.
SOW	Statement of Work
State	The State of Florida
SU	Subscriber Unit - Portable or Mobile Unit
Subcontract	Any contract, express or implied, between the Contractor and another party or between a Subcontractor and another party delegating or assigning, in whole or in part, the making or furnishing of any material or service requested for the performance of the Contract.
Subcontractor	A party to a Contractor, as included in the Vendor's Proposal
System	The new radio communications network to be proposed by Vendors and installed by the Contractor.
TDMA	Time Division Multiple Access
TIA	Telecommunications Industry Association
TIA-102	Telecommunications Industry Association, P-25 Standards
TIA-603E	Telecommunications Industry Association, Land Mobile FM and PM Communications Equipment Measurement and Performance Standards.
TIA TSB-88	Telecommunications Industry Association, Technical Service Bulletin-88, Wireless Communications Systems Performance in Noise and Interference-Limited Situations.
UHF	Ultra-High Frequency (i.e., 450-512MHz
UPS	Uninterruptible Power Supply
User	An entity or person that operates land mobile radio equipment.
User-Selectable	A radio feature that can be enabled/disabled by radio-equipped field personnel.
uV	One-millionth of a Volt
VAC	Volts Alternating Current
Vendor	The entity that is responding to this RFP Specification
VHF	Very-High Frequency (i.e., 136-174MHz)
VPN	Virtual Private Network

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Appendix G: Network Management Requirements

This section provides additional requirements for the management and integration with Jackson County's network.

1.0 Option 1: Vendor managed network

1.1. Radio vendor after reserving needed bandwidth will provide to the county an unmanaged RJ45 or Fiber connection to install our own routers and switches at each tower location. All remaining bandwidth will be consumed as the county's discretion.

1.2. All egress points into the county's production data networks require firewall or approved access control list for routing that must be approved by the county.

1.3. All deployed vendor hardware and software well not be using the default login credentials from the manufacture and must use unique passwords. Passwords will use the minimum following criteria.

1.3.1. At least 12 characters—the more characters, the better.

1.3.2. A mixture of both uppercase and lowercase letters.

1.3.3. A mixture of letters and numbers.

1.3.4. Inclusion of at least one special character, e.g., ! @ # ?]

1.4. Any remote access into the radio systems by devices such as computers, tablets, phones or any other devices will use VPN encryption when possible. Multifactor authentication is strongly recommended.

1.5. Jackson county will perform a network penetration test looking for security vulnerabilities after the vendor has indicated the build out is complete and ready for production use. The vendor designed and implemented network must pass security review meaning any reasonable vulnerabilities closed and latest security patches applied to any software services offered.

1.6. Vendor will provide all security login credentials to the county for all equipment and software services configured for the radio system.

1.7. All router and switch configurations will be provided to be reviewed by the county but not managed by the country.

1.8. Any changes to firewall rules or access control list configurations will be reviewed and approved by the country prior to implementation.

2.0 **Option 2: County managed network**

2.1. County will use either EIGRP or OSPF for ring routing collapse protocol based on vendor requirements.

2.2. All routing and switching equipment will be cisco manufactured and provided by the county.

2.3. County will build QOS bandwidth management allocating vendor required priority traffic on network. All remaining bandwidth will be used at the county's discretion.

2.4. County will provide vendor dedicated isolated VLAN and IP address allocations. All deployed vendor hardware and software will not be using the default login credentials from the manufacture and must use unique passwords. Passwords will use the minimum following criteria.

2.4.1. At least 12 characters—the more characters, the better.

2.4.2. A mixture of both uppercase and lowercase letters.

2.4.3. A mixture of letters and numbers.

2.4.4. Inclusion of at least one special character, e.g., ! @ # ?]

2.5. All egress points into the county's production data networks require firewall or approved access control list for routing and must be approved by the county.

2.6. Vendor will provide all security login credentials to the county for all equipment and software services configured for the radio system.

2.7. Any remote access into the radio systems by devices such as computers, tablets, phones or any other devices will use VPN encryption when possible. Multifactor authentication is strongly recommended.

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tusa

Jackson County, Georgia

Public Safety Communications Needs Assessment & Conceptual Design Phase 1 Report

November 2019

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1.0 Executive Summary

TUSA Consulting Services II, LLC (TUSA), a radio consulting firm experienced in the field of public safety communications, was retained by Jackson County, Georgia to provide professional consulting services associated with the modernization of the County's existing DMR trunked public safety radio network. Originally, this process started due to a proposal from a vendor, Motorola Solutions, Inc (Motorola). TUSA was asked to review the proposal. However, to truly understand if the proposal would satisfy the needs of the county, TUSA requested to perform a full needs assessment study. As part of this study, TUSA conducted a series of interviews and surveys with the radio system stakeholders to gain an understanding of the operational and reliability shortfalls within the existing system. Additionally, TUSA was asked to study and review the County's existing Fire Paging and Tornado alerting system. Currently that system is, and would remain, separate from the proposal Motorola system. Therefore, TUSA was asked to identify the technical and cost challenges with keeping two systems, or combining these operations into one system. TUSA also performed propagation modeling, and site visits to study the overall sustainability of the current system.

The County operates a nine (9) site Motorola UHF DMR system for its various agencies. This system will be referred to as the "MotoTRBO", "TRBO", or "the system". All public safety agencies within the county use this system for their daily radio communications. Additionally, other county and city agencies use this system, including schools.

The system draws its roots to the FCC's Narrowband mandate. This mandate has been widely recognized in the industry as a turning point within public safety communications. This mandate forced VHF & UHF frequencies to utilize half as much spectrum as had been available prior (25 kHz vs now 12.5 kHz). While this was primarily done to allow for additional channel availability in the VHF & UHF band for other two-way radio systems, the technical effect on existing systems was a loss of coverage area and forced obsolescence of large portions of existing radio infrastructure across the country. When the stake-holders in the county were forced to use a system that had degraded coverage and increased maintenance costs, options were presented to the county for moving forward. Grant funding was initially attempted, however when the grant funds were ultimately not awarded to the county, officials used existing funds to acquire the current system.

Digital radio systems of many types have been a popular choice for this transition, as the loss of coverage could be overcome with the ability to easily implement additional tower sites. As these new systems utilized common TCP/IP networking, many options were now available to link these towers together, and create a network that allowed for roaming among tower sites for increased coverage. Additionally, the subscriber radios (both vehicle and handheld) for a MotoTRBO system provided many cost effective options to fill out fleets of users with new radios. However, these radios were not designed with as high of durability standards, such as Mil-spec ratings, when compared with vendor's public safety radio models. Heat, cold, moisture, drops, and other pressures are much greater with public safety use. Therefore the wear-and-tear that public safety staff imbue onto a radio can be much greater than standard use in commercial or industrial facilities.

The interviews and surveys have identified some other notable concerns. Among them are:

- Inadequate Mobile and Portable Radio Coverage – The current system does not provide adequate in-building coverage. When Police/Fire enter a building, there is a strong probability they will lose their communication ability with dispatch, preventing them from being able to request additional resources for backup and support. There are large areas throughout the County that have no coverage at all. For example, the area surrounding Braselton has spotty mobile and portable coverage. Additionally, many areas along I-85, where frequent public safety activity occurs, are identified by users as lacking in mobile and portable coverage. Finally, among other areas such as Pendergrass, Talmo, and Jackson Trail, coverage is frequently cited as lacking or non-existent. With the growth of the Atlanta metro area slowly, but surely, creeping outward, the population expansion within Jackson County has forced a new consideration for indoor coverage as well.

- Interoperability Issues – The County does not have a simple way to talk to the surrounding counties or with the State. Some fire departments have responsibilities with the surrounding counties, and others have expressed frustration with not being able to talk to Georgia Highway Patrol. Modern digital trunked radio systems that utilize industry accepted Project 25 (P25) technology, solve this problem by providing for automatic, seamless interoperability and unit roaming across like-configured radio systems. There are also multiband radios from multiple manufacturers that can help address interoperability issues. Finally, Jackson County is surrounded by 3 different types of technology: Barrow, Hall, Athens-Clarke, and Gwinnett utilize 800 MHz P25 trunking; Madison County utilizes VHF Analog; and Banks Co utilizes UHF Kenwood Nexedge that is very similar to the Jackson Co system. However both Banks and Jackson systems are proprietary, therefore both must utilize other methods for interoperability.

- Reliability concerns – With the end of life announcements for various devices (detailed in section 2.0) within the radio network, maintaining this system long term has become a concern for public safety staff. The cost will escalate due to lacking supply, and the quality of parts purchased will be unknown due to being purchased from sources other than the manufacturer.

- Subscriber Durability / Quality - MotoTRBO is specifically designed and marketed to commercial markets in the United States. Additionally, Motorola has modified a public standard to be proprietary, therefore forcing only Motorola radios onto their systems. These radios are not designed with the same Mil-spec and durability standards, nor do they have the features of public safety radios, such as larger knobs, louder speakers, higher quality noise cancellation, and other features.

This Report provides conceptual radio configuration solutions for Jackson County's consideration, including options to be self-supporting, or share a core with Hall County, GA. These configurations take into consideration future growth, emerging technologies, and are structured to support coverage/capacity needs for a life cycle of 15 years. These conceptual

solutions directly address coverage, performance, reliability, interoperability/operability, procurement, and maintenance costs.

The Report also includes budgetary estimates, leveraging fresh information gleaned from recent P25 radio system procurements throughout the United States. This includes comprehensive budgetary spreadsheets that depict the costs of each new site as may be added to the existing configuration. Likewise, the Report includes coverage map predictions for individual tower sites, thereby allowing the County to consider the relative effectiveness of each site and its contribution to overall coverage reliability. By so doing, the County can delete or modify the conceptual system site count to best meet its envisioned needs and funding realities. Finally, this report will review the proposal supplied by Motorola Solutions as an optional solution for these problems.

2.0 Existing Network Configuration

Jackson County and its Cities currently utilize a nine (9) site Motorola MotoTRBO IP Site Connect UHF DMR system. The Tower sites are connected with 11GHz microwave links. There is a fiber link between the Jail radio tower and the Sheriff's Office to provide connectivity to the dispatch consoles. Figure 2.0.A shows the microwave interconnection between the sites. This microwave connection provides a loop configuration that will reroute the data traffic if there is a failure between andy two of the sites.

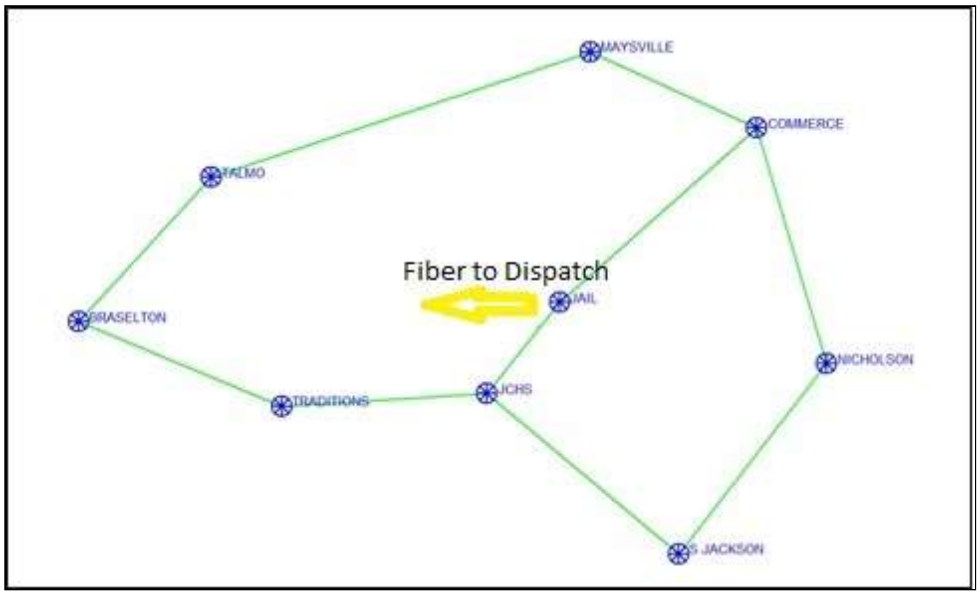

Figure 2.0.A - Jackson County Microwave Interconnection

The DMR system used in Jackson County lacks many features that modern radio systems have. Frequency efficiency, shared infrastructure, ubiquitous data applications, interoperability and scalability are all among the features that a modern Project-25 (P25) digital trunking system can offer to the public safety entities in Jackson County.

The nine tower sites used by the system are:

- Braselton
- Commerce
- Jackson County High School
- Jackson County Jail
- Maysville
- Nicholson
- South Jackson
- Talmo
- Tradition

All of the repeaters in the radio systems utilize Motorola MTR3000 base-stations, and technology that makes up the MotoTRBO IP Site Connect DMR system. Motorola announced that 30 September 2016 was the end of sales. Jackson County has been informed that the end of support on the equipment will be in 2022. Most of the equipment can not be maintained with any degree of consistency, and would require parts to be found in 3rd party markets such as eBay or Sunny Communications. Furthermore, the wireless links connecting the tower sites together utilize PTP-800 Microwave equipment and att the time of purchase, this was produced by Motorola. However since then, the entire Microwave division within Motorola was spun to separate company called "Cambium Networks", and the PTP-800 line has since been discontinued. Therefore not only is the radio equipment at end-of-life, but also the microwave links between the sites as well.

Today's public safety radio systems are constructed using a newer, open-standard termed EIA/TIA Project-25 (referred to as "P25") technology. The attributes and history of Project-16 and 25 are described later in this report, however, the net result has been a gradual replacement of radio systems throughout the Country. Accelerating this transition is the lack of product software support and spare parts availability for the older technologies previously offered by legacy and proprietary radio system manufacturers. Such is the case with the Jackson County Mototrbo DMR radio system.

3.0 Motorola Proposal Review

As part of TUSA's requirements, the task was given to review the Motorola proposal. The proposal itself will be provided and referenced with this document as Appendix A.

3.1. Proposal Technical Configuration

This proposal was for a Five (5) or Six (6) site Simulcast P25 System that joined Hall County, GA's existing Motorola P25 system.

For portable (handheld) subscribers, it included

- 239 APX6000 radios for Law Enforcement
- 287 APX6000XE radios for Fire & EMS
- 316 APX900 radios for general government (Corrections, Board of Educations, etc…)
- 4 APX8000 All band radios.

For mobile (vehicle) subscribers it included

- 677 APX1500 Dash Mount (one unit) radios for general public safety
- 5 APX4500 Remote Mount (split unit) radios for general public safety
- 1 APX850 Dash Mount (one unit) All bands radio for general public safety
- 12 APX6500 Dual Control Head Remote Mount (split unit) radios for EMS
- 24 APX1500 Desktop Control stations

The proposal offered three (3) coverage models:

- Mobile (vehicle) quarter (¼) wave antenna outdoors
- Portable (handheld) half (½) wave antenna outdoors
- Portable (handheld) half (½) wave antenna in buildings with up to 8db of loss

3.2. Proposal Civil Configuration

The proposal laid out many civil responsibilities for Motorola, and for the County. These responsibilities covered all aspects of the construction of a new system.

Motorola's responsibilities included, but are not limited to:

- Project Management
- Design
- Educating the county on project details
- Establishing project schedule

- Assist with site acquisition and development
- Assist with frequency planning
- Work with customer to identify interference

- Supply and ship equipment
- Stage and prep equipment for installation without customer viewing
- Test system prior to shipment for correct operation

- Develop template / fleetmap for subscribers
- Develop console configuration
- Program radios

- Provide site drawings
- Submit for construction permits
- One time mobilization for site construction
- Installation of equipment on tower sites
- Perform NEPA screening at sites

- Develop new tower site at Plainview
- Prepare lease and site exhibits for new site
- Prepare FAA filings for new site
- Supply Generator with Automatic Transfer Switch (ATS) for new site
- Provide new standard Motorola Standard Building (MSB) with 2x 2-ton HVAC
- 700' of road at new site

- Install and document all equipment in shelters
- Install an 11 Ghz and 6 Ghz Microwave ring at 99.9995% reliability
- Reprogram existing consoles

- Test total system performance once installed in the field
- Install all subscribers
- Train customer for system use
- Other administrative items

Customer responsibilities included, but are not limited to:

- Provide a customer project manager
- FCC frequency licensing at the County's cost
- Provide storage at County's cost
- Not visiting staging
- Provide oversight of policies and management of system
- Negotiate with Hall County for joining their system.

- Provide existing buildings that met the following requirements
  - HVAC
  - UPS Backup power that can handle the new equipment's electrical load.
  - Generator with Transfer Switch that can handle the new equipment's electrical load.
  - Grounding that met Motorola's R56 standard
  - Fire Suppression
  - Wiring / cable facilities
  - Cable trays that can accomodate 7.5' racks
  - Ceilings 9' or taller
- FEMA / EPA discovery and mitigation required for new construction
- Strengthening any tower that cannot handle the loading to maintain the existing system while also building the new system. This includes any geo-technical testing, ground testing, Water Tank Rail strengthening, or any tower mapping.
- Provide space on cable ladder for new cabling

- Supply UPS at new site

- Perform all tree clearing and haul off trees
- Prepare and submit Electromagnetic Energy (EME) plans for site
- Pay for all utility connections required
- Pay for generator fueling needed during construction
- Pay to upgrade electrical systems if needed
- Provide deed or lease agreement and right of entry for site
- Maintain roads, even during heavy construction
- Perform tower work to allow new equipment mounting on towers
- Provide as-built information and geo-technical reports on all towers

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- Pay for the difference in labor cost if prevailing wage is required.
- Pay for any site surveys
- Paying for any additional cost due to local or jurisdictional codes and requirements if not covered by national codes and requirements.
- Rock breaking, coring, shoring, casing, dewatering, and hazmat requirements and associated costs.

- Disposal of existing equipment that isn't necessary on new system
- Provide any control station interfaces on Avtec consoles that aren't compatible with APX radios.
- Provide test vehicles for coverage testing
- Provide, or pay for, PM and alignment on all Motorola P25 radios currently owned

3.3. Noted concerns with Motorola Proposal

This proposal is what TUSA commonly refers to as a "boiler-plate" proposal. It makes many assumptions and exceptions to minimize Motorola's costs due to not performing due-diligence to understand the true scope and needs of a new system. There are many items within this proposal that TUSA finds concerning, and would drastically increase the costs Jackson County would be responsible for, in addition to the price of the proposal. Many of these concerning items are traditionally shifted to the vendor in an RFP / negotiation scenario, thereby relieving the county of bearing such costs.

Additionally, there are many items not included in the proposal that TUSA would strongly urge the County to consider in a RFP / negotiation environment.

Those items include:

- Other than enhanced data, there is no mention of what capabilities / features will be included with the subscribers listed.
- Motorola provided coverage based on a Portable (handheld) radio with a half (½) wave antenna. The ½ wave antenna is not the shortest antenna available for such radios. The quarter (¼) wave antenna, like what is offered for the vehicles, is also available for portable radios. These ¼ wave antennas are much shorter than the ½ wave antennas proposed. Often TUSA sees the ½ wave antennas protrude into the abdomen of its user and eventually replaced with the shorter ¼ wave antenna. If done, the coverage maps provided in the proposal become invalid, as the coverage is less with a ¼ wave antenna when compared to a ½ wave antenna. **TUSA strongly urges any coverage modeling, and therefore any vendor guarantees, be performed with ¼ wave antennas, to provide a "worst case scenario" for radio coverage, and a better ergonomic experience for the users.**
- Motorola proposes APX1500 mobile radios for nearly all public safety vehicles. The APX1500 is Motorola's least expensive P25 capable mobile radio. This radio lacks many capabilities seen in the moderate range of radios, and will likely not meet user needs as identified in our interviews.

  In an RFP / negotiation scenario, vendors commonly will take on many responsibilities that are shifted to the County in this proposal. Those responsibilities include:

  - Payment of frequency coordination
  - Be responsible for identifying and mitigating site interference
  - Not allowing site interference as a delay in schedules
  - Include customer in system staging
  - Submission of all documents, not just preparing them
  - Pay for and provide all storage for equipment
  - Supply UPS at each site
  - Perform tree clearing and hauling off
  - Perform EPA discovery and mitigation

- Upgrade grounding to meet R56.
- Prepare and submit EME plans
- Pay for utility connections
- Pay to upgrade electrical connections
- Repair roads damaged after heavy construction
- Strengthen towers for new equipment
- Cover all labor costs, including prevailing wage
- Rock breaking, coring, shoring, casing, dewatering, and hazmat requirements and associated costs
- Disposal of unused old equipment
- Align and tune any existing P25 capable radios
- Provide vehicles for testing.

Additionally, there are many other items not called out specifically that Motorola has excluded from their proposal, that would cause more costs for the county. Items such as buildings that must support 7.5' racks. Your existing buildings, and their cable trays, would not support racks this tall. Therefore, Motorola would force the County to modify the existing buildings to support such racks, or in extreme cases, replace the buildings to accommodate taller racks. There are real risks that the existing shelters may not support the height of these racks, and the square footage required for the floorspace this new equipment.

Below are costs associated with these items not covered under the Motorola proposal:

Jackson County, Georgia Solution Costs not covered by Motorola proposal	
Items not covered under Motorola Proposal	
Additional Cost of Mobile Radios (Mid tier vs Low)	$ 666,822
Additional Control Stations Identified in Interviews	48,643
Shelters needed for new equipment	1,632,000
UPS or Battery Backup	210,000
Upgrade Electrical for new equipment	60,000
Strengthen towers to support both old and new systems	300,000
Subscriber features identified in interviews	75,000
Road repair and other civil items during construction	30,000
Additional Costs Total	**$3,022,465**
Coverage failures due to antennas being changed	**????????**

4.0 Site Visits

During the period between September 30th through October 1st, 2019, TUSA conducted site visits and inspected twelve (12) infrastructure sites, the County radio dispatch center. These sites consist of the DMR trunked radio system equipment, the VHF simulcast paging system, and tower locations that are owned by the county. TUSA was accompanied on the site visits by representatives from Jackson County Emergency Management.

TUSA's radio infrastructure site inspections are comprehensive and include an assessment of not only the radio equipment itself, but also important supportive equipment such as: microwave/fiber backhaul, equipment shelters, towers, generators, UPS/battery backup systems, site organization, electrical grounding and overall site installation/maintenance workmanship. These inspections are not only done to understand current infrastructure but also verify if any of the current facilities or infrastructure are reusable for future use. Important findings and workmanship observations are presented in the pages that follow.

The Site locations that were inspected include:

- Jackson County Dispatch
- Jail Tower
- Jackson County High School
- South Jackson
- Nicholson Site Water Tower
- Commerce Tower
- Maysville Tower
- Talmo Tower
- Braselton Water Tower
- Traditions Tower
- Jefferson Fire Station 12 Tower
- Gordon Street Tower

4.1. Jackson County Dispatch

Ground Elevation – 893 ft.
Coordinates – Latitude: 34° 08' 29.1"N; Longitude: 83° 33' 31.5"W
Primary Frequencies / Channels

- So Dispatch
- Patrol
- Law Mut-Aid
- Sheriff Tac9
- PD Dispatch1
- PD Dispatch 2

- Jail Ops
- Courthouse
- JCCI
- Code Enforcement
- Fire/EMS Dispatch
- Fire Tac 2

Secondary Frequencies / Channels

- UCALL
- UTAC40
- UTAC41
- UTAC42
- VHF Interop
- 8TAC
- Barrow 911
- Commerce Schools
- Jackson Co Schools
- Jefferson Schools
- County Wide
- Public Works

Figure 4.1.A Jackson County Sheriff's Office

Jackson County utilizes one dispatch center for the county. All Law, Fire, EMS, & other public safety is dispatched from this center. This dispatch center is located as an attachment adjacent to the Jackson County Jail and Sheriff's office building.

4.1.1. Site Observations

Figure 4.1.1.A - Satellite view

Figure 4.1.1.B - Console interface equipment

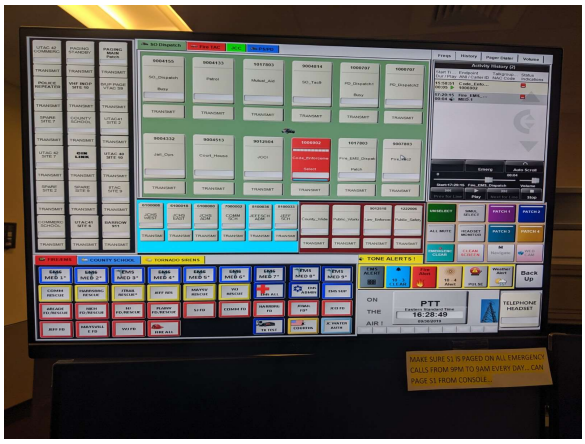


Figure 4.1.1.C - Radio Dispatch software layout

4.1.2. Noted Site Issues

There are not many issues to note about dispatch and the quality of the installation. As will be discussed at greater length in later sections of this report, the radio dispatch software/hardware is a flexible system. While it isn't designed to utilize the complete breadth of capabilities of a console matched from the manufacturer, it does supply plenty of functionality, and is among the top choices for radio dispatch software/hardware that can integrate with the MotoTRBO system.

The server/IT room is fairly well kept. One note of concern is the heating/cooling system. A tarp has been placed over equipment racks in an effort to keep condensation / water from dripping onto electronics equipment (see Figure 4.1.2.A). The auxiliary effect is that the tarp acts as a temperature barrier, trapping heat into the equipment racks, thereby preventing truly proper ventilation. While there are a few errant wires to be noted, clearly quality and care were kept in mind during installation, and in the years of maintaining the system since its inception. The long term logging recorder is of good quality, and has the capability of being upgraded to stay with changing technologies, rather than replacing at a high cost.

