DELAWARE COUNTY

REQUEST FOR PROPOSAL
(RFP)

DELAWARE COUNTY

FOR

PURCHASE AND IMPLEMENTATION OF
A 700MHZ PUBLIC SAFETY RADIO SYSTEM
APCO PROJECT 25 PHASE II

RFP NUMBER CP-081921

IMPORTANT DATES:

- **Preliminary Questions from Proposers Due: August 27, 2021**
- **Mandatory Pre-Proposal Conference: September 1, 2021**
- **Site Visits for Proposers: September 1-3, 2021**
- **Deadline for Final Questions: September 13, 2021**
- **County Response to Proposer Questions: October 06, 2021**
- **Responses Due: Friday October 22, 2021, by 1:00 PM ET**
- **Council Consideration: Wednesday, December 15, 2021***
- **Notification of Approved Proposer: Thursday, December 16, 2021***

Date subject to discretion of County Council.

Issued: August 19, 2021

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1 Request for Proposals

1.1 REQUEST FOR PROPOSALS

NOTICE IS HEREBY GIVEN that proposals will be received by the County of Delaware, Pennsylvania (the "County") until the date and time shown below for the following:
RFP CP- Purchase and Implementation of a 700 MHz Public Safety Phase II Radio System

Proposed Timetable:

- **Preliminary Questions from Proposers Due: August 27, 2021, by 4:00 PM eastern time**
- **Mandatory Pre-Proposal Conference: September 1, 2021**
- **Site Visits for Proposers: September 1 -3, 2021**
- **Deadline for Final Questions: September 13, 2021**
- **County Response to Proposer Questions: October 6, 2021**
- **Responses Due: Friday, October 22, 2021, by 1:00 PM eastern time**
- **County Council Consideration of Proposals: Wednesday, December 15, 2012**
- **Notification of Approved Proposer: Thursday, December 16, 2021**

Submissions
Responses to this Request for Proposals ("RFP") shall be submitted **by the date and time shown above** to the County as further described herein. Responses and submitted documents remain the property of the County and will be retained in accordance with applicable records retention laws.

Registration of Interest

Firms which desire to register interest in responding to this RFP and receive updates, if any, as described herein, should register with the County by sending an e-mail with contact information to CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com.

Inquiries and Questions

During the RFP process, all prospective responders (hereinafter, "Proposer(s)" or "Contractor(s)") are hereby prohibited from contacting (i) any member of the County Council, the County Executive Director or any County employee or agent regarding the solicitation in any respect during the solicitation period, and (ii) the County Executive Director or any County employee or agent regarding the solicitation in any respect during the evaluation period. The violation of this rule shall result in the automatic disqualification of any response submitted by the violator. The no-contact rule set forth shall not apply to inquiries submitted to County employees or agents in the manner specifically provided in this RFP, or to communications seeking clarification regarding instructions or specifications submitted in the manner specifically provided for in this RFP, or to pre-bid conferences provided or to formal presentations by finalists to the County.

All questions must be submitted via email to CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com by the date and time shown on the proposed schedule. No telephone calls will be accepted. To the extent Delaware County determines to respond to a question, all responses will be posted at https://delcopa.gov/purchasing/invitbid.html by the date and time shown on the proposed schedule. In addition, responses will be shared with all firms who have recorded their interest in this opportunity by registering with the County at CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com.

1.2 GENERAL TERMS AND CONDITIONS

1. While the County has used considerable efforts to ensure an accurate representation of information in this RFP, all Proposers are urged to conduct their own investigations into the material facts and the County shall not be held liable or accountable for any error or omission in any part of this RFP.

2. All Proposers must be prepared to present suitable evidence of their financial standing and furnish a list of similar work or services recently completed or performed.

3. No verbal instructions or information to Proposers will be binding. This RFP is considered clear and complete unless modified or amended by the County, in its sole discretion.

4. Submitted Proposals will be considered as conclusive evidence of complete examination of this RFP and constitutes express acceptance by the Proposer of all terms and conditions and provisions of this RFP including all addenda, attachments, and exhibits. Failure to comply with any of the conditions may result in the rejection of the Proposal or the immediate termination of any agreement which may be executed between the County and the selected Proposer. The County reserves the sole right to waive technicalities and accept or reject all Proposals or items therein, in the best interest of the County as it deems proper and/or necessary.

5. Proposal forms and instructions are provided in this RFP and must be used when submitting the Proposal.

6. To the extent permitted by law, selection of a Proposer under this RFP will not be based on the concept of the "lowest responsible bidder." Delaware County, at its sole discretion, may choose to withdraw this RFP at any point in time following its release. The County may procure any services, including those that are the subject of this RFP, by any other means permitted by law.

7. Proposals shall be submitted at no cost to the County and any Proposal received shall remain the property of the County. Any subsequent costs relating to contract negotiations are entirely the responsibility of the Proposer.

8. Responses may identify proprietary or confidential information for purposes of meeting an exception to the Pennsylvania Right-To-Know Law; however, the County is not bound by the identification of such information as propriety or confidential and will provide copies of materials provided hereunder in response to a right-to-know request as required by Pennsylvania law. The County's determination of the application of the Pennsylvania Right-To-Know Law is dispositive, and by submitting a response to the RFP, Proposers agree not to challenge the County's determination.

9. Any Proposer who has demonstrated unsatisfactory performance during any agreement with the County or any other organization may be considered unqualified. The County reserves the right to exercise this option as the County deems proper/necessary.

10. Interview/Presentation: County reserves the sole right, in the best interest of the County, upon review of the Proposals to:

10.1 Request and obtain additional information and/or clarification from Proposers.

10.2 Request and schedule Proposer(s) to meet at a designated time, date and County location for an interview and/or presentation.

10.3 Negotiate the terms and conditions and request a best and final offer.

11. Agreement: The selected Proposer shall execute a written agreement with the County (the "Agreement" or the "Contract"). The final terms of the Agreement will be determined by direct negotiation, and the Agreement is subject to the approval of County Council. As such, acceptance of any Proposal pursuant to this RFP does not guarantee that the County will enter into an Agreement with the selected Proposer.

11.1 If an Agreement cannot be negotiated within forty-five (45) days of notification to the successful Proposer, the County may at any time thereafter, at its sole option, terminate negotiations with that Proposer and negotiate an Agreement with another Proposer of its choice.

11.2 Standard Terms and Conditions which the County anticipates will be incorporated into the Agreement are attached hereto as Attachment A. Should a Proposer have any exception(s) to the RFP, including, but not limited to, incorporation of such Standard Term and Conditions into the Agreement, the exception(s) must be submitted in writing with its response.

11.3 This Request for Proposal is intended to cover the performance of all work/services that may be required or necessary for the complete performance of the Agreement. The Contractor will be required to fully complete the work/services within the purview of this RFP and the terms and conditions of the Agreement.

11.4 The County is anticipated to be the beneficiary of Redevelopment Assistance Capital Program ("RACP") grant funding (the "Grant") from the Commonwealth of Pennsylvania ("Commonwealth") to fund certain construction activities and materials associated with County's the new trunked radio system. To the extent that the Commonwealth awards the Grant, the Contractor shall comply with all applicable provisions, terms and conditions of the Grant and any written contracts between the Commonwealth, the Delaware County Industrial Development Authority (as the "Grantee") and/or the County, which provisions, terms and conditions shall be mandatory and not waivable. Certain specific, mandatory, non-waivable provisions, terms and conditions of the Grant are included on Attachment B to this RFP.

12. Statutes Applicable to this RFP: Proposer is responsible for familiarity and compliance with statutes that apply to their response to this RFP.

13. The County may modify the selection process, the scope of the project or the required responses to this RFP. Any such modifications will be posted at https://delcopa.gov/purchasing/invitbid.html and shared with all firms who have recorded their interest in this opportunity by registering with the County at CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com.

14. Debarred & Suspended Contractors in the Commonwealth of Pennsylvania: Proposals submitted by any Contractor or sub-contractor who are identified on the Pennsylvania debarment list will automatically be rejected by the County.

1.3 REQUEST FOR PROPOSAL INSTRUCTIONS

RFP CP-, Purchase and Implementation of a 700 MHz Public Safety Phase II Radio System

Delivery and Receipt of Proposals:

Proposals shall be submitted by the date and time indicated herein to:

Director of Central Purchasing
County of Delaware
201 W. Front Street Room 228
Media, PA 19063

One (1) original hardcopy, eleven (11) additional hardcopies and one (1) electronic copy (flash drive) in PDF format of the Proposal must be received in a sealed box. Proof of insurance coverage required by this RFP and form W-9 taxpayer identification number shall be included with all responses submitted.

The words" **RFP CP-081921, Purchase and Implementation of an 700 MHz Public Safety Phase II Radio System"** shall be clearly marked on the box containing the Proposal.

Due Date: Proposals will be received by carrier or in person until Friday, October 22, 2021, at 1:00 PM ET

A. All Proposals will be "clocked" at the time they are received to indicate the time and date of receipt.
B. Proposals WILL NOT be accepted in person after the time and date specified.
C. Proposals received by carrier WILL NOT be accepted if they are received after the time and date specified regardless of the postmark or circumstances.

Withdrawal of RFP: Proposals may be withdrawn by a request emailed to CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.combefore the date and time for receiving Proposals has expired. Negligence on the part of the Proposer in preparing a Proposal is not grounds for withdrawal or modification of a Proposal after such Proposal has been received by the County. Proposers may not withdraw or modify a Proposal after the date and time for receiving Proposals has expired. Proposers may not assign or otherwise transfer their Proposals.

Inquiries and Questions: All inquiries and questions relating to this RFP shall be emailed to CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com. Please note that questions and correspondence by any means (i.e., telephone, email, etc.) with anyone other than the points of contact listed above will be grounds for disqualification from this RFP. No oral interpretation of the meaning of the plans, specifications, or any other aspect of this RFP will be made to any Proposer. All questions must be submitted as described above by the date and time shown on the proposed schedule. No telephone calls will be accepted. To the extent the County determines to respond to a question, all responses will be posted at https://delcopa.gov/purchasing/invitbid.html by the date and time shown on the proposed schedule. In addition, responses will be shared with all firms who have recorded their interest in this opportunity by registering with the County at CentralPurchasing@co.delaware.pa.us with a copy to ali.shahnami@acdtelecom.com.

Award: The contract will be awarded to the responsible Proposer(s) submitting a response determined to provide the best value to the County with price, technical, and other applicable factors considered. The County reserves the right to award to multiple Proposers. The County reserves the right to request any additional information from Proposers as may be necessary to assist in review and evaluation of any Proposal prior to submittal of a recommendation for award to the County Council.

Waiver of Formalities/Rejection of Proposals: The County reserves the right to waive informalities in any Proposal, to reject any or all Proposals with or without cause, to waive irregularities/technicalities, and waive technical and non-technical or non-material defects in the Proposal document or submittal of any Proposal. The County reserves the right to make award either in part or completely, and/or to accept the Proposal that, in its judgment, will be in the best interest of the County. Proposals in which the prices are unbalanced will be rejected. The County reserves the right to reject any and all Proposals and to re-advertise for all or any part of this RFP as deemed in its best interest.

Cancellation of Proposal: The County reserves the right to cancel all or any part of this RFP at any time prior to approval of the award. The decision to cancel cannot be the basis for a protest.

Errors: Where forms have erasures or corrections, each erasure or correction must be initialed in ink by the Proposer. In case of unit price items, if an error is committed in the extension of an item, the unit price as shown in the Proposal will govern. Errors between any sum, computed by the Proposer, and the correct sum thereof will be resolved in favor of the correct sum. Any discrepancy between words and numbers will be resolved in favor of the written words.

Deviations: Proposers are hereby advised the County will only consider Proposals that meet the specifications and other requirements imposed upon them by this RFP. In instances where a deviation is stated in the Response, it may be subject to rejection by the County.

Performance and Payment Bond Requirements: Performance and Payment Bonds will be required for this project. The recorded Performance and Payment Bonds shall be provided prior to the commencement of construction to Director, Delaware County Purchasing Department, 201 W Front Street, Room 228, Media, PA 19063

Performance and Payment Bonds must be increased in accordance with any change order increases on the project.

Bid Preparation Costs: By submission of a Proposal, the Proposer agrees that all costs associated with the preparation of its Proposal will be the sole responsibility of the Proposer and shall not be borne by the County and also agrees that the County bears no responsibility for any costs associated with the preparation of its Proposal and/or any administrative or judicial proceedings resulting from the solicitation process.

Contractor Qualifications and Requirements: As part of the response, the Proposer shall submit a description of the Proposer's background, qualifications, history and experience in large-scale county and city projects of a similar nature and with the proposed system technology. The County would like to see three (3) references of public safety projects of similar size and scope that have been completed in the Commonwealth of Pennsylvania or throughout the United States.

The Proposer must submit a high-level company organizational chart, as well as a team organizational chart including the members of the proposed project team for the
County.

The Proposer must include resumes, certifications and licenses of all key personnel who will be responsible for the delivery, installation and services of associated with the project. The Proposer shall also describe the experience of any sub-contractors and what their role will be in the project.

The County shall have the right to review the references, experience of assigned personnel, and qualifications of the Proposer in order to make the final determination of the acceptability of the Proposer to be awarded the contract.

County Council may reject, at its sole discretion, any Proposer Council finds to lack, or whose present or former executive employees, officers, directors, stockholders, partners or owners are found by Council to lack honesty, integrity, or moral responsibility. The Council's finding may be based on any of the following factors: the disclosure required herein, the County's own investigation, public records, or any other reliable source of information. County Council may also reject any Proposer failing to make the disclosure required herein. By submitting a Proposal, Proposer recognizes and accepts that County Council may reject any Proposal at its sole discretion and waives any claim it might have for damages or other relief arising from the rejection of its Proposal or resulting directly or indirectly from the rejection of its Proposal based on these grounds or from the disclosure of any pertinent information relating to the reasons for rejection of its Proposal.

Subcontractors: The County reserves the right to approve all subcontractors for this Contract. If subcontractors are to be utilized, their names and references must be included in the Proposal. Responsibility for the performance of the Contract remains with the main Contractor exclusively. After the commencement of the project, subcontractors may be added or modified during the Contract period only with prior written permission from the County, and only for reasonable cause, as judged by the County.

2 Introduction and Overview

The County currently operates an analog conventional UHF T-Band (470MHz to 512MHz) system across several zones. Law Enforcement utilize fourteen (14) channels split into seven (7) sectors. Fire and EMS utilize ten (10) channels split into six (6) zones. The County has coverage issues in many areas of the county and the system is obsolete resulting in the need for replacement. The County is soliciting proposals from interested and qualified radio system manufacturers and integrators having large-scale system development experience to provide a turnkey solution for replacement of the existing radio system, including infrastructure and the replacement of radios. The County is also requesting a P25 Voice paging solution to replace the current low band 2 tone analog system. This RFP outlines the County's requirements and specifications for a new trunked radio system and Fire and EMS Alerting.

Delaware County's new trunked radio system will replace the existing radio system and where required, stand-alone repeaters and satellite receivers. The replacement system must be in conformance with applicable APCO Project 25/TIA/EIA-102 (hereinafter, "P25") standards, which have been approved at the time of the first equipment order.

The new system shall be capable of full-featured operation in both the 700 MHz and 800 MHz frequency bands. The County has submitted applications for 700 MHz channels at the current sites and antenna heights. These applications are awaiting approval by the Region 28 Planning Committee. Proposers are required to propose a complete replacement of the existing system(s) and equipment to achieve the desired P25 configuration. Some requirements in this RFP refer to "Contractor," and Contractor requirements are those that are not necessary in the Proposal, but they become an obligation of the Contractor as a result of the Proposal, compliance with P25 and contract negotiations. The requirements utilized in this RFP are not intended to be proprietary or restrictive to a single manufacturer. The sole intent of these requirements is to establish a benchmark of the equipment quality desired as an outcome to this RFP. Alternatives to the requirements listed in this RFP shall be considered and evaluated. It is the responsibility of each Proposer to identify in writing before the scheduled pre-proposal conference, the requirements they believe are restrictive. Failure to do so will automatically nullify any post-conference concerns in this regard.

The successful Contractor shall be totally responsible to the County for the entire system replacement package. This replacement is to include, but not be limited to, all system design(s), additional site preparation on existing and/or proposed sites, radios, pagers, hardware, software, engineering, implementations and installations of materials, all labor for design, engineering and installations, program management, system integration with other specified systems and hardware, customer and emergency responder training, fleet mapping, programming, and warranty maintenance. The Proposer's replacement network should utilize existing microwave network unless otherwise justified with a detailed system design and analysis. The Proposal must also include all network connectivity to all existing sites and utilizing the existing network, if appropriate and feasible.

Proposals for new sites must also include any additional costs that may be required for buildings, power, emergency back-up power, roads, towers, FCC licensing, site acquisition and some level of assurance the site will be available to the County to achieve the coverage offered by the Proposer. If the Proposer's radio system requires changes in existing microwave backhaul technologies, the Contractor will be responsible for conversion or addition of the needed changes to the existing microwave system.

The County will not order or install any equipment until FCC licenses have been granted and obtained by the Contractor on behalf of the County for any proposed or existing sites. The selected Contractor will be responsible for licensing including any FAA, zoning and FCC requirements, including working with Regional Planning Committee(s) and the FCC authorized Frequency Coordinator. It is the intent of this RFP that all new or modified microwave systems will include all necessary hardware/software to provide interconnection to the existing network and the newly proposed County-wide trunked system.

The new system must be developed, installed and tested in a manner that provides continued, uninterrupted communications via the current system during migration and cutover. The new system must be installed while the current system is still in place and fully operational.

The Proposer must provide a detailed plan with their proposal as to how they will make the transition and what, if any problems or issues, they anticipate as the system is implemented. The new system is intended to support the County agencies for at least the next twenty (20) years following system acceptance without unanticipated hardware upgrades or a major overhaul or addition of repeater sites. The County believes its current coverage requirements are reasonable, but if a Proposer believes otherwise, it should be so noted in writing prior to the pre-bid conference. Proposers are responsible for designing and proposing a system that meets the requirements set forth by the County. It is important that the proposed design have the flexibility to accommodate additional emergency responders who may enter the system in the foreseeable future due to continued growth.

2.1 Background

The County of Delaware spans 191 square miles,184 square miles of land, bordering the City of Philadelphia, Montgomery County, Chester County and New Castle County Delaware. In 2019, the County's estimated population was over 566,747 making it the fifth most populous county in Pennsylvania and the third smallest in area. Delaware County has more than 244,417 housing units at an average population density of 3,070 per square mile. Delaware County currently provides local Law Enforcement, Fire, and Emergency Medical Services (EMS) agencies operating in Delaware County with a countywide public safety radio system. The existing Delaware County radio system operates on UHF-T Spectrum. Per the Middle-Class Tax Relief and Jobs Creation Act of 2012, the UHF-T spectrum is to be vacated by 2023. Delaware County desires a turnkey solution for a comprehensive replacement of the County's public safety 500 MHz UHF radio system. Delaware County has been allocated nine (9) channels in the 700 MHz spectrum. In addition, additional channels are available in the 700 MHz and 800 MHz range. A summary of frequencies and call signs licensed under the Delaware County FCC Registration Number (FRN) is shown in Appendix B of this document.

2.2 Project Scope

The existing Delaware County public safety radio system was installed in the 1990's. The infrastructure equipment and technology have reached end-of-life and the County requires a new P25 digital system that results in improved system performance, security and coverage. Delaware County understands that the migration to digital technology and the desire for improved on-street coverage for portable radios may require some number of additional sites or a change to existing sites beyond the existing twelve (12) licensed sites. As

part of their proposal, Proposers are required to design, implement, test and warrant the system with as many sites as may be needed to achieve the desired on-street signal levels and system coverage described later in this document.

Technologies and services to be deployed include the following major components:

- Replacement of the current public safety proprietary T-Band, 24-channel, 123-site network and any stand-alone repeaters or satellite receivers (actual replacement proposal may use an optional design which could preclude the need of existing components, but that will need to be clearly defined and justified in the response) with an interoperable, P25 Phase II compliant 700 MHz, 9-channel, multi-site simulcast, public safety communications system/network infrastructure including conventional and Interop repeaters.

- Upgrade or replace the current Zetron radio consoles to operate the new radio system.

- Provide the County the equipment to deploy a backup dispatch center.

- While the County anticipates not having the need to replace the existing 6 GHz and 11 GHz microwave network, the County does realize that there may be an expansion of the current microwave backbone which may be needed for network extension to new sites.

- The successful proposal will include a detailed network/system/channel Utilization Plan.

- Provide the County with an asset and network management software system solution with a centralized database that is able to track, manage, and maintain the equipment and systems being proposed in response to this RFP, as well as existing assets.

- Provide the County with cost for mobile, portable and fixed voice radio equipment compatible with the new system including delivery and installation cost per unit. Cost will be provided for at least three years after final system acceptance. All County agencies, local municipalities and response agencies will be eligible for radio and pager purchase at per unit price.

- Provide the County with a P25 Voice paging system to alert fire and EMS agencies.

- Provide the County with the cost for Fire and EMS pagers compatible with the new system including chargers, relay outputs for station alerting and programming software.

- Provide a minimum of two years warranty on the entire system and provide a yearly cost of maintenance and warranty from year three (3) through year fifteen (15).

2.3 Definitions

The meaning of certain words as used within this RFP shall be controlled through the use of the following definitions unless stated otherwise in the document.

700 MHz: the public safety radio spectrum between 763 and 805 Megahertz as currently authorized by the FCC

800 MHz: the public safety radio spectrum between 806 and 862 Megahertz as currently authorized by the FCC

APCO Project 25 (P25): a series of standards for digital Land Mobile Radio (LMR) communications backbone and mobile and portable radios for use by federal, state/province, and local public safety agencies in North America and globally to enable them to communicate with other agencies and mutual aid response teams in a local or wide-area emergency

ASR: FCC Antenna Structure Registration

AVL: Automatic Vehicle Location

Backbone: a network of redundant components that provides communications between network RF transmission sites, communications centers where consoles are located, and the master network control location

BDA: Bi-Directional Amplifier system to enhance in-building coverage

BER: bit error rate

Business Day: any day Monday – Friday that is not designated as a legal holiday by Delaware County

CAD: Computer Aided Dispatch

CAI: Common Air Interface for a P25 radio network

CAP: P25 Compliance Assessment Program

***Change Order*:** A written order authorized by the County authorizing one or more of the following: (i) changes in the System; (ii) adjustment in the basis of payment for work on the System that are affected by the change; or (iii) adjustment in the contract time.

Change Directive: A written directive issued by the County to Contractor, ordering an addition, deletion or revision to the System.

Console RESOURCE: a controllable radio channel (conventional) or talk group (trunking) which can be accessed via the dispatch console interface

Contractor: refers to the prospective bidder that is awarded the voice radio project contract by Delaware County

Control Site: In this document, the term Control Site is used to refer to the site controlling the radio network. This term refers to Master Site Core Technology and IP Distributed Architecture and any other technology used to control and distribute control of the radio network.

CSSI: Console Sub-System Interface for a P25 radio network

Electronic Patch (or Network Gateway patch): a device such as a Motorola Motobridge®, Harris Network First®, Raytheon ACU-1000® or similar product designed to provide interoperability between radio systems employing incompatible electronic technologies or architectures

FDMA: Frequency Division Multiple Access

FNE (Fixed Network Equipment): all hardware and software used to transmit and receive radio signals including but not necessarily limited to: the system's 700/800 MHz transceivers, comparator/voter, system control systems, combiners, multiplexers, antennas, microwave transceivers and dishes, etc.

FSI: Fixed Station Interface for a P25 radio network

Full Duplex: the ability to simultaneously transmit and receive a radio signal

In-building Coverage: the amount of signal margin in decibels or dB provided for in a radio system design for the purpose of overcoming signal attenuation due to building structure, in order to provide the minimum signal level necessary to provide acceptable portable radio communications inside a building

ISSI: Inter Sub-System Interface for a P25 radio network

Network Site: a location proposed by the Proposer and approved by Delaware County for the installation of FNE or other system/network backbone equipment

NPSPAC: the National Public Safety Planning and Advisory Committee

NPSPAC Region 28: the coordinating body authorized by the National Public Safety Planning Advisory Committee with administrative authority over Delaware County

P25 SoR: the P25 Statement of Requirements most current version as of the date of the proposal

Proposer: refers to prospective responders prior to award of a contract

Reliability: 97% reliability means 97% of the time at 97% of locations

Repeater: an electronic device deigned to instantly retransmit at what is most often a higher power transmission of a mobile and/or portable. Power levels are design criteria that should be included in a response to this RFP.

Replacement System or System: all electronics, hardware, and software components routinely employed to operate the 700 MHz digital trunked network including but not limited to fixed network equipment, antenna, transmission lines, microwave system, towers, tower grounding systems, associated subsystems, etc., resulting in a fully operational, licensable, highly reliable 700 MHz digital trunked public safety radio communications capability meeting the requirements of and intended to be procured as a result of this RFP

RF: Radio Frequency

RFSS: RF Sub System

Semi-Duplex (Half-Duplex): the ability to non-simultaneously transmit and receive a radio signal using two discrete radio frequencies

Talk-around (Simplex): the ability of a mobile or portable radio to communicate directly with another mobile or portable radio without the support of the network

Talk group: a trunked radio system talk channel

TDMA: Time Division Multiple Access

TIA/EIA: Telecommunications Industry Association/Electronic Industries Alliance

Turnkey Solution: the entire system and all tasks or services associated with the system, including the preparation of sites or structures for the installation of system components, including the removal of any existing components of any kind, shall be performed under the responsibility of the Contractor.

3 Present Communications System

3.1 Voice Infrastructure

Delaware County currently operates a Motorola Quantar Analog Conventional that operates on UHF T-Band which was deployed in the late 1990's and has been upgraded and reconfigured over time to the present equipment configuration. The system is twenty-four (24)-channels and utilizes Twelve (12) licensed towers and a total of forty-three (43) transmit and receive sites. At a typical remote tower site, Delaware County either owns an equipment shelter or leases space in a shared shelter. That equipment is powered by 120 VAC which is backed up by an on-site generator and UPS system. Connectivity between sites is achieved with Nokia microwave equipment, which is installed at each location, in the 6 GHz and 11 GHz bands forming a loop and spur design. Microwave equipment is powered by an on-site 48 VDC battery and rectifier system.

3.2 Dispatch Console System

The current dispatch console system consists of eighteen (18) Zetron, AcomNovus version consoles at the operator positions and fifteen (15) command post laptops. These consoles are used by the 911 center telecommunicators to interface with the conventional UHF-T Band system. A duplicate dispatch center will be created at a second remote location, location to be determined. That backup dispatch center will contain eighteen (18) consoles and will have access to all the channels, resources and features of the primary console system. IP connectivity between the main and backup dispatch centers will be the responsibility of Delaware County, but the Contractor must provide all necessary system equipment. For planning purposes, the County anticipates the backup dispatch center to be approximately 70 feet by 160 feet. The proposers have the option to upgrade to the latest Zetron console and utilize these consoles in their proposal or submit their P25 compliant consoles. If new consoles are proposed rationale for change must be included in the proposal and the proposal shall include a line item in the Pricing Summary sheet including any trade-in value for the current consoles.

3.3 Computer-Aided-Dispatch

The current CAD system is Hexagon version 9.2. The County is currently upgrading to Oncall which is expected to be deployed first quarter 2022. The County would like radio-CAD interface as an option to the proposal.

3.4 Fire and EMS Paging

Delaware County currently utilizes a five (5) site analog 2 tone low band voice paging system. In addition, the County operates a VHF digital system for text alerting. Several agencies utilize third-party software to provide alerting to cellular phones. As part of this proposal, the County would like a P25 Voice Paging system which will operate on the new radio system infrastructure.

3.5 Logging Recorder

Delaware County utilizes an Eventide logging recorder. The Replacement System must interface with the current logging system. The Contractor is responsible for full integration with the current Logging Recorder.

3.6 Digital Microwave System

Delaware County currently operates in 6 GHz and 11 GHz bands. The system is part of the loop microwave backhaul system from Nokia that provides network connectivity. The microwave utilizes Multiprotocol Label Switching (MPLS). It was purchased and installed in 2015. The ring includes the following sites: Lima, Prison, Twin Oaks, Eddystone, Burlington, and Upper Darby. A spur to the Media courthouse, and Radnor House Condominiums exists off of the Lima site. Currently, due to tree growth, the Lima to Radnor hop is provided by T1 line.

3.7 Portable and Mobile Equipment

There are approximately 4,500 portable radios and 1,500 mobile radios currently affiliated with the system. Additionally, 100 control stations are part of the system. The portable and mobile radios are a mixture of brands and models. Purchasing of portables and mobiles is a mixture of county, municipality, and agency. Mobile installation is the responsibility of each agency.

3.8 Present Coverage Area

While the County's current system has the ability to provide countywide coverage: spectrum congestion and improved structural designs have decreased coverage. The goal of the new system is to achieve street level coverage for a hip mounted portable radio countywide.

3.9 Present Issues and Needs

The County has experienced numerous issues with the current system, which together with system obsolescence, have led to the issuance of this RFP.

3.9.1 Coverage Issues

The County currently has issues with radio coverage. Troposphere Propagation, also known as ducting, is a cause for concern. With the new system, the County expects greatly improved portable radio coverage. The County's required portable hip level radio configuration will be discussed later in this RFP.

3.9.2 Channel Congestion

The County currently does not have any major issues with channel congestion. However, due to anticipated growth of the system and the number of emergency responders using the system, the County does not want channel congestion to become an issue with the new system. Proposers are to fully explain and describe the

capabilities of their system as it relates to existing traffic or increased traffic on the replacement system, without post-installation hardware or software additions for a period of twenty (20) years.

3.9.3 Outdated Equipment

With the current system's age, the system infrastructure has reached obsolescence. The LMR radio system infrastructure is no longer manufactured or supported by the manufacturer.

3.10 FCC Licenses

Delaware County's FCC Registration Number (FRN) is 3233723. Delaware County has applied for nine (9) allocated 700 MHz trunked licenses and holds several 6 GHz and 11GHz microwave FCC licenses. The County anticipates approval by Region 28, its adjacent regions, APCO and FCC on or before December 31st, 2021. The complete list of licenses pertinent to this project can be found in the Appendices B and D of this document.

3.11 Communications Sites

The addresses, physical locations, and pertinent technical data for the twelve (12) existing FCC licensed sites are included in the Appendices of this document. Of the twelve (12) sites on the existing system, four (4) are owned by Delaware County. While using existing sites is preferred, the County will consider all candidates for expansion sites that meet the criteria for enhanced coverage on the new system.

4 New System Requirements

Delaware County desires that the new Replacement System provide an improved level of radio coverage, communications features and capabilities, and intra-agency interoperability while achieving P25 Phase II compliant 700 MHz communications for public safety. Proposers shall describe in fine detail their approach and strategy for achieving Delaware County's project goals. The new P25 system must have the capability to interoperate with surrounding Counties, the Commonwealth of Pennsylvania, the States of Delaware and New Jersey and the Delaware River Port Authority. The Proposer must look up these agencies' FCC licenses, and compile a list of their channels in order to include them in their interoperability design and approach for Delaware County's new LMR and voice paging system.

The System will also need to contain both trunking and conventional elements for system redundancy and interoperability. Delaware County requires an Internet Protocol (IP) network function throughout all county sites that allows controlled and managed interconnection of the County system to other systems and other equipment. The replacement system shall include the expansion and/or realignment of the 6 GHz and 11 GHz microwave backhaul system as needed to provide network connectivity to new tower sites. The cost for this expansion shall be itemized separately in the proposal. The new system shall be designed around the needs and requirements of the emergency responders, radio coverage requirements, capacity and expandability requirements, system features and capabilities, interoperability, reliability, system lifespan and cost effectiveness. System size, capacity, functionality, and flexibility must be sufficient to support the County's growth and changing needs in the future. The proposed design approach shall have the flexibility to accommodate additional emergency responders who may enter onto the system in the foreseeable future. The system must also be easily expandable to accommodate County population growth and urban expansion.

4.1 P25 Compliance

The replacement architecture shall, at a minimum, conform to the objectives and user requirements outlined in the current P25 Phase II standards in terms of digital modulation, spectral efficiency, enhanced audio quality, conventional and trunking modes, ID methodology, and direct interoperability with equipment from other manufacturers. The proposal shall include comprehensive detail on all mobile and/or portable and fixed network P25 conformance testing for equipment being offered. Such conformance testing detail shall include field and laboratory test results from the ongoing compliance assessment programs. All manufacturer proprietary features and operational characteristics shall be identified in writing for all proposed mobile and/or portable and fixed network equipment to identify the Proposer's deviation from the P25 Phase II standards. Proposers shall also identify any other radio equipment manufacturers that offer radio equipment that is known to be fully compatible with the P25 features of the proposed system infrastructure. The primary proposal must be compliant with P25 trunking standards and must not contain any trunking messages and/or procedures that are proprietary. However, because the P25 specifications and standards continue to evolve, some of the features required by Delaware County may initially be outside of the current scope of the P25 standards. The County requires the Proposer to adhere to the P25 standards for all features that are included in the P25 TIA/EIA-102 specifications, but the County will accept Proposer-specific solutions for those features currently outside of the P25 scope in order to obtain a full featured communications network. The Proposer must fully disclose any proprietary feature(s) in their design and cost proposal.

The Proposer has the responsibility to demonstrate P25 conformance for the mobile and/or portable and network infrastructure features contained in the P25 standards, while clearly delineating those features that have been developed with proprietary solutions. The Proposer accepts the added responsibility of working openly with all qualified industry vendors to facilitate P25 interoperability for those features that may initially be offered as proprietary solutions.

For the life of the contract and maintenance period, the Proposer accepts full responsibility and expense for remedying and correcting any identified P25 non-conformance issue for all affected replacement hardware and software.

4.1.1 P25 Phase II Conformance

All new infrastructure and portable and mobile radios proposed shall be compatible with P25 Phase II compliance. Proposers shall also describe how any Phase II infrastructure and radios are backward compatible with both P25 Phase I equipment and legacy analog equipment.