Figure 4.1.2.A - Tarp over rack

Dispatch furniture, while older, is properly designed for the physical strains on dispatchers. This furniture would be acceptable for future system use, if desired by the county.

Grounding and cable management standards have been mostly maintained throughout the system's operational use (see figure 4.1.2.B)

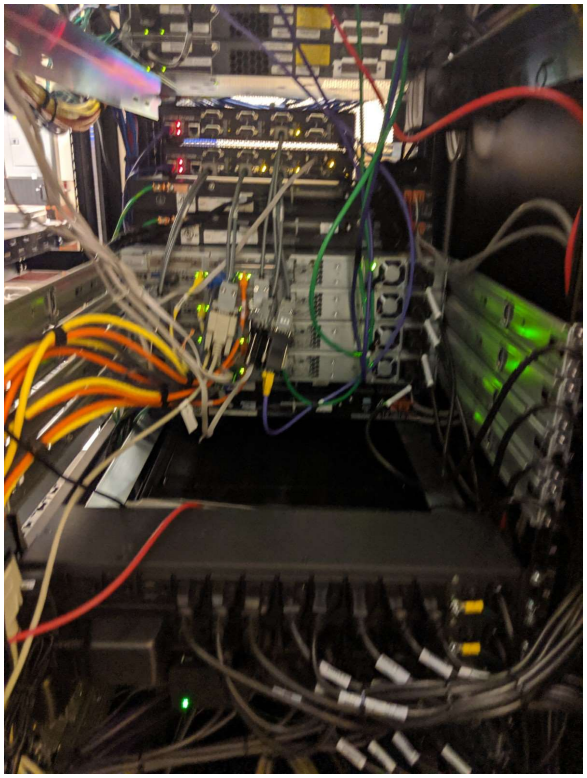


Figure 4.1.2.B - Cable management

4.2. Jail Tower Site

Ground Elevation – 903 ft.
Coordinates – Latitude: 34° 8'28.99"N; Longitude: 83°33'37.98"W
Tower Type - 150ft Monopole
Primary Frequencies / Channels

- MotoTRBO site
- Fire Paging
- 453.4875 Law/Fire Backup
- 11 Ghz Microwave

Figure 4.2-Jail Tower Site

4.2.1. Site Observations

Figure 4.2.1.A - H-Frame available power

Figure 4.2.1.B - Fiber connection box

Figure 4.2.1.C - Equipment racks

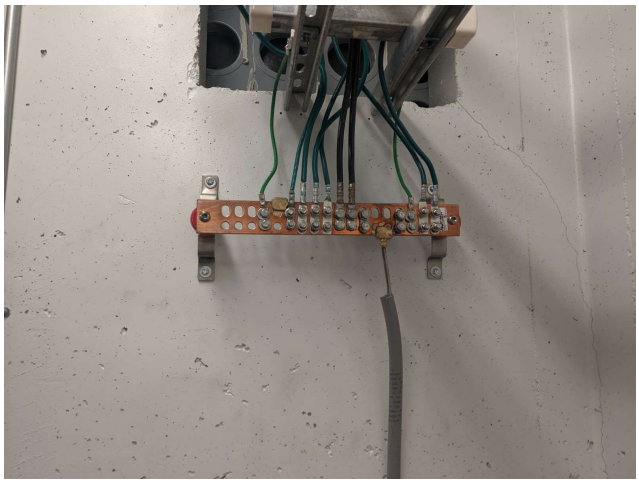


Figure 4.2.1.D - Site Grounding and coax window

4.2.2. Noted Site Issues

Outdoor compound maintenance had noticeable overgrowth. Poison ivy is growing around the site area and doorway. Weeds are growing around the generator

Figure 4.2.2.A

Figure 4.2.2.B

The building's UPS, generator, and fuel tank are undersized for a modern public safety radio system. Additionally, the generator and fuel tank are not secured down or grounded[1] with a common grounding network at the site.

A single HVAC unit is utilized in the building as noted in figure 4.2.2.C. This doesn't allow for redundancy in case of HVAC failure.

Figure 4.2.2.C - Single HVAC

Finally, the overall size of the building, while suitable for the existing system, would likely not be large enough for the size and quantity of equipment utilized in a modern public safety radio system.

[1] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

4.3. Jackson County High School Site

Ground Elevation – 811 ft.
Coordinates – Latitude: 34° 6'17.00"N; Longitude: 83°35'47.29"W
Tower Type - 250ft Guyed tower
Primary Frequencies / Channels

- MotoTRBO site
- VTAC
- Board of Education
- 11 Ghz Microwave

Figure 4.3.A - Jackson County High School Tower

4.3.1. Site Observations

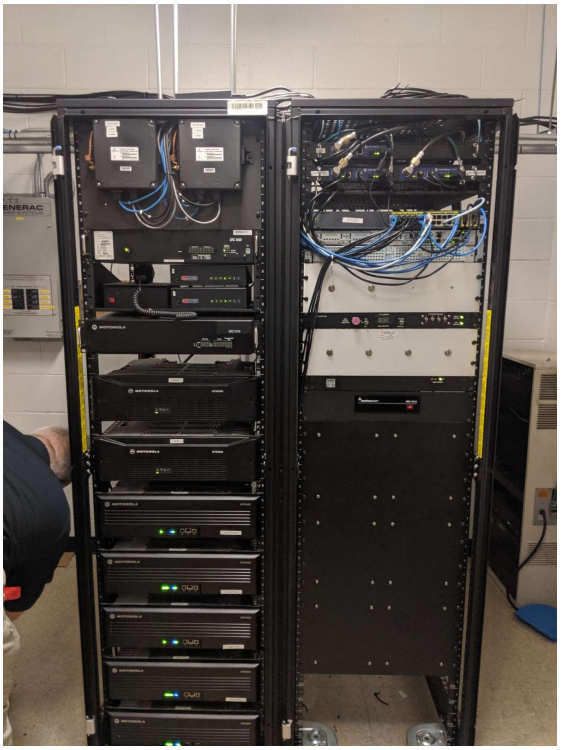


Figure 4.3.1.A - Site Equipment

Figure 4.3.1.B - Wireless networking equipment

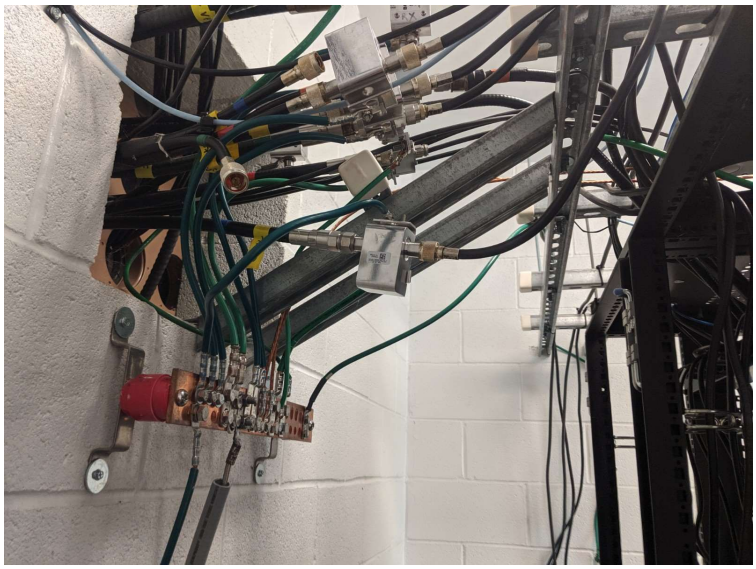


Figure 4.3.1.C - Site Grounding and coax window

4.3.2. Noted Site Issues

When observing site quality, it should be noted that like other sites, the UPS, generator and fuel tank are undersized and not secured down nor grounded[2]. Also, as seen above in Figure 4.3.1.C, open coax lines exist inside the shelter. These can allow RF signals to broadcast unfiltered into the shelter, and can cause interference. They should be capped and terminated.

Figure 4.3.2.A - Site generator not mounted down, nor grounded

[2] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Cables at the antenna entry ports are bundled up and not properly grounded[3]. Additionally, entry ports are poorly sealed around antenna cables.

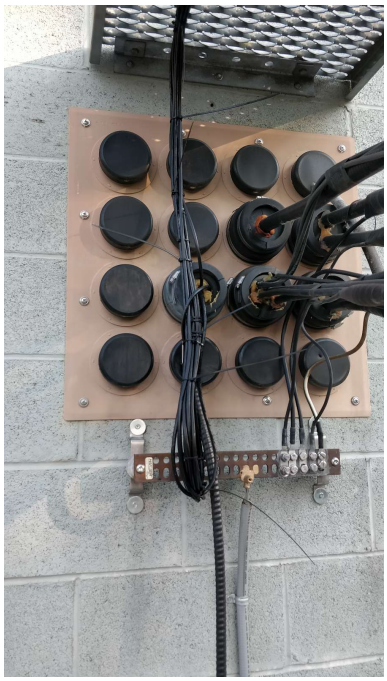


Figure 4.3.2.B - Grounding and coax window

Cable installation is questionable. In some instances, cables are lying on the ground and not properly routed, dressed, or grounded[3].

Figure 4.3.2.C - Cables lying on ground

[3] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Figure 4.3.2.D - Cables not secured

The tower is old and more than moderately loaded. Grounds are clamped to a painted surface[4]. Grounds that are not exothermically welded and used clamps outside have lead to corrosion and failing grounds.

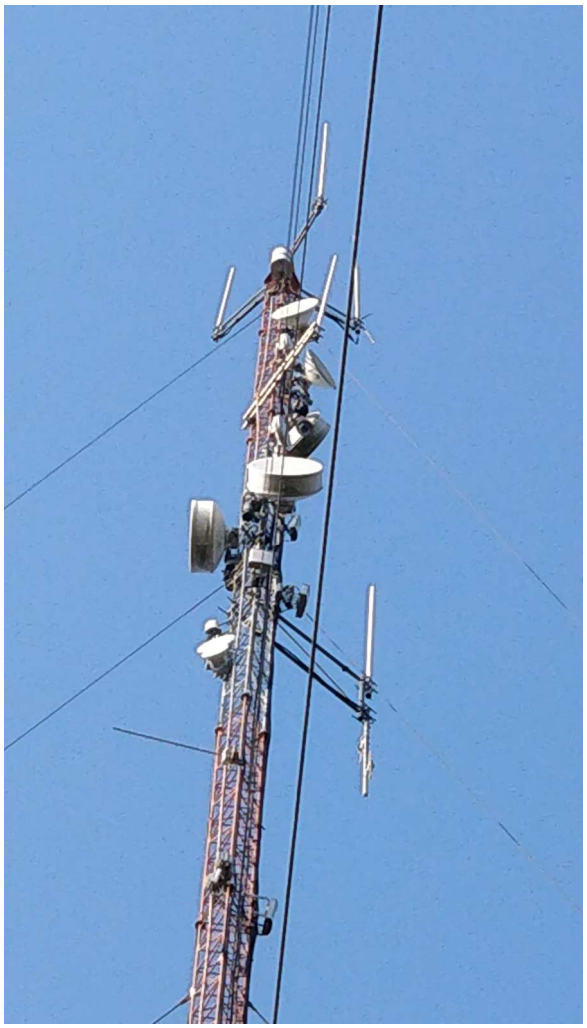


Figure 4.3.2.E - Tower loading

[4] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Figure 4.3.2.F - Improper grounding

Finally, an MSF-5000 transmitter was found at the site labeled 154.4 Mhz. MSF-5000 equipment is not capable of meeting the narrowband mandate from 2013. Therefore, if this equipment were to transmit, it would be in violation of FCC orders. That being said, the equipment did not transmit while on site, and there was no indication that it has transmitted recently.

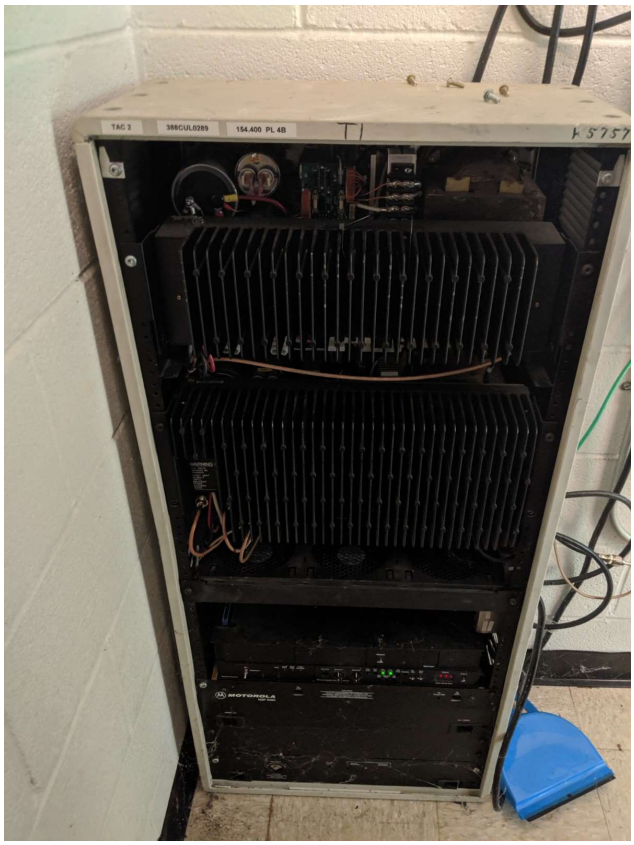


Figure 4.3.2.G - MSF5000 Transmitter

4.4. South Jackson Site

Ground Elevation – 830 ft.
Coordinates – Latitude: 34° 2'26.20"N; Longitude: 83°30'8.40"W
Tower Type - 250ft Guyed tower
Primary Frequencies / Channels

- MotoTRBO site
- Fire Paging
- ICOM D-Star Amatuer Repeater
- UTAC41
- 11 Ghz Microwave

Figure 4.4.A - South Jackson Tower

4.4.1. Site Observations

Figure 4.4.1.A - Site equipment

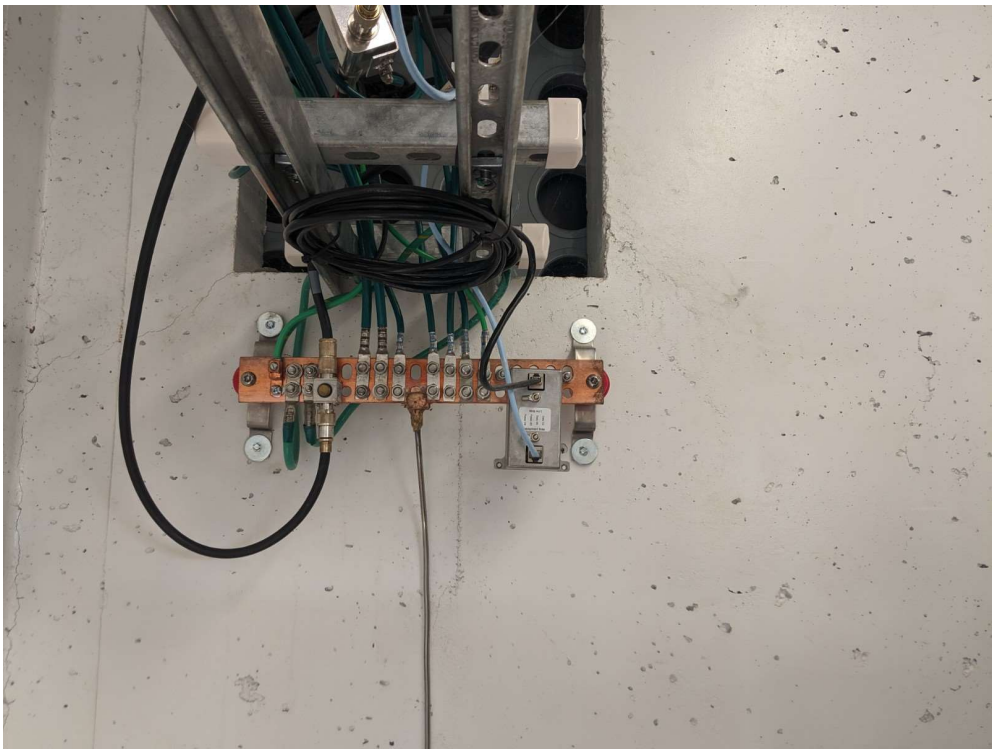


Figure 4.4.1.B - Grounding and coax window

Figure 4.4.1.C - Automatic Transfer switch

4.4.2. Noted Site Issues

At this site, it is noted that the outside generator and fuel tank are not secured to the ground. As with other sites the UPS, Generator, and fuel tank are not sized for a modern public safety radio system. Additionally the fuel tank is not grounded[5].

Figure 4.4.2.A - Generator undersized and not secured

[5] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Figure 4.4.2.B - Fuel tank not secured or grounded

The coax window is of concern for this site. First and foremost, not all coax lines are grounded appropriately[6]. Additionally, as seen in Figure 4.4.2.C, one hole is not utilizing the appropriate coax boot, therefore allowing weather, insects, and other natural items into the building. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.4.2.C - Not all coax grounded and missing coax boot

[6] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

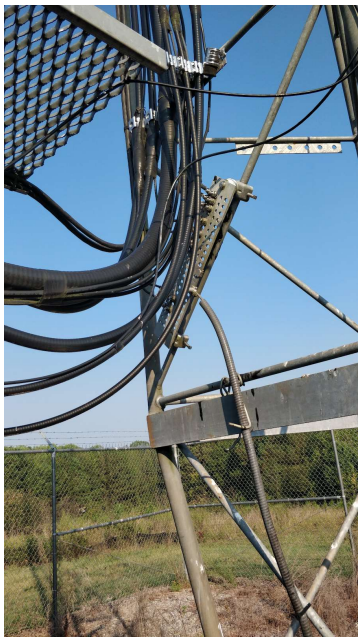


Figure 4.4.2.D - Not all coax is grounded appropriately

Guy wires allow a tower to be attached to the ground for stability at great heights. The guy wires at this site have plants growing in and around that wires and mounting brackets. This can pose a danger of damage to these items, with a risk of causing the tower to collapse in very extreme cases. As noted in Figure 4.4.2.E these should be cleared immediately to prevent compromising tower integrity. Finally, as with other sites, a single HVAC unit can pose problems should it fail, and temperatures not be regulated.

Figure 4.4.2.E - Growth on Guy Wire Mounts

Figure 4.4.2.F - Single HVAC unit

While not seemingly critical, as shown in Figure 4.4.2.G, spider webs have been woven throughout the radio equipment. This indicates spider and other animals could find their way into the radio equipment. Animals can cause electrical shorts and have been known to eat equipment, therefore causing failures.

Figure 4.4.2.G - Spider webs on equipment

4.5. Nicholson Site Water Tower

Ground Elevation – 860 ft.
Coordinates – Latitude: 34° 7'00.70"N; Longitude: 83°25'48.10"W
Tower Type - 180ft Water tower
Primary Frequencies / Channels

- MotoTRBO site
- Fire Paging
- 11 Ghz Microwave

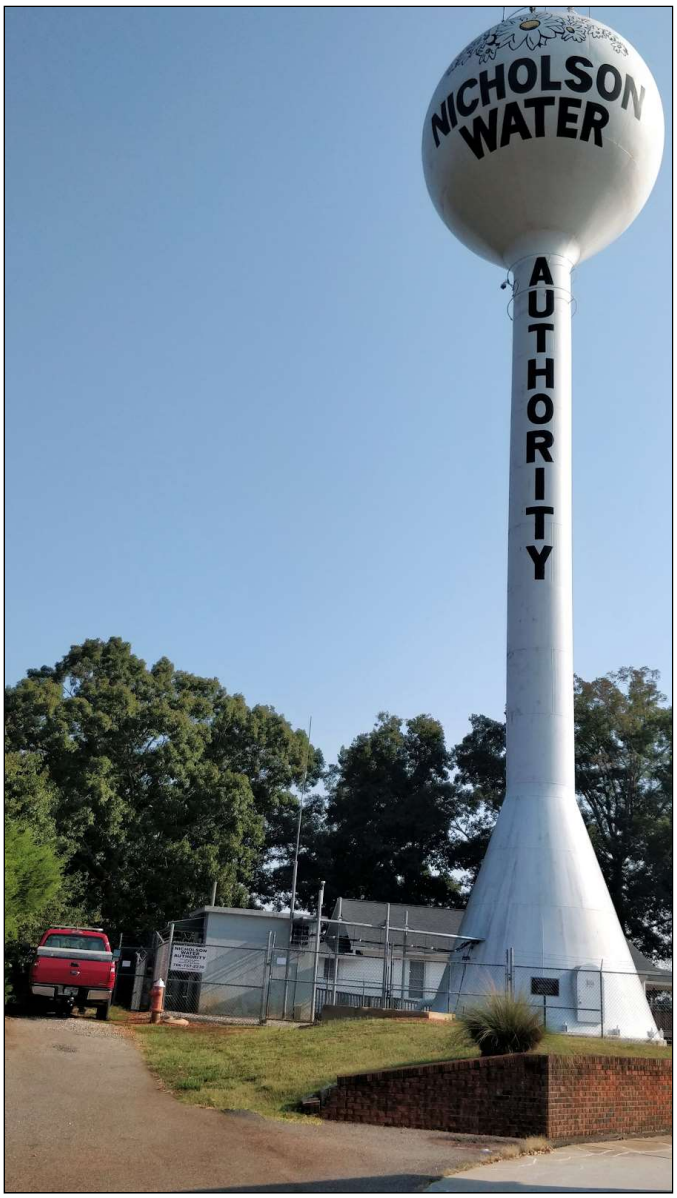


Figure 4.5.A - Nicholson Water Tower

4.5.1. Site Observations

Figure 4.5.1.A - Site equipment

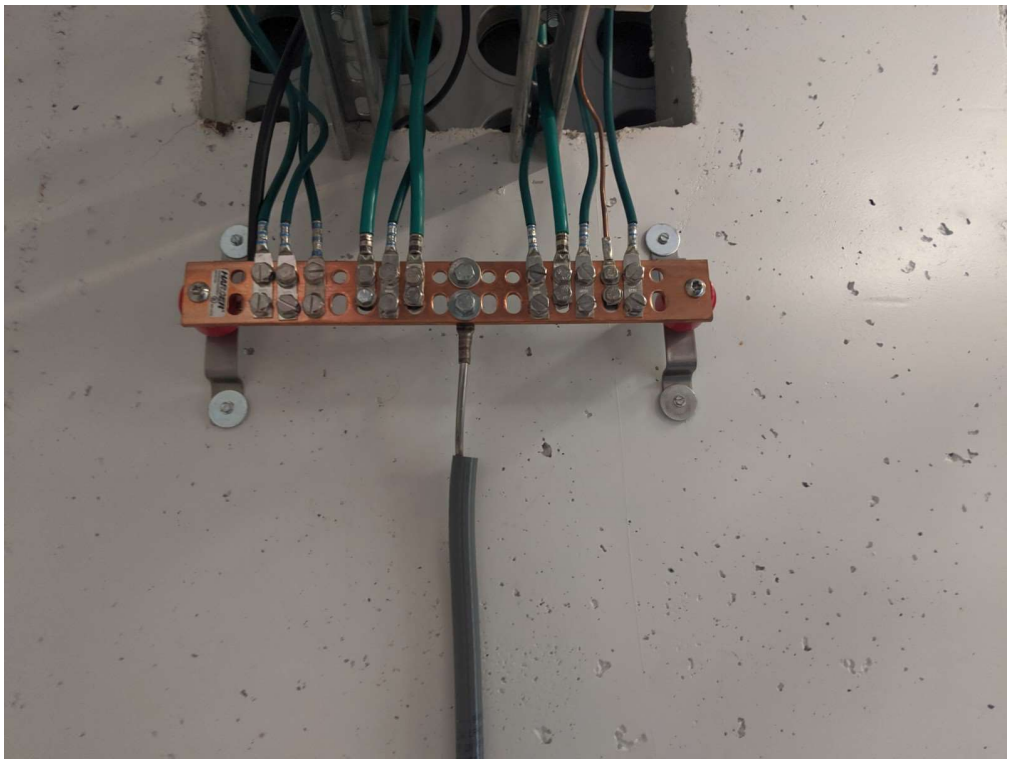


Figure 4.5.1.B - Grounding and coax window

Figure 4.5.1.C - Electrical Panel

4.5.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. It is noted in Figure 4.5.2.A that the outside generator and fuel tank are not secured to the ground. As with other sites the UPS, Generator, and fuel tank are not sized for a modern public safety radio system. Additionally the fuel tank is not grounded[7]. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.5.2.A - Generator and fuel tank not secured.

[7] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

The coax window for this site has items that should be addressed. Notably, there is rigid conduit ran into a hole cover, then sealed. This is not correct to seal an entry into the building as the boot used is not clamped to the hole. It is simply pushed onto the hole, and could be easily removed. Specifically sized boots should be used for any entry through this window. Additionally, it appears ground connections are rusting[8], likely due to a lack of chemical treatment that can prevent rust.

Figure 4.5.2.B - Rigid conduit incorrectly sealed through the window

Figure 4.5.2.C - Grounds rusting

[8] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Ss with other sites, a single HVAC unit can pose problems should it fail, and temperatures not be regulated.