4.1.2 Phase II Half-rate Vocoder

Delaware County requires all transmitting and receiving Land Mobile Radio (LMR) equipment adhering to P25 standards must implement the DVSI AMBE+2 vocoder. The Proposer is to discuss how proposed equipment also incorporates before and after vocoder voice enhancement features to address fire ground and other loud environment conditions.

4.2 Simulcast Operation

The County requests a simulcast configuration The Proposer must provide other options such as frequency diversity at Area 1 towers (as described in Section 7.1) versus non-Area 1 towers and provide Linear Simulcast design. The Proposer must provide the County with their assumptions, criteria, and other factors used during the design of the system.

The simulcast design shall be GPS synchronized and shall have the capability to connect audio and data between the Control Site and the transmit sites via the microwave network. Each trunking site shall be equipped with a redundant GPS receiver and precision frequency source with a separate antenna. The GPS receiver and precision frequency source will act as a master oscillator and control the carrier frequency and launch timing of the transmitted bit stream of each simulcast transmitter. The precision frequency resource must meet or exceed the performance of a Stratum 2 ANSI clock standard and shall maintain short-term and long-term stability to support the performance requirements outlined in this RFP. The proposed standard must meet the simulcast frequency stability requirements when selective availability impairs the accuracy of the GPS system or when GPS timing clocks are lost.

The proposed trunked system design shall be capable of automatically adjusting the path delay and amplitude of any one or all of the microwave links utilized in the system to maintain high simulcast audio quality in the talk-out direction. This automatic adjustment shall compensate for any change in the microwave path. The system shall be capable of maintaining a phase delay to ensure that the system's delivered audio quality meets the coverage requirements outlined in Section 6.2. The proposed system shall include centralized automated

simulcast test equipment. This equipment shall be installed at Delaware County's main dispatch location to ensure that the system operates within the specified system design parameters. Because of the importance simulcast operation has on this system, the Proposer shall provide a response outlining how the system will address the following subjects:

1. Simulcast Time Delay Control – Once the path delays have been measured, the method by which audio path time delay will be automatically controlled and equalized shall be specified.

2. Frequency Stability – The method by which the frequency of base station transmitters is maintained within the required tolerance for satisfactory simulcast operation shall be specified.

3. Addition of Sites – The procedure and equipment required for the addition of trunking or receiver sites shall be specified. The maximum site capacity of a single simulcast site controller shall also be specified.

4. Addition of Channels – The procedures and equipment required for the addition of base stations or receiver channels shall be specified.

5. Control of Sites – The method by which the simulcast remote sites are controlled and interfaced with the trunked system controller shall be described including link type and bit rate.

6. System Architecture – The trunked simulcast system architecture shall be described in detail, with written descriptions of all major system components and their functions. System and site block diagrams shall be provided to show the interconnection and the detailed audio/logic signal flow between system elements.

4.3 Responder Radio Features

The County requires small, lightweight radios that are user friendly, easily programmed, easy to read and easy to operate, especially while wearing protective gear. The County is very interested in having access to multiple vendors to purchase radio accessory equipment such as in-mask devices, under helmet earpieces, replacement antennas and batteries. The Proposer must address the compatibility of its responder equipment with readily available third-party accessories.

4.3.1 Intrinsic Safety

Delaware County does not require all portable devices to be Intrinsically Safe (IS) but recognizes that there will be times and places where IS equipment is required. To that end, Proposers must include pricing for optional intrinsically safe radios, batteries, and other accessories which may need to be purchased by the County or responder agencies.

4.3.2 Mandatory Responder Radio Features

Delaware County requires the following features to be **mandatory** in all new portable and mobile devices being proposed:

- Easy-to-read displays with logical channel selection controls
- Ability to operate radios while wearing protective gear
- Units must be as small and lightweight as possible
- Ability to operate on any system such as trunking, conventional, digital, and analog, modes in the 700 MHz and 800 MHz bands, with several switch turns or keystrokes
- Manual emergency button with GPS locator
- Automatic unit ID on transmit, with programmable alias
- Short status messaging capability
- Remote unit 'kill' feature for dispatchers – This feature may be achieved through the NCMS
- Scanning capability for any analog, digital, trunked, conventional, encrypted, or clear channels or talk groups programmed into the radios. Scan groups must also have selectable priority levels. The Proposer shall describe the limitations of the scan function including maximum number of scan lists and maximum number of talk groups per scan list, as well as the latency associated with scanning multiple lists
- Noise cancellation. Must note if noise cancellation is through attached microphone or just the portable
- Long lasting, light weight batteries with minimum 12-hour run time on 5/5/90 cycle. Rapid charging, no memory, Lithium Polymer or equivalent
- Battery level (remaining life) indicator on display
- The Proposer shall discuss and describe the types of rechargeable batteries to include chemistry, discharge and recharge rates, and number of estimated recharge cycles.

4.3.3 Optional Responder Radio Features

Delaware County requires the Proposer to address the availability of the following **optional** features in all new portable and mobile devices:

- Automatic locator option with GPS in portable or mobile radios
- Encryption selection with positive feedback to responders, using P25 standards
- Selectable received signal strength indicator on displays
- Battery mounting options for portable radios
- Optional Intrinsically Safe ratings.

Proposers must include description and pricing for all other features available in portable and mobile radios not listed above.

4.4 Fire and EMS Alerting

The County would like to utilize the new system infrastructure to provide fire and EMS responder paging and station alerting. Fire and EMS Alerting must meet the same reliability and availability specifications as the voice radio system. Proposers shall provide a P25 Voice paging system and pagers with the following:

- Complete system design
- Network infrastructure and control
- Minimum 5,000 pager capacity
- Priority and group paging
- Capable of multiple alphanumeric formats
- Operate in 700 MHz and 800 MHz
- Operate in P25 Conventional
- Support a minimum of 2 Talk Group IDs
- Message storing and playback
- Provide audio output for Station Alerting.

The County expects to purchase a minimum of 1,000 pagers for responders and 100 pagers with amplified chargers with relay output for station alerting. Proposers must include description and pricing for pagers and accessories proposed including all other features available in pagers not listed above. The proposer will extend the proposed cost to all Delaware County response agencies as part of this proposal.

4.5 Fleet Mapping

The Proposer shall discuss the Talk Group capacity of the new system in terms of typical increased number of emergency responders and increased number of talk groups in a typical and comparable public safety system. Proposers must describe the talk group capacity of the new system, and the means by which these groups are added or modified. Actual names for the active talk groups will be provided during the final system design process, but those names must be able to be changed by system administrators as needed. Proposers are also requested to address the ability for new (temporary) talk groups to be created on-the-fly by field groups on the scene of an emergency. It is desirable that the field crews have the ability to do this via direct keyboard access on the radios, or that it be possible to program remotely via OTAP by the system administrator.

4.6 Site Upgrades and Additions

Delaware County requires that the new P25 system be installed and integrated seamlessly while the existing UHF system continues to provide uninterrupted service to emergency responders. This will require the installation of new digital equipment into the existing shelter spaces while existing equipment remains in service. Proposers will need to survey all existing sites for available space and submit a plan of action to accomplish the transition. Some existing sites have ample room for new equipment, but others will be very tight. It is anticipated that all existing sites will have ample AC power to handle the new and old equipment at the same time. It is the proposer's responsibility to ensure there is sufficient AC power at those existing sites.

4.6.1 Current Site Upgrades

The Proposer shall include in their response, the proposed plan for cutover and simultaneous operation of both systems. The proposer is responsible for and shall include in their response, site upgrades required including shelter space during and after cutover. Possible microwave network expansion detailed in Section 4.8 below.

4.6.2 Additional Sites

Proposers may identify areas that require an additional site. It is the Proposer's responsibility to meet the desired on-street coverage levels. If the Proposer believes additional sites are required, they should provide multiple site options in each area where possible.

Coverage maps must be provided for each potential additional site, showing individual site coverage and composite coverage with the rest of the system as outlined in Section 6.6. As part of the design of any new site, the Proposer must include an analysis of space requirements for new equipment and antennas. Space may be available inside existing shared shelters, or the County may be required to purchase and install a new dedicated shelter for its equipment. Proposers must include pricing for a prefabricated shelter and a generator when that option is necessary.

Proposers must also include all zoning, permitting, and construction costs associated with installation of new shelters and generators when required. Another possibility is that new tower sites may need to be constructed from scratch in areas where no towers are currently available. In this case, the Proposer must provide pricing for the complete purchase and construction of a new tower, shelter, generator, and antennas, including all associated zoning, permitting, and site acquisition costs and fees as needed.

4.7 Antenna Systems

Delaware County defines the antenna system as antennas, antenna mounting accessories, feed lines and associated cable connectors and components, transmit combiners, and receiver multicouplers. The Proposer must present a plan that will not cause disruption to the ongoing emergency communications. Proposers must notify the County if coverage design of the new system requires relocation of any antennas on existing towers. All new antenna components must be designed for full 700 MHz and 800 MHz band coverage, even if 800 MHz is not initially utilized. Proposers are free to optimize the system design with recommended changes to antenna gain or electrical down-tilt if necessary. The antennas shall be mounted to the tower using either galvanized or stainless-steel hardware. All support brackets and other installation hardware shall be hot-dip galvanized in order to provide a long service life. All support brackets and antennas shall be heavy duty type and shall be installed vertically or down-tilted using the appropriate down-tilt brackets. If additional sites are recommended, the Contractor must select and negotiate the antenna locations and other site issues to provide a completely operational site for optimal coverage.

Transmission lines for the Delaware County radio system shall be a coaxial cable and connectors, with a solid outer shield conductor to minimize signal leakage and interference. RF connectors with Teflon® insulation and gold- or silver-plated mating surfaces are required for all Delaware County radio system applications, with the

possible exception of some mobile, control station, and portable installations. The RF connectors shall remain in the original packaging until installation to prevent oxidation and corrosion of the mating surfaces.

4.8 Microwave Network Expansion

In conjunction with additional sites to enhance coverage, Proposers should assume that Delaware County prefers to connect any new sites into the system with privately-owned microwave hops in the 6 GHz to 18 GHz band. Any potential new site must also be evaluated on the basis of microwave connectivity to the next two closest sites, in a manner that will preserve the primary ring network currently in use. All new microwave hops should be fully compatible with the current Delaware County microwave system. It will be necessary for the Contractor to maintain a relationship with Nokia throughout the design, implementation, and cutover phases. If the Proposer elects to utilize different microwave equipment, this must be fully explained in the proposal, including the compatibility with the existing microwave equipment. As part of the proposal, the proposer shall discuss options to maintain full system performance in the event that a microwave site fails, such as LTE backhaul.

The Contractor must negotiate space for two microwave dishes on each new tower, and space for microwave equipment in each new shelter as needed to create the new network connections. The Contractor must also negotiate space on existing towers for the additional microwave dishes, and space in existing shelters for the additional equipment if necessary. If the new sites are integrated into the microwave loops, there may be no net increase in dishes or equipment at the existing sites, except for possible temporary duplication while the path is being re-aligned. Proposers must create a detailed design for integration of all new tower sites into the Delaware County microwave system, including changes to existing hops to accommodate new sites inserted into the loops. A cutover plan must be created to bring the new sites on-line without any interruptions of service. Temporary loss of redundant paths may be necessary, but the Proposers must provide details, if that is the case. Proposers must itemize the cost of these new microwave hops separately. The Contractor will be responsible for the licensing of any new microwave frequencies.

4.9 System Redundancy

All current sites have and any new site must have redundant AC power with generator/UPS backup at all locations.
Acceptable redundant architectures include but are not limited to:

- Dual redundant power supplies and system controllers with automatic switch-over
- “Standby controller” architectures based on two completely independent, electrically isolated, mirror-image common electronic units with automatic switching between the units in the event of a malfunction.

The Proposer shall specify the requirements for a master timing source on the system, if the County’s current timing source does not meet those requirements the Contractor shall provide one. The Contractor shall include all cabling needed to connect to the existing console system. This cabling shall employ quick-connects wherever possible to simplify installation.

4.10 System Documentation

The Proposer shall clearly itemize all equipment components that will be a part of the system, including the back-room electronics and interconnecting cabling.

4.11 Installation and Cutover

The Contractor will be responsible for complete installation of the new trunking system and for interfacing to all internal or external resources, including but not limited to the County's existing microwave network and existing Dispatch Consoles.

4.12 Training

The Contractor shall develop and conduct training classes for County personnel to certify them to maintain the new console system. Complete details on the overall training requirements of this proposal are contained in Section 11 of this RFP.

4.13 Network Control and Management System (NCMS)

The Proposer shall provide a detailed description of the standard and optional capabilities of their NCMS as part of their proposed system offering. The Proposer shall specify the type of network connectivity required for the system manager, security, and the type of network operating system. The NCMS shall provide system administrators access to databases for data entry and retrieval, record keeping, adjustment of the system operating parameters, and system usage statistics. The NCMS shall support a minimum of six (6) multiple users and unlimited sessions.

The NCMS shall be configured to monitor the integrity of all major communications system components and subsystems, and routinely poll system devices to determine status. This shall include, but not be limited to, the trunked system status & alarms, the digital microwave system status & alarms, the digital channel banks status & alarms, and all related site status & alarms. In some cases, device failures will prevent the transmission of an alarm; these situations shall be detected through polling. The polling interval should be automatically adjusted by the NCMS to avoid unnecessary polling. The NCMS shall allow operators to create, change, and delete items such as adding sites, talk groups, aliases, channels, and updating mobile and/or portable programming including encryption keys. When a field unit (portable, mobile, and RF control station) is powered on, the unit's discrete address and user group selection shall be recorded into the system's online data logger, and when requested, printed on a hard-copy printout. The NCMS shall be password protected from access by unauthorized personnel.

4.13.1 NCMS Terminals

The Proposer shall specify the minimum and maximum number of terminals that can be incorporated into the system. The terminals shall consist of a keyboard, processor, software, 21-inch LCD or LED color display, all necessary interconnect cabling, and 120 VAC operation. Two (2) color network printers shall also be provided.

The master terminal and two others shall be installed at the Lima Site, along with a network printer. Two other terminals and a printer shall be installed in the offices at the maintenance facility. The final terminal shall be installed along with the redundant system control point.

The NCMS terminal shall allow an operator at the terminal to perform at least the following typical tasks:

- Inquire about the status of alarms.
- Inquire and make changes to the priority level of assignments of any and all units in the system; the priority shall be assigned on an individual basis, by user group assignments, or both.
- Inquire about dispatch call loading information. The NCMS terminal shall display the real time activity of the system controller and shall include, at a minimum, the following information:

    - System configuration and management
    - System alarms
        - Specific working channels in current use
        - Specific working channels available for use
        - Specific channel being used as trunking control/signaling channel
        - Working channels removed from operation by the NCMS
    - Date and real time
    - Type of communications activity in process (group, individual, emergency, data, etc.)
        - Emergency calls
        - Disabled units
        - Queuing statistics
        - Time duration of communications in progress
        - Queue time delay of any radio channel
        - Identification of calling and called parties using the system (unit ID)

The NCMS terminal shall be capable of being connected with other terminals operating in a multi-tasking network. The NCMS terminal shall be the master terminal with control over the other terminals. The master NCMS terminal shall be utilized by the system supervisor and shall control which functions and user groups a user terminal shall interact with and display. The terminal shall include a printer to print reports and alarms.

4.13.2 Remote Access

Delaware County may have the need to access the NCMS from remote locations within the Delaware County VPN and externally from unspecified locations via the internet. Access shall be provided using a Windows based computer with the latest Windows operating system software. The Proposer shall provide a detailed description of the remote access capabilities as part of their proposed system offering and clearly address the functionality available via remote access, the method of connectivity proposed, and the security measures provided to prevent unauthorized system access. This should include the proposers plan for Cybersecurity over the life cycle of the system.

4.13.3 NCMS Security

The Proposer shall describe in detail their proposed security measures to protect physical network components (routers/switches, buildings, etc.) and how the network and the information on the network will be kept secure from unauthorized access. The system manager system shall be capable of partitioning the system into departmental or organizational functional sub-networks and providing multiple levels of password-protected hierarchical access control to restrict user privileges and access to functional sub-networks. The proposer's solution shall incorporate security industry best practices from the design inception of the system and implement a defense in-depth strategy around people, processes and technology. The security strategy shall involve physical security, information security and cyber security.

The solution shall incorporate the following cyber security mitigation strategies, including but not limited to:

- Incorporate a holistic security approach that protects all assets, systems and sub-systems related to the Offeror's solution including but not limited to critical RF sites, repeater sites, microwave backhaul, WAN, LAN, WLAN, dispatch sites, command/operations center, portables and mobile radios, security cameras, body cameras, network equipment, software, firmware, software releases, dispatch operator positions, voice logging systems and additional assets related to the radio system.
- Incorporate security mitigation mechanisms to identify, protect, detect, respond and recover from a cyber-attack.
- Embed cyber security standard best practices in accordance to, but not limited to: NIST Cyber Security Framework, NIST Special Publication 800-53, ISO/IEC 27001 and the Control Objectives for Information Technologies (COBIT 5) framework.
- Account for mitigation plans that limit the spread and impact of malicious infiltrations, including but not limited to ransomware and command and control attacks.
- All network flows and data must be encrypted while at rest, in transit and in use.
- Incorporate network segmentation and least-privilege access control mechanisms.
- Incorporate security zones to isolate critical sections of the network.
- Provide on-going information related to software vulnerabilities of the system, provide remediation and compensating mechanisms as needed.
- The design shall facilitate continuous risk management and monitoring, business continuity and disaster recovery.
- Provide cyber security awareness training with emphasis on the proposer's system.