Figure 4.5.2.D - Single HVAC unit

At this site, the posts for the ice bridge are showing signs of corrosion and rust. The ice bridge is the structure that coax lines are mounted to from the building to the tower, to ensure they are cleanly ran, and provide protection from falling ice between the two structures.

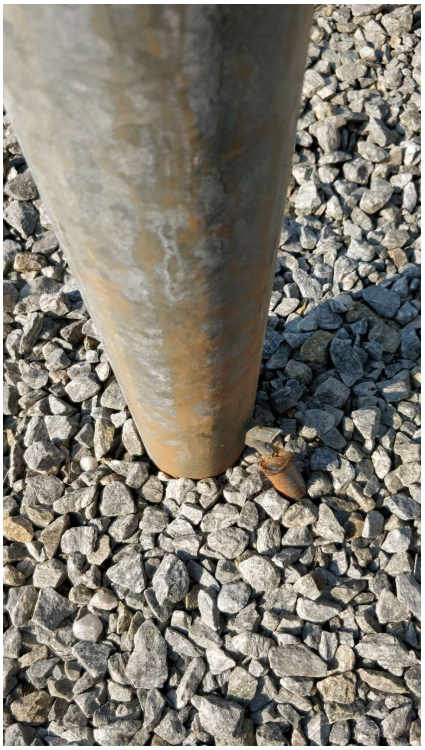


Figure 4.5.2.E - Rusting / Corroding posts

4.6. Commerce Tower Site

Ground Elevation: 906 ft
Coordinates: 34° 12'40.50"N; Longitude: 83°27'51.10"W
Tower Type: 250 ft Self Supporting
Channels Used:

- MotoTRBO site
- Fire Paging
- UTAC42
- 11 Ghz Microwave

Figure 4.6.A - Commerce Tower

4.6.1. Site Observations

Figure 4.6.1.A - Site Equipment

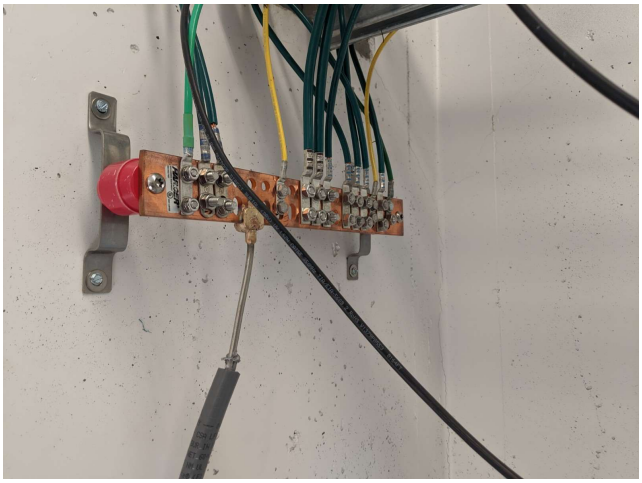


Figure 4.6.1.B - Grounding

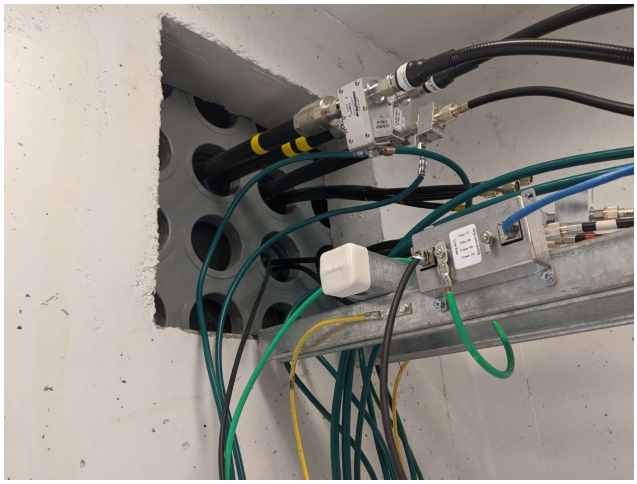


Figure 4.6.1.C - Coax window

Figure 4.6.1.D - Electrical Meter

4.6.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. It is noted in Figure 4.6.2.A that the outside generator and fuel tank are not secured to the ground. As with other sites the UPS, Generator, and fuel tank are not sized for a modern public safety radio system. Additionally the fuel tank is not grounded[9] as shown in Figure 4.6.2.B below, and the outside casings are showing rust/corrosion. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.6.2.A - Site Generator not secured

[9] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

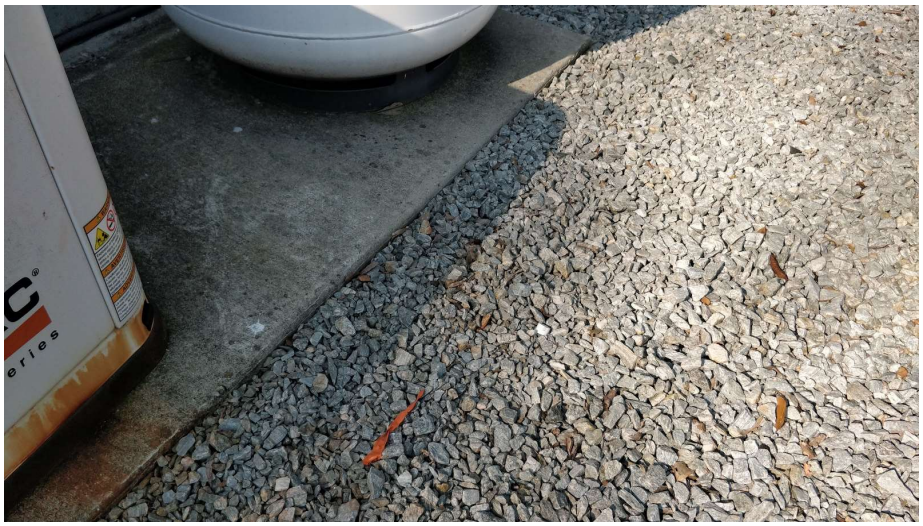


Figure 4.6.2.B - Unsecured & ungrounded tank. Casing rust.

Unique issues to this site include cabling and HVAC concerns. Shown in Figures 4.6.2.C & D, there are various cables unsecured and across driving areas.

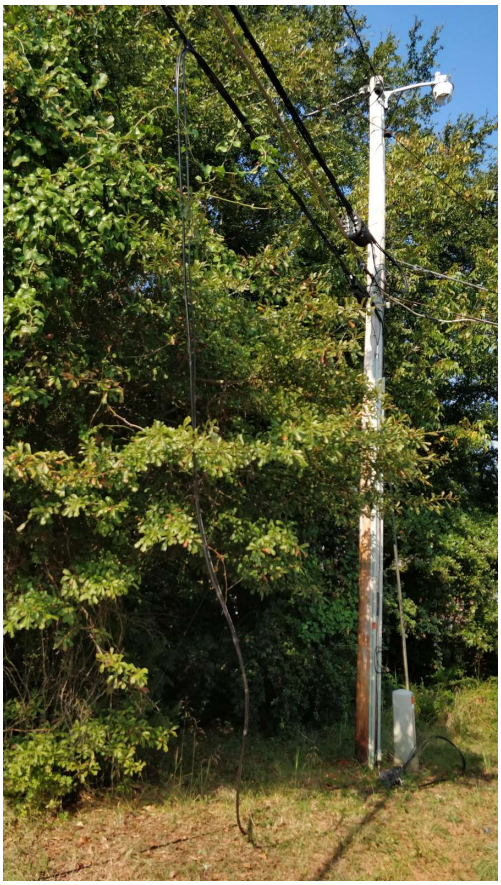


Figure 4.6.2.C - Unsecured wires / cables

Figure 4.6.2.D - Cables across driveway

The HVAC unit, like other sites, has no redundancy. However, this unit is also missing outside cover and insulation is falling out.

Figure 4.6.2.E - HVAC unit cover is off and insulation falling out

The ice bridge posts do not appear to be grounded and show signs of corrosion as shown in Figure 4.6.2.F below. Tower grounding is not welded and is attached to a painted surface with a corroded bolt as shown in Figure 4.6.2.G below.

Figure 4.6.2.F - Post rust / corrosion

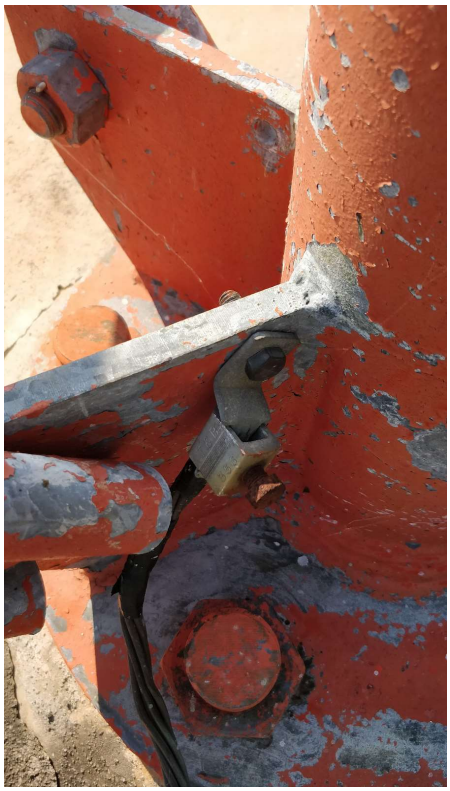


Figure 4.6.2.G - Insufficient tower grounding[10]

[10] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

4.7. Maysville Tower Site

Ground Elevation: 880 ft
Coordinates: 34° 14'19.7"N; Longitude: 83°33'02.10"W
Tower Type: 148ft Water Tower
Channels Used:

- MotoTRBO site
- 11 Ghz Microwave

Figure 4.7.A - Maysville Water Tower

4.7.1. Site Observations

Figure 4.7.1.A - Site Equipment

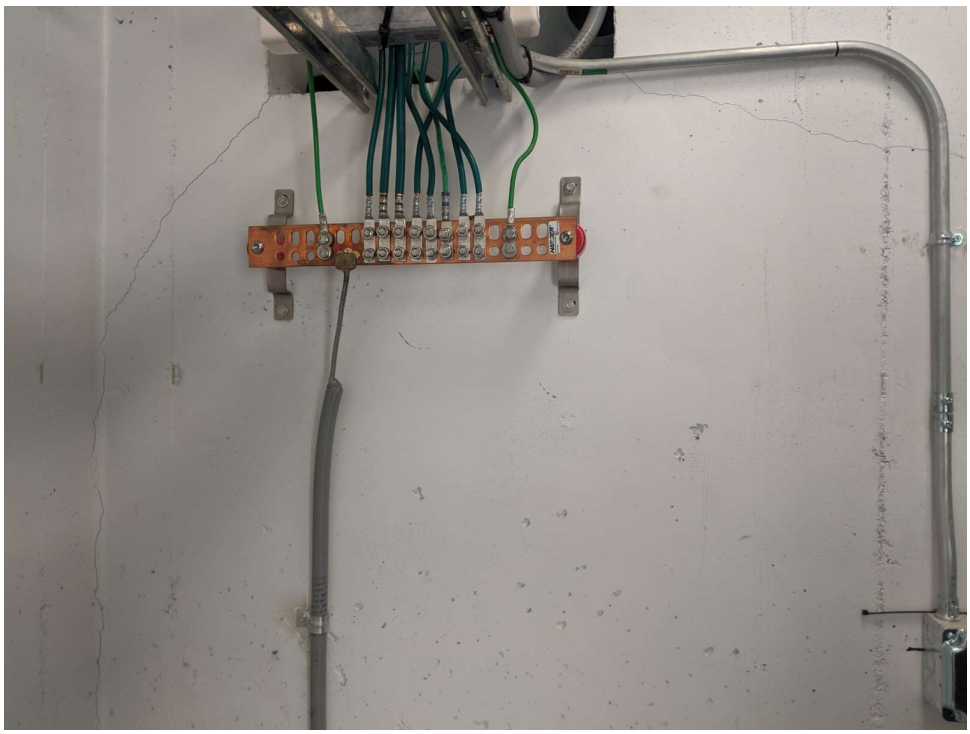


Figure 4.7.1.B - Grounding

Figure 4.7.1.C - Coax Window

4.7.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. It is noted in Figure 4.7.2.A that the outside generator is not secured. As with other sites the UPS and Generator, are not sized for a modern public safety radio system. However, the fuel tank for this site would be appropriate for public safety radio communications, if grounded correctly[11] and brought to current standards.The outside shell of the tank is showing rust/corrosion. Also, as seen above in Figure 4.7.1.C, open coax lines exist inside the shelter. These can allow RF signals to broadcast unfiltered into the shelter, and can cause interference. They should be capped and terminated. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.7.2.A - Generator case rusted and not secured to ground

[11] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Figure 4.7.2.B - Fuel tank shows rust

As previously noted, single HVAC units pose problems if they fail, due to unregulated temperatures inside the building.

Figure 4.7.2.C - Single HVAC unit

As mentioned in the Nicholson Water Tower section, this site has flexible conduit running through a window cover. This is not the correct item to properly seal external wires coming through the window. A correctly sized boot clamped to the window should be utilized.

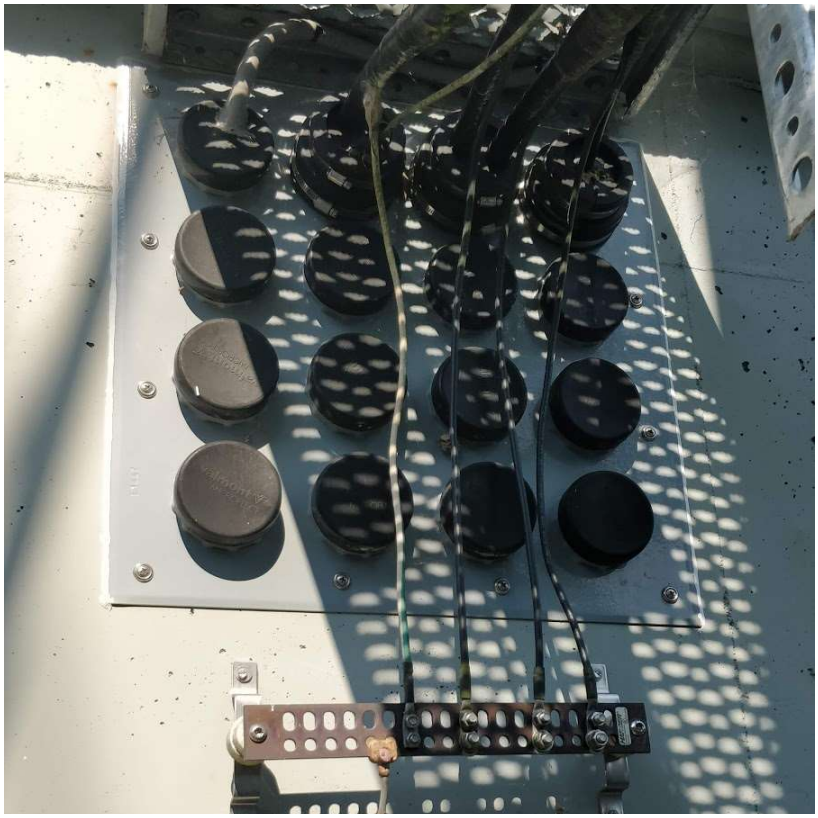


Figure 4.7.2.D - Improperly sealed pass through window (Top left)

4.8. Talmo Tower Site

Ground Elevation: 997 ft
Coordinates: 34° 11'30.00"N; Longitude: 83°43'53.60"W
Tower Type: 180ft Guyed Tower
Channels Used:

- MotoTRBO site
- 11 Ghz Microwave
- Fire Paging

Figure 4.8.A - Talmo Tower

4.8.1. Site Observations

Figure 4.8.1.A - Site Equipment

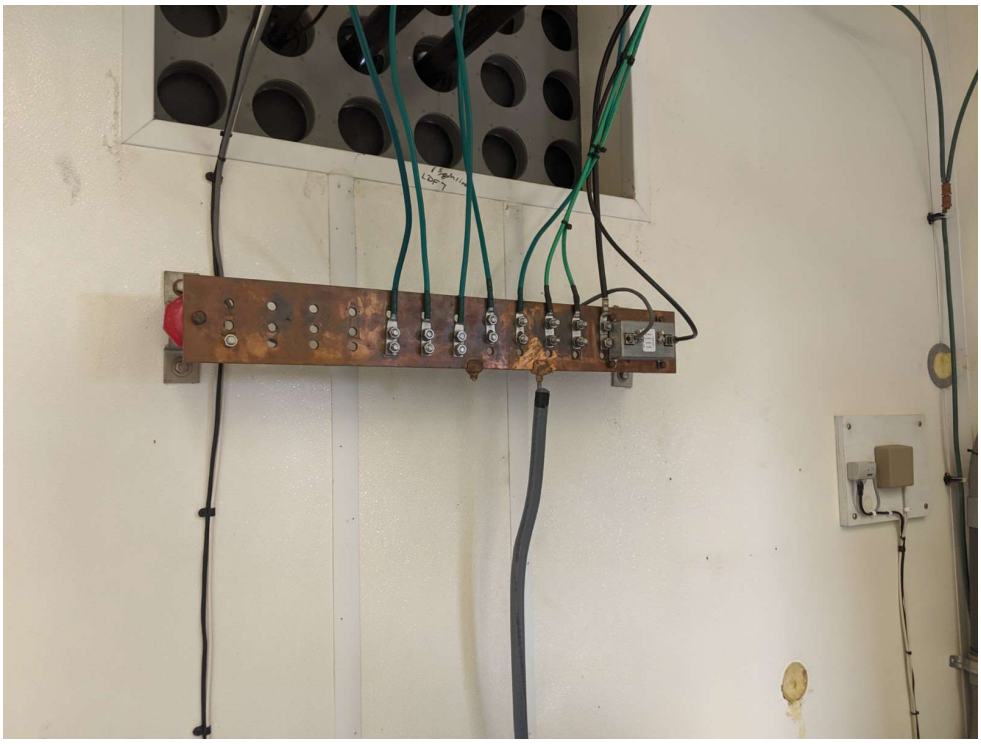


Figure 4.8.1.B - Grounding

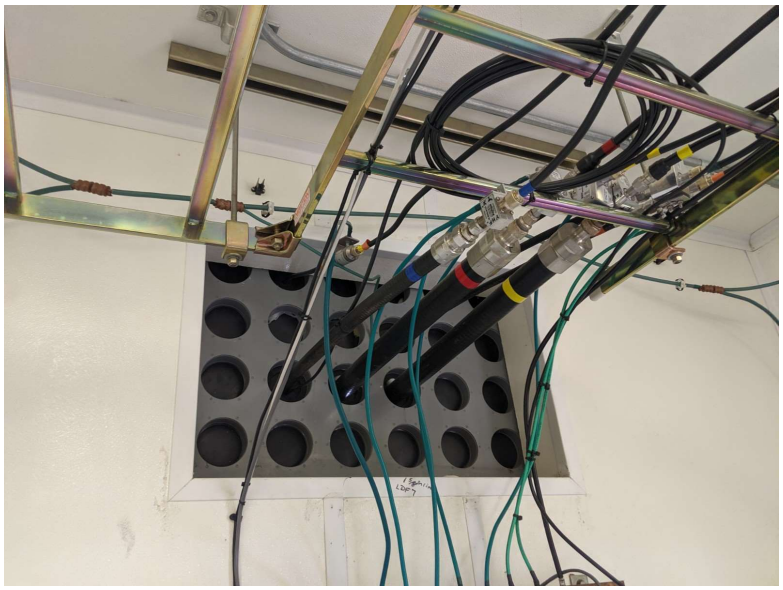


Figure 4.8.1.C - Coax window

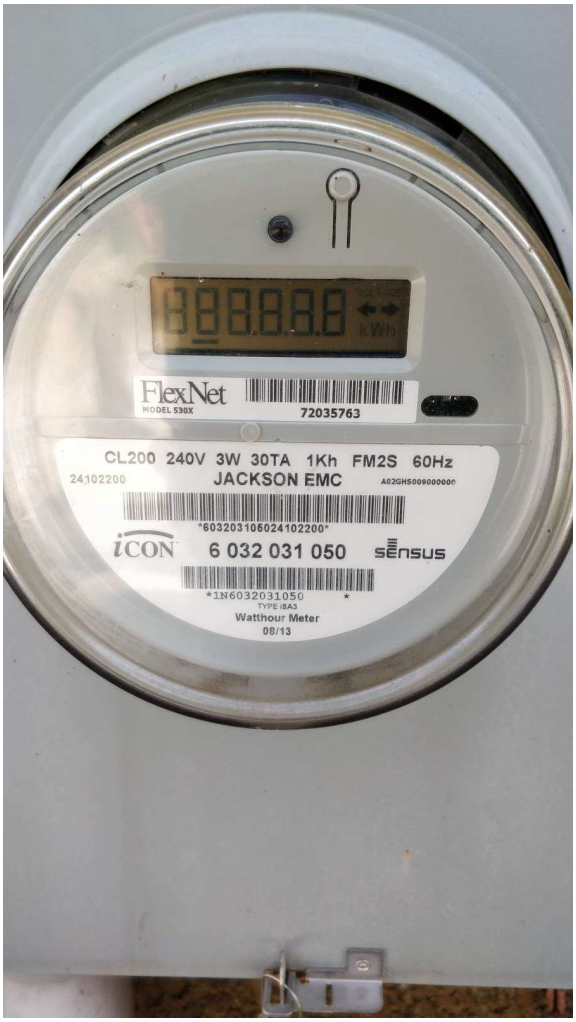


Figure 4.8.1.D - Electrical Meter

4.8.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. It is noted in Figure 4.8.2.A that the outside generator and fuel tank are not secured. As with other sites the UPS, Fuel tank and Generator, are not sized for a modern public safety radio system. However, unlike most other buildings this building is adequately sized for all equipment required in a modern public safety radio system. However, the floor construction being wood may preclude it from modern equipment, depending on the weight requirements. Additionally, unlike most other buildings, this shelter has 2 HVAC units as shown in Figure 4.8.2.B. These units are older, and are showing rust and other signs of age

Figure 4.8.2.A - Generator and Fuel tank undersized and not secured

Figure 4.8.2.B - Dual HVAC unit, and appropriate shelter size

Guy wires allow a tower to be attached to the ground for stability at great heights. The guy wires at this site have plants growing in and around that wires and mounting brackets. This can pose a danger of damage to these items, with a risk of causing the tower to collapse in very extreme cases. As noted in Figure 4.8.2.C & D, these should be cleared immediately to prevent compromising tower integrity.

Figure 4.8.2.C

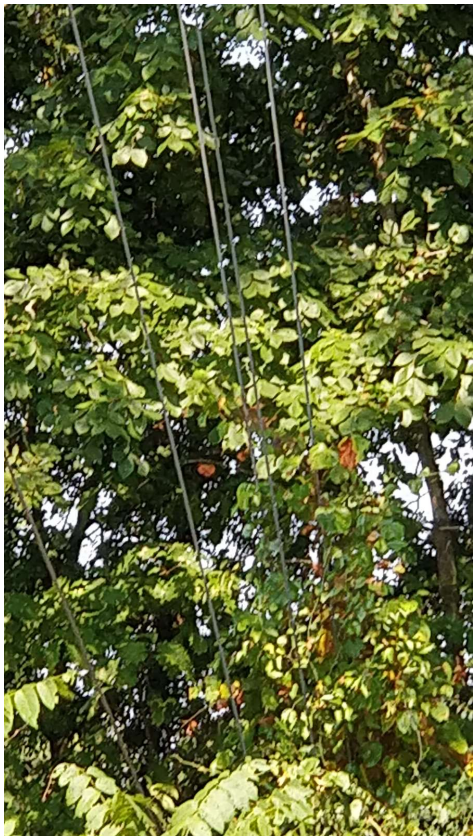


Figure 4.8.2.D

4.9. Braselton Water Tower Site

Ground Elevation: 1007 ft
Coordinates: 34° 08'01.00"N; Longitude: 83°47'43.00"W
Tower Type: 190ft Water Tank
Channels Used:

- MotoTRBO site
- 11 Ghz Microwave

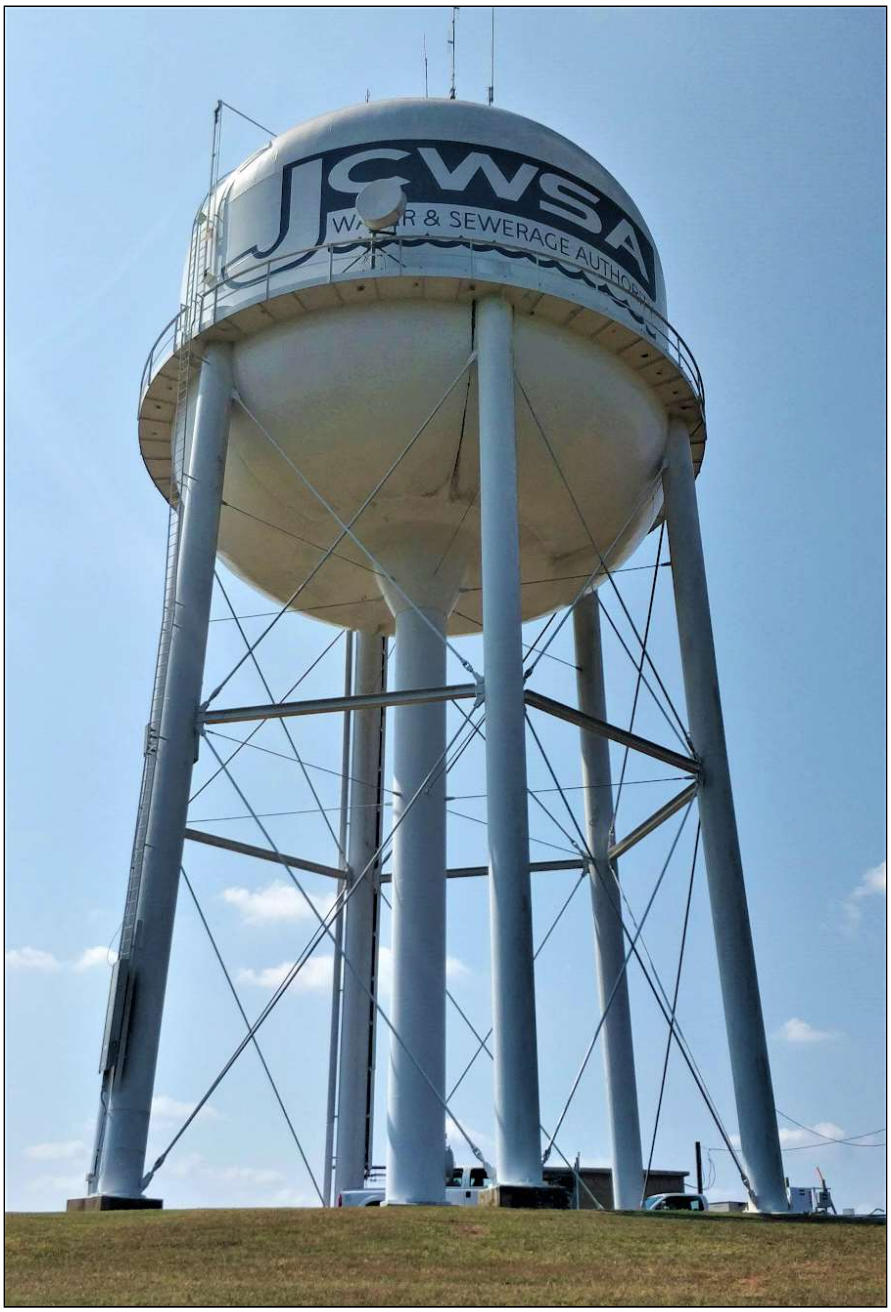


Figure 4.9.A - Braselton Water Tower

4.9.1. Site Observations

Figure 4.9.1.A - Site Equipment

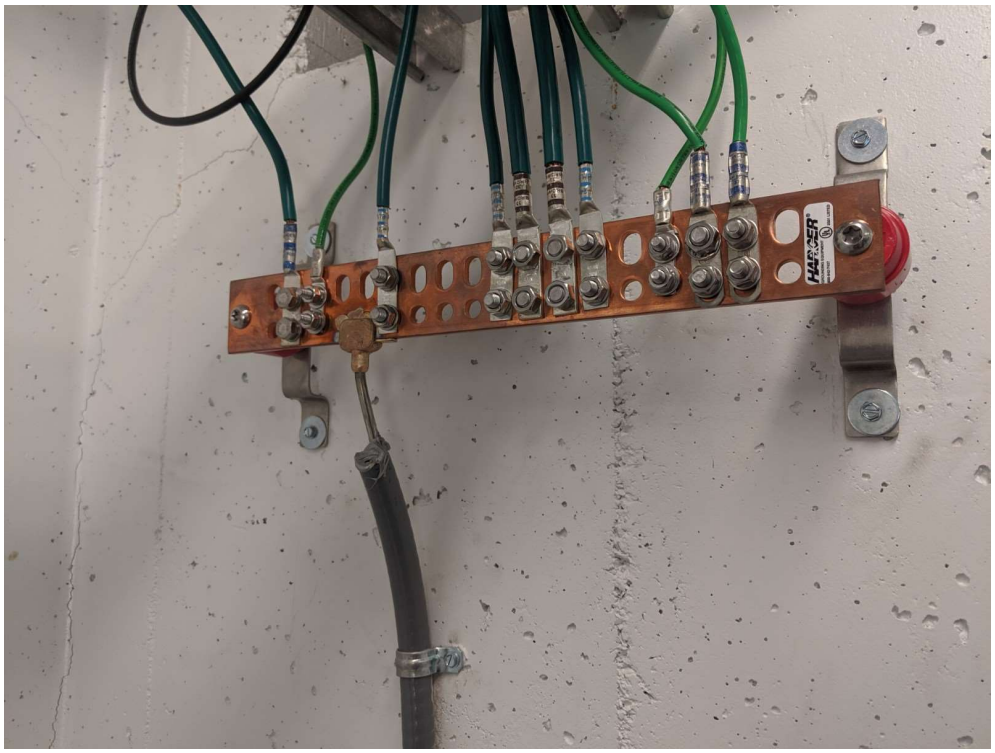


Figure 4.9.1.B - Grounding

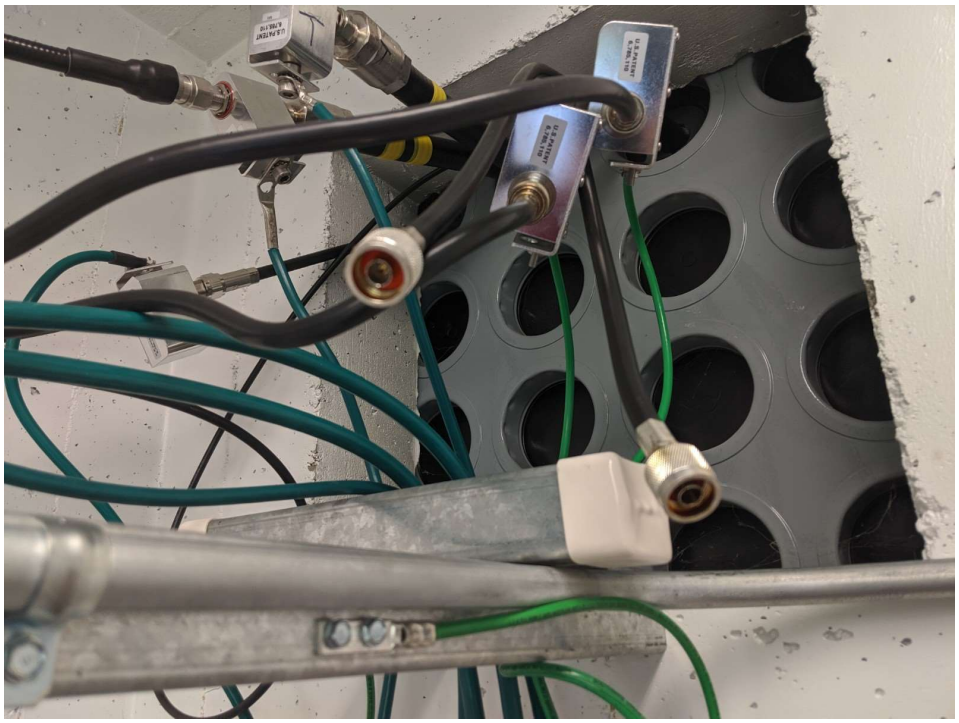


Figure 4.9.1.C - Coax Window

Figure 4.9.1.D - Electrical Meter

4.9.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. It is noted in Figure 4.9.2.A that the outside generator and fuel tank are not secured. As with other sites the UPS, Generator, and fuel tank are not sized for a modern public safety radio system. Additionally the fuel tank is not grounded[12]. Also, as seen above in Figure 4.9.1.C, open coax lines exist inside the shelter. These can allow RF signals to broadcast unfiltered into the shelter, and can cause interference. They should be capped and terminated.The outside casings are showing rust/corrosion. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.9.2.A - Generator and fuel tank

Construction of a second water tank in the compound area, as shown in Figure 4.9.2.B below, could block signal and effect coverage.

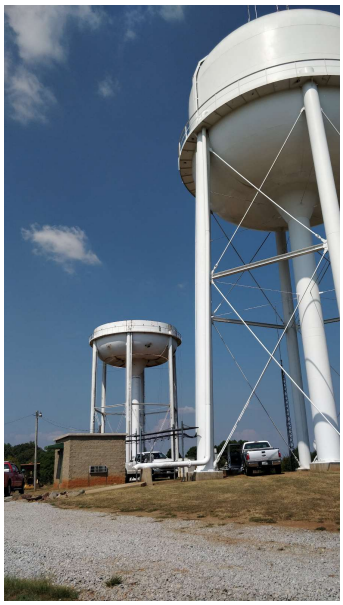


Figure 4.9.2.B - New water tower

[12] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

As previously noted, single HVAC units pose problems if they fail, due to unregulated temperatures inside the building, as shown in Figure 4.9.2.C.

Figure 4.9.2.C - Single HVAC unit

At this site, coax cable entries are not properly sealed allowing daylight to be seen through the holes, as shown below in Figure 4.9.2.D

Figure 4.9.2.D - Light seen through top center coax window

Not all of the coax cables coming into the shelter are grounded. Coax cables are not grounded at the bottom of the water tower as is industry standard for lightning protection[13]. This is shown below in Figures 4.9.2.E & F.

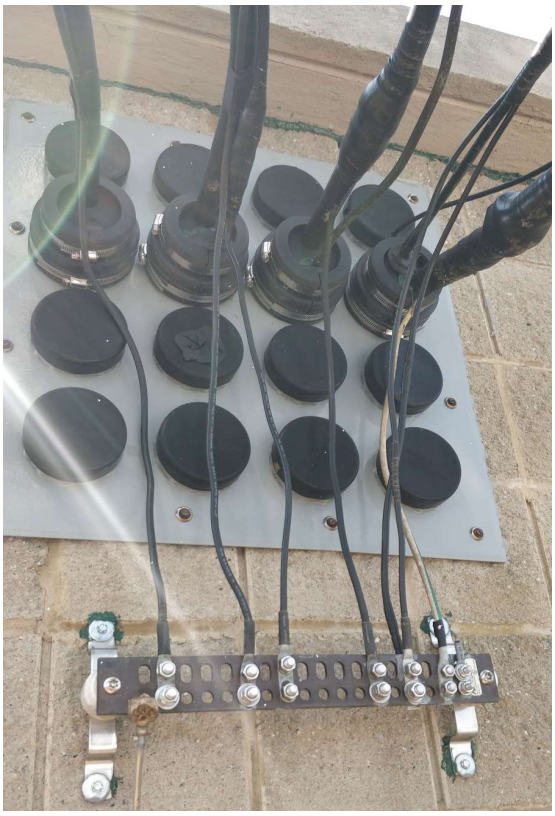
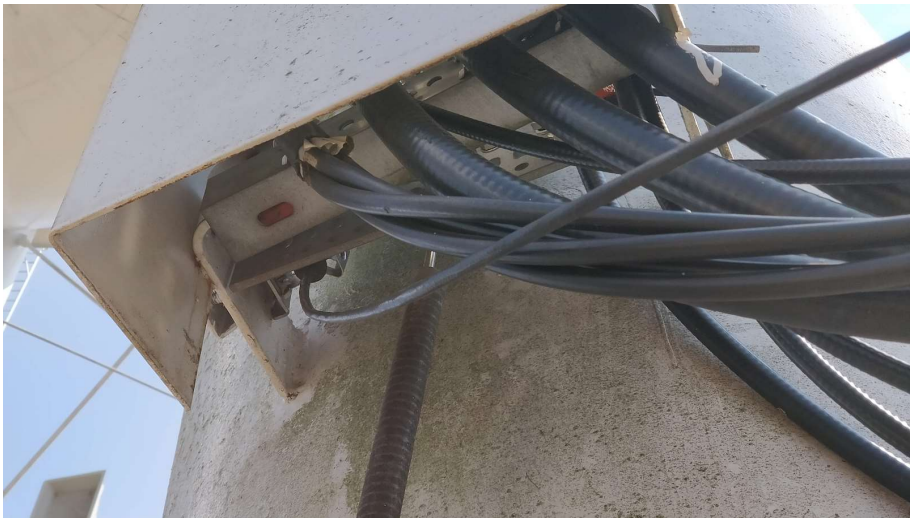


Figure 4.9.2.E - Outdoor Coax entry to building



4.9.2.F - Cables and lines not properly grounded

[13] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

4.10. Traditions Water Tower Site

Ground Elevation: 968 ft
Coordinates: 34° 5'59.60"N; Longitude: 83°41'46.20"W
Tower Type: 100ft Water Tank
Channels Used:

- MotoTRBO site
- 11 Ghz Microwave
- Fire Paging

Figure 4.10.A - Traditions Water Tower

4.10.1. Site Observations

Figure 4.10.1.A - Site Equipment

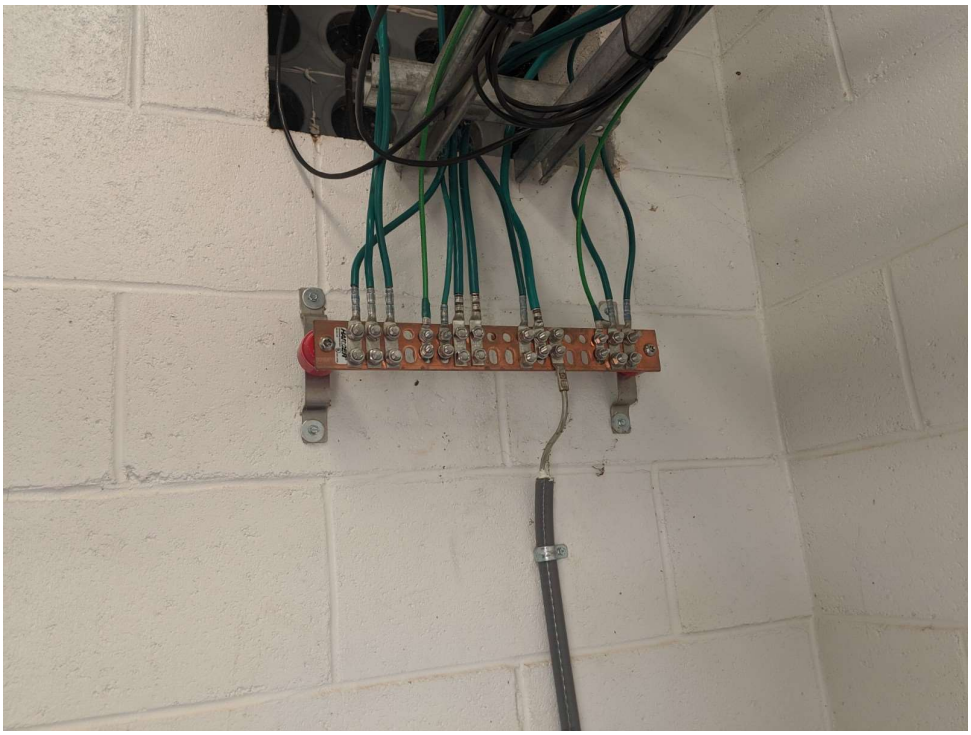


Figure 4.10.1.B - Grounding

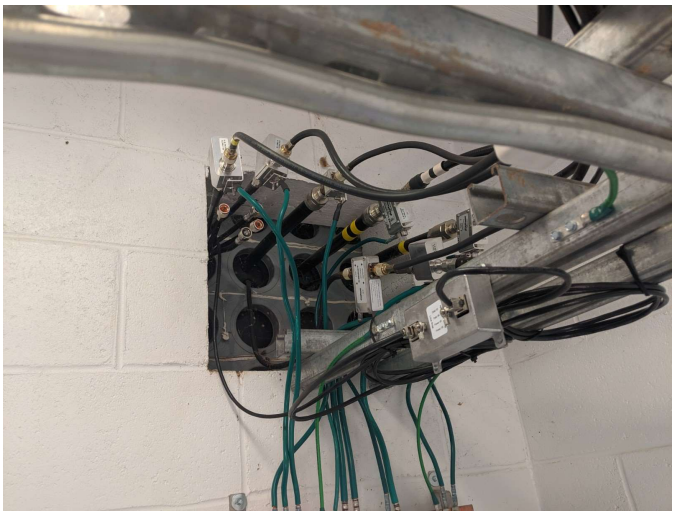


Figure 4.10.1.C - Coax Window

4.10.2. Noted Site Issues

This building has very similar issues when compared to the previous sites. The outside generator and fuel tank are not secured. As with other sites the UPS, Generator, and fuel tank are not sized for a modern public safety radio system. Additionally the fuel tank is not grounded[14]. The outside casings are showing rust/corrosion. As previously noted, single HVAC units pose problems if they fail, due to unregulated temperatures inside the building, as shown in Figure 4.9.2.C. Also, as seen above in Figure 4.7.1.C, open coax lines exist inside the shelter. These can allow RF signals to broadcast unfiltered into the shelter, and can cause interference. They should be capped and terminated. Finally, as noted previously, the building is not sized for all equipment required in a modern public safety radio system.

Figure 4.10.2.A - Single HVAC Unit

[14] See Motorola R-56 or Harris AE/LZT1234618 Site Grounding Standards

Additional sites below are not part of the primary public safety system. The following are notes about those sites for reference.

4.11. Gordon Street Tower Site

161 GORDON ST JEFFERSON

4.11.1. Site Observations

This site is a 250' guyed tower with a multi-room shelter at the base. Currently, the tower is used as an auxiliary site for various communication equipment. Scanners, low-band (47-49 Mhz) radios, and paging devices make up some of the devices on this tower.

4.11.2. Noted Site Issues

The second room of this site was intended for a generator, but currently houses a UPS backup battery system. The room is not ventilated well, and the elevated temperatures have likely caused a severe decrease in the UPS battery life. As of our visit, the UPS was in an alarm state.

Additionally, we were made aware of conversations desiring the tower to be demolished. While located near the historic downtown area of Jefferson, this tower would need extensive remediation. The current building, if gutted and renovated, is appropriately sized for public safety equipment. However, its lack of multiple HVAC units, and sufficient generator would make for an extensive list of requirements.

4.12. Jefferson Fire Station 12 Tower Site

2758 US HWY 129 NORTH JEFFERSON

4.12.1. Site Observations

This site is a 180ft Guyed tower. It has no generator or sizeable battery backup systems. There is a small window-style HVAC unit. This site is primarily used for mutual aid capabilities.

4.12.2. Noted Site Issues

There is significant overgrowth around the site. The building is very small, even when compared to other buildings within the system. The tower is older, and is moderately loaded.

Extensive work would be required if this site was to be used as a primary site for future public safety communication.

4.13. Site Visit Summary Recommendations

It is very clear that Jackson Co did the absolute best with what could be afforded at the time. Most of the sites have limited growth capacity, and due to HVAC, generators, fuel, and batteries, the existing sites would not meet the stringent requirements for a modern public safety radio system.

Additionally, while the equipment is still functional and capable, the site visits verified that the equipment used in the Microwave and Repeaters is equipment that has been announced as end of life. Cambium (Microwave) and Motorola (Repeaters) have already announced this date, and replacement items will begin to require the use of 3rd party transactions (3rd Party being not from the primary manufacturer) such as eBay or Sunny Communications. .

The positive aspect to come from this, is that the microwave paths have shown to be clear among the sites, and therefore reusing some, or all, of the existing sites is a very feasible path moving forward. This alone can provide significant savings along the path to a new radio system.

Significant problems with rust and corrosion around mounts and grounds could cause future problems in structural and electrical systems.

Currently Jackson Co has an agreement with MobileComm to repair equipment. The locations of the tower sites used by the County and City in the various radio systems are placed in locations spread throughout the County, therefore providing capabilities to maximize coverage with an appropriate radio network design. However, almost all of the existing buildings, and the compounds they reside in, cannot support the space needed for a modern public safety radio system without substantial cost, assuming the property owner would grant permission to expand compounds.

5.0 Existing DMR Radio System Coverage

TUSA, upon conclusion of existing system site survey/inspections, developed a set of coverage maps as based on FCC-filed configuration data for the County's constructed configuration as well as performance specifications typical for UHF trunked DMR radio system technology. In addition, we considered the normal use-case for user equipment devices by public safety officials (i.e., on-hip portable radios with speaker-mics).

The audio quality criteria used in these coverage studies is DAQ 3.4, as defined by EIA/TSB-88D Wireless Communications Systems Performance in Noise-Limited Situations. DAQ 3.4, which is the minimum recommended for federal and public safety communications systems. DAQ 3.4 is defined as "Speech understandable with repetition only rarely needed. Some noise and distortion" When gauged against legacy analog FM receiver performance testing, DAQ 3.4 is equivalent to the traditional 20db signal/noise and distortion ratio, or SINAD measurement.

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

Note: when a call is placed on the radio system, a transmitting channel is enabled and audio information is broadcast from the transmitter site simultaneously. The resultant transmitted coverage is termed talk-out as the tower sites are then communicating out to distant portable subscribers.

Likewise, the receive path from field subscriber-unit to tower sites is termed talk-in coverage. Here in the talk-in path for the County DMR ra

dio system, each of the nine tower sites receives the incoming user portable radio's signal at differing level and audio clarity/quality. Each subscriber operates on a "talkgroup" or a designated voice communication channel that is immaterial to what frequency you use. Once a

subscriber transmits, the receiving tower, and any other tower listening to that talkgroup will hear the traffic.

Consider first that following coverage maps depict portable radio coverage predicted from these sites with the assumption that both the infrastructure's base station equipment and outside antenna systems are working correctly and, second, that the coverage in the talk-out/talk-in paths is normally designed to be balanced. Balanced coverage means that wherever a low-power portable radio can hear talk-out communications from the County's tower sites, that the user can then reliably communicate back, or talk-in, to the radio system. As odd as it may sound, even the pine needles on the trees can affect radio coverage.

The following coverage maps illustrate predicted portable radio on-street performance as well as within building structures whose losses are 6db (Common 1 story wood frame house); 10db (Larger house, strip mall, or supermarket) and 20db (Industrial building, Large warehouse, or Walmart). Hospitals or other types of dense building layouts can typically exceed 20db. The County radio system's nine tower site location are plainly illustrated in Figure 2.0.

5.1. Existing DMR Portable On-hip/On-street Predicted Coverage

The predicted coverage depicted in green is where the coverage/audio quality for portable on-hip/on-street talk-out coverage is at or above DAQ 3.4. The areas outside of the green, are areas where the coverage is predicted to be below DAQ 3.4. These depicted areas illustrate performance that could range between broken coverage and no-coverage areas and are below the signal level thresholds needed to achieve DAQ 3.4 audio quality.

Figure 5.1.A – Jackson Co Predicted DMR Portable Street Coverage, Radio on the Hip

5.2. Predicted DMR Portable On-hip Building Coverage

The following maps predict what should be balanced portable on-hip radio coverage within 6db, 10db and 20db loss building structures. As the loss value increases, the corresponding area where reliable coverage is predicted to occur, decreases. So, by simple inspection, one can gauge the predicted coverage versus known coverage shortfalls.

The following are 6db Portable on-hip Talk-in / Talk-out coverage maps for the Jackson County DMR radio system. 6db Portable Coverage is regarded as a standard single story wood frame house.

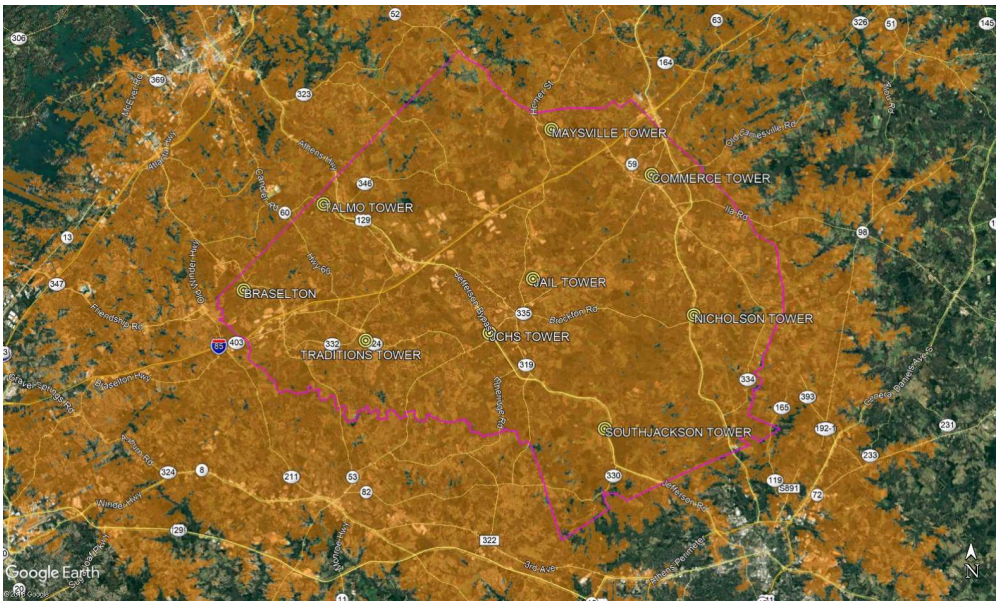


Figure 5.2.A - Jackson County Predicted DMR Portable on-hip 6db Inside Building Coverage

The following predicted coverage maps are for 10db and 20db Portable on-hip Talk-in coverage maps for the Jackson County DMR radio system. 10db portable radio coverage is regarded as commercial concrete type buildings. 20db Portable Coverage is regarded as a large industrial building, hospital, or courthouse (generally thick and dense walls).