4.13.4 System Database

The system management function shall be capable of partitioning the database such that different managers have access and control over the units and groups for which they have been authorized. The proposed radio system will have messages that include caller ID, start of call, end of call, call transmitter location, transmitter outage, etc. All of these messages need to be recorded in a database with three (3) years system message capacity information. A database shall be maintained to simultaneously store and update system user profiles, such as user group access, priority levels, dynamic regrouping plans, authorization codes, call statistics, traffic recordings for each radio, talk group, fleet map and agency, etc.

The system manager workstation shall include a primary and redundant online data logger with sufficient memory to store one (1) week of data from the trunked radio system under maximum system loading. The redundant, real-time data logger shall automatically go "online" in the event the primary data logger fails. The Proposer shall provide a means of transferring and recalling this data to/from an off-line, quasi-permanent storage media. Delaware County intends to store this media for a period of not less than ninety (90) days.

Additionally, whenever a field unit is turned on and the unit is within RF coverage range of the system, the unit's discrete address and user group selection shall be recorded into the system database. The database shall permit user defined sorting of calls by units, groups, time of day, duration of call, channel, site, and priority. The database shall be continuously backed up in real time. The backup database shall function as a "fault tolerant" database that is automatically kept current. Should there be a failure with the primary database; the backup database shall automatically be activated for system access with no drop in service.
The database shall have sufficient capacity to store all system profiles, as well as the capacity to store a minimum of one (1) month of system activity for report generation. Every twenty-four (24) hours, the database shall be automatically backed up and stored on devices external to the trunked control system.

4.13.5 System Diagnostics

Sufficient hardware and software shall be provided to monitor and test the trunked radio system. The diagnostic system shall continuously test all RF repeater stations, site controllers, and other critical hardware and software functions. Should any abnormalities be found during a test sequence, the abnormality shall be logged in non-technical language.

Typical alarms to be displayed by the NMCS shall include, but not be limited to the following:

- Radio equipment alarms from the P25 repeaters and controllers
- Power system alarms including UPS, batteries, generators, etc.
- Microwave system alarms and dehydrator alarms
- Site alarms like entry, temperature, smoke, AC failure

At a minimum, the log shall include the type of problem encountered, the date and time, and the channel(s) or equipment where the problem occurred. Additionally, the diagnostics system shall activate audible and visible alarms to notify the system supervisor of the problem. If a failure results in a loss of transmitter power or high VSWR on a repeater station, combiner, or antenna system, the system controller shall automatically remove that repeater station from the system until such time that the fault is corrected. If interference is received on a radio channel, the system controller shall automatically remove that channel and associated receivers from the system until such time that the fault is corrected. When a repeater station or a radio channel is removed from service, an alarm shall be sent to the system supervisor. The NCMS alarming subsystem shall be capable of expansion with additional alarms in the future as needed by Delaware County.

4.13.6 Report Generation

The Proposer shall provide a detailed description of the standard and optional reporting capabilities as part of their proposed system offering. The NCMS shall be capable of generating management reports to provide the necessary information for management personnel to review the reports and make decisions regarding staff

resource allocation, altering system size, and evaluating the operational effectiveness of the various components of the trunked radio system. This report shall include the system availability metrics for the requested time period. The system shall be capable of archiving a minimum of sixty (60) days of data and reports shall include at least one (1) month of system activity.

At a minimum, standard management report generation shall be provided in the following areas:

- Unit and Group database
- Site database
- System queuing, usage, activity, and traffic reports
- Site statistics
- Emergency calls
- Individual and Group calls
- RF channel statistics
- Alarm reports
- Listing of unacknowledged alarms
- Current values of analog points at a selected site.

4.14 Interoperable Communications

Delaware County understands that not all agencies within the surrounding jurisdictions will operate on compatible P25 digital systems, and hence may not be able to communicate directly on Delaware County's new system. However, all new radios on the County's new P25 system will have multi-mode capability to offer the greatest flexibility for communications with legacy analog, conventional, or trunking systems. Delaware County hopes to accomplish interoperability with most of its neighboring organizations.

Proposers must detail the options available in the new P25 system to accomplish the desired levels of interoperability and provide pricing for any optional equipment. The County desires maximum flexibility to implement various levels of interoperability quickly and efficiently from the field units or from the dispatch consoles.

Specific training on all aspects of interoperability must be included in the overall training program included with this project. That training must include any technical or functional processes, and any policy or procedural issues which need to be addressed.

5 Technical and Functional Specifications

5.1 Fixed Equipment

The reliability of the Replacement System is paramount to safe and effective radio communications by all personnel. For this reason, the quality, reliability, performance, and specifications of the radio communications equipment are of critical importance. All equipment provided shall meet or exceed current standards of the Electronic Industries Alliance (EIA) and the Telecommunications Industry Association (TIA), and the rules and regulations of FCC. All equipment shall be type accepted by the FCC.

5.1.1 Communications Equipment Sites

The Proposer shall make every effort to utilize existing County communications sites in the implementation of the radio system. Existing towers, and power systems should be utilized wherever possible.

5.1.1.1 Equipment Racks

All electronic equipment shall be mounted in open racks in a neat and efficient manner in such ways and positions that will readily provide maintenance and service access and provide for replacement of components without movement of racks. The racks shall be of metallic construction (aluminum or steel) of sufficient strength that the equipment will be securely supported and of shape and form which will provide for proper cooling. All equipment racks shall be securely anchored to the floor and bonded to the existing equipment shelter ground system. Cable routing shall use existing racks where available.

5.1.1.2 Electrical Power

It is anticipated that the power consumption of the new P25 infrastructure equipment will be comparable to the power consumption of the legacy infrastructure equipment. However, it is likely that a large number of components of the P25 and the legacy systems will require full power simultaneously throughout cutover. The Delaware County Fixed Network Equipment (FNE) sites have sufficient electrical capacity to power all equipment during the transition but may lack the number of circuits to supply both systems simultaneously. The Contractor shall assess the electrical resources available at each site for suitability and, if needed, upgrade the electrical systems to accommodate the replacement system. The County will allow the use of certain circuits to power multiple components on a temporary basis only to facilitate implementation of the replacement system.

5.1.1.3 GPS Frequency Standards

The Contractor shall furnish new frequency standards and associated antennas and connect all new and existing site equipment requiring synchronization to the new frequency standards. Proposers shall identify how the simulcast system will utilize the GPS.

5.1.1.4 Antenna Systems

The Proposer shall have flexibility in the choice of the replacement antennas and shall propose models that they believe would provide Delaware County with the best radio coverage. The Proposer shall comply with all FCC and Region 28 requirements and all County requirements.

5.1.1.5 Transmission Lines

The Contractor shall perform sweeps of existing transmission line systems and provide the comprehensive sweep and return loss data to the County. The existing transmit and receive transmission lines may be considered for reuse if the sweeps pass. Any lines that are determined to be questionable or faulty shall be reported to Delaware County for repair or replacement.

5.1.1.6 Transmitter Combiners

The new combiners must be capable of full 700/ MHz and 800 MHz coverage, and must each be capable of at least twelve (12) transmitter inputs. The Proposer shall describe the possible expandability and maximum limits on expansion for each site in terms of increasing the number of transmitters at a given site.

5.1.1.7 Receiver Multicouplers and Tower-top Amplifiers

All new multicoupler/tower-top amplifier systems shall be equipped with pre-selector filters, tower-top amplifier, variable attenuators, and on the ground test ports, and be of sufficient capacity to support all legacy and replacement receivers.

5.1.1.8 RF Interconnect Cables

The County requires super flexible 1/4" or 1/2" coaxial cable shall be utilized for interconnecting transmitters, combiners, receivers, multi-couplers, and antenna system transmission lines. Standard-type connectors suitable for the 700/800 MHz band with Teflon insulation and gold- or silver-plated mating surfaces shall be used throughout the RF system.

5.1.1.9 Transmission Line Surge Suppressors

All new surge suppressors shall support the 700/800 MHz bands. Wherever possible, the surge protectors shall be installed at the port where cables enter the shelter.

5.1.1.10 Base Station Repeaters and Controllers

The new P25 system shall be designed around P25 digital base station repeaters with the following minimal specifications:

- Mounted on 19” open equipment racks
- 100-watt minimum nominal power output, continuous duty
- Frequency range of 763 to 862 MHz, covering all public safety 700 MHz and 800 MHz bands
- Metering included for all critical parameters for alignment and adjustment

- Primary power source to be 120VAC with battery backup capability
- Separate antenna connectors for transmit and receive, 50 Ohm output impedance
- Redundant site controllers with auto failover
- All solid state and FCC type accepted
- Alarmable Power Sensors
- Local and remote programming ability.

Transmitter

Frequency Range	700 MHz and 800 MHz Public Safety Bands
Power Output	At a minimum, determined by Region 28 approved value and FCC granted license coverage study, adjustable +/-4 dB
Duty Cycle	Continuous transmit
Frequency Stability	+/- 0.0000001%
Output Impedance	50 Ohms nominal
Spurious and Harmonic	-80 dB below carrier
FM Noise	-50 dB for 300 Hz to 3300 Hz, referenced to 1 kHz at 60% deviation
Modulation	P25 – TIA 102 series documents
Audio Response	+1 dB to -3 dB, from a 6 dB emphasis per octave from 300 Hz to 3000 Hz
Transmitter Audio Distortion	<2 percent 1000 Hz with 60% Deviation
Attack Time	<10 milliseconds

Receiver

Frequency Range	700 MHz public safety band and 800 MHz Public Safety band
Frequency Stability	+/- 0.0001% at -30°C to +60°C
RF Input Impedance	50 Ohms nominal
Sensitivity	-119 dBm for <5% BER
Spurious and Image Rejection	-100 dB minimum
Modulation Acceptance	P25/EIA
Channel Spacing	25 kHz, 12.5 kHz offset from FCC and NPSPAC plan
Selectivity	TIA/EIA-102.CAAB Class A - 70 dB minimum at 12.5 kHz EIA, -80 dB minimum at 25 kHz
Audio Response	+1 to -3 of 6 dB per octave de-emphasis from 300 Hz to 3000 Hz for analog
Audio Distortion	<3% at 1000 Hz for analog
Audio Output (Local Speaker)	5 Watt output audio power into 4 Ohms.

(Line Output)	Continuously adjustable from –20 dBm to +10 dBm (0 dBm nominal) at 600 Ohms transformer balanced

The trunked repeaters shall be managed so that the system will dynamically select the communications channels. When a request for communications from a field unit occurs, the controller shall acknowledge the request and assign an idle channel for communications. The proper talk group shall also be assigned. Each transmitter shall be capable of remote configuration through the system management system. The Proposer is to describe the extent of such remote capabilities, including firmware/software upgrades, monitoring features, and supervisory capabilities. Remote metering shall be properly RF decoupled and protected for wire-line or microwave interconnection.

5.1.2 Trunked System Features and Services

The Proposer shall describe the expansion capabilities and limitations of the hardware being supplied for the trunked system. The Proposer shall provide details on the maximum number or combinations of simulcast sites, channels, dispatch positions and mobile and portable radios. In the P25 standards process, the fundamental document is the Users' Statement of Requirements (SoR). The P25 process has agreed that some requirements in the SoR are mandatory for every P25 application, and some requirements could be optional. Delaware County will not accept any trunked radio system proposals that incorporate any non-P25 standard signaling. At a minimum, proposals must meet all of the mandatory requirements of the P25 SoR.

The Proposer shall provide a listing of all system features and functions including a detailed description of each. The system shall allow a transmitting unit access to an available channel and un-mute a receiving unit's speaker with the transmitting unit's audio within a timely manner of pressing the transmitting unit's Push-to-Talk (PTT). The Proposer shall specify the latency between pressing the PTT button and transmission associated with both digital and analog operation modes. If all channels are busy, the system will automatically give preference to higher priority units attempting access. The system shall also indicate to the emergency responder that channels are busy. The Proposer shall describe the extent of priority the system offers.

5.1.3 Encryption and Over-the-Air-Rekeying (OTAR)

As an option, Delaware County requests details and optional pricing for multi-key, 256 bit AES encryption with a single key management facility and one (1) key loader. The Proposer shall provide costs of encryption on a per-channel and per emergency responder radio basis. As part of the Proposers option for encryption, the replacement system's ability to provide P25 standard 'Over-the-Air-Rekeying' (OTAR) capability for mobile and/or portable units shall be described. Proposals shall include appropriate Key Management Facility (KMF) equipment and software, including the DES-OFB algorithm, to affect any proposed OTAR capabilities. Delaware County considers OTAR functions as data transactions, and therefore, they shall not interfere with voice traffic priority.

Specific encrypted system performance requirements include the following:

- When operating in the encryption mode, the system must provide the same voice clarity and intelligibility as the clear mode of operation.

- When operating in the encryption mode, the system shall provide the same coverage as in the clear mode of operation.
- The system shall provide the capability of talk-around operation in the encrypted mode for those units equipped with proper encryption devices.

The Proposer shall describe the system's capability for OTAR including any limitations that rekeying over-the-air has over traditional methods as well as the timeframe required to rekey an individual radio.

5.1.4 Over-the-Air-Programming (OTAP)

As an option the County requests the Proposers to include OTAP functionality as an option. As a result, the replacement system shall provide 'Over-the-Air-Programming' (OTAP) **capability** for mobile and/or portable units so equipped. Delaware County considers OTAP functions as data transactions, and therefore they shall not interfere with voice traffic priority. The proposer shall provide an option for OTAP over WiFi. The Proposer shall describe, in detail, the full capabilities of their OTAP or equivalent technology including the limitations as outlined in the P25 Statement of Requirements (SoR), and any and all manufacturer proprietary features and functionality.

5.1.5 Dynamic Regrouping

From a supervisory dispatch position, the systems shall be capable of dynamically reprogramming the addressing protocol for those groups or constituent individual units that are under the direct control of that particular system manager position. The system manager workstations must have password protection such that each authorized person can alter only their assigned organization's radio programs. Inherent in this requirement is the need to be able to provide a hierarchal and petitioned management system and control platform. Given the above requirement, the authorized staff of Delaware County is to have this control capability for the entire County's system. The access must therefore be multi-layered to provide supervisory dispatchers to have independent control of their emergency responders' radios, and yet permit the County system manager total access to the County's system. Delaware County will have a single, centralized system manager terminal.

5.1.6 Talk Group / Channel Priority

The RF channels shall be automatically assigned by the system controller in response to system emergency responder's requests and according to channel availability and emergency responder assignment priorities. The system shall provide five (5) or more levels of priority. The system manager terminal, along with authorized subsystem or partitioned manager terminals, shall be able to assign individual and/or user group priority levels for field units.

5.1.7 System Queue

If the system becomes fully loaded (all available channels are assigned), requests for service shall be placed in queue according to the priority levels involved. Except for an emergency call, all requests for a channel by any emergency responder while the system is fully loaded shall be placed in queue. The queue shall cause the system to assign channels on a priority level basis as the channels become available. Each block of priority users will be allocated channels on a "first-in, first-out" (FIFO) basis within each priority level. If the design for

the Delaware County system includes multi-site operation (as opposed to a countywide simulcast system that appears as a single site to the controller), the system configuration option set must include the ability to continue the transmissions at sites with available channels in the event that one site has no available channels.

Whenever any unit's channel request is placed into a system's busy queue, the system shall include the suitable option of an automatic callback feature to alert the user when the system is available. The system must have the capability to offer or remove the audible channel grant tone.

5.1.8 Private Conversation

The trunked radio systems shall permit authorized radios to initiate individual private conversations. The specific requirements for this function shall be identified by the County during the detailed design process. These calls, as well as group calls, are to be recorded on the logging recorder.

5.1.9 Selective Alerting

Dispatch console positions and control stations shall be capable of selectively alerting any unit within the associated user group or system, depending on the operator's privileges. This alert shall provide an audible and visual indication at the called radio. The called radio unit shall be able to respond to alert calls without manually selecting the originating caller's user group.

5.1.10 Unit ID

Each mobile and portable radio, control station, and dispatch console position shall transmit a unique and discrete address or user identification (ID) to the system with each transmission. The ID shall be displayed on the associated group dispatch console as well as on any other consoles, RF control stations, control units, or field units that are equipped with ID display capabilities and are programmed for that group and have that group selected.

5.1.11 System Access Time

The Proposer shall specify the actual access time within the proposed trunked radio system and between systems in the network. Individual system access time, under normal operating conditions, shall not exceed 500 milliseconds. In addition to the system access time, the end-to-end time for one mobile or portable radio to key-up and a second mobile or portable radio to start to receive the message shall not exceed a time of one (1) second through the entire system per P25 standards. This requirement does not include transition through an ISSI.