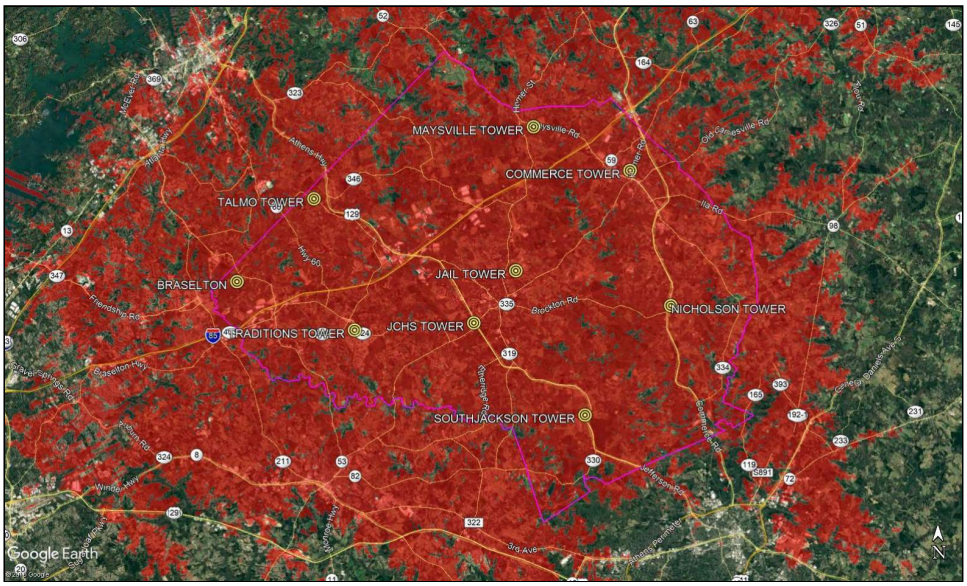


Figure 5.2.C – JacksonCounty DMR Portable on-hip 10db Buildings

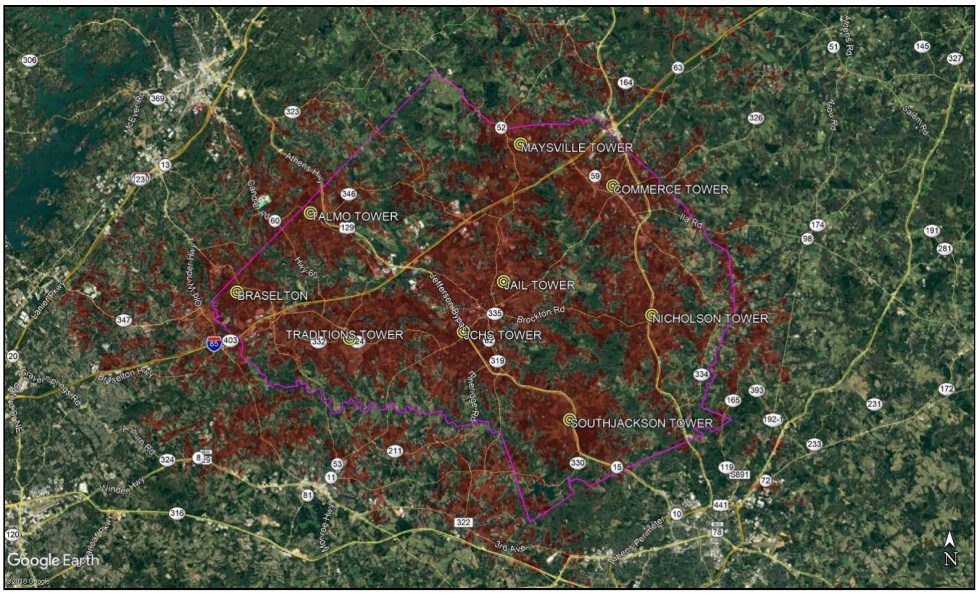


Figure 5.2.D – Jackson County DMR Portable on-hip 20db Talk-in.

5.3. Coverage Assessment

While the predicted coverage maps indicate adequate and usable coverage inside standard homes and businesses within the city and county limits, the results of the actual user interviews paints a far different picture. When the users who participated in the TUSA interviews were asked to compare predicted on-street coverage with what they typically encounter, their response was that they can often hear the radio system's talk-out coverage but have difficulty or cannot talk-in to the radio systems at those same

locations. All of the maps shown are predicted coverage for a portable talking into the radio system.

Users repeatedly described coverage as far less than what is predicted. Portable coverage on the street is described as similar to 20db in building coverage shown in figure 5.2.D. The shortfall of radio coverage is likely caused by improperly aligned/configured equipment, defective receiver antennas at the tower sites, unbalanced RX vs TX without the use of Tower Top Amplifiers (TTA), improperly aligned receiver-voter equipment, or outside interference.

The shortfall could be caused by improperly aligned/configured equipment, defective receiver antennas at the tower sites, improperly aligned receiver-voter equipment, or outside interference.

6.0 User Interviews and User Needs

6.1. User Interviews

User interviews were conducted from Sep 30th - Oct 1st, and from Oct 22nd - Oct 23rd. Additionally user surveys were sent out Oct 6th.

TUSA and County staff held open meetings for all Jackson County agencies to attend, and also offered to travel to various agencies locations in an effort to have as many agencies heard and interviewed as possible. After the Oct 22 open meeting, each agency was asked to stay after and were asked additional questions.

6.2. Identified User Needs

Different agencies and departments often have different perceptions of how a radio system performs. For example, the Sheriff's deputies might have the best "big picture" view because they travel all over the county. These users are more aware of wide-area coverage challenges. A local fire department however might have problems with in-building portable radio performance due to poor coverage, or there are communications challenges when on mutual aid calls.

Public service departments might have problems using portables, or do not have enough channel capacity. Dispatch center operations might be hampered by inefficient/obsolete equipment, or ergonomic issues. All of these unique items feed into what the user actually needs. This allows TUSA to develop a "picture" of how the radio system performs from the user's standpoint.

The results of the online questionnaire and user interviews can be summed up into the following categories and priorities:

- Coverage
- Reliability/Performance
- Interoperability
- Subscriber durability

6.2.1. Coverage

One area of concern communicated during the interviews was the lack of coverage being provided to support safe operations. Many of the agencies complained about the lack of radio coverage throughout parts of the County. For example, Brasleton is seen as a particularly tough area. It has interstate close by, and also extends into nearly 4 different counties. Communicating internal to the county is spotty. Communicating with neighbors is nearly non-existent.

While there are no formally outlined minimum standards for either coverage or capacity for a Public Safety radio system, the objectives defined by TUSA for coverage and capacity follow those generally employed in the industry. Specifically, any potential solution should provide no less than 95% countywide portable indoor coverage with a Delivered Audio Quality (DAQ) level of at least 3.4, and no less than 95% coverage in 20dB or defined critical buildings within defined coverage areas, also at DAQ level of 3.4. The table below provides a definition of DAQ levels. Critical coverage areas are those other than wetlands, forests, agricultural and rural environments.

Minimum capacity requirements are defined as better than a Grade of Service (GOS) 1%, which is statistically defined as less than 10 in 1,000 calls could be delayed as a result of insufficient system capacity and the delay itself, should not exceed 0.5 seconds.

Today, portable radio coverage deficiencies are reported to exist in certain areas of the County and are clearly visible in the portable radio talk-in/talk-out coverage maps contained in Section 5.0 of this Report. The majority of the performance shortfall is noted in multiple areas throughout the County.

As part of Phase 2 Procurement process, TUSA will be working with Jackson County to further define the coverage parameters that will be featured in the RFP specification. This will come after the County reviews our conceptual solutions presented in this report and determines what option best suits their desired level of coverage, feature performance, reliability and interoperability. The goal is to find the best option that serves the public safety users of Jackson County at an affordable price. We have presented our recommended coverage solution in the conceptual designs of this report that is based on the coverage needs expressed by the users and required by the critical building needs in the County.

6.2.2. Reliability/Performance

While the system has not seen failures as a common occurrence, the overall performance of the system has lacked in multiple regards. First and foremost, as has been mentioned earlier, the coverage of the system has appeared to degrade,

and is currently at a point where public safety staff struggle with the day to day communications due to coverage gaps.

TUSA will be addressing the reliability and coverage concerns of the County when we move into Phase 2 of the RFP Procurement process. We will create a specification that ensures reliable communication and performance.

The specification will also make certain the RFP process provides for a best in class maintenance program to prevent the system from regressing. This program will include yearly health checks and preventative maintenance of the system. This maintenance will include line sweeps, power level settings, and a host of other industry standard best practices that are required for properly maintaining a radio system. This program will also ensure software and hardware upgrades are identified in the overall lifecycle and maintenance program. The cost for this is captured in our conceptual budgets and shows what it will take to maintain the system over the typical radio network life cycle of 15-years.

6.2.3. Interoperability/Operability

Users also commented about interoperable, the ability to talk to surrounding counties and the state, and operable communications between the agencies within the county.

Jackson County uniquely resides in an area where all three major public safety bands are utilized by surrounding counties. Athens-Clarke, Barrow, Gwinnett, and Hall counties all use 800 Mhz P25 communication. Banks County, to the north, utilizes a proprietary digital UHF radio system. Madison County uses analog VHF radio communication. Therefore, for Jackson County staff to adequately communicate with all neighbors, each department will likely need access to multiple frequency bands to ensure interoperability is available.

While TUSA addresses interoperability and operability later on in this report (see Section 11), we also want to discuss it here. P25 radios can be equipped/programmed to talk to surrounding P25 systems. Of course, this will require mutual aid agreements and standard operating procedures (SOPs) to be developed between departments. There are also other interoperability solutions available as well, but those will ultimately be driven by cost. (i.e. multiband radios, Interoperability Overlays, control stations, cache of Radios, etc.). Connecting directly or communicating directly to the P25 systems or other types of radio networks around you will assist with the audio quality issues.

6.2.4. Subscriber Durability/Quality

Users commented about the quality of subscriber radios available for use on the current system not meeting the durability needs for public safety uses. Temperature rating, battery life, knob sizes, speaker volume, accessories, common channels with neighbors, and screen visibility were all items directly related to the durability and quality of the radios available on the MotoTRBO system. Public Safety grade radios have models and features to overcome all of these listed hurdles.

7.0 Radio Technology Available Today

In order to fully understand the pros and cons of the various options available to Jackson County and its user agencies, it is important to recognize the benefits and limitations presented by the technologies available today. The following is a brief overview of these technologies. This overview in no way attempts to touch on all of the aspects of any of these technologies, but instead focuses on the features and limitations of each that directly relate to the County's situation.

The discussion also touches on the differences between analog and digital systems, as well as aspects of proprietary systems versus systems based on open standards. In addition, included is an overview of system configurations alternatives available to support wide-area coverage desired County, i.e., multisite, simulcast and hybrid systems.

7.1. Analog Vs. Digital Systems

Since the late 1930's, public safety radio communication has used analog Frequency Modulation (FM) near exclusively as its wireless communications technology. Analog FM is inexpensive, robust, and provides good voice quality given reasonable signal levels. In terms of disadvantages, while FM's strong signal voice quality is good, the quality begins to degrade rather quickly as communication distance increases. As users move farther and farther from the main transmitter site, and signal levels drop, static and other noise factors steadily increase until finally the received signal is rendered unintelligible.

In many cases users operating within the outer reaches of coverage are able to communicate only with difficulty. This usually requires message repeats and results in misunderstood message intention. Furthermore, analog systems provide little security from eavesdroppers. Anyone with an inexpensive scanner can easily intercept and monitor the traffic on an analog system. Analog voice scramblers are available however, they are expensive, offer poor voice quality and are cumbersome to implement.

Digital communications systems first arrived on the public safety communications scene in the late 1980's. These initial systems were characterized by poor range and highly distorted voice audio; however, they were highly secure. In the past two and a half decades digital mobile radio technology has advanced to the point that voice clarity in digital systems rivals the best analog audio. Radio coverage of a digital system is equivalent to, or exceeds that of a similar analog system. Furthermore, the static and noise that is typical in analog systems is dramatically reduced.

Digital systems provide significantly more voice security than analog systems. Voice encryption on a digital system is easy to implement, provides excellent voice quality, and is virtually impossible to crack. Digital systems represent the future of public safety communications. As an example, the FCC has allocated a new section of spectrum in the 700 MHz band exclusively for public safety use, designed for digital systems only. Analog systems will not be permitted to utilize this new spectrum.

7.2. Proprietary Vs. Open Standard Systems

To provide needed call capacity, County's Motorola DMR radio system configuration uses multiple UHF channels in trunking configurations to provide communications for Police, Sheriff, Fire, EMS and Public Works agencies. Older trunked systems, as well as some currently available ones, utilize proprietary signaling protocols in their design. Examples of such systems are Motorola SmartNet/SmartZone, Motorola MOTOTRBO DMR, L3 Harris EDACS, and L3 Harris OpenSky. While these proprietary protocols do significantly increase functional capabilities, they do so at the expense of intersystem interoperability and competition. In general, users with equipment from different vendors cannot directly communicate on the same system, and interoperability between them depends upon dispatcher relaying, console patches, or inter-system bridges. In terms of competition, if a system owner needs to expand or replace equipment in a proprietary system, the owner's procurement options are limited to one, or at most, a very limited number of vendors. Historically, this has resulted in a significant increase in the cost of a system over its lifetime.

All trunking systems initially developed and deployed for the public safety market, were proprietary. An agency that purchased a trunking system from one vendor would be stuck with that vendor for the life cycle of the system. That agency also was forced to buy user equipment (mobile and portable subscribers) from that same vendor as a cost that was not always very competitive. If a neighboring agency purchased a system from a different vendor, direct interoperability/roaming between the two was difficult at best. To address these and other issues, APCO, in concert with representatives of the Federal government and radio equipment manufacturers, have been working for more than two decades to develop a suite of open standards defining nearly all of the technical specifications needed to build systems that can meet the functional requirements of public safety communications yet not limit interoperability or competition. This suite of open standards is known collectively as Project 25 (P25).

While still evolving, sufficient progress has been made such that P25 compliant systems and user equipment are available today from multiple vendors. If adjacent jurisdictions or counties were to purchase P25 compliant systems from different vendors, user radios if properly programmed would be able to communicate directly with each other and on other P25 system infrastructure. In addition, each agency would be free to purchase radios from any vendor providing P25 compliant equipment, based on required features and budget.

Multiple vendors also now provide multiband radio user equipment. The multiband radio allows communication on multiple frequency bands (VHF, UHF, 7/800) and protocols (analog, digital, P25). This creates an environment of innovation at a cost competitive advantage to a customer from these multiple vendors.

It should be noted that many of the Federal public safety communications grants available in the past few years, and expectedly in the future, either explicitly define P25 systems and equipment as a requirement, or heavily favor applications from agencies defining P25 in their requests. An agency applying for such a grant based on proprietary, non-P25 technology would be at a significant disadvantage in the competition for the available funds.

Vendors that provide P25 equipment as of today are:

Infrastructure Equipment

- JVC Kenwood (EF Johnson)
- L3 Harris
- Motorola Solutions
- TAIT

Subscriber Radios

- BK Technologies
- JVC Kenwood (EF Johnson)
- L3 Harris
- Motorola Solutions
- TAIT

8.0 Options for Covering Large Geographic Areas

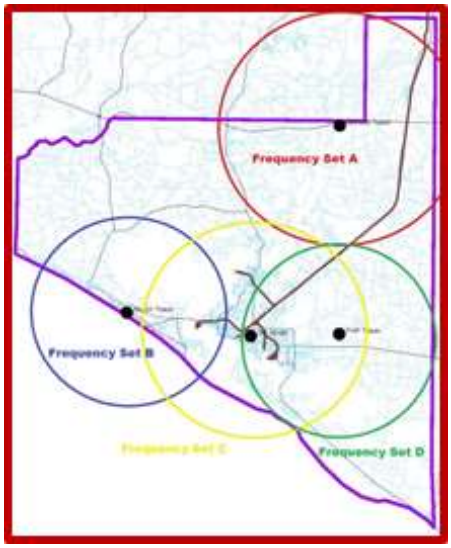
Wide area systems fill the need when an agency's radio coverage requirement exceeds that which is capable of being met by a limited number of tower sites. Simply adding tower sites will increase radio coverage, but adding sites alone will not result in a cohesive public safety communications system.

What is needed is the capability for users operating on one site to communicate with the users operating on the others along with seamless switching between zones/channels/talkgroups when traveling in Jackson County. That capability is provided by wide-area technology. The industry has developed several approaches to accomplishing this task, three of which have emerged as leading coverage enhancement options. Those three approaches are Multisite Networks, Simulcast, and Hybrid Simulcast/Multisite Networks. For those unfamiliar with wide area voice system technology, the following provides a general overview and describes the pros and cons of each approach. The following illustrations, while hypothetical cases in themselves, are representative of how such options are often configured.

8.1. Multisite Networks

A multi-site network is comprised of radio sites spread throughout a geographic area, each having its own set of radio frequencies. The image shown is an example of such a configuration. This is similar to the current Jackson County DMR radio system.

In order to allow communication between users operating in different tower site coverage areas, a means must be provided so that calls within the coverage area of one tower site are retransmitted on another tower site or combination of sites. Such wide area communication is accomplished through an intelligent central "switch" that monitors the site activity of every operational radio unit in the system and dynamically connects users together as needed. A call using a frequency on one site is connected to the appropriate, but different frequency on another. When a call is placed, the central switch determines which sites and frequencies are available to be assigned for that call and temporarily connects them all together via leased lines or microwave circuits.



The key characteristic of this type of network is that a completely separate set of radio frequencies (channels) is needed at each site. Because inter-site interference is not an issue, site placement is much less critical for a multisite network, compared to a simulcast system. In addition, a multisite network is extremely robust from the standpoint of reliability. In the event of a failure of one or more of the inter-site links, a simulcast site must operate with reduced capacity. A multisite network can continue to

operate at full capacity in the event of such a failure, although with reduced wide area coverage capability. The technical requirements for the communication links connecting the sites are also less critical than for simulcast systems, which can result in lower system implementation and operating cost.

While a primary strength in one regard, the requirement for separate frequency sets for each tower site is also a multisite network's primary weakness. The frequencies available for public safety use are extremely limited. The availability of frequencies can effectively block a multisite system's capability for future expansion, in terms of either coverage or capacity. If additional frequencies cannot be made available, additional sites cannot be added to an existing multisite network to increase its coverage.

Capacity expansion is further constrained by frequency availability as capacity expansion usually requires adding channels to multiple sites in the network. In order to prevent dropped or missed calls, the quantity of channels at each site must be high enough to handle all of the calls that the central switch may route to that site at any instant.

Another issue to consider is the effect of transitioning from one site to another when traveling throughout the service area. Site transitioning has an effect on the apparent coverage performance of a multisite network. In order to ensure that coverage within the required service area is contiguous, the coverage from adjacent sites must overlap each other. As users travel in these overlapping coverage areas, the radio must determine which site provides the strongest signal at that specific location and transition to the stronger site's operating frequencies. This transition is not instantaneous. To prevent missed calls due to excessive transitioning between sites, the transition to the stronger site is delayed until the signal difference between the current site and the new site exceeds a specific signal difference threshold. The net result is that a user may not always be operating on the optimum site. From the user's perspective, system coverage can be sporadically less than expected.

8.2. Simulcast Technology

Like multisite, simulcast is a technology that increases coverage beyond that available from a single site by implementing multiple sites throughout the desired coverage area. Simulcast differs from a multisite configuration in that the same frequency set is used throughout a given system. With a simulcast system, a channel's associated transmitter at each site broadcasts the same information simultaneously on the same RF channel as the other sites, hence the name.

The primary advantage of a simulcast system over a multisite network is that simulcast increases coverage without increasing the number of channels necessary to support the system. Also, given the same site configuration, inbound coverage from subscriber units to the base stations is improved over multisite because of the diversity effect of multiple receiver sites monitoring the same inbound frequency, and outbound coverage is improved because there is no site transitioning effect to contend with. From the user's

point of view a simulcast system operates exactly like a single site system. There are no zones or site transitions for the user to contend with.

However, as a result of multiple sites transmitting on the same frequency, each site's transmitted frequency, phase and timing must be precisely controlled to prevent destructive interference as signals transmitted from multiple sites overlap. This requirement to precisely control the output signals from each site in order to prevent destructive time delay interference (TDI) makes the implementation and long-term support of a simulcast system more complex and costly than for a multisite network. This disadvantage also places constraints on a simulcast system's site placement. With the Industry's adoption of linear-simulcast base station technology (vs. non-linear simulcast), the design of a simulcast is much easier to accomplish with its more relaxed TDI constraints.

A simulcast radio system also requires highly stable and reliable inter-site connectivity. If inter-site connectivity is lost in a simulcast system, the affected sites will operate as stand-alone sites with severely limited capacity. This requirement for reliability and stability can usually only be met by a dedicated microwave or fiber optic sub-system. Currently leased circuits, even leased fiber, are not recommended for simulcast, and some vendors will not support simulcast systems utilizing them. From the standpoint of reliability, microwave has proved to be far more reliable and robust than leased circuits in the face of severe storms.

8.3. Hybrid Simulcast/Multisite Configurations

The final wide area system configuration one might consider is a hybrid design using a combination of multisite and simulcast technologies. This system configuration consists of several simulcast sub-systems, or "cells" connected together in a larger multisite network. From the standpoint of the multisite network, each simulcast cell looks like a single site, but each of these cells has significantly greater coverage than is possible from a single site. This design can provide a system solution when the geographic area is too large to be accommodated by a single simulcast system, and frequency constraints preclude a purely multisite network approach.

9.0 Available Wireless Data System Configurations

The following section provides an overview of the various wireless data options currently available to Jackson County's users.

9.1. Commercial Wireless Data

Current public safety wireless data requirements are being met almost entirely by commercial wireless carriers. The initial deployments of commercial wireless data provided only moderate data rates and spotty coverage. Within the past several years, however, commercial system data rates have dramatically improved. Commercial wireless carriers are currently implementing improvements to their systems to provide significantly increased data speeds compared to services available only a few years ago.

As an example; AT&T, Verizon, Sprint, and T-Mobile have constructed high-speed downlink packet access (HSDPA) sometimes known as 4G, with initial deployments providing peak rates in excess of 1 Mb/s and theoretical peak rates of 14 Mb/s. While performance is good and getting better, it is important to remember that these systems are still commercial networks. They are not hardened to withstand severe storms and long periods without commercial power. In addition, public safety users do not receive priority over private subscribers. Experience proves that these systems quickly overload and are rendered essentially useless during and immediately after a natural disaster such as a hurricane.

The bottom line is that a commercial wireless data solution cannot be counted on to provide reliable public safety/mission critical service in an emergency situation. While commercial systems can provide economical high capacity mobile data connectivity on a routine basis, public safety agencies should have plans in place to deal with inevitable service outages.

9.2. Private Narrowband Wireless Data

A private narrowband data system provides data connectivity over narrow bandwidth RF channels that are primarily meant for voice service. These systems can provide good geographic coverage, but the narrow bandwidth limits data throughput. Such systems normally provide data throughput rates measured in thousands of bits per second instead of the hundreds of thousands of bits per second or more that a commercial data network can provide. The primary advantage of such a system is that it can be designed to public safety reliability standards. In addition, user access can be strictly controlled, reducing the possibility of system overload during emergency situations. In short, while the data throughput of a narrowband data system cannot match that of a commercial system, it is far more likely to be available when needed most.

9.3. Private Broadband Wireless Data

Private broadband data systems operate on frequencies that have channel bandwidths measured in Megahertz. As such, they are capable of very high data throughput, but only over a very small area. Typically, these operate in the 900MHz, 2.4, 4.9, and 5GHz bands and utilize an access point model similar to Wi-Fi networks in their design. Because each access point only provides coverage over a small area, it would be extremely costly to cover an area the size of Jackson County with broadband wireless.

Instead a more practical approach would be to provide access points at strategic locations throughout the County to form high speed wireless “hotspots”. This high-speed connectivity would then be available to users when they come within range of a hot spot, allowing them to access the central network and perform functions that require very high speed, such as updating local databases or uploading reports. Outside of the range of hotspots, users would have to rely on other means of data connectivity, either commercial or private narrowband.

A limiting factor in the deployment of a network of hotspots is the cost and availability of high-speed data connections that are necessary to connect each hotspot to the primary network.

9.4. Data On The Trunked Voice Network

Many trunked voice systems, including EDACS, OpenSky, and P25 have the capability of providing data communication using the voice network. This approach is called trunked data. It has the dual advantage of not requiring the implementation of a separate data infrastructure, and the data network inherits the same reliability as the voice network. The disadvantages are that a certain amount of voice capacity must be sacrificed in order to support trunked data, and that the maximum data rate that this technology can support is quite low (9.6kb/s).

Typically, trunked data rates are measured in hundreds of bits per second, instead of the kilobits or megabits per second offered by other options. This slow throughput of trunked data cannot support the requirements of modern public safety applications and most users that relied on this approach in the past have abandoned it for other options that provide the required higher data rates. The technology is still applicable in certain niche applications such as GPS location, over-the-air reprogramming/rekeying of radios, status reporting and short text message delivery.

9.5. Hybrid Wireless Data

Each of the previous data options has advantages and disadvantages. Commercial data options have high throughput, good coverage, but poor reliability. Narrowband data has good coverage and reliability, but only moderate throughput. Trunked data has high reliability and low cost, but low throughput, whereas broadband data has excellent throughput, reasonable reliability, but poor coverage. A hybrid data solution is a mixture of the available options configured to provide an acceptable system solution when a single technology cannot. This hybrid approach does significantly increase cost and complexity.