5.2 Reliability and Redundancy

Delaware County requires that wide-area simulcast communications remain intact to the greatest extent possible during various failure conditions. The system shall be designed with robust levels of redundancy and the ability to provide continued trunked communications if a failure occurs. The radio equipment shall meet the mandatory reliability requirements of all related P25 standards.

The Proposer shall provide a detailed fallback plan showing and discussion of all possible system failure conditions and shall define the system's operational capabilities and any limitations that may result from these failures including the impact to dispatch console operations. In the event of a loss of wide-area simulcast trunking, a minimum of two (2) trunking system failure modes shall be provided to minimize the loss of communications system features and functions.

The Proposer shall ensure that each proposed system complies with the following failure mode protection at a minimum:

- Loss of System Control at a Single Site – Proposer shall discuss the programmable features, system configuration and options for site failure modes.
- Loss of System Control at Multiple Sites – Proposer shall discuss the programmable features, system configuration and options for site failure modes.
- Each base station RF channel shall utilize its own transmitter and receiver.
- The system shall degrade gracefully. In the event of channel failure, the system shall automatically transfer its traffic to the remaining operating channels.
- Should a signaling channel become inoperative, the signaling function shall be automatically transferred to one of the remaining operating traffic channels.
- Failure of a traffic channel or signal channel shall be alarmed and identified at the system control center. The controller shall not select the defective channel nor designate it for use but shall continue to assign traffic to the remaining operating channels.
- The system controller shall have the capability to manually "lock out" or disable selected mobile units that are interfering with the proper operation of the system.

5.2.1 Single Point Failure Modes

The proposed system shall be designed to prevent a loss of trunked communications due to any single point failure within the system. The Proposer shall list and define all single point failure modes that will cause the radio system to be degraded into catastrophic failure modes or an operational mode that degrades system functionality. If there are system modifications that can be made to prevent these failures, the Proposer shall include modifications in their proposals as separate line items. All subsystems shall be considered in this evaluation.

During the Acceptance Testing phase, if Delaware County can remove a single module or disconnect a single cable that causes a catastrophic failure, the system shall not be accepted until the Contractor corrects the failed configuration. These modifications shall be at no cost to the County.

5.2.2 Equipment Redundancy

Redundancy shall be employed for all system elements whose failure would result in a major failure of the system, as defined in this document, or constitute a single point of failure of the entire system. As necessary, a suggested list is below:

- System Controllers

- The fixed end control equipment for the County public safety system will be located at the Lima Site.
- The control site for the County trunked radio system shall be the same location.
- The system controllers, any radio frequency gateway devices, and other computer-based fixed end equipment shall be fully redundant and automatically protected against failure using either hot-standby switch-over or a fault-tolerant, multi-processor architecture.
- The system controller shall maintain 100 percent functionality in the event of the failure of one of its redundant elements.
- Fault-tolerant design shall ensure that performance and capacity of the controllers are not reduced by more than ten (10) percent during the failure of any single processor.

5.2.3 Remote Simulcast Site Failure

In the event of the failure of one or more RF sites, the remaining simulcast sites shall maintain full operation. The system should temporarily remove the failed sites from the system to maintain operation at the remaining sites. Proposers shall describe how their simulcast system will maintain operation in the event of this failure.

5.2.4 Network Link Failures

In the event that the microwave network connection is lost to one or more individual sites, but not the entire system, the Proposer shall describe the possibility of these sites remaining operational is some form of ‘reduced-trunking’ mode. Operation of the mobile and portable radios in this mode must also be described. The system shall not be off-the-air for longer than fifteen (15) seconds during the transition to and from this reduced-trunking mode. The Proposer shall utilize the provided self-healing ring/loop and/or alternate path topology for the backbone transmission system to meet County’s availability objective. The County system shall be configured as one or more self-healing rings which interconnect to centrally located fixed-end equipment at all trunked repeater sites.

5.2.5 Site Trunking Mode

Should the wide-area trunked radio system fail to the point that wide-area trunking can no longer be maintained, then the trunking system shall revert to what is commonly known as the "Site-Trunking" mode of operation which reverts to a single-site system.

During this mode of operation, the system shall not be off-the-air for longer than fifteen (15) seconds during the transition to and from the site trunking mode.

5.2.6 Failsoft Mode

Should the trunked radio system fail to the point that trunking can no longer be maintained, the trunking system shall revert to what is commonly known as a "Failsoft" mode of operation. During this mode of operation, the system shall not be off-the-air for longer than fifteen (15) seconds during the transition to and from the conventional fallback mode. The Proposer shall include a detailed discussion of the operation of the Systems “Failsoft” mode in their proposal.

5.2.7 Control Channel Redundancy

The system shall have the capability of assigning multiple trunked repeater stations to perform the control signaling function. When a new control/signaling channel is assigned, radio units shall automatically search for and acquire the new channel. The control signaling shall periodically be rotated between trunked repeater stations. In the event that the control/signaling channel fails, the failure shall be detected and one of the remaining stations shall be automatically assigned to transmit the control signaling.

5.3 Mobile and Portable Equipment

All mobile and / or portable equipment intended for public safety use that is offered under this project shall have been independently tested for compliance to the published MILSTD 810 G standards for temperature, shock, humidity, vibration, salt, fog, dust, blowing rain and, where appropriate, water submersion. The Contractor shall provide authenticated inspection and factory test documentation for all equipment supplied, showing that the equipment meets the specifications.

Portable radios offered as part of this system replacement may have occasion to be used in hazardous atmospheres which require Intrinsic Safety certification. Proposers should provide pricing and options for both intrinsically safe and non-intrinsically safe radios and batteries as part of this proposal. Delaware County intends to utilize mobile and portable radios with different features depending on the emergency responder departments and their operational needs. The term “mobile and/or portable radio equipment”, refers to mobile radios, portable radios, and control station radios. These radios will fall into several classes, from those with the most features and flexibility such as alpha-numeric displays, speaker/microphone/antenna assemblies, etc. to more standard models. Delaware County desires that mobile and portable accessories are standardized to the greatest extent possible to simplify maintenance and reduce spare parts inventories. The Proposer shall describe the features and functionality provided with each proposed mobile and/or portable radio model. All mobile, portable, and control station radios shall be capable of performing all functions and features of the system. To enhance interoperability, Delaware County requires that all mobile and/or portable equipment is capable of operating in the 700 MHz and 800 MHz bands in the same radio. Proposers shall provide per unit pricing for mobile and/or portable equipment based on the general tier descriptions and feature-sets listed below.

Table 1 – Breakdown of Radio Tier Features

Radio Feature	Mid-Tier	High Tier
700/800 MHz Capable	X	X
Group/Channel Selector, 16 Position	X	X
Rotary top-mounted Volume Control	X	X
System Selector	X	X
Minimum Number of Modes	512	512
Speaker Mic w/Antenna	X	X
Public Safety Speaker Mic w/Antenna	X	X
GPS	X	X
Scan Control with Priority Scan	X	X
Alphanumeric Display Backlit	X	X
Partial Keypad with Backlit Keys	X	X

Full Keypad with Backlit Keys		X
Emergency Switch (programmable)	X	X
Over-the-air-Programming	X	X
Multi-Key Encryption (48 minimum)	X	X
Over-the-air Rekeying	X	X
Analog Voice	X	X
Ruggedized Construction Option	X	X
Intrinsically Safe Option	X	X
WiFi		X
AES Encryption		X
Bluetooth		X

5.3.1 Mobile Radios

All mobile radios offered shall meet technical standards recommended by the latest P25 suite of standards and by the latest version of TIA-603. Radios shall be delivered with all necessary channels already programmed. Detailed operational and technical instructions on programming shall also be supplied. Mobile radios supplied under this procurement shall be frequency synthesized with an RF output power of 30 watts minimum, and furnished to operate on all channels in the 700/800 MHz bands capable of operation in the following modes:

- P25 12.5 kHz FDMA trunked mode
- 12.5 kHz TDMA trunked mode
- P25 12.5 kHz FDMA conventional mode
- 12.5 kHz analog FM mode in the 700/800 MHz public safety band.

Proposers shall describe the capabilities of the proposed mobile radios to provide an indication to the emergency responder that the trunked system is operating in a condition that is not normal such as a fallback mode. Responders must have the ability to silence the failure indication tone. A transmitter time out timer shall be provided to limit key down time. All mobile units shall be dash-mount, 10-watt audio external speaker, microphone, and all accessories required for installation and operation shall be included in unit price. Proposers shall include the price of one (1) control unit for each trunk-mounted radio. A remote-mount option shall also be provided for mobile radios with self-contained control heads. Open air mobile units and all external headsets, microphones, and speakers shall be weatherproofed and suitable for outdoor installation. Control head mounting locations shall be subject to the approval of the department being supplied.

Fire, EMS, and special purpose vehicles with intercoms shall be equipped with a water-resistant external speaker and noise-canceling microphone. In addition, when required, pump control units with headsets and water-resistant speakers shall be supplied. Mobiles for fire departments shall be connected to the headset intercom system (if applicable) currently in place on fire apparatus. The mobile radio shall be capable of operation from a nominal 12 VDC primary power source, with positive action reverse polarity protection to avoid damage if the radio were to be incorrectly installed. Mobile radios shall be equipped with priority-scanning capability and shall be capable of scanning a minimum of ten (10) Talk groups/Channels. The operator shall be able to select the Talk groups/Channels to be scanned, to designate and change the priority channel, and to enable or disable the scanning mode.

Additional functional/feature requirements are listed below.

- Dynamic talk group reconfiguration
- System access priority
- Trunking controller failure operating mode
- Selective inhibit and uninhibit
- Visual and audible notification whenever any reduced backbone functionality occurs or operation is localized to autonomous subsystems
- Multikey Encryption (Selected radios) - OPTION
- Over-The-Air-Rekeying (OTAR) (Selected radios) - OPTION
- Over-The-Air-Programming (OTAP) - OPTION
- Emergency Alarm Button - mobile radio control heads shall be equipped with an emergency button which will encode a unit identification and emergency status message when depressed. This indication shall be placed onto the system immediately and shall be decoded and displayed at the dispatch center
- Talk-around and Conventional Operation - Shall provide for direct, simplex, mobile-to-mobile communication on the base station transmit frequency or other frequency, and conventional mobile relay operation.

Status Tones - Audible indication shall be provided for the following operational conditions:

- System busy
- Callback when channel is available
- Site Trunking
- Failsoft
- Time out timer operation
- Access to system denied
- Out of range of trunked system

Control Head

- Mounting - Shall provide for mounting on vertical or horizontal plane mounting surface
- Displays - Shall be clearly labeled and shall be backlit for nighttime visibility
- Microphone - Palm type, with push to talk switch
- Multiple control heads - Some vehicles require a front and rear control head
- An "on / off" switch shall control primary power to the radio set
- A volume control shall regulate the audio level of the speaker
- Indicator lamps (either incandescent, LED, or LCD devices) shall be provided which indicate "radio set on" and "transmitter carrier on" functions
- A talk group selector switch or switches, if applicable
- The ability to send and display short status messages such as Available, En-route, On Scene, etc.

Selective Signaling and Alert Decoder

- Shall allow for selective signaling of mobile units
- Shall provide a visual or audible indication on the radio display of a call waiting

Mobile Antenna Kit

Mobile antennas may be installed on several types of vehicles, depending on their mission and application. Installations shall be in accordance with the mobile radio installation plans schedule, as proposed by the Proposer and approved by Delaware County. The Contractor shall exercise care to ensure compliance with the manufacturer's installation instructions as previously noted. Each mobile antenna kit shall include:

- 3db gain (may be larger or smaller gain depending on final system design) operational across the entire 763-862 MHz frequency range per current FCC requirements
- NMO style base with 17' of Teflex coax or its equivalent
- All required mounting hardware, accessories, and appropriate coax connector.

5.3.2 Portable Radios

All proposed portable radios shall be equipped with a personal, desktop-style, single battery charger, a spare battery of the same type and duty cycle rating as the primary battery provided with the radio, and a standard belt clip. Portable radios not operating in a vehicular charger or adapter should provide no less than 500 milliwatts of audio output power. All proposed portable radios shall be equipped standard with a ½ wavelength whip style antenna operational across the entire 763-862 MHz frequency range per current FCC requirements. The portable radio shall fit comfortably in the hand and permit one hand operation. Transmitter RF power output shall be a minimum of 3 watts. Portable radios supplied under this procurement shall be frequency synthesized and furnished to operate on all channels in the 700 MHz and 800 MHz land mobile bands capable of operation in the following modes:

- P25 12.5 kHz FDMA trunked mode
- 12.5 kHz TDMA trunked mode,
- P25 12.5 kHz FDMA conventional mode, and
- 12.5 kHz analog FM mode in the 700/800 MHz public safety band.

Proposers shall describe the capabilities of the proposed portable radios to provide an indication to the emergency responder that the trunked system is operating in a mode that is not normal. Responders shall have the ability to silence the failure indication tone. The radio handset shall be small, lightweight, and rugged and shall be capable of withstanding severe operating conditions. The portable housing shall be constructed of high impact resistant material and shall be sealed and gasketed to protect internally mounted circuitry against dust, foreign particles, moisture, and splashing water. Proposer will provide the ratings for immersion and dust/particle intrusion. Opening the battery compartment shall not break the seal to the radio circuitry. "Ruggedized" portable radios are preferred as the standard unit to be proposed.

The volume and mode selection controls on the portable radios shall be mounted on the top of the unit for easy access. A rotary control knob shall be provided to select talk groups as desired, simultaneously selecting the correct transmitter and receiver digital code. Other controls shall include a volume control and on-off switch. A sealed transmitter "push-to-talk" (PTT) switch shall be provided on the side of the unit, and an emergency switch shall be provided for user defined quantities of radios. For the purposes of the proposal, Proposers shall use a rechargeable lithium polymer battery (or better), which shall be quickly and easily removed. Battery life, based on a 5% transmit, 5% receive, 90% stand-by duty cycle, measured in accordance with EIA RS- 316 at

250 milliwatts of audio output, shall be at least twelve (12) hours. Batteries shall be capable of full recharge in two (2) hours or less.

Batteries provided shall be capable of withstanding a 3-foot drop test to concrete without damaging battery performance or visibly cracking the battery housing. Radios shall be delivered with all necessary channels already programmed. Detailed operational manuals, technical instructions, and programming software shall also be supplied.

A variable automatic transmit timer shall turn off the transmitter after a predetermined length of transmission and audibly alert the operator that his transmitter is off with a tone. The audio output level of the tone shall be independent of the volume control.

All portables shall be available with a variety of devices such as belt clips, leather cases, etc. Public safety speaker / microphone assemblies shall be available and thoroughly described in the proposal. Furthermore, it shall be possible for an operator to remove the public safety speaker / microphone assembly from a portable radio without the use of tools, and then operate the radio in normal fashion. Speaker / microphones shall not have antennas on the microphone. All speaker / microphones shall use coiled cords to connect the speaker microphone to the radio. Speaker microphones shall be noise canceling. Speaker microphones for the Fire Department shall be water resistant. All portables shall transmit a unique digital identification when the PTT switch is depressed.

System Compatibility - Radios shall be equipped and compatible with the following trunked system software or firmware related functions:

- Dynamic talk group reconfiguration
- System access priority
- Trunking controller failure operating mode
- Wide area operation capability
- Selective inhibit and uninhibit
- Visual and audible notification whenever any reduced backbone functionality occurs or operation is localized to autonomous subsystems
- Multikey Encryption (Selected Public Safety radios) - OPTION
- Over-The-Air-Rekeying (OTAR) (Selected Public Safety radios) - OPTION
- The ability to send and display short status messages such as Available, En-route, On Scene, etc.
- Batch cloning capability
- Over-The-Air-Programming (OTAP) - OPTION
- Emergency Switch - An emergency button / switch shall be provided which, when activated, permits immediate access to a channel and alerts the dispatcher of an emergency transmission. When the emergency button is activated, the transmitter operates in its highest priority mode, and the PTT switch can be used to key the transmitter in that mode. Upon emergency activation, the field unit shall transmit the Unit I.D. and /or alias and emergency message on a periodic basis until acknowledged by the console operator. Activation of the emergency button shall report last know location.

Status Tones - Shall provide audible indication of the following conditions:

- System busy

- Call back when channel available
- Site Trunking
- Time out timer activation
- Access to system denied
- Out of trunked radio system range
- Failsoft
- Other reduced capability indicator.

The Proposer shall also describe the portable radio's P25 compliance in being backward compatible with legacy analog systems and P25 Phase I systems.

5.3.3 Battery Chargers

Cost for battery charging units operating from 120 VAC / 60 Hz primary power shall be provided. All chargers shall automatically switch to trickle charge when the battery is 70% (or more) charged. Lighted indicators shall be provided which will indicate when a battery is charging and also when it is fully charged.

Four types of battery chargers shall be quoted:

- Desktop charger capable of holding a single radio unit or battery
- Multi-unit charger suitable for wall mounting or desktop placement
- Multi-unit battery charger / conditioner capable of diagnosing / restoring battery performance
- Vehicular Charger/Adapter Unit.

Each charger provided shall be tri-chemistry, capable of recharging Nickel Cadmium, Nickel Metal Hydride, and Lithium Ion / Lithium Polymer batteries either connected to, or removed from, the radio set. The charger shall be equipped with manual and automatic full discharge option to first fully discharge the battery to a minimum of one (1) volt per cell and then recharge the battery, or else the bidder shall certify that this feature is not needed, because the batteries being supplied are not susceptible to developing "battery memories."

5.3.4 Control Stations

Control stations, excluding antennas and transmission lines, shall be provided that operate on 120 VAC / 60 Hz primary power. All radio equipment shall be FCC type accepted under Part 90 of the FCC Rules and Regulations. Additional equipment specifications are listed below.

Automatic Radio ID - Shall transmit a digital ID on push to talk.

System Features – Control station radios shall be equipped and compatible with software related features of the trunking system:

- Dynamic talk group reconfiguration
- System access priority
- Trunking controller failure operating mode
- Selective inhibit and uninhibit

- Visual and audible notification whenever any reduced backbone functionality occurs or operation is localized to autonomous subsystems
- Multikey Encryption (Selected Public Safety radios) - OPTION
- Over-The-Air-Rekeying (OTAR) (Selected Public Safety radios) - OPTION
- Software driven tuning and alignment capabilities
- Batch cloning capability
- Over-The-Air-Programming (OTAP) – OPTION.

Emergency Switch - Control stations shall be equipped with an emergency switch which will encode a unit identification and emergency status message when depressed. This indication shall be placed onto the system immediately and shall be decoded and displayed at the dispatch center.

Status Tones - Audible indication shall be provided for the following operational conditions:

- System busy
- Callback when channel is available
- Trunking controller failure
- Time out timer operation
- Access to system denied
- Out of range of trunked system.

Local and Remote Control

- Stations must have basic controls to allow operation of the unit locally, including microphone, speaker, selector switches, and a basic display to show the operating mode(s). Local control can be through a separate desktop unit wired into the station.
- Stations must also be equipped for remote control from another room in the same building, or another building within the same complex. This will normally be accomplished through a 4-wire 600-ohm audio connection, with a desktop unit or full console unit at the other end.
- Indicator lamps (either incandescent, LED, or LCD devices) shall be provided which indicate "radio set on" and "transmitter carrier on" functions.
- A talk group selector switch or switches, if applicable.

Service Facilities - A central metering jack shall be provided for connecting test apparatus to the radio for measuring transmitter and receiver circuitry alignment.

Selective Signaling and Alert Decoder

- Shall allow for selective signaling of radio units
- Shall provide a visual or audible indication on the control head of a call waiting.

Talk-around and Conventional Operation - Shall provide for direct, simplex, radio-to-radio communication on the base station transmit frequency or other frequency, and conventional mobile relay operation. Control station antennas must be chosen and installed to be in conformance with any FCC and FAA requirements and with system design requirements and parameters to ensure system access. The Proposer shall determine the optimum antenna type and gain for each control station location.

5.4 Microwave System Requirements

The Proposer shall design new microwave hops in the 6 GHz to 18 GHz bands for network connectivity to any new sites being added to the Delaware County system. These new hops must integrate seamlessly with the existing microwave loop systems which support critical and sensitive public safety and local government communications. New microwave radios and antennas systems must match or exceed the quality, capacity, and specifications of the existing system as outlined below. Appendix D shows the current microwave hops. Microwave radios should be fully compatible with existing County microwave system. Each new tower site will require the installation of two new microwave antenna systems, one directed to each of the two next closest microwave sites. The Contractor will be responsible for obtaining FCC licenses for all new microwave hops, and for modifying the existing microwave licenses to account for re-direction of existing antennas. Dish model and sizing shall be chosen to provide at least 99.9995% reliability of each new hop.

All new microwave antennas shall be FCC-Part 101-Category "A" compliant, parabolic dishes. All microwave antennas shall be provided with protective radomes, standard four-inch pipe mounts, dual side struts and ice shields. Antennas, side struts, ice shield mounts, transmission lines and grounds shall be attached to the tower in accordance with the manufacturer's instructions and relevant EIA/TIA standards. Antenna systems shall use standard waveguide sizes and rectangular flanges of a consistent type to the maximum extent practical, so as to minimize sparing and tool costs. All transmission lines shall be pressurized jacketed copper elliptical waveguide in continuous lengths without splices and shall be installed in accordance with manufacturers' specifications. All new microwave paths will utilize all-indoor microwave digital radios.

Elliptical waveguide transmission lines shall be of premium quality, use pre-tuned connectors, and provide a measurable return loss equal to or greater than 23 dB, as measured at the antenna port of the radio. Flex waveguide shall not be used outdoors.

An AC-powered, automatic dehydrator of the mechanical, non-desiccant type, and all accessory equipment, including line monitoring for each waveguide and an overpressure relief valve, shall be provided for every microwave site with pressurized transmission lines. The dehydrator shall provide the necessary capacity for all of the waveguides and feed horns with an anticipated leak rate of 1 percent and provide sufficient capacity to maintain a stable pressure during a 19°C (35° F) temperature drop in sixty (60) minutes. All dehydrators shall provide dry contact alarms for at least low pressure, high humidity and excess run time alarms. The Proposer shall provide an inventory of manufacturer recommended spares for all critical digital microwave system network components as necessary to meet Delaware County reliability and restoration times.
All spare equipment shall be uniquely noted and itemized by line-item unit independent of the primary system equipment pricing matrices.

The microwave proposed shall include MPLS-capable radios with throughput capacity that will meet or exceed Delaware County's current needs and for the lifetime of the radio system. The new microwave system is intended to be in use for at least the next 15 years. The Proposer shall design the system to support any reasonable future growth (cameras, alarm system etc.).

The microwave system shall use at least 16QAM modulation at the rate of at least 100Mbps for each link including existing microwave links, to prove the design of new microwave system the Proposer shall submit a path analysis in CDR, to each new link or existing link the had been modified.

The minimum specifications and requirements for the new Microwave Network are:

- Frequency of 6GHz-18GHz
- Support data rate of 100Mbps or higher
- Follow appropriate grounding standards
- New rectifiers (-48V @ minimum 50 amps) with hot standby at all microwave sites
- Batteries with 8 – 10 hour run time
- New IP-based, all indoor microwave digital radios with automatic power control and adaptive modulation
- 1000 Base -T Ethernet/SFP ports
- Hitless receiver switching
- TDM over IP capable
- Alarm card with a minimum of 8 alarm inputs for each site
- Network management system and software
- Minimum 99.9995% path reliability
- New microwave antennas and waveguide
- Waveguide support snap-ins to be used where possible to support the new waveguide
- Dual microwave antenna kickback support braces/stiff arms to be used
- Set of appropriate number of spare cards
- Minimum 2-year warranty from microwave system acceptance date
- Frequency coordination and FCC permits, approvals and licenses.

5.5 Fire and EMS Alerting

The Fire and EMS alerting system proposed must provide, at least, the same coverage as the voice radio system. The alerting system shall be integrated into the proposed console system and allow for single and multiple agencies to be alerting for an incident. The proposed Alerting system shall be fault tolerant and contain no single point of failure that would disrupt communications. Capable of automatic activation of failure modes in the event of a failure beyond a single point. Offerors shall provide a description of the proposed fault tolerance and how loss of a system component (s) shall not prevent alerting.

The paging system shall include audio output for station alerting such as siren and lighting controls. All proposed paging devices shall be equipped with a battery and devices which utilize rechargeable batteries shall be equipped with a charging device. Paging devices shall operate utilizing the new voice radio system infrastructure and capable of operating in:

- P25 trunked mode
- P25 conventional mode.

The proposed pagers shall be constructed of high impact resistant material and shall be sealed and gasketed to protect internally mounted circuitry against dust, foreign particles, moisture, and splashing water. Proposer will provide the ratings for immersion and dust/particle intrusion.

Paging devices must be capable of:

- Capability to combine tone and recorded voice using digital formats (such as .mp3, mp4, wav)
- Out of Range alert
- Text messaging
- Minimum two Talk Group IDs
- Priority Talk Group Scan.

The volume and selection controls mounted on the top of the unit for easy access. If rechargeable batteries are proposed, they shall provide a minimum of fourteen (14) hour service.

Detailed operational manuals, technical instructions, and programming software shall also be supplied.

6 Delaware County 700 MHz Trunked System Coverage Performance and Requirements

Coverage and reliability are the cornerstones of public safety communications. Delaware County has experienced unreliability with the current voice radio system. This system supports Police, Fire, and EMS, throughout the County. As a result of the age of the current system, the County is replacing the system. The intention of this section of the RFP is to provide the Proposers with a clear understanding of the County's performance and coverage requirements for the new system. The information in this section will allow Proposers the ability to develop their system designs based on the County's expectations and requirements.

Information included in this section of the RFP includes:

- A description of the County's jurisdiction and required coverage areas therein
- Delivered Audio Quality Performance Telecommunications Industry Association Telecommunications Systems Bulletin (TSB) TSB-88.1-E DAQ – voice sound quality requirement for the system)
- Level of reliability for coverage throughout the defined coverage areas
- Coverage acceptance testing requirements that will be used to verify performance upon completion of system construction.

Delaware County understands that a major aspect of system design will involve site selection which may include adding additional sites to what the County is currently utilizing. The County requires that the system proposed for this project be capable of meeting the radio coverage requirements (97% reliability on street portable coverage). The County does not intend to add additional repeater sites after the initial purchase. Contractor is solely responsible for any additions needed to pass Field Acceptance Testing. To aid Proposers in system design and development, Appendix B includes a listing of the existing radio tower locations used by the County and a list of the call signs for the radio system. Appendix C provides a list of receive sites used for the existing radio system.

6.1 Definition of Coverage

For the purposes of this project, coverage is defined as successful and understandable transmission both outbound (dispatch to emergency responder) and inbound (emergency responder to dispatch) achieved through the system infrastructure with at least the minimum required level of audio quality. In addition to network communications, quality simplex communications (talk-around) are also required.

6.2 Audio Quality

Audio quality will be determined based on the level of Delivered Audio Quality (DAQ). The table below lists the DAQ definitions as defined by the Telecommunications Industry Association Telecommunications Systems Bulletin (TSB) 88.1-D.

Table 1 – 88.1-DTSB-88.1-E Delivered Audio Quality Definition

Delivered Audio Quality (DAQ)	Faded Subjective Performance Description
1	Unusable, Speech present but unreadable
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion
3	Speech understandable with slight effort. Occasional repetition necessary due to Noise/Distortion
3.4	Speech understandable with repetition only rarely needed. Some Noise/Distortion
4	Speech easily understood. Occasional Noise/Distortion
4.5	Speech easily understood. Infrequent Noise/Distortion
5	Speech easily understood.

As part of the Proposer's response, the County requests the Proposer submit recorded samples of digital voice messages for the DAQ values of 2, 3, 3.4 and 4. Audio samples may be submitted in .WAV or .MP3 format on a CD. **Per the 88.1-DTSB-88.1-E recommendation for public safety, Delaware County will require a DAQ value of 3.4 as the coverage requirement for the new system.**

6.3 Coverage Reliability

The coverage reliability requirement outlined in this RFP will refer to area coverage 97% reliability. The County requires the system meet the DAQ 3.4 performance requirement for portable radios worn at hip level in 97% of the area bounded by Delaware County's jurisdiction. **This means the County requires that 97% of the service area described herein shall exhibit the specified coverage resulting in a DAQ 3.4 97 % of the time at 97% of locations.**

6.4 Mobile Radio Coverage

Delaware County is requiring the system be designed for on-street portable radio coverage. Therefore, mobile radio coverage and performance is expected to exceed that of the portable radios in both audio quality and range. When in a vehicle, it is understood that the emergency responder will be using the mobile radio and not their portable.

6.5 Portable Radio Coverage

The system shall be designed for portable radio coverage on-street with the portable radio and antenna worn at hip level (1m AGL) throughout the Delaware County jurisdiction. The proposals, system design and coverage acceptance testing configuration shall be conducted with the radio and antenna at hip level using a microphone without a microphone antenna.

Proposers must specify the portable antenna that will be used for the system design. The Proposer will be expected to exhibit sample radios with the proposed antenna at their oral presentation after the system proposal has been submitted. Because of the variety of methods for hip mounting and portable carrying cases, the County is asking that the system be designed based on a swivel case on the hip as this is the TSB-88.1-E recommendation for the "worst case" carrying device. However, if the Proposer does propose a portable radio carrying case other than a swivel case, the proposal shall include a description of how the carrying device impacts coverage performance if at all. This information should be included in the proposal with the proposed coverage maps.

In the Proposer's coverage maps, they shall provide signal power that is anticipated to achieve a DAQ of 3.4. The required signal power is based on the reference sensitivity minus the static C/N for reference sensitivity, plus the C/ (I+N) for DAQ 3.4, minus the loss of the portable carrying method minus the building attenuation. The example below is based on TSB-88.1-E. The street level signal for a hip mounted portable shall be -82 dBm. This value was calculated from the TSB-88.1-E formulas for acceptance test plan signal level.

		Running Total
Reference Sensitivity	-119 dBm	-119 dBm
Static C/N	-7.6 dB	-126.6 dBm
Faded C/N for DAQ 3.4	17.7 dB	-108.9 dBm
Swivel Clip Carrying Case	8.5 dB	-100.4 dBm
Building Attenuation	18 dB	-82.4 dBm

The County will accept alternate designs if a DAQ 3.4 can be proven to be achieved through an alternative engineering design. If the body loss value used in a vendor's signal power threshold calculation is less than the value shown for the equivalent configuration in TIA TSB-88.1-E, the vendor shall justify the value used.

6.6 Radio Coverage Prediction

Delaware County is requiring Proposers to submit coverage maps depicting proposed radio system coverage predicted through the use of a radio signal propagation model. The exact propagation model used is at the discretion of the Proposer. The propagation model used should, however, be developed on the basis of theoretical and empirical data and take into account channel bandwidth, modulation type, delivered audio quality, coverage reliability, terrain, land use and land clutter and building penetration losses.
The Proposer must identify the propagation model used in determining the coverage prediction as well as the parameters used in the propagation model. The terrain database used must have a maximum of 1 arc-second of resolution. All maps must follow the same technical range, signal strength and color coding as the reference map (Current System Overview) provided as Appendix A.

The coverage maps should include a legend outlining the following information:

- Coverage type: portable on-street, or portable in-building
- Portable receiver and transmitter location i.e. portable radio at hip level (1 m)
- Delivered Audio Quality requirement
- Modulation type

- Covered Area Reliability shown as percentage of the number of tiles predicted to meet or exceed the DAQ divided by the total number of tiles
- Carrying device option used for the portable
- RF signal level in dBm associated with coverage colors shown on the map
- A simulcast map showing the probability of achieving DAQ 3.4 based on the combination of received signal power and signal delays for the proposed modulation

Delaware County also requires that all Proposers use the following conventions in their map formats to make the evaluations consistent with each other.

- On-street portable coverage with portable radio worn at hip level – 1-meter AGL – with received power shown in the same colors and ranges as shown on the maps in Appendix F and G.

7 Acceptance Testing

It is essential to the County that the new trunked radio system operates properly, both initially and long term. Delaware County and the selected Contractor will collectively develop and execute a detailed Acceptance Test Plan (ATP). This plan will verify proper installation, optimization and performance of the system and the system's components. The ATP can be broken down into two categories, the Coverage Acceptance Test Plan (CATP) and the System Acceptance Test Plan (SATP). The Proposer shall provide a full scope and as detailed as possible ATP with their proposal clearly addressing the requirements set forth in this section of the RFP. This plan will be finalized during the detailed design phase of the project.

7.1 Coverage Acceptance Testing

Coverage testing must be done as part of the overall system acceptance. This testing will verify that the appropriate and required coverage performance is being provided by the new system. Representatives from the County will participate in and supervise every aspect of the coverage testing program.

Two separate test sequences will be performed. With the exception densely urban and congested ares (refered to as area 1), the tile size will be ½ mile by ½ mile. Tiles of ¼ mile by ¼ mile will be used in the area as indicated in the red linesof the map in Appendix I. For visual purposes, Appendix J has close-up maps of four (4) sections of Area 1, refered to as A, B, C and D. Area 1 will be considered a separate test and the results of both test combined and weighted will provide the Coverage Area Reliability.

The first test will be performed in tiles that fall entirely outside of the defined Urban Industrial Area. Where no portion of the tile touches any portion of the Urban Industrial Area. These tiles will be tested for Portable On-Street coverage. The second test shall be for the remaining tiles that are part of Area 1. In this area the testing will be performed for portable on-street with an additional 20dB of attenuation added to the portable radios to simulate building losses. Pass/Fail calculations shall be performed for each portion of this test independently. Both tests need to achieve greater than 97% pass rating for the Contractor to pass the overall CATP requirement. In addition to the overall 97% 3.4 DAQ requirement, the County also requires that no more than three (3) adjacent tiles fail. Adjacent tiles are defined as any two tiles that touch along a face (edge). Tiles that only touch on corners are not considered to be adjacent. If more than three (3) adjacent tiles fail the DAQ test, then the coverage is determined to be deficient, and the Contractor is required to remedy this coverage deficiency, including adding a new site, at the Contractor's sole cost. In the **example** shown below, tiles 1, 5, & 7 are not considered adjacent tiles. Tiles 2, 3, & 6 are considered adjacent tiles.