Unlike with a voice multisite/simulcast hybrid approach where the subscriber equipment is essentially unaffected and the additional complexity is in the infrastructure, a data hybrid solution pushes the complexity out to the subscribers. In addition to multiple infrastructure subsystems, the mobile subscriber equipment must also be equipped with multiple radio platforms as well as additional software applications to permit selection of the appropriate data provider, depending upon the immediate circumstances.

9.6. FirstNet

On the horizon is FirstNet, a nationwide LTE broadband network to support First Responders. In 2012, Congress passed the Middle-Class Job Creations Act, which authorizes the creation of the First Responder Network Authority. This independent authority within NTIA is able to provide emergency responders with the first nationwide, high-speed, broadband network dedicated to public safety.

The construction of the new network requires each state to have a Radio Access Network (RAN), and each state can choose whether they will allow FirstNet to build the RAN, or each state can opt out and build their own RAN.

FirstNet released its initial state plans on June 19, and the state of Georgia has chosen to opt-in and will accept the FirstNet deployment plans. The new network will be built by AT&T. Part of the plan is to leverage AT&T's existing cellular network and give public safety priority on the network.

At the present time it is difficult to predict how FirstNet will play out and when it will be available for public safety. AT&T is now challenging the definitions of what public safety grade is for networks. To complicate this more, on August 15, 2017, Verizon announced they will build their own dedicated public safety LTE core network as a viable option to FirstNet.

10.0 Methods for Enhancing Coverage Reliability

A radio system's portable radio coverage reliability can be extended through the use of devices designed to receive and retransmit signals, much like a repeater. These options are typically reserved for worst case environments, such as mountainous areas, or for very dense structures such as hospitals that commonly have radio penetration issues.

10.1. Digital Vehicular Repeater System (DVRS)

A cost-effective solution to improve portable RF coverage reliability within a given radio system/network is accomplished through the use of a Digital Vehicular Repeater System (DVRS). A DVRS provides repeater capability between portable radios (portable radios being the most susceptible to coverage problems) and the RF infrastructure system (tower sites). This dramatically improves coverage by leveraging the large mobile coverage of a radio system and extending it to portable radios which would otherwise have reduced coverage reliability in some buildings and remote areas.

A DVRS accomplishes this "repeating" function by using two radio devices integrated together with a hardware controlling device. One of the radios would be programmed onto the host trunked radio system with the appropriate talk groups. The second radio (usually supplied with the repeater device) operates outside of the frequency range of the trunked radio system. Because of this, a DVRS would require approval and licensing from the FCC via the state frequency coordinator.

On the flip side, there is a difficult engineering problem to overcome with these types of systems. Anytime there are two DVRS at the same physical location, a protocol must be established so a portable radio doesn't activate two or more DVRS simultaneously and potentially causing self-interference between multiple DVRS units. Technology has improved with these devices to help mitigate this issue.

10.2. Bi-directional Amplifier (BDA)

The Bi-Directional Amplifier (BDA) amplifies and repeats the radio system frequencies from a donor antenna located in an area where host coverage is available. The amplified signal is then repeated in or toward an area experiencing degraded coverage. Likewise, the signal from a subscriber radio is repeated back to the donor antenna which directs it back to the host infrastructure site(s).

An important difference between BDA and Digital Vehicular Repeater System (DVRS) equipment is that BDAs do not change the frequency of the signal. This simplifies the operation of the BDA, however results in has a major drawback in this design. Because both uplink/downlink antennas operate on the same frequencies within a BDA configuration, they must be separated/isolated by some type of shielding mechanism. The more physical separation between the antennas, the better their performance will

be. Water towers/water tanks offer the best type of structure for installing outdoor BDAs. Because of the metal used in these structures, these antennas can be separated in such a way as to offer the most advantageous isolation. Other types of structures appropriate for outdoor BDA configurations are buildings structures where antennas can be installed on opposite sides of the structure, thereby creating a shielding/decoupling effect.

11.0 Project 25 ISSI-Key to User Roaming

As cities and counties in Georgia move forward with their deployments of APCO Project 25 radio systems, the groundwork is being set for user radio roaming. First, of course, radios in a given region or area must be capable of operation on P25 equipped infrastructures.

Additionally, all new public safety trunked radio purchases should require radios that are operable on both the 800 MHz and the new 700 MHz voice channels, if a network exists in the region or area of operation. These new radios should be fully compatible with Project 25's Phase-1 (12.5 KHz FDMA) and Phase-2 (12.5 KHz, two-slot TDMA) functional and operable requirements. By so doing, user radios newly purchased will be fully compatible with future Phase-1 and Phase-2 7/800MHz rollouts and will experience significantly longer service lives than those having only Phase-1 capabilities.

While equipping users with P25 compliant equipment will potentially allow a user to communicate while traveling outside of their home area, this step alone will not allow radio users to communicate directly with radio users located in another jurisdiction. Such interoperability and seamless roaming require the establishment of Memorandums of Understanding (MOUs), regional radio governance and technical committees, development of flexible talkgroup profiles, and the instantaneous and continuous connectivity of radio system controllers (called switches) throughout the various regions.

Prior to P25, connectivity standards between compliant radio systems did not exist. These standards exist today at a base level where user IDs, talk group and transaction audio can be instantaneously routed between radio systems. These new switch interoperability standards are termed: Inter RF SubSystem Interface (ISSI).

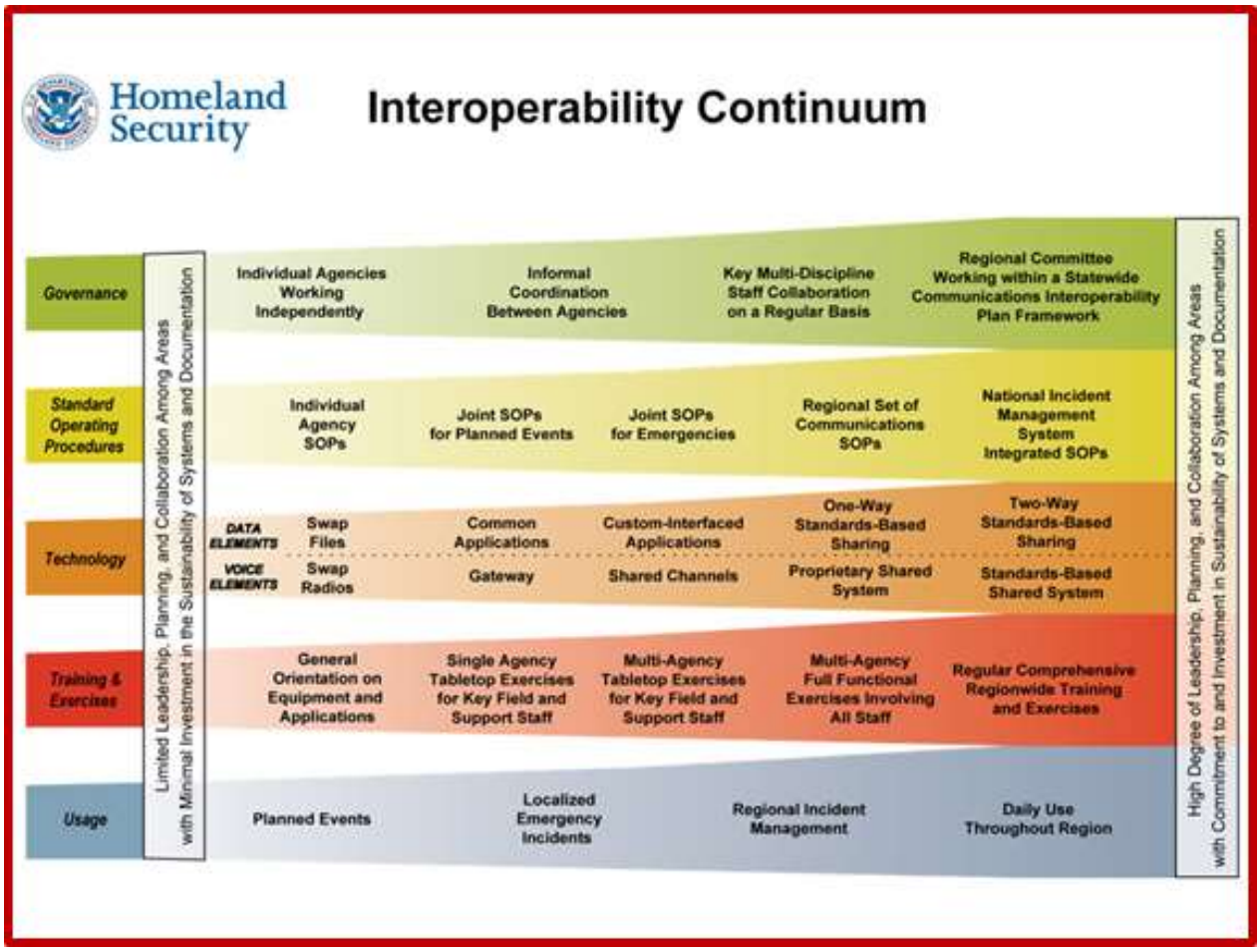
Project 25 ISSI defines the types of functionality that can be supported between radio network/system switches. The ISSI P25 Standard is vendor neutral such that radio systems designed and deployed by competing radio vendors can support call interoperability and user roaming. This is an extremely important point as Project 25 would have otherwise failed its primary goal: open-architecture and elimination of proprietary solutions.

It is important to understand that ISSI is a functionality of the controllers/switches and gateways employed within the various deployed radio systems. All P25 cores/switches within a roamable network must support ISSI or interoperability cannot occur via this method. Yet, nothing happens with respect to user roaming without a secure, reliable means for interconnecting the various radio system switches together and this is why an expanded microwave solution is so vitally important and bears consideration.

12.0 Interoperability/Roaming Considerations

Many states across the country, including Ohio, Michigan, Louisiana, Mississippi, and other states including Georgia have made great strides in improving public safety communications, interoperability and user radio roaming. For example, a gateway now exists between Louisiana's LWIN and Mississippi's MSWIN 700/800MHz statewide radio networks.

Other interoperable solutions, of course, exist and those include swapping radios, gateways, shared channels, Nationwide mutual aid channels on VHF, UHF and 700/800MHz bands, and proprietary shared systems. The following illustrates the various recognized means for achieving interoperable communications:



Interoperability with the surrounding counties and agencies can be done either by direct connection through ISSI equipment, as explained in Section 10.0, or by link radios for each channel that these groups operate on.

12.1. NPSPAC Mutual Aid System

Most public safety agencies in the State of Georgia who operate 800 MHz systems, or own subscriber units that operate on a participating Public Safety system, have access to the nationwide mutual aid channels generally referred to as the TAC (Tactical Communications) channels. These are 5 distinct 800MHz channel assignments that are designated for conventional analog communications in support of mutual aid operations and interoperable communications. These channels are generally set aside for 3 main categories:

- Day to Day Interoperability – Generally used during routine Public Safety operations such as accident scene response or other first response activity. Several area jurisdictions may respond to these types of calls. TAC channels are generally used so that Public Safety agencies may all use a designated common channel for communications during these routine events.

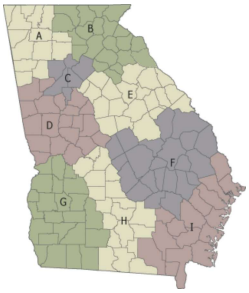
- Mutual Aid Disaster Response – Planned use of specified channels during joint response to major disasters that may exceed the resources of one specific agency. These events include possible terrorist activity, airplane crashes, bombings, large forest fires and other major events and acts of nature when the situation overwhelms local responses and outside support is requested.

- Task Force Interoperability involving state, local and/or federal agencies coming together for a period of time in response to major events such as sporting events, political rallies, or for investigations related to prolonged criminal activity.

The Association of Public-Safety Communication Officials (APCO) and the National Public Safety Telecommunication Council (NPSTC) have jointly developed a new ANSI (American National Standards Institute) Standard for Channel Naming for Public Safety Interoperability Channels. The standardization of mutual aid channelization across the United States is important as it reduces confusion during mutual aid events and ensures uniformity.

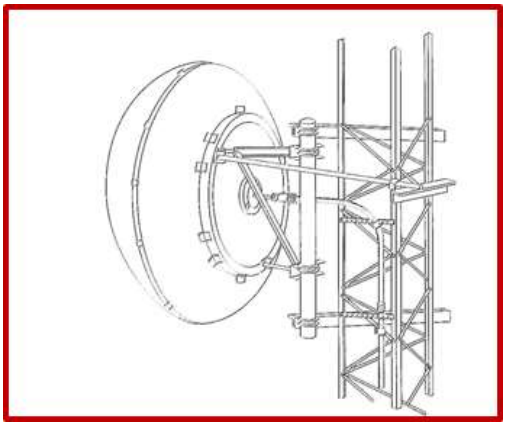
12.2. Statewide Mutual Aid System

Georgia State Patrol (GSP) provides a unique hurdle for interoperable communication. Internally, GSP utilizes VHF Analog repeaters throughout the state to cover various Troops. However, as regional 800 Mhz radio systems have been constructed throughout the state, GSP has leveraged the coverage provided by those systems to provide more in depth coverage, rather than spending millions of dollars to build systems that may, in many cases, overlap the existing coverage. Therefore VHF and 800 Mhz P25 will be necessary to provide interoperability with State Patrol.



The VHF resources provided by the state are configured by troop, and therefore the needs of Jackson Co staff will vary depending upon which GSP troop is needed for communications.

13.0 Enhanced Microwave Subsystem



Immediate attention has been given by the federal government in driving the convergence of new public safety and federally operated radio systems toward Project 25 digital voice standards. It is important that newly deployed digital radio networks depart from prior Project 16 trunked radio configurations. Where each manufacturer had developed highly efficient, and proprietary radio systems, but they were incompatible technology solutions. As radio networks expand in step with coverage needs, the role of remote antenna site connectivity takes center stage. Connectivity is essential as this allows independent antenna sites, each singularly exhibiting natural coverage and performance limitations, to be combined into a cohesive wide-area network. The critical importance of reliable connectivity between sites can overshadow other radio network design consideration as the loss of even a single linkage could lead to devastating consequences.

The fragility of some wide-area trunked radio and commercial cellular networks was vividly laid bare through the devastating effects of Hurricane Katrina. Here, low cost fiber and copper T-1 connections were either directly damaged by storm winds and flood waters or power-starved by the depletion of run-time limited battery backup systems and the lack of reliable on-site power generation equipment. By far, the biggest contributor to the collapse of radio communications throughout areas damaged by Hurricanes Rita and Katrina was the combined result of failed site interconnectivity and loss of electrical power support. Those few radio systems that remained operational (Harrison County, MS as an example was one of those few) did so due to their use of private point-to-point microwave facilities and well planned standby electrical power systems sized for days…not hours…of operational capacity.

Using the lessons learned from those types of events, a modernized P25 Radio Network would require development of an expanded IP-packet switched, protected public safety digital microwave network supportive of the City/County's range of needs. In this envisioned configuration, broadband microwave technology would provide resilient, seamless interconnectivity with the principal radio dispatch E9-1-1 center as well as linkages to the

County's trunked radio system sites, backup dispatch locations and ISSI connections to other regional or future P25 networks. This microwave system could be easily scaled to include linkages to other P25 radio systems as those materialize.

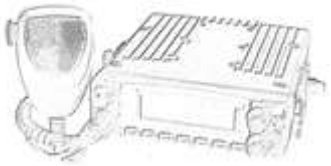
One of the more exciting features of an enhanced digital microwave solution is its inherently private broadband capacity. The microwave network's excess capacity could be used to support the City/County's data needs by providing multiple points of entry for outside federal and state criminal history databases. Thus, loss of connectivity to such databases within one municipal area would not preclude backhaul of such data from other points in the microwave network.

By comparison, the use of commercial broadband services, while having economic benefits, is inherently susceptible to service interruption. The hundreds of miles of copper and fiber cabling necessary to interconnect these various radio communication systems and dispatch facilities would pass through unprotected spaces and right of ways. As such, they would be vulnerable to unintentional damage caused by the forces of nature or construction crews. Worse, the expansive design of wired facilities opens the possibility of unauthorized activity that could compromise the security of critical communications resources.

By direct contrast, a County-managed microwave backhaul subsystem is fully private. Access points are limited to the antenna sites, themselves, and the interception of microwave communications would require the ability to intersect the actual elevated and narrowly-focused radiated signal. Furthermore, the information contained within the microwave network, particularly voice and mobile data communications, would be encrypted using nationally recognized (standards-based AES) security systems having codes that would take impossibly long periods of time (hundreds of thousands of years on average) to decipher.

Finally, there is the issue of telephony and video conferencing connectivity. The excess bandwidth provided in a microwave network approach can be efficiently and securely used to support emergency telephone or video conference communications between dispatch centers and/or Emergency Operation Centers (EOC's) in support of response coordination. If configured with steerable antenna arrays and made operable on public safety 4.9GHz allocations, full transportable/mobile PSAP-Radio Dispatch facilities could be deployed. And since P25 radio consoles and NG-9-1-1 telephony/CAD is now IP-based, their deployment and utilization would no longer be limited to fixed-core infrastructures.

14.0 Subscriber Radios



Public Safety users have stringent expectations for system reliability, radio coverage and audio quality. Interruptions in radio service availability and access are, in most cases, unacceptable. High-quality portable unit coverage is desired and necessary throughout the user-agency's geographic service area, both on-street and within buildings and automobiles. Delivered audio must be of the highest order of clarity with little background noise or radio static.

These requirements greatly exceed the needs of, for example, a commercial, radio-dispatched delivery service, but are essential to the mission of Public Safety departments. Unfortunately, increased performance leads to more complex and costly radio communication infrastructures.

Coverage reliability is enhanced through proper consideration of environmental losses, building losses and other user configuration factors. For example, at 800 MHz, it has been found that in-vehicle propagation losses may be 6 to 10 times higher than those encountered on-street. Portable radios operated at hip-level (by speaker/ microphones) are subjected to additional body losses which may be 8 to 10 times higher when compared to utilizing the same radio at head level. Building propagation losses vary widely due to location (densely-packed structures are affected by shading losses) and construction materials, further aggravating portable radio operations.

The following illustrates the propagation losses at 800MHz that must be overcome by virtue of tower site placement and antenna configurations for typical geographic settings:

Environment	Category	Environment Loss dB
Water	Lakes	0
Snow & Ice	Snow Pack	0
Wetland	Non-forested	3
Open Land	Bare Land	5
Range Land	Herbaceous	3-7
Transportation	Roadways	5
Agriculturaral	Grassland	7
Residential	Suburban	12
Forest	Pine greater than 30 ft	15-21
Mixed Urban/Buildings	Apartments less than 4 stories	15
Commercial/ Industrial	Commercial Services	19
High Density Urban	Skyscrapers	28

How users intend to operate radio communications systems and equipment likewise has a profound impact on infrastructure design configurations. Generally speaking, Public Safety systems are optimized for the user group having the most stringent operational requirements, which automatically provides an enhanced performance margin to those groups having lesser needs.

To illustrate this point, consider that firemen utilize insulated "turn-out" gear due to the high heat and water encountered during fire-fighting incidents. Radios are usually placed within these coats and so the antenna is shielded or in contact with water-soaked fabric material. This naturally adds to signal loss. Police officers usually carry their radio in a belt holster. Thus, when inside an automotive vehicle, the radio is often jammed into the seat, with the antenna in contact with a fabric surface of some type…and the radio is enveloped within the vehicle's steel framework. So, in that instance, the additional propagation losses due to the vehicle's local environment can be in the order of 8-12db.

In order for a radio system to meet an agency's coverage expectations, these types of configurations and losses must be properly considered during the project's design stage.

A principal advantage of P25 technology is that radios are designed to an open standard, but what means is there to ensure where radios bought from multiple sources will, in fact, work on a host radio system?

Fortunately, this aspect as considered by EIA/TIA when developing the P25 standards and a means for compliance testing has been established. Multiple independent testing facilities have been certified by TIA/EIA as having the appropriate test equipment and expertise to accurately assess how closely vendor radios comply with P25 standards. Vendors routinely publish compliance testing statistics for manufactured radios whereby knowledgeable parties can determine if proposed products appropriately conform to P25 Industry standards.

15.0 Dispatch / Console Analysis

The 9-1-1 Dispatch Center uses the AVTEC radio console for dispatching on the radio system. It currently operates with 10 total positions. The existing console equipment would be usable within a variety of radio systems. However, it is prevented from taking advantage of proprietary modern console features included in all modern P25 consoles, regardless of vendor. The console should likely be replaced as part of a new-system's deployment.

It should be noted that Jackson Co and Barrow Co dispatches are backup centers for each other. There is not a depth of interconnectivity between the two centers on any systems. While the CAD vendors are the same, there is no link between the two. Radio dispatch only has limited communication resources available, should there be a need to communicate within Barrow Co.

If Jackson Co and Barrow Co desire to continue that backup relationship, consideration should be given to expanding the sharing of resources between the two dispatch centers.

16.0 Frequency Analysis

Jackson County primarily operates in the 450-470 MHz UHF frequency band. UHF is a band that is used among public safety, commercial, and industrial entities. UHF has many benefits and drawbacks for a public safety entity.

The benefits include:

- Quality channel plan by the FCC.
- Among the 3 main frequency bands (VHF, UHF, 700/800) used by public safety, UHF is the least used. Therefore the UHF band, as a whole, is not difficult to acquire new frequencies for expanding radio system.

The drawbacks include:

- In building coverage isn't as strong when compared with 700/800 MHz;
- Many agencies in the Atlanta Georgia area are operating on 800 MHz and VHF in some rural areas;
- Barrow and Hall Counties border Jackson County on the West and are operating on 800 MHz.
- Purchasing subscribers that operate on 2 or more public safety bands (Dual-Band or Tri-band) to achieve interoperability, is likely more expensive than a single-band radio;
- If nearby public safety agencies are either 800 MHz or VHF, it is less likely that their representatives have UHF radios for ease of interoperability from their perspective.

Since Jackson County is currently using UHF and DMR technology, new frequencies would have to be obtained to move over to a new 800/700 MHz P25 system. By utilizing a simulcast system, the number of required new frequencies can be reduced. If Jackson County chooses to join or share another system such as Hall County, then the requirement for sites and frequencies may change depending on the configuration utilized. In an RFP specification, TUSA also allows vendors the additional flexibility to find frequencies from other systems to use as a transition phase, should Jackson County choose to join another system, rather than build a separate stand-alone countywide system.

17.0 Conceptual System Design

This section focuses on providing conceptual design information geared to addressing interoperability and coverage shortfalls and expectations derived from interviews with County radio user agencies. TUSA considered the following when evaluating potential tower site placement solutions for next-generation conventional and trunked radio system configurations:

- The primary design goal was to achieve reliable portable radio building coverage within the populated areas of the county;
- Balanced talk-out/talk-in coverage required, with a bias toward talk-in performance;
- 20db coverage within high-density commercial building structures (higher margins available within 3-mile radius of tower sites);
- Ability to support a public safety specification for countywide on-street portable radio coverage (96% outdoor, with a 95% in-building coverage);
- A baseline user radio configuration for the study consists of a hip-mounted portable radio device; quarter-wave antennas mounted on the radio package; use of remote speaker-microphones such that the user's radio is on-hip for both talk-in and talk-out coverage pathways;
- Project 25 (P25) Conventional, P25 Phase 1 trunking & P25 Phase 2 trunking coverage (i.e., 9.6kbs control channel/12kbs voice; 2-slot TDMA if phase 2 trunking);
- Location of tower sites would focus on County-provided critical building locations;
- The minimally-allowed delivered audio quality is TSB-88's defined DAQ 3.4 for a portable on the hip & DAQ 4.0 for mobile.;
- New, greenfield sites to minimize the potential for interference as might exist with co-location onto shared rental site facilities;
- Construction of licensed microwave backhaul network;
- Reuse of existing County tower sites to support a seamless parallel implementation.

TUSA developed coverage map overlays for both principal roadways and the location of critical building sites. By so doing, County personnel can more readily evaluate and consider predicted coverage based on critical building locations.

17.1. Conceptual Configuration Designs

Throughout the interview sessions, the same themes took root: coverage and interoperability issues with the current system configuration. Thus, the new P25 radio system must thoroughly address coverage and interoperability concerns first and achieve or exceed the audio quality and reliability as voiced by actual radio users.

The following solutions provide no less than 96% countywide portable outdoor on-street coverage with a Delivered Audio Quality (DAQ) level of at least 3.4. In addition, the concept provides portable in-building coverage as indicated for 6db structures (residential), and 10db structures (light commercial) coverage for structures in the cities of Jefferson. This conceptual configuration contains 9 transmit/talk-out tower sites, all of which are at the County's existing locations. The inherent physics of 800 Mhz will increase in-building coverage, while also allowing for ease of interoperability.

The approach used here was to first examine the existing radio system's coverage and identify weak spots. Ignoring for the moment coverage reductions due to failures or maintenance issues, this was to just identify inadequacies within the original design. By reviewing the earlier-presented existing-system maps in this Report, it is apparent there are many locations where portable radio coverage is poor to absent, spread across the county. In fact, the interview responses point to technical/maintenance deficiencies within the existing system involving the portable radio's talk-in path, as explained earlier.

The improvement approach used in developing this configuration submittal was to identify candidate site locations that would serve to improve each identified coverage-deficient area. These candidate sites compared between existing and potentially new sites. So, in our iteration of coverage enhancements, identified improvement sites were added to the original sites to yield the following configuration. This is only applicable to Camp Phillips, which needs a new tower to achieve the coverage displayed.

When defining candidate sites, TUSA kept in mind the various critical locations identified by the County. Each of the sites depicted in the following maps provide for incremental increases in coverage reliability.

Presumably, once a configuration has been decided upon that, for example, joining an existing system, vs building a stand-alone system, then TUSA would make available a final composite using the final design, for a final concept configuration as part of an RFP specification for the City/County.

The supplied map configurations exclude the use of third-party leased sites for good reason. Leased sites that must accommodate microwave backhaul and transmit/receive antennas are expensive, with the typical lease cost being nearly $3,000-$5,000 a month and with annual escalation factors. A new owned-site will cost more money up front, but it will save the County significantly over time. In fact, the break-even point for owned versus leased tower in today's market is approximately Year 8. A new site (Tower,

Shelter, and other equipment) is an investment in the County's long-term infrastructure and will last well over 50 years or at least two (likely three) generations of radio technology if properly maintained.

Solution #1 - 800 Mhz Stand Alone

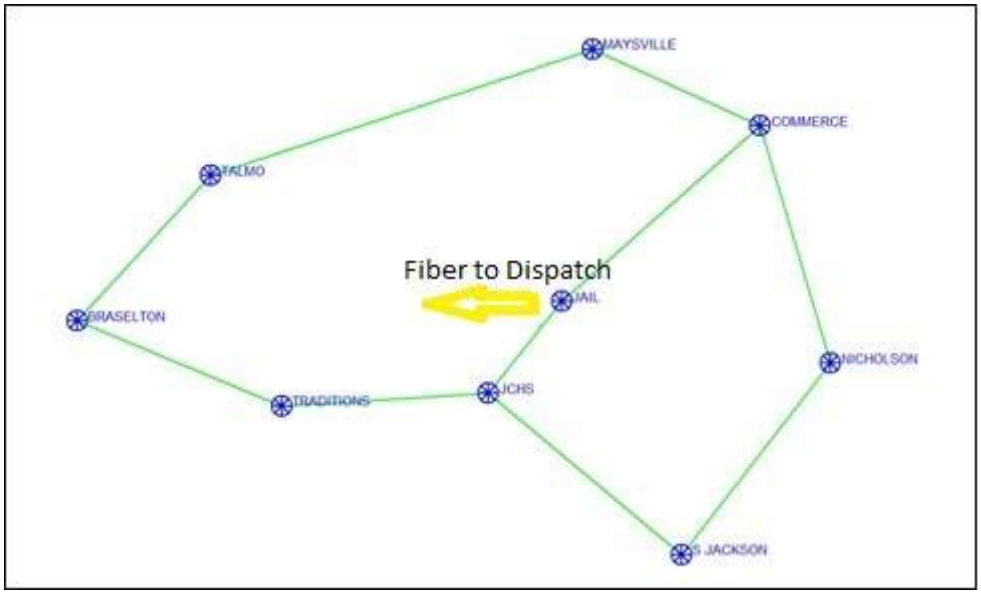


Figure 17.1.1A - Conceptual Microwave Design

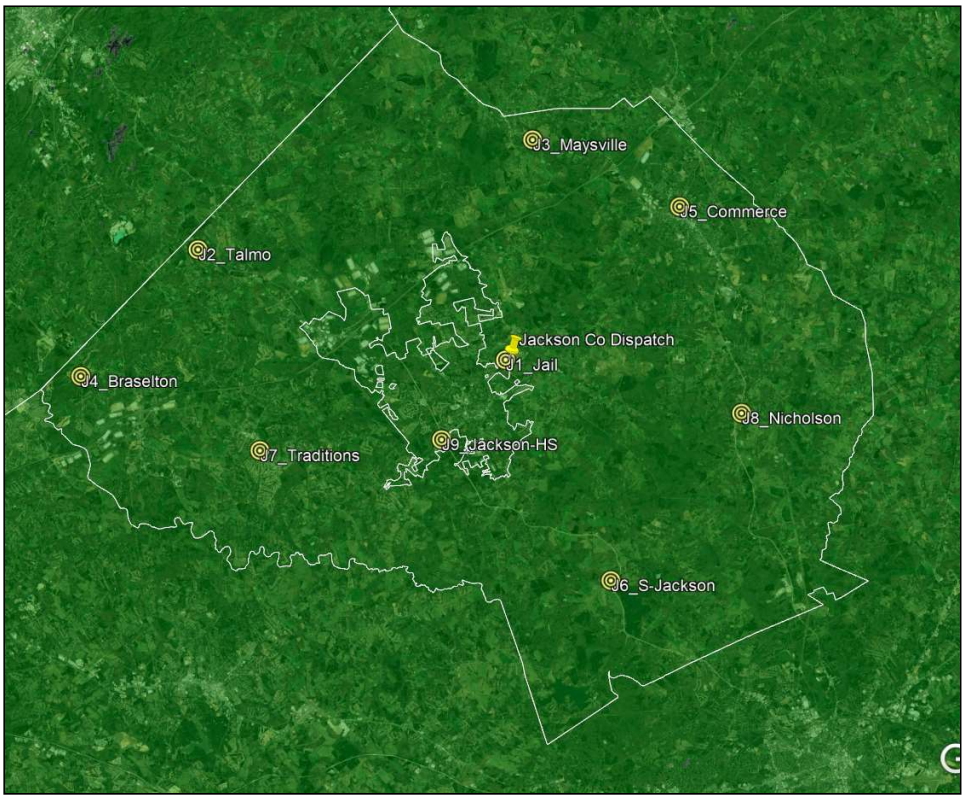


Figure 17.1.1.B - Mobile Outdoor

Figure 17.1.1.C - Portable Outdoor

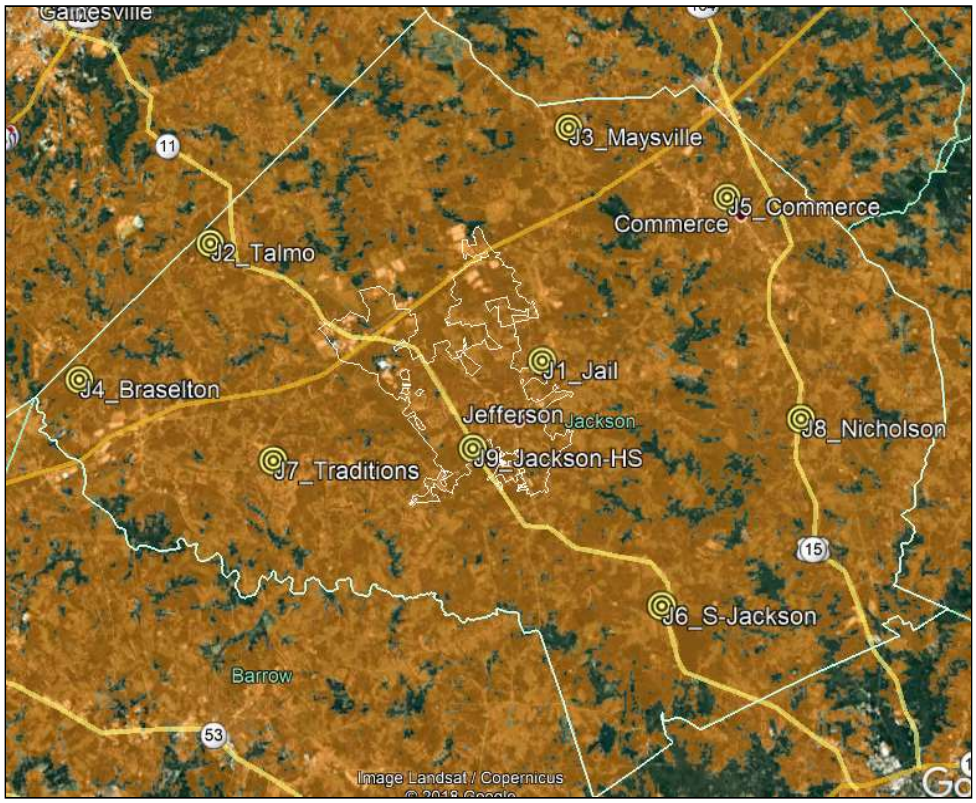


Figure 17.1.1D - Portable 6db

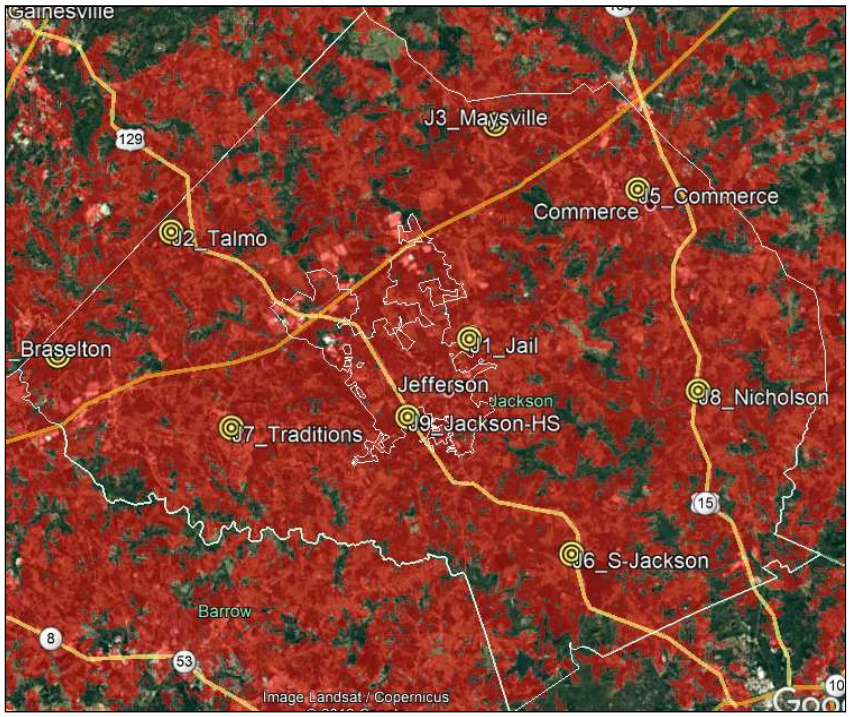


Figure 17.1.1.E - Portable 10db

While a stand-alone system offers the most overall self-control for the county, TUSA is also respectful of the significant prices involved with these systems. Because of this, conversations have occurred with neighboring Hall County to gauge the viability for Jackson County to join the existing system for a cost effective solution. Below are maps that utilize two towers from the existing Hall county system. This would remove the need of towers used in Jackson County, while still providing a minimally acceptable coverage model.

Solution #2 - 800 Mhz Joint System With Hall County

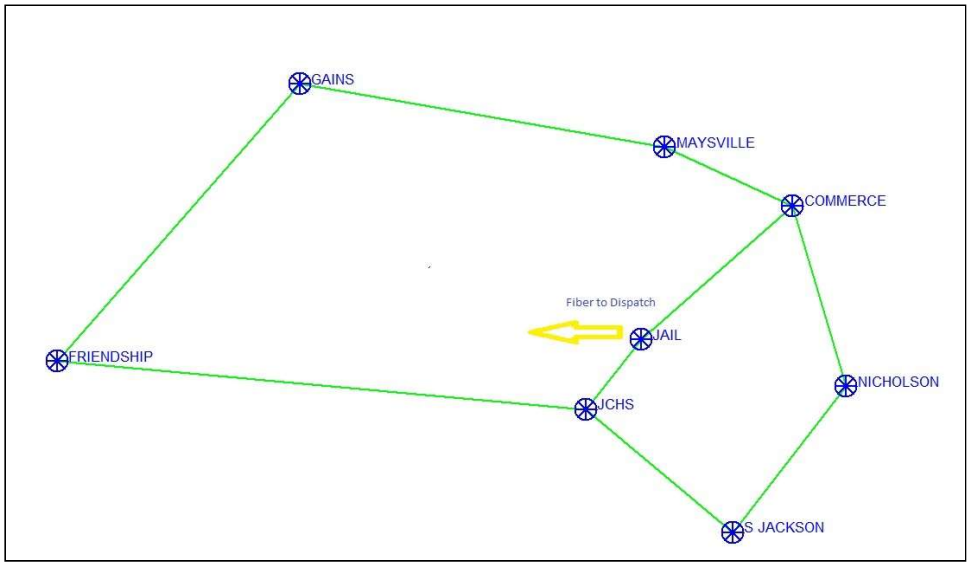


Figure 17.1.2.A - Conceptual Microwave Design

Figure 17.1.2.B - Mobile Outdoor

Figure 17.1.2.B - Portable Outdoor

Figure 17.1.2.C - Portable 6db

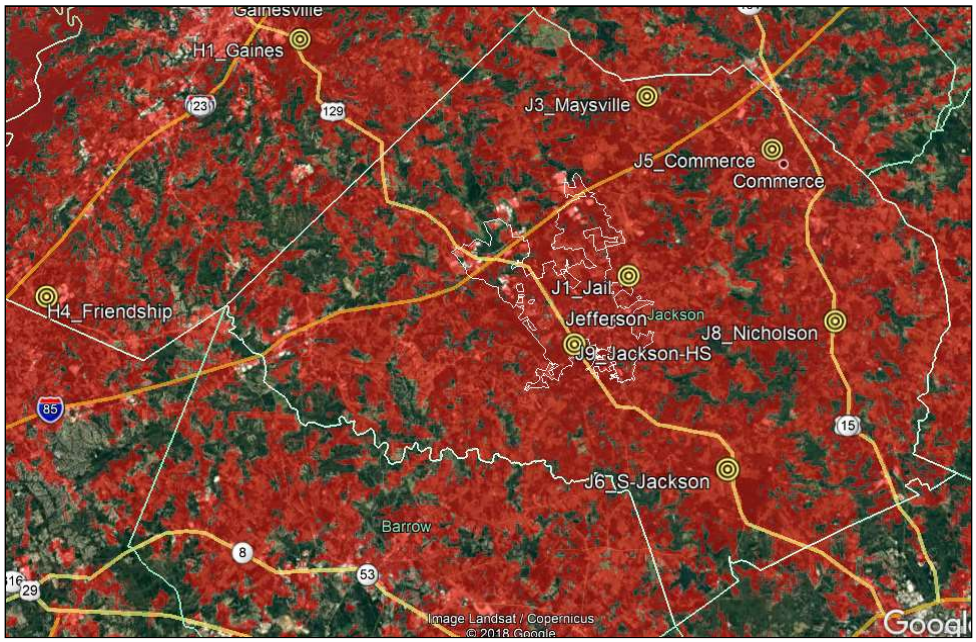


Figure 17.1.2.D - Portable 10db

17.2. Regional Configuration Concepts

The material presented in 16.1 was geared toward operable, shared coverage. Many of those interviewed expressed needs to communicate with other agencies, with each have varying types of radio systems in different frequency bands, and configuration types. interoperability can be accomplished in several conceptual ways:

17.2.1. Control Station Linkages

Regardless of the choice made to build a standalone system, or join another system, talkgroup-specific control station 800MHz links could be established and controlled via a P25 radio system core (whether owned by Jacson County, or shared with another agency). This is an expedient, relatively low-cost solution that would allow Jackson County users to have specific interoperability talkgroups programmed into their radios such that whenever those groups are switch-enabled in the field, the radio system would activate the control station link. These links between a Jackson County talkgroup, and control station links could also be controlled by dispatch. Thus, a radio user positioned within the Jackson County radio system's footprint, could then communicate with neighboring jurisdictions.

In the reverse case, where an outside agency wanted to communicate with a Jackson County public safety agency, that user would request access via the control station, whose receive audio pathway is always present at the County's dispatch center consoles. The dispatcher would then alert the parties and direct communications to the appropriate linked talkgroup.

The advantage to this configuration is that control of who accesses Jackson County radio resources is fully controlled by the County. Further, software updates made by outside counties to their radio systems would have no direct impact or cost to County radio operations. Finally, this linkage concept is relevant to P25, legacy P16, conventional radio systems, and other neighboring systems.

17.2.2. Project-25 Core Sharing

Should a given number of jurisdictions utilize the same vendor for their respective Project-25 radio infrastructure solution, it is possible to share P25 core equipment. By so doing, a regional communication system is formed and controlled under the umbrella of a shared core/management structure.

In practice, such a configuration involving two jurisdictions may consider constructing geographically-separated and mirrored P25 cores (i.e., one located in each jurisdiction). By so doing, enhanced network reliability is gained and users within the constellation of co-joined tower sites could freely roam and communicate throughout the combined geographic region.

A significant cost and maintenance limitation exists with shared-core configurations. If the owner of one core requires software features that the other may not need, both parties must still fund complete the sought hardware/software change. So, each participant is locked in with respect to maintenance and upgrade costs that either of the former two methods circumvents. Of course, the core itself is not inexpensive…in the order of $1M or more, depending upon the configuration and features needed and the required annual software/hardware support can be in the order of 10% of the initial buy-in cost.

Like for an ISSI configuration, a shared core configuration requires the development of MOU/governance processes which must survive the life of the radio communications network. It is possible to decouple cores at a later date, however, doing so risks service and coverage disruption and is not a process that once can readily undertake.

The concept of core sharing can only take place once the vendor for the subject jurisdictions is known. P25 standards do not now support the integration of core to core connectivity across vendor platforms, thus such an endeavor essentially leads to a sole-source/single-vendor radio infrastructure configuration (however, this does not preclude sole-source/single vendor for subscribers).

17.2.3. Project-25 Inter RF Subsystem Interface (ISSI)

The radio system core controllers utilized by adjacent counties can support ISSI gateways. These gateways allow for the interconnection of disparate P25 radio systems in a manner that supports many P25 common features (I.e., Unit ID, Emergency Call, Group Calls, etc.) and roaming across radio systems. To support this level of interoperability, each P25 system must be equipped with ISSI equipment, one gateway per desired system connection.

Additional gateways could be purchased for planned growth connectivity to other future P25 systems Of course, concurrence (in the form of a Memorandum of Understanding) would be required for each such interconnection. The purpose of MOUs here is to establish user roaming protocols, what talkgroups could be shared across radio systems and cost/response responsibilities for maintaining this equipment and the various Ethernet linkages needed for the actual voice/data transport between gateways.

The use of ISSI gateways has been encouraged, due to their inherent talkgroup management flexibility and the ability for radio users to roam outside their home systems and yet retain the ability to communicate with home groups and dispatch personnel. A further advantage is, as was the case for control station linkages, software upgrades made to participant radio systems do not in themselves force others to undertake the cost of in-step software changes. Yet, the cost of ISSI gateways varies considerably by vendor. Costs have been seen to range anywhere between $250,000 and $2M, depending on the locations involved and

willingness of vendors to support ISSI connectivity due to strategic market concerns.

18.0 Conceptual Design Budgets

The following budgetary estimates are based off of actual prices that TUSA has seen in recent RFPs with other clients. It takes into consideration cost results seen by other recent procurements throughout the country.

The budgetary estimates also look at the total cost of ownership over a 15-year anticipated lifecycle period. Often, a proposing vendor will discount the system on the front end, only to make up for it on the back end. TUSA looks at the entire life cycle of the system as proposed by responsive vendors, including maintenance and upkeep as part of the RFP specification process.

- There are multiple options in today's procurement environment that the County can consider. These options typically are:
- Capital Outlay (CAPX) – County pays for the system and then budgets yearly for maintenance throughout the system life cycle.
- Leased Option (OPX) – County pays for system over a defined period to include maintenance throughout the system lifecycle.
- Service Option – Vendor builds the network and the County pays a monthly service fee over the lifecycle.

Conceptual Design Budgets are provided for:

- Option #1 - An 800 Mhz P25 Stand Alone System
- Option #2 - An 800 Mhz P25 Joint System With Hall County

18.1. Solution #1 Procurement Budget

The following budget shows the anticipated procurement costs for a new 800MHz P25 Trunking System Standalone.

- A redundant core/switch
- Redundant simulcast control/prime site.
- New simulcast sites
- Dispatch center equipment.
- New subscriber equipment.
- An IP technology refresh (Microwave and correlated network devices).
- 15 years of support and maintenance

Jackson County, Georgia Solution #1 Pricing Summary	
Description	**Total**
Voice Infrastructure	$ 5,796,590
Systems Integration	$ 1,796,943
Voice Infrastructure Total	**$ 7,593,533**
Site Construction	$ 3,398,000
Site Construction Contingency	$ 509,700
Site Construction Total	**$ 3,907,700**
Microwave	$ 2,095,668
Microwave System Integration	$ 649,657
Microwave Contingency	$ 209,567
Microwave Total	**$ 2,954,892**
Customer Dispatch Centers	$ 552,363
Dispatch Center Total	**$ 552,363**
Customer Subscribers	**$ 6,291,633**
Customer Grand Total	**$ 21,300,121**
Competitive Procurement Process	
Infrastructure	$ 10,842,094
Dispatch	$ 414,272
Subscribers	$ 5,033,306
Competitive Process Grand Total	**$ 16,289,672**

18.1.1. Solution #1 - Total Cost Of Ownership

The following budget shows the total cost of ownership over a 15-year life cycle.

Jackson County, Georgia Solution #1 Pricing Summary	
Description	**Total**
Competitive Process Grand Total	**$ 16,289,672**
Maintenance Services (2-5 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 1,266,693
Preventative Maintenance	$ 88,000
Subscriber Depot & Return	$ 497,160
Microwave Maintenance	incl
HVAC	$ 45,000
Generators	$ 54,000
Battery Plants & UPS	$ 45,000
Logging Recorder	$ 25,000
Year 2-5 Maintenance Services Plan Total	**$ 2,020,853**
Average Yearly Total	**$ 505,213**
Maintenance Services (6-10 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 1,684,702
Preventative Maintenance	$ 117,040
Subscriber Depot & Return	$ 662,880
Microwave Maintenance	incl
HVAC	$ 51,750
Generators	$ 62,100
Battery Plants & UPS	$ 51,750
Logging Recorder	$ 30,000
Year 6-10 Maintenance Services Plan Total	**$ 2,660,222**
Average Yearly Total	**$ 532,044**
Maintenance Services (11-15 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 1,937,407
Preventative Maintenance	$ 134,596
Subscriber Depot & Return	$ 828,600
Microwave Maintenance	incl
HVAC	$ 77,625
Generators	$ 93,150
Battery Plants & UPS	$ 59,513
Logging Recorder	$ 35,000
Year 11-15 Maintenance Services Plan Total	**$ 3,165,891**
Average Yearly Total	**$ 633,178**
Total Cost of Ownership 15 years	**$ 24,136,638**

18.1.2. Solution #1 - Infrastructure Budget

The following shows a detailed breakdown of the Infrastructure Budget.

Jackson County, Georgia Solution #1 Public Safety Communications System									
Voice Infrastructure									
6 Channel Simulcast Sites	Repeater Equipment	Primary & Secondary Controller	Simulcast Control Point Equipment	Rx Antenna System (antenna, multicoupler, TTA)	Tx Antenna System (antenna, combiner)	Administrator Training	Installation Services	ISSI (one gateway)	**Voice Infrastructure Total**
Jail	$ 250,000	$ 750,000	$ 368,945	$ 10,300	$ 30,000	$ 50,000	$ 94,000	$ 50,000	**$ 1,603,245**
Talmo	$ 250,000	$ 750,000	$ 368,945	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 1,503,245**
Maysville	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Braselton	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Commerce	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
South Jackson	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Traditions	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Nicholson	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Jackson HS	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
SO Dispatch	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Total	**$ 2,250,000**	**$ 1,500,000**	**$ 737,890**	**$ 92,700**	**$ 270,000**	**$ 50,000**	**$ 846,000**	**$ 50,000**	**$ 5,796,590**
								Systems Integration	**$ 1,796,943**
								Voice Infrastructure Total	**$ 7,593,533**

Site Construction									
6 Channel Simulcast Sites	Shelter and Foundation	Tower and Foundation	Generator Subsystem	UPS or Batter Subsystem	Site Development	Site Upgrades / Water Tower Upgrades			**Site Construction Total**
Jail	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Talmo	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Maysville	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Braselton	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Commerce	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
South Jackson	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Traditions	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Nicholson	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Jackson HS	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
SO Dispatch	$ -	$ -	$ -	$ 50,000	$ -	$ -			**$ 50,000**
Total	**$ 2,025,000**	**$ -**	**$ 423,000**	**$ 50,000**	**$ 450,000**	**$ 450,000**			**$ 3,398,000**
								Site Construction Contingency	**$ 509,700**
								Site Construction Total	**$ 3,907,700**

Microwave System									
6 Channel Simulcast Sites	Microwave Radio Equipment	LAN/WAN Equipment	DC Power System	Antenna Systems	Path Surveys	Installation Services			**Microwave Construction Total**
Jail	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Talmo	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Maysville	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Braselton	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Commerce	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
South Jackson	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Traditions	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Nicholson	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Jackson HS	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
SO Dispatch	$ -	$ -	$ -	$ -	$ -	$ -			**$ -**
Total	**$ 860,688**	**$ 225,000**	**$ 315,000**	**$ 405,000**	**$ 45,000**	**$ 244,980**			**$ 2,095,668**
								Microwave Systems Integration	**$ 649,657**
								Microwave Contingency	**$ 209,567**
								Microwave Total	**$ 2,954,892**

Jackson County Georgia Site Infrastructure Grand Total	**$ 14,456,125**

18.1.3. Solution #1 - Subscriber Budget

The following budget shows a detailed breakdown of the Subscriber Equipment.