Adjacent Tiles Example

1	**2**	**3**
4	**5**	**6**
7	**8**	**9**

As part of the CATP, the Contractor shall submit a proposed map showing the test tiles planned for the CATP. All tiles that include any part of the Delaware County primary service area shall be tested, regardless if the center point of the tile is outside of Delaware County. For tiles along the border, it may be necessary to drive outside of the county to access the tile in order to conduct the test and/or take measurements. Any tiles that the Proposer believes to be inaccessible can be indicated on proposed grid maps. However, the final determination of tile accessibility will be reviewed and approved by the county. Every effort will be made to test every tile. Alternate testing vehicles such as boats and ATVs will be utilized when applicable. Final determination of a tile's inaccessibility shall be made by the field team. Tiles that are determined to be inaccessible shall be removed from the pass/fail calculation entirely.

7.1.1 Test Teams

The test teams shall consist of one representative from the Contractor, one from Delaware County and one from the County's consultant. There shall be one test team located in the dispatch center and one test team in the field. Delaware County shall also provide the vehicle (s) and the driver(s) for the on-street testing as well as the critical in-building testing process. The driver(s) shall only be responsible for the proper and safe operation of the vehicle(s) and shall not participate in the audio quality testing. All navigation directions shall be the responsibility of the Contractor's representative and is expected to be provided via an automatic computerized signal measurement system.

For the subjective DAQ audio tests, the team shall exit the test vehicle and get as close to the center of the grid as practicable. The speaker will hail the dispatcher with the test grid id. Once acknowledged the speaker will say the message. The dispatcher will repeat the message. Each team member will classify a transmission as a "Pass" or "Fail". Then the test team must reach a consensus as to whether the test point is a "Pass" or a "Fail". If a test point fails either the outbound or inbound test, the point may be retried once. The test team is to move in any direction up to 3 feet and repeat the test. Upon failure of the retry the grid is confirmed as failing and may not be retried again. In the event the message classification is not unanimous that specific location will need to be retested for the purpose of determining the cause of the discrepancy between the graders. Retries for this purpose are not counted as retries for final scoring purposes.

The speakers shall speak the test messages as clearly as possible and occasionally incorporate voice inflections characteristic of typical emergency responder transmissions. Tests may be repeated at any or all grids as determined by Delaware County to reflect any differences between male and female voice characteristics. It is understood the emergency responders shall use proper microphone utilization by talking directly at the microphone. The test teams will be divided between a central team and one field team. The central team will be located at the dispatch facility to monitor the test, as well as assist in test coordination. The central team will consist of the following:

- Dispatcher or other County staff (speaker)– Provided by the County
- Test Monitor – County's consultant
- Test Monitor – Provided by the Contractor
- Observer – Optional participant provided by the County
- Record keeper (a separate person or define which Test Monitor would perform that function.

The field team will utilize the test vehicle driving throughout the County. This team will consist of the following members:

- Driver – Provided by the County
- Speaker – Provided by the County
- Test Monitor – Provided by the Contractor
- Record Keeper – County's consultant
- Observer – Optional participant provided by the County

7.1.2 Test Vehicles and Equipment

Delaware County will provide all vehicles required for the coverage testing as well as the driver for the field team(s). It is anticipated that the standard test vehicle will be sufficient to hold the test equipment as well as team members plus sufficient room for occasional observers. The same vehicle types and equipment installation configuration shall be used throughout the CATP so that a consistency of data is ensured. For portable coverage testing, each test vehicle will be supplied with a portable radio from the Contractor's stock of radios to be supplied to the County. The Contractor is required to install all test equipment and apparatus in the test vehicles with no damage.

7.1.3 Portable Radio Coverage Testing

The system is to be designed for portable on-street coverage. Therefore, portable radio coverage will need to be thoroughly tested. Subjective audio quality tests to determine the DAQ will be used in specified areas throughout the County for street level coverage. Bit Error Rate (BER) and signal strength will also be measured to provide additional information.

Coverage testing will not begin until the system acceptance testing has been complete. This means that every component of the system infrastructure has been properly installed and fully optimized. Delaware County will request written certification that system acceptance has been completed prior to commencing coverage acceptance testing. Once the coverage testing has been initiated, no system modifications to infrastructure such as component replacement, antenna reorientation or anything else that will affect radio coverage shall take place, unless coverage testing is restarted.

Also prior to radio coverage testing, the following items must be addressed and documented with successful results:

- Repeater / base station output power and deviation for each channel
- Receiver sensitivity for each channel
- Transmit and receive frequency noise floor sweeps for each channel to identify harmful interference prior to coverage testing
- Repeater antenna time domain reflectometry (TDR), VSWR and return loss sweeps for each antenna
- Measured insertion loss for the entire repeater transmit and receive path from each repeater to the associated transmit and receive antennas
- Measured tower top amplifier system gain as configured
- Detailed description of test procedures used to provide the test results
- Current certification of test equipment calibration for all equipment used to verify system performance.

Prior to testing, the Contractor shall make records of the make, model and serial numbers of all radio equipment being used during the radio coverage testing. These records shall also include the software version running on the radio, as well as the programmed settings, activated features, and type of battery in the radio. Portable radios will use subjective DAQ testing. This testing shall be performed using a list of standard sentences supplied by the County. Tests will be performed for both talk-in (portable to dispatch) and talk-out (dispatch to portable). For a test point to qualify as successful, a delivered audio quality of at least DAQ 3.4 must be achieved in both the talk-in and talk-out directions. All accessible grids will be tested within the defined service area will be tested for audio quality with a portable radio.

A failure in either the talk-in or talk-out direction will constitute a failed test call. A failed test call will be subject to a retry. All retries will be counted. However, no more than 5% of the retry attempts will be allowed to pass this portion of the portable coverage testing. If a failed test call does occur, the second (final) attempt must be conducted within the same grid of the failed test call. If this retry-call fails, the test location will be determined to be a failure. All portable radio coverage tests will be performed at walking speed using a portable radio with the proposed antenna, worn at hip level (1 meter above ground level) and equipped with a speaker/microphone. The Contractor shall also supply the test radio with the proper carrying device (i.e. leather case, swivel attachment, etc.) as is clearly outlined in the portable coverage description offered by the Contractor.

The results of the portable radio coverage testing shall be provided to the County with the following information:

- A map with showing the number of test tiles and where within each test tile the DAQ test took place.
- A table with the Pass/Fail scores for each test tile location for each test.
- The percentage of Passes for the test.
- Calculations to show how the overall Covered Area Reliability was determined to compensate for the different tile sizes utilized in the CATP.

7.2 System Acceptance Testing

Prior to beginning coverage acceptance testing, the new system and its components must be properly installed and optimized. As part of the System Acceptance Test Plan (SATP), Delaware County is requiring factory acceptance testing, as well as on-site field testing in Delaware County to assure operational compliance.

7.2.1 Staging and Factory Acceptance Testing

Because the new system will be large and complex, the County is requiring that system “staging” takes place at a Contractor provided facility where any system problems can be addressed. This will allow any issues to be corrected prior to shipping the system infrastructure to Delaware County. The facility provided by the Contractor shall be secure and specifically suitable for public safety radio communication system equipment. The staging environment must be RF and climate controlled. Outdoor staging will not be an acceptable option. Staging will be attended by Delaware County and/or their representatives. Any and all costs associated with attending staging will be paid by the Contractor. The Contractor will be responsible for assembling and staging the system. The testing process for system staging shall simulate as closely as possible the final configuration of the system. The layout of the system in the staging area shall represent geographically the layout of the system

in the field as closely as possible. Prior to demonstration of the staged system, the Contractor shall provide a presentation describing the staging event and schedule. The presentation must identify what equipment is being staged and how the system testing will be conducted.

The following are components and tasks that shall be included in the staging area test:

- Physical review of the system to familiarize the County team with the equipment firsthand
- Overview of the theory of system operation, particularly the redundant operational capabilities designed to keep the system operational when failures occur
- Network Controllers
- All trunking controllers
- All repeater sites
- All simulcast equipment
- All voting comparators
- All dispatch consoles
- Testing of all P25 features including OTAP and OTAR, if the County exercises this option
- Proper operation of simulcast equipment and simulcast redundancy issues
- Microwave equipment, including radios
- Trunked system management system
- Trunked system alarm and monitoring system
- Representative emergency responder radio equipment

At the conclusion of factory testing and staging, the Contractor shall submit three (3) certified paper copies and three (3) electronic copies of the factory test reports to the County for approval prior to equipment being released and shipped to Delaware County. Delaware County reserves the right to approve or disapprove system infrastructure shipment after staging based on the results of the factory test. Upon the County's approval to begin shipment of the system infrastructure, the Contractor shall provide appropriate shipping transportation via a method specifically designed for the safe transportation and delivery of the equipment. In the proposal, the Proposer shall provide their plan for staging and outline what system tests will be conducted during the factory acceptance testing.

7.2.2 Field Acceptance Testing

After the completion of installation and optimization of all system and subsystem components in Delaware County, installation, performance and operational tests shall be performed. These tests shall be performed by the Contractor and observed by County representatives to verify proper operation of all subsystems, features and capabilities of the system. Physical inspections of all sites will be conducted to ensure the quality and accuracy of the equipment installation. The Contractor shall provide all test equipment required for the Acceptance Test Plan (ATP). All test equipment must be calibrated to match the appropriate calibration recorded for the system equipment. The Proposer shall provide an outline of their proposed Functional Acceptance Test Plan (FATP). The FATP shall include all procedures to be followed, equipment to be used and the pass/fail criteria to be utilized to verify system performance. The FATP must include a table comparing the required tests listed in the RFP to all tests to be performed during staging. A final FATP shall be submitted by the awarded Contractor during contract negotiation.

7.2.2.1 Functional Acceptance Tests

The functional acceptance tests, included in the proposal must, at a minimum, include the following test procedures:

- Verification that all equipment has been delivered and properly installed in a manner in accordance with this RFP and the negotiated contract.
- Demonstration that all equipment meets specification.
- Verification that all functions and features are performed according to specification and the terms agreed to in the contract.
- Verification that system redundancy capabilities function properly.
- Successful completion of dispatch console operation.
- Successful completion of system coverage testing.
- Successful completion of a 60-day burn-in test – If a major failure occurs during the 60-day burn-in test, the time period will restart. If a minor failure occurs and is corrected in a timely manner, the original 60-day period will continue.

7.2.3 System Reliability Features

The Proposer shall devise a plan for testing the system's redundancy and fallback mode operation for cases of failure. Tests to be performed shall include, but not be limited to the following:

- Commercial power failure at transmission sites and proper operation of the auxiliary power systems
- Commercial power failure at repeater sites and proper operation of the auxiliary power systems and the system as a whole.
- Automatic switching to backup equipment
- Response time for transition to backup system
- Trunked signaling channel failure and proper response
- Repeater failures and appropriate alarm reporting functions
- Trunked site failure, proper alarm reporting and system response
- Network Controller failure and proper system response
- LAN/WAN equipment failures
- Frequency standard failure
- Remote site controller failure
- Field radio behavior under system failure modes
- Loss of connectivity

Proposers shall include in their plan any additional tests that reflect potential failure scenarios in the proposed system.

7.2.3.1 Trunked System Features

The following trunked system features, at a minimum, shall be tested and demonstrated for system acceptance:

- Automatic unit identification
- System access time for both encrypted and non-encrypted calls
- Emergency alarm function, with and without all voice channels busy
- Talk group selection and operation for mobile and portable radios, as well as control stations

- Regrouping from control terminal
- Call queuing capability
- Emergency access to voice channel when all channels are busy
- Operation of equipment alarm functions
- Operation of talk group database
- Over-the-air-rekeying (OTAR), if the County exercises this option
- Over-the-air-programming (OTAP), if the County exercises this option
- Interface as appropriate to other radio systems for interoperability
- Encryption operations, if the County exercises this option

7.2.3.2 Base Repeater Site Functions

The following base repeater site functions, at a minimum, shall be tested and demonstrated for system acceptance:

- Transmit frequency and deviation
- Output and reflected power
- Receiver sensitivity
- Receiver multicoupler gain
- Receiver preamplifier gain
- Time domain reflectometry of transmission lines
- Frequency domain reflectometry of transmission lines
- Transmitter combiner loss
- System and site alarm functions
- System optimization
- Proper setting of audio levels and phase delays
- Receiver audio output levels
- Voting system function and level adjustment
- Proper operation of frequency standard
- Proper operation of redundant frequency standard

7.2.3.3 New Microwave Hop Testing and Acceptance

After the completion of installation and optimization of all new microwave hops and subsystem components in Delaware County, performance and operational tests shall be performed. These tests shall be performed by the Contractor and observed by County representatives to verify proper operation of all microwave features and capabilities. Physical inspections of all sites will be conducted to ensure the quality and accuracy of the microwave equipment installation including tests of the following:

- Proper installation and operation of the microwave system equipment
- Proper adjustments of all audio and data levels throughout the system
- Perform and document all microwave system level and optimization tests
- Proper operation of automatic switching during hop failure testing
- Proper recovery after hop is brought back online

7.2.3.4 Communications Console Functions

The following communications console operations shall be tested and demonstrated for system acceptance:

- Proper operation of all talk group and conventional resources
- Proper operation of all signaling and encoding functions
- Proper display of Unit ID and alias database functionality
- Proper operation of cross patch functions
- Proper operation of relay controlled external devices
- Over-the-air-rekeying (OTAR), if the County exercises this option
- Over-the-air-programming (OTAP), if the County exercises this option

7.2.3.5 Mobile and Portable Radio Functions

The following mobile and portable radio functions shall be tested and demonstrated for system acceptance:

- Proper programming and fleet mapping in the radio
- Proper operation of talk group selector switches
- Proper operation of automatic unit identification and emergency switch
- Transmit frequencies
- Transmitter output and reflected power
- Receiver sensitivity
- All proposed radio functions
- Proper operation of battery life display on the radio
- Proper operation of battery and charger
- Operation of accessory functions
- Proper operation of conventional base station selector
- Proper Receive Signal Strength Indication
- Proper site identification display

Because of the number of mobile and portable radios likely to be proposed, 5 % of each type of each radio will be randomly selected and evaluated in conjunction with the tests listed above.

7.2.3.6 Wide-Area Operation

The following wide-area operation conditions shall be tested and demonstrated for system acceptance:

- Verification of automatic wide-area operation throughout the defined coverage area
- Site/system switching parameters
- Site/system switching operation
- Verification of site /subsystem preference operation within radio unit

7.2.3.7 Network Management System

The following network management system functions shall be tested and demonstrated for system acceptance:

- System configuration
- Portable and mobile radio access management
- Manager partitioning
- Diagnostic management
- Dynamic radio commands
- Selective inhibit/uninhibit
- Activity reporting
- User database maintenance
- Activity monitor
- Automatic backup controller database updating
- Alarm system

7.2.3.8 Master Network Switch / Controller

The following master audio switch and network controller functions, at a minimum shall be tested and demonstrated for system acceptance:

- Alarm monitoring and diagnostic functionality
- Disablement of failed voice channels
  - Low forward power
  - High reflected power
  - Unidentified carrier on unassigned voice channel
  - Signaling interface failure between base and controller
  - Audio circuit failure between controller and base
  - Voting receiver failed
  - Voting receiver disabled
- System usage reports
  - System configuration
  - Configuration information for all components in the system
  - Functional configuration of controllers, channels and sites
- Emergency responder device management
  - Manager database (list of system managers)
  - Logged on managers
  - Regrouped radios
  - Inhibited radios
  - Storm plans
  - Commands-in-Progress (regroups, inhibits)
  - Responder device configuration and attributes (by individual, talk group and multigroup)
- Channel usage
  - Identification of calling units by talk group and unit identification number
  - Time of channel access
  - Duration of transmission
  - Classification of call

  - Channel assigned
  - Site or subsystem involved in a call
- Fault management
  - Current alarms
  - Alarm history (daily, weekly, monthly)
  - Alarm history (by component)
  - Technician notes
- Channel access priority levels
- Dynamic talk group reconfiguration
- Selective disablement of field units
- Control of time out parameters
  - Channel hang time (message trunking)
  - Interfering carrier time (length of time site remains enabled without a remote site data link)
  - Remote link failure time (length of time site remains enabled without a remote site data link)
  - Channel fade time (length of time channels remain assigned without a carrier or low speed data present)
  - Emergency call time (length of channel hang time when an emergency call is initiated)
- Channel partitioning

7.2.3.9 Site Grounding and Bonding Verification

High quality grounding and proper installation of the grounding system are important to the County. The ATP shall include inspections of the grounding and bonding system installed at all sites as part of this project. Proper installation practices and requirements are outlined in Section 8 of this RFP. All grounding facilities that are to be installed below ground and buried will be inspected by a county representative prior to burial, but after installation. As part of the ATP, the Proposer shall include their plan for grounding and bonding testing.