Mobiles													
	Mid-tier Remote Mount P25 Single Band		Mid-tier Dash Mount P25 Single Band		Low-tier Dash Mount P25		High-tier Dash Mount P25 Multiband		High-tier Remote Mount P25 Multiband		Install & Program	Removal Old Equipment	Totals
Cost Each		$ 4,658		$ 4,539		$ 2,500		$ 7,500		$ 7,650	$ 250	$ 75	
Total Each	**309**		**0**		**221**		**0**		**0**				
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Total**	**Total**	
Sheriff/Dispatch	130	$ 605,540		$ -		$ -		$ -		$ -	$ 32,500	$ 9,750	$ 647,790
Cache Radios		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
EMA	4	$ 18,632		$ -		$ -		$ -		$ -	$ 1,000	$ 300	$ 19,932
EMS	15	$ 69,870		$ -		$ -		$ -		$ -	$ 3,750	$ 1,125	$ 74,745
Rec Department		$ -		$ -	12	$ 30,000		$ -		$ -	$ 3,000	$ 900	$ 33,900
Nicholson	12	$ 55,896		$ -		$ -		$ -		$ -	$ 3,000	$ 900	$ 59,796
Arcade	6	$ 27,948		$ -		$ -		$ -		$ -	$ 1,500	$ 450	$ 29,898
West Jackson	12	$ 55,896		$ -		$ -		$ -		$ -	$ 3,000	$ 900	$ 59,796
Jackson Trail	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Harrisburg	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
North Jackson	10	$ 46,580		$ -		$ -		$ -		$ -	$ 2,500	$ 750	$ 49,830
South Jackson	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Jail		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
Corrections	3	$ 13,974		$ -		$ -		$ -		$ -	$ 750	$ 225	$ 14,949
PD	30	$ 139,740		$ -		$ -		$ -		$ -	$ 7,500	$ 2,250	$ 149,490
Jefferson PD	25	$ 116,450		$ -		$ -		$ -		$ -	$ 6,250	$ 1,875	$ 124,575
Jefferson	9	$ 41,922		$ -		$ -		$ -		$ -	$ 2,250	$ 675	$ 44,847
Pendergrass PD	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Commerce PD	25	$ 116,450		$ -		$ -		$ -		$ -	$ 6,250	$ 1,875	$ 124,575
Roads / Public Works		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
Fleet Maintenance		$ -		$ -	4	$ 10,000		$ -		$ -	$ 1,000	$ 300	$ 11,300
County Schools		$ -		$ -	175	$ 437,500		$ -		$ -	$ 43,750	$ 13,125	$ 494,375
Commerce Schools		$ -		$ -	15	$ 37,500		$ -		$ -	$ 3,750	$ 1,125	$ 42,375
Jefferson Schools		$ -		$ -	15	$ 37,500		$ -		$ -	$ 3,750	$ 1,125	$ 42,375
Totals	**309**	**$ 1,439,322**	**0**	**$ -**	**221**	**$ 552,500.00**	**0**	**$ -**	**0**	**$ -**	**$ 132,500**	**$ 39,750**	
												Total Mobiles	**$ 2,164,072**

(continued on next page)

Portables							
	Mid-tier P25 Single Band		Low-tier P25 Single Band		High-tier P25 Multiband		Programming
Cost Each		$ 4,873		$ 2,560		$ 7,500	$ 50
Total Each	**535**		**250**		**20**		
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Total**
Sheriff/Dispatch	156	$ 760,188		$ -	5	$ 37,500	$ 8,050
Cache Radios	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
EMA	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
EMS	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Rec Department		$ -	12	$ 30,720		$ -	$ 600
Nicholson	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Arcade	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
West Jackson	40	$ 194,920		$ -	1	$ 7,500	$ 2,050
Jackson Trail	35	$ 170,555		$ -	1	$ 7,500	$ 1,800
Harrisburg	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
North Jackson	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
South Jackson	15	$ 73,095		$ -	1	$ 7,500	$ 800
Jail		$ -	100	$ 256,000		$ -	$ 5,000
Corrections		$ -	32	$ 81,920		$ -	$ 1,600
PD	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Jefferson PD	21	$ 102,333		$ -	1	$ 7,500	$ 1,100
Jefferson	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Pendergrass PD	8	$ 38,984		$ -	1	$ 7,500	$ 450
Commerce PD	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Roads / Public Works		$ -	25	$ 64,000		$ -	$ 1,250
Fleet Maintenance		$ -	4	$ 10,240		$ -	$ 200
County Schools		$ -	45	$ 115,200		$ -	$ 2,250
Commerce Schools		$ -	20	$ 51,200		$ -	$ 1,000
Jefferson Schools		$ -	12	$ 30,720		$ -	$ 600
Totals	**535**	**$ 2,607,055**	**250**	**$ 640,000**	**20**	**$ 150,000**	**$ 40,250**

(continued on next page)

Accessories and Totals									
	Carry Case / Belt Clip		Desk Charger		Multi-Unit Charger		Speaker Mic		Totals (Includes all portables from pg 109 and all accessories)
	$ 64		$ 110		$ 600		$ 125		
	776		**776**						
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	
Sheriff/Dispatch	156	$ 9,984	156	$ 17,160	10	$ 6,000	156	$ 19,500	$ 858,382
Cache Radios		$ -		$ -		$ -	21	$ 2,625	$ 108,635
EMA	21	$ 1,344	21	$ 2,310	2	$ 1,200	21	$ 2,625	$ 113,489
EMS	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Rec Department	12	$ 768	12	$ 1,320	1	$ 600		$ -	$ 34,008
Nicholson	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Arcade	21	$ 1,344	21	$ 2,310	3	$ 1,800	21	$ 2,625	$ 114,089
West Jackson	41	$ 2,624	41	$ 4,510	5	$ 3,000	41	$ 5,125	$ 219,729
Jackson Trail	35	$ 2,240	35	$ 3,850	3	$ 1,800	35	$ 4,375	$ 192,120
Harrisburg	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
North Jackson	21	$ 1,344	21	$ 2,310	2	$ 1,200	21	$ 2,625	$ 113,489
South Jackson	16	$ 1,024	16	$ 1,760	2	$ 1,200	16	$ 2,000	$ 87,379
Jail	100	$ 6,400	100	$ 11,000	12	$ 7,200	100	$ 12,500	$ 298,100
Corrections	32	$ 2,048	32	$ 3,520	4	$ 2,400	32	$ 4,000	$ 95,488
PD	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Jefferson PD	21	$ 1,344	21	$ 2,310	3	$ 1,800	21	$ 2,625	$ 119,012
Jefferson	30	$ 1,920	30	$ 3,300	4	$ 2,400	30	$ 3,750	$ 166,610
Pendergrass PD	9	$ 576	9	$ 990	1	$ 600	9	$ 1,125	$ 50,225
Commerce PD	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Roads / Public Works	25	$ 1,600	25	$ 2,750	3	$ 1,800	25	$ 3,125	$ 74,525
Fleet Maintenance	4	$ 256	4	$ 440	1	$ 600	4	$ 500	$ 12,236
County Schools	45	$ 2,880	45	$ 4,950	6	$ 3,600		$ -	$ 128,880
Commerce Schools	20	$ 1,280	20	$ 2,200	2	$ 1,200		$ -	$ 56,880
Jefferson Schools	12	$ 768	12	$ 1,320	1	$ 600		$ -	$ 34,008
Totals	**776**	**$ 49,664**	**776**	**$ 85,360**	**85**	**$ 51,000**	**708**	**$ 88,500**	
								Portable Totals	**$ 3,711,829**

Control Stations (non-dispatch / desk radios)								
	Control Station		Antenna System		Unication Pager		Programming & Installation	Totals
Cost Each		$ 6,124		$ 825		$ 660	$ 1,123	
Total Each	**31**		**31**		**175**			
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Total**	
Sheriff/Dispatch	9	$ 55,116	9	$ 7,425		$ -	$ 10,107	$ 72,648
Cache Radios		$ -		$ -		$ -	$ -	$ -
EMA		$ -		$ -	20	$ 13,200	$ -	$ 13,200
EMS		$ -		$ -	30	$ 19,800	$ -	$ 19,800
Rec Department		$ -		$ -		$ -	$ -	$ -
Nicholson		$ -		$ -	15	$ 9,900	$ -	$ 9,900
Arcade		$ -		$ -	10	$ 6,600	$ -	$ 6,600
West Jackson		$ -		$ -	20	$ 13,200	$ -	$ 13,200
Jackson Trail		$ -		$ -	15	$ 9,900	$ -	$ 9,900
Harrisburg		$ -		$ -	15	$ 9,900	$ -	$ 9,900
North Jackson		$ -		$ -	10	$ 6,600	$ -	$ 6,600
South Jackson		$ -		$ -	10	$ 6,600	$ -	$ 6,600
Jail		$ -		$ -		$ -	$ -	$ -
Corrections		$ -		$ -		$ -	$ -	$ -
PD		$ -		$ -		$ -	$ -	$ -
Jefferson PD		$ -		$ -		$ -	$ -	$ -
Jefferson		$ -		$ -	30	$ 19,800	$ -	$ 19,800
Pendergrass PD		$ -		$ -		$ -	$ -	$ -
Commerce PD		$ -		$ -		$ -	$ -	$ -
Roads / Public Works	1	$ 6,124	1	$ 825		$ -	$ 1,123	$ 8,072
Fleet Maintenance		$ -		$ -		$ -	$ -	$ -
County Schools	11	$ 67,364	11	$ 9,075		$ -	$ 12,353	$ 88,792
Commerce Schools	5	$ 30,620	5	$ 4,125		$ -	$ 5,615	$ 40,360
Jefferson Schools	5	$ 30,620	5	$ 4,125		$ -	$ 5,615	$ 40,360
Totals		**$ 189,844**		**$ 25,575**	**175**	**$ 115,500**	**$ 34,813**	**$ 365,732**
							User Training	**$ 50,000**
							Total Control Stations	**$ 415,732**

18.1.4. Solution #1 - Dispatch Budget

Jackson County, Georgia Solution #1 Public Safety Communications System Dispatch	
	SO
Dispatch Positions	4
Desktop	$ 252,600
Microphone	1,300
Headset	5,120
Auxiliary Speaker (Qty. 2)	1,400
Backup Control Stations	29,415
Interoperability Control Stations (Multiband Qty. 6)*	44,118
LAN/WAN	25,000
Radio Network Manager	Included
Logging Recorder*	80,000
Alarm Monitoring	-
Installation Services	88,410
Training	25,000
Dispatch Equipment Total	**$552,363**
* All Agencies have access	

18.2. Solution #2 Procurement Budget

The following budget shows the anticipated procurement costs for a new 800MHz P25 Trunking joining with the Hall County 800MHz P25 radio system.

This budget demonstrates the information for the following;

- A redundant simulcast control/prime site.
- New simulcast tower sites.
- Added channels and capacity on Hall County simulcast sites.
- Dispatch center equipment.
- New subscribers.
- A technology refresh of Repeater and Microwave equipment.
- 15 years of support and maintenance.

Jackson County, Georgia Solution #2 Pricing Summary	
Description	**Total**
Voice Infrastructure	$ 4,106,190.00
Systems Integration	$ 1,272,919.00
Voice Infrastructure Total	**$ 5,379,109.00**
Site Construction	$ 2,282,000.00
Site Construction Contingency	$ 342,300.00
Site Construction Total	**$ 2,624,300.00**
Microwave	$ 1,629,964.00
Microwave System Integration	$ 505,289.00
Microwave Contingency	$ 162,996.00
Microwave Total	**$ 2,298,249.00**
Customer Dispatch Centers	$ 552,363.00
Dispatch Center Total	**$ 552,363.00**
Customer Subscribers	**$ 6,291,633.00**
Customer Grand Total	**$ 17,145,654.00**
Competitive Procurement Process	
Infrastructure	$ 7,726,244.00
Dispatch	$ 414,272.25
Subscribers	$ 5,033,306.00
Competitive Process Grand Total	**$ 13,173,822.25**

18.2.1. Solution #2 - Total Cost Of Ownership

The following budget shows the total cost of ownership over a 15-year life cycle.

Jackson County, Georgia Solution #2 Pricing Summary	
Description	**Total**
Competitive Process Grand Total	**$ 13,173,822**
Maintenance Services (2-5 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 943,278
Preventative Maintenance	$ 60,000
Subscriber Depot & Return	$ 397,728
Microwave Maintenance	incl
HVAC	$ 24,000
Generators	$ 28,800
Battery Plants & UPS	$ 24,000
Logging Recorder	$ 25,000
Year 2-5 Maintenance Services Plan Total	**$ 1,502,806**
Average Yearly Total	**$ 375,702**
Maintenance Services (6-10 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 1,254,560
Preventative Maintenance	$ 79,800
Subscriber Depot & Return	$ 662,880
Microwave Maintenance	incl
HVAC	$ 27,600
Generators	$ 33,120
Battery Plants & UPS	$ 27,600
Logging Recorder	$ 30,000
Year 6-10 Maintenance Services Plan Total	**$ 2,115,560**
Average Yearly Total	**$ 423,112**
Maintenance Services (11-15 yr plan)/Estimated	
Corrective Maintenance and Software/Hardware Maintenance	$ 1,442,744
Preventative Maintenance	$ 91,770
Subscriber Depot & Return	$ 828,600
Microwave Maintenance	incl
HVAC	$ 41,400
Generators	$ 49,680
Battery Plants & UPS	$ 31,740
Logging Recorder	$ 35,000
Year 11-15 Maintenance Services Plan Total	**$ 2,520,934**
Average Yearly Total	**$ 504,187**
Total Cost of Ownership 15 years	**$ 19,313,122**

18.2.2. Solution #2 - Infrastructure Budget

The following shows a detailed breakdown of the Infrastructure Budget.

Jackson County, Georgia Solution #1 Public Safety Communications System									
Voice Infrastructure									
6 Channel Simulcast Sites	Repeater Equipment	Primary & Secondary Controller	Simulcast Control Point Equipment	Rx Antenna System (antenna, multicoupler, TTA)	Tx Antenna System (antenna, combiner)	Administrator Training	Installation Services	ISSI (one gateway)	**Voice Infrastructure Total**
Jail	$ 250,000	$ -	$ 368,945	$ 10,300	$ 30,000	$ 50,000	$ 94,000	$ 500,000	**$ 1,303,245**
Maysville	$ 250,000	$ -	$ 368,945	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 753,245**
Commerce	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
South Jackson	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Nicholson	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Jackson HS	$ 250,000	$ -	$ -	$ 10,300	$ 30,000	$ -	$ 94,000	$ -	**$ 384,300**
Hall County	$ 250,000	$ -	$ -	$ -	$ -	$ -	$ 62,500	$ -	**$ 312,500**
SO Dispatch	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
	Phase 2 Transcoding License								**$ 75,000**
	Dynamic Transcoding License								**$ 125,000**
Total	**$ 1,750,000**	**$ -**	**$ 737,890**	**$ 61,800**	**$ 180,000**	**$ 50,000**	**$ 626,500**	**$ 500,000**	**$ 4,106,190**
								Systems Integration	**$ 1,272,919**
								Voice Infrastructure Total	**$ 5,379,109**

Site Construction									
6 Channel Simulcast Sites	Shelter and Foundation	Tower and Foundation	Generator Subsystem	UPS or Battery Subsystem	Site Development	Site Upgrades / Water Tower Upgrades			**Site Construction Total**
Jail	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Maysville	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Commerce	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
South Jackson	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Nicholson	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Jackson HS	$ 225,000	$ -	$ 47,000	$ -	$ 50,000	$ 50,000			**$ 372,000**
Hall County	$ -	$ -	$ -	$ -	$ -	$ -			**$ -**
SO Dispatch	$ -	$ -		$ 50,000	$ -	$ -			**$ 50,000**
Total	**$ 1,350,000**	**$ -**	**$ 282,000**	**$ 50,000**	**$ 300,000**	**$ 300,000**			**$ 2,282,000**
								Site Construction Contingency	**$ 342,300.0**
								Site Construction Total	**$ 2,624,300**

Microwave System									
6 Channel Simulcast Sites	Microwave Radio Equipment	LAN/WAN Equipment	DC Power System	Antenna Systems	Path Surveys	Installation Services			**Microwave Construction Total**
Jail	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Maysville	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Commerce	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
South Jackson	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Nicholson	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Jackson HS	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
Hall County	$ 95,632	$ 25,000	$ 35,000	$ 45,000	$ 5,000	$ 27,220			**$ 232,852**
SO Dispatch	$ -	$ -	$ -	$ -	$ -	$ -			**$ -**
Total	**$ 669,424**	**$ 175,000**	**$ 245,000**	**$ 315,000**	**$ 35,000**	**$ 190,540**			**$ 1,629,964**
								Microwave Systems Integration	**$ 505,289**
								Microwave Contingency	**$ 162,996**
								Microwave Total	**$ 2,298,249**

18.2.3. Solution #2 - Subscriber Budget

The following budget shows a detailed breakdown of the Subscriber Equipment.

Mobiles													
	Mid-tier Remote Mount P25 Single Band		Mid-tier Dash Mount P25 Single Band		Low-tier Dash Mount P25		High-tier Dash Mount P25 Multiband		High-tier Remote Mount P25 Multiband		Install & Program	Removal Old Equipment	Totals
Cost Each		$ 4,658		$ 4,539		$ 2,500		$ 7,500		$ 7,650	$ 250	$ 75	
Total Each	**309**		**0**		**221**		**0**		**0**				
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Total**	**Total**	
Sheriff/Dispatch	130	$ 605,540		$ -		$ -		$ -		$ -	$ 32,500	$ 9,750	$ 647,790
Cache Radios		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
EMA	4	$ 18,632		$ -		$ -		$ -		$ -	$ 1,000	$ 300	$ 19,932
EMS	15	$ 69,870		$ -		$ -		$ -		$ -	$ 3,750	$ 1,125	$ 74,745
Rec Department		$ -		$ -	12	$ 30,000		$ -		$ -	$ 3,000	$ 900	$ 33,900
Nicholson	12	$ 55,896		$ -		$ -		$ -		$ -	$ 3,000	$ 900	$ 59,796
Arcade	6	$ 27,948		$ -		$ -		$ -		$ -	$ 1,500	$ 450	$ 29,898
West Jackson	12	$ 55,896		$ -		$ -		$ -		$ -	$ 3,000	$ 900	$ 59,796
Jackson Trail	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Harrisburg	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
North Jackson	10	$ 46,580		$ -		$ -		$ -		$ -	$ 2,500	$ 750	$ 49,830
South Jackson	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Jail		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
Corrections	3	$ 13,974		$ -		$ -		$ -		$ -	$ 750	$ 225	$ 14,949
PD	30	$ 139,740		$ -		$ -		$ -		$ -	$ 7,500	$ 2,250	$ 149,490
Jefferson PD	25	$ 116,450		$ -		$ -		$ -		$ -	$ 6,250	$ 1,875	$ 124,575
Jefferson	9	$ 41,922		$ -		$ -		$ -		$ -	$ 2,250	$ 675	$ 44,847
Pendergrass PD	7	$ 32,606		$ -		$ -		$ -		$ -	$ 1,750	$ 525	$ 34,881
Commerce PD	25	$ 116,450		$ -		$ -		$ -		$ -	$ 6,250	$ 1,875	$ 124,575
Roads / Public Works		$ -		$ -		$ -		$ -		$ -	$ -	$ -	$ -
Fleet Maintenance		$ -		$ -	4	$ 10,000		$ -		$ -	$ 1,000	$ 300	$ 11,300
County Schools		$ -		$ -	175	$ 437,500		$ -		$ -	$ 43,750	$ 13,125	$ 494,375
Commerce Schools		$ -		$ -	15	$ 37,500		$ -		$ -	$ 3,750	$ 1,125	$ 42,375
Jefferson Schools		$ -		$ -	15	$ 37,500		$ -		$ -	$ 3,750	$ 1,125	$ 42,375
Totals	**309**	**$ 1,439,322**	**0**	**$ -**	**221**	**$ 552,500**	**0**	**$ -**	**0**	**$ -**	**$ 132,500**	**$ 39,750**	
												Total Mobiles	**$ 2,164,072**

(continued on next page)

Portables							
	Mid-tier P25 Single Band		Low-tier P25 Single Band		High-tier P25 Multiband		Programming
Cost Each		$ 4,873		$ 2,560		$ 7,500	$ 50
Total Each	**535**		**250**		**20**		
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Total**
Sheriff/Dispatch	156	$ 760,188		$ -	5	$ 37,500	$ 8,050
Cache Radios	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
EMA	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
EMS	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Rec Department		$ -	12	$ 30,720		$ -	$ 600
Nicholson	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Arcade	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
West Jackson	40	$ 194,920		$ -	1	$ 7,500	$ 2,050
Jackson Trail	35	$ 170,555		$ -	1	$ 7,500	$ 1,800
Harrisburg	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
North Jackson	20	$ 97,460		$ -	1	$ 7,500	$ 1,050
South Jackson	15	$ 73,095		$ -	1	$ 7,500	$ 800
Jail		$ -	100	$ 256,000		$ -	$ 5,000
Corrections		$ -	32	$ 81,920		$ -	$ 1,600
PD	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Jefferson PD	21	$ 102,333		$ -	1	$ 7,500	$ 1,100
Jefferson	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Pendergrass PD	8	$ 38,984		$ -	1	$ 7,500	$ 450
Commerce PD	30	$ 146,190		$ -	1	$ 7,500	$ 1,550
Roads / Public Works		$ -	25	$ 64,000		$ -	$ 1,250
Fleet Maintenance		$ -	4	$ 10,240		$ -	$ 200
County Schools		$ -	45	$ 115,200		$ -	$ 2,250
Commerce Schools		$ -	20	$ 51,200		$ -	$ 1,000
Jefferson Schools		$ -	12	$ 30,720		$ -	$ 600
Totals	**535**	**$ 2,607,055**	**250**	**$ 640,000**	**20**	**$ 150,000**	**$ 40,250**

(continued on next page)

Accessories and Totals									
	Carry Case / Belt Clip		Desk Charger		Multi-Unit Charger		Speaker Mic		Totals (Includes all portables from pg 119 and all accessories)
	$ 64		$ 110		$ 600		$ 125		
	776		776						
	Qty	**Total**	**Qty**	**Total**	**Qty**	**Total**	**Qty**	**Total**	
Sheriff/Dispatch	156	$ 9,984	156	$ 17,160	10	$ 6,000	156	$ 19,500	$ 858,382
Cache Radios		$ -		$ -		$ -	21	$ 2,625	$ 108,635
EMA	21	$ 1,344	21	$ 2,310	2	$ 1,200	21	$ 2,625	$ 113,489
EMS	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Rec Department	12	$ 768	12	$ 1,320	1	$ 600		$ -	$ 34,008
Nicholson	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Arcade	21	$ 1,344	21	$ 2,310	3	$ 1,800	21	$ 2,625	$ 114,089
West Jackson	41	$ 2,624	41	$ 4,510	5	$ 3,000	41	$ 5,125	$ 219,729
Jackson Trail	35	$ 2,240	35	$ 3,850	3	$ 1,800	35	$ 4,375	$ 192,120
Harrisburg	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
North Jackson	21	$ 1,344	21	$ 2,310	2	$ 1,200	21	$ 2,625	$ 113,489
South Jackson	16	$ 1,024	16	$ 1,760	2	$ 1,200	16	$ 2,000	$ 87,379
Jail	100	$ 6,400	100	$ 11,000	12	$ 7,200	100	$ 12,500	$ 298,100
Corrections	32	$ 2,048	32	$ 3,520	4	$ 2,400	32	$ 4,000	$ 95,488
PD	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Jefferson PD	21	$ 1,344	21	$ 2,310	3	$ 1,800	21	$ 2,625	$ 119,012
Jefferson	30	$ 1,920	30	$ 3,300	4	$ 2,400	30	$ 3,750	$ 166,610
Pendergrass PD	9	$ 576	9	$ 990	1	$ 600	9	$ 1,125	$ 50,225
Commerce PD	31	$ 1,984	31	$ 3,410	4	$ 2,400	31	$ 3,875	$ 166,909
Roads / Public Works	25	$ 1,600	25	$ 2,750	3	$ 1,800	25	$ 3,125	$ 74,525
Fleet Maintenance	4	$ 256	4	$ 440	1	$ 600	4	$ 500	$ 12,236
County Schools	45	$ 2,880	45	$ 4,950	6	$ 3,600		$ -	$ 128,880
Commerce Schools	20	$ 1,280	20	$ 2,200	2	$ 1,200		$ -	$ 56,880
Jefferson Schools	12	$ 768	12	$ 1,320	1	$ 600		$ -	$ 34,008
Totals	**776**	**$ 49,664**	**776**	**$ 85,360**	**85**	**$ 51,000**	**708**	**$ 88,500**	
								Portable Totals	**$ 3,711,829**

18.2.4. Solution #2 - Dispatch Budget

The following budget shows the budget for the dispatch center.

Jackson County, Georgia Solution #1 Public Safety Communications System Dispatch	
	SO
Dispatch Positions	4
Desktop	$ 252,600
Microphone	1,300
Headset	5,120
Auxiliary Speaker (Qty. 2)	1,400
Backup Control Stations	29,415
Interoperability Control Stations (Multiband Qty. 6)*	44,118
LAN/WAN	25,000
Radio Network Manager	Included
Logging Recorder*	80,000
Alarm Monitoring	-
Installation Services	88,410
Training	25,000
Dispatch Equipment Total	**$552,363**