7.2.4 Final Acceptance and ATP Documentation

Within thirty (30) days of successful completion of the Acceptance Test Plan, the Contractor shall provide Delaware County with a complete set of test documentation, including the test procedures, dates of tests, locations of tests, project participants, weather conditions, descriptions of any irregularities that occurred during testing, and the results of the tests. The Contractor will also provide a complete map and documentation of the Coverage Acceptance Test. In addition to the test results, the Contractor shall include a complete inventory database of all equipment sold and installed for the County for this project. Infrastructure equipment information must include item description, make, model, model number, serial number and latest software load and version. Responder radio equipment information shall include description, make, model, model number, serial number, latest software load and version and flash code. The Contractor will include all passcodes, login passwords and system identification usernames.

8 Installation and Documentation

8.1 Installation Standards

All equipment provided to meet any section of this RFP shall be Underwriters Laboratories (UL), FCC Part 15 and FCC Part 68 approved and so labeled. The Contractor shall install all components of the new radio system as defined in the approved detailed design document. Rack-mounted equipment shall be installed in lockable closed racks, using minimal floor space. Before the installation of any equipment, the Contractor shall provide a Site Preparation Completion Report. The Contractor shall incorporate any and all comments received into the final document.

The Proposer shall indicate, in the response to this RFP, the installation standards to be used. The Contractor shall install all equipment furnished for the radio system in accordance with good engineering and workmanship practices. The constituent installations shall also conform to appropriate installation standards. All equipment installations shall meet all local codes and ordinances. All standards shall be subject to prior approval. The Contractor is responsible for installing all equipment necessary for the operation of the radio system as described in this RFP, as well as interfacing with any conventional resources. The Contractor's proposal must include comprehensive pricing for the complete purchase, construction, and implementation of the project. This is to include all aspects of the proposal including new towers, shelters, generators, and antennas, including all associated zoning, permitting, and site acquisition costs and fees as needed. Bid proposals shall include an all-inclusive price proposal for a turnkey solution as described in the RFP.

During the detailed design phase, the Contractor shall develop detailed installation plans and procedures to perform the work in accordance with the schedule, implementation plan, and contract documents. After equipment installation, the Contractor shall provide an Installation Completion Report. The Contractor shall incorporate any and all comments received from the County into this final document. An initial and final walk-through will be conducted to determine operational conditions.

8.2 Installation Plans, Procedures and Approvals

The Proposer shall prepare, in response to this RFP, an installation plan, which outlines the installation of the infrastructure equipment on a site-by-site basis. The installation shall be performed in accordance with the overall radio system project schedule, implementation plan, and contract documents. The installation plan shall also include the installation of the dispatch center radio console system and associated equipment, as well as the installation of remote-control terminals. The Contractor shall provide detailed installation plans and procedures showing the proposed installations at each site and facility at least fourteen (14) days before the beginning of work at that site. The Contractor shall not perform any installation work until approval of the proposed plans and procedures is received. All work in the dispatch center shall strictly follow the approved cutover plan for that facility.

The installation plans shall include the proposed plot plan, floor plan, equipment layout, rack elevations, tower elevations, cabling and wiring diagrams, antenna installation drawings, and seismic bracing details. The equipment layout and space requirements shall be identified at each site and included in the proposed installation plans.

8.3 Installation Coordination

The proposed installations shall be approved prior to commencement of a particular stage of work on a site-by-site basis. Installation at any site or facility shall not commence without written approval from the County. The Contractor shall install the equipment within the designated space as proposed in the installation plan; all changes require prior written approval from the County. Access to all existing County facilities shall require prior coordination with the County.

8.4 Equipment Installation Requirements

The Proposer shall provide a copy of its latest installation and quality standards with the response to this RFP. The Contractor shall be responsible for the installation of all equipment furnished for the Voice Radio Project. The equipment shall be installed in accordance with appropriate installation standards. The installation of this equipment shall conform to the applicable requirements outlined in this section, the Proposer's applicable installation and quality practices, and the County's requests. The most stringent of these requirements and guidelines shall govern if a conflict arises during the installation. The County reserves the right to approve or disapprove the use of any portion of the Proposer's standards to which it does not agree. This shall include all metal conduit, trays, racks, cabinets, antennas, transmission lines, electrical service entrance conductors, telephone lines, and other metallic conductors. Active RF equipment shall be mounted in the equipment room. Tower-mounted RF equipment is to be limited to RF receive preamplifiers where these devices are necessary for system design. Where these standards, and/or those listed in this section conflict, the more stringent requirement shall prevail.

The Contractor shall inspect the grounding systems at all facilities and provide a written report delineating any deficiencies and identifying the required corrective action. The written report shall be submitted to the County at least sixty (60) days prior to the installation of new equipment. The County will consider the deficiencies and make disposition in a timely manner. The County may elect to correct the noted deficiencies or have the deficiencies corrected by the Contractor at additional cost. The Contractor shall furnish and install all grounding and bonding conductors and make connections to existing facilities. The conductors shall be Number 6 American Wire Gauge (AWG) copper wire or larger. The Contractor shall provide all grounding and lightning protection equipment, including surge arresters, to comply with the requirements of this section for all equipment installed as part of the project.

Bonding conductors shall be used to bond the various pieces of equipment, conduit, trays, etc. together. A four-wire soil resistivity test shall be performed, and appropriate electrodes installed to meet the ground resistance requirement of less than 10 Ohms.

A ground resistance test shall be performed after ground rods and lines are installed to demonstrate compliance with the requirement. The ground resistance readings shall be recorded and provided to the County prior to site acceptance. A single point ground system shall be used, whenever possible and approved by the County, on all equipment installed as part of the project. The single point ground system installed within equipment shelters or buildings shall be connected to the exterior building/tower ground system. The grounding system installation shall be in accordance with the guidelines outlined in the following section.

8.5 Electrical Installation, Grounding, Bonding and Lightning Protection

The Contractor shall ensure that all equipment is installed, electrically bonded, grounded, and protected in accordance with the latest editions of:

A. NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
B. NFPA 70, National Electrical Code
C. NFPA 72, National Fire Alarm Code
D. NFPA 110, Standard for Emergency and Standby Power Systems
E. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems.
F. NFPA 1221, Standard for the installation, Maintenance and Use of Emergency Services Communications Systems
G. Each single row of equipment shall have a separate ground bus consisting of an AWG #2 or larger solid or stranded copper conductor. Each bus shall be connected to the single point ground window
H. A single cabinet, rack, or enclosure and any associated transmission line or circuit protection devices shall have a ground conductor bonding all components to a single point ground near the equipment installation.
I. The antenna support structure/tower must be bonded to the external ground system using an exothermic weld, if permitted by the tower manufacturer.
J. All ground conductors that compose the external ground system shall be connected using exothermic welding.
K. Transmission lines shall be grounded with properly sized ground kits and connected to the tower and entry bus.
L. The external ground system shall be tested for soil impedance in accordance with MILHDBK- 419A and shall provide a ground resistance of 10 Ohms or less.

The Contractor shall provide lightning surge protection for all metallic cables interfacing with equipment outside the site or facility. This includes alternating current (AC) power, RF cabling to the towers, telephone lines, and other equipment interfaces. All cables in cable trays shall be secured at intervals of no more than thirty-six (36) inches. Cables shall be supported for all runs in excess of twenty-four (24) inches. The Contractor shall provide a cable tray system at each site as may be required and/or as they propose new or replacement trays. The Contractor shall install surge protection devices for all RF cabling and wiring associated with the radio system project.

The Contractor shall identify surge protection deficiencies at existing facilities, if any exist, and recommend changes to the County. In the event that the County does not choose to improve any noted surge protection deficiencies, the Contractor shall take appropriate steps to protect the new equipment associated with the radio system project, including the inclusion of surge arresters in interfaces between equipment.

All coaxial transmission lines to external antennas shall be protected using suitable flange mount (or bulkhead mount, where necessary) surge protectors equivalent to the PolyPhaser IS-50-NX-CI. Telephone lines shall be protected using gas tube protectors that comply with Telcordia GR-1361 specifications.

8.6 General Requirements

These specifications define the minimum requirements and standards for a countywide public safety voice radio system, including related components, accessories and required facility upgrades/construction for Delaware County. The County is seeking a multi-channel, countywide, trunked, simulcast digital, P-25 voice radio solution operating in the 700 and 800 MHz range. The system is expected to support between 2000 and 3000 emergency responders utilizing portable and mobile radios in a public safety environment.

8.6.1 Quality

Proposed equipment shall meet or exceed industry standards for quality and reliability. All materials, parts, assemblies, etc. shall be new, and be free of corrosion, blemishes, or other cosmetic defects.

8.6.2 Certifications

All equipment proposed shall be certified to Part 15, Subpart "J" and, as applicable, Part 68 of the Federal Communications Commission (FCC) rules for Class "A" computing devices.

8.6.3 Warranty

Contractor shall warrant all equipment to be free from defects in material and workmanship, and to operate in accordance with the specifications set forth in this RFP, the successful Proposal, and the Contract with the County for a period of not less than two (2) years from date of final acceptance. Additional warranty and post warranty information can be found in Section 10 of this RFP.

8.6.4 Replacement Part Availability

Proposals shall include product availability and life cycle estimates for:

Infrastructure
Base station/repeater equipment
Responder equipment
Console equipment/software

These estimates will discuss product availability based on the following four periods:

- New System & Add-on Shipments – The period for which a product will be shipped in new systems from the factory and for expanding existing fielded systems.
- Add-on Shipments – The period for which a product will be shipping from the factory for the purpose of expanding existing fielded systems only. New systems will no longer ship with this product.
- Release Support – The period for which a product will be designed, tested, and certified for operation within the P25 system after product cancellation.

- Parts Support – The period for which component parts and board-level repair will be available for a product after a product's cancellation.

The manufacturer of the proposed radio equipment, components and accessories shall maintain a complete stock of all repair components for the system for a period of not less than ten (10) years from the date of Final System Acceptance.

These parts shall be available for same day shipment on an expedited basis 24 hours per day, 365 days per year including weekends and holidays. Additionally, the warranty repair shop shall be properly stocked to support emergency maintenance activities within a two (2) hour response and four (4) hour repair window. The Contractor shall provide a letter in writing that details this requirement and condition as part of the award of this contract.

8.6.5 Utilization of Contractors and Sub-Contractors

Proposers shall be allowed to use contractors and sub-contractors provided the following conditions are met:

- The Proposer shall provide a list of any and all contractors and sub-contractors to Delaware County at the time of RFP submittal. Delaware County maintains the right to reject any contractor or sub-contractor and shall exercise that right via a written response to the Proposer within 5 business days of receipt of the Proposer's intent to utilize a contractor or sub-contractor
- The Proposer shall ensure all contractors and sub-contractors are licensed and eligible to work in the state of Pennsylvania
- The Proposer shall assume all responsibility for contractors and sub-contractors to include but not be limited to workmanship, quality of materials and labor, safety, insurance, site cleanup and completion dates

8.7 Quality Assurance

The County or its assigns shall, at their discretion, provide oversight of any and all installation and construction work. The County reserves the right to stop work at any given location where they believe a condition exists that undermines safety, performance or code violation until such time as the issue or condition is resolved. The Contractor shall work with the County to address such situations in a timely manner. The Contractor shall work directly with the County to resolve issues involving contractors or sub-contractors.

All contractors and sub-contractors shall be held to the same standards as the Contractor with regard to any and all installation and construction work. Both the Contractor and the County must sign off on contractor and sub-contractor work before it will be accepted.

The Contractor shall provide a list of major activities for each site location where work will occur. The Contractor, the County or its assigns must inspect and approve each major activity before it will be accepted. The site will not be accepted until all activities meet the quality expectations of the County. Overall radio system acceptance is addressed in Section 7 of this RFP. Test methods, conditions and thresholds will be determined in the acceptance section as well. Contractors shall ensure all work completed on the site is

completed in a fashion that will not void any warranties provided. Contractor acceptance of any work implies that all materials and craftsmanship meet or exceed standards recognized by warranty language not to void warranties. The Contractor and County agree to resolve disagreements in quality by guidelines expressed in the general requirements section of this RFP.

8.8 Workmanship

The Contractor shall perform all work to the highest industry standards. The Contractor shall take full responsibility for the work of any and all contractors and sub-contractors utilized on the Replacement System. All components of the radio system shall be installed in a neat, clean and professional manner. Equipment shall be installed in the equipment room(s) with appropriate spacing as defined by the County to accommodate maintenance and ensure the safety of personnel. The Contractor shall ensure electrical circuits and resources such as UPS systems; DC power plants and generators are sufficient and not overloaded. The Contractor shall employ dedicated, protected power to all radio components. The Contractor shall ensure all antennas and tower work meet or exceed construction and safety standards and that all transmission lines are positively secured and properly grounded to the tower structure and all antennas and side arms are securely fastened.

The Contractor shall ensure all construction activity meet or exceed all local, state, federal and industry building codes. This includes all tower construction and shelter construction even if the shelter is pre-fabricated off site and simply placed. The Contractor shall comply with all FCC and FAA mandates and regulations that impact a radio system from both a construction and operational stand point. The Contractor shall ensure that all trash, construction waste and other debris generated by the installation and construction process is removed from sites and properly disposed of, for deposition instructions see Section 8.11 of this RFP. The Contractor shall ensure all materials, parts, assemblies, etc. shall be new, and be free of corrosion, blemishes or other cosmetic defects. In the event the Contractor, with County approval, uses existing resources as part of the new system, such components shall be in a condition that both the Contractor and County agree will provide reliable service and not negatively impact service or warranty.

8.9 Software, Manuals, Handbooks and Documentation

The Contractor shall provide Delaware County with a complete system documentation package. Each major component of the system shall include, at a minimum, three (3) printed and one (1) PDF copy of manuals that address the following functions or activities:

- Installation
- Service
- Programming
- Operation

The manuals shall be printed in black ink on 8.5” x 11” white paper utilizing at least a 10-point type font. The individual manual sheets shall be fastened together with a comb-binding, three-ring binder, or other similar positive binding mechanism. Three (3) copies shall be provided to Delaware County. Major components are described as radio consoles, portable radios, mobile radios, control stations, base stations, receivers, voters, microwave systems, system controllers, switches, routers and computers associated with the radio system. Furthermore, the Contractor shall provide the County with similar support material for accessory items such as

UPS systems, DC power plants, antennas, surge protectors and any other components installed by the Contractor or their agent in support of the Delaware County Voice Radio Project.

8.9.1 Software

The Contractor shall provide all software required to use and operate the system. System software includes, but is not limited to, any and all operating software, radio channel software, configuration software, radio programming templates and system diagnostics. The Contractor shall ensure that, at a minimum, the following have unlimited access to these software items, the warranty service shop, Delaware County technical staff, post or extended warranty service shop, as identified in RFP, if different than the warranty shop. The Contractor shall provide Delaware County with sufficient copies and or licenses to utilize the radio system to its fullest ability. The Contractor shall also authorize Delaware County to share such software with a third party radio maintenance vendor of the County's choice if the County chooses to switch repair facilities after the warranty and extended warranty periods.

8.9.2 End User Equipment Support

As many modern radio systems require unit specific programming of portable and mobile radios, the Contractor shall provide Delaware County with the resources to complete such programming. The Contractor shall provide Delaware County with all software, templates (soft and hard copies), and programming cables along with anything else required to complete field unit programming.

8.9.3 Interface cables

The Contractor shall provide interface cables for any radio component that requires interaction with PC based software. Delaware County and or their service partners shall have the ability, in house, to interface with any and all radio system components.

8.10 Codes

The Contractor shall provide Delaware County with all keys, passwords and other such items required for normal routine operation, customer level maintenance and security requirements of the radio system, components and accessories. Furthermore, the Contractor agrees to provide the warranty and post warranty service center utilized by the County for maintenance with all keys, passwords and other such items, to allow for complete system service. All codes, keys, passwords and other such items become the property of Delaware County and the Contractor agrees not to release these items to unauthorized parties without written consent from the County.

8.11 As-Built Documentation

The Contractor shall provide as built documentation to the County upon completion of the voice radio project. As-built drawings shall be provided for each location where work occurs. These drawings shall include, but not be limited to, a compound drawing identifying all structures and utilities on the property; tower stick drawing including identification of all antennas, frequencies and owners; shelter drawings showing all equipment, utility,

back boards placement; system drawings and connectivity drawings. Drawings shall be completed in either AutoCAD or Visio but must be presented to the County as a PDF and three (3) hard copies. The Contractor shall review these drawings with the County or their representatives prior to final acceptance of the drawings by the County.

8.12 Equipment Staging and Delivery

Prior to installation of new system equipment, all system components will be staged by the Contractor and then delivered. Details of the staging requirements are listed along with Factory Acceptance Test Plan information in Section 7.2.1. The following are additional requirements and tasks for staging and delivery.

- System staging must be performed in the United States.

  - Set up and rack the system equipment on a site-by-site basis, as it will be configured in the field at each of the transmitter/receiver sites.
  - Cut and label cables according to the approved CDR documentation.
  - Label the cables with to/from information to specify interconnection for field installation and future servicing needs.
  - Complete the cabling/connecting of the subsystems to each other
  - Assemble required subsystems to assure system functionality.
  - Power up, program and test all staged equipment.
  - Confirm system configuration and software compatibility to the existing system.
  - Load application parameters on all equipment according to input from Systems Engineering.
  - Complete programming of the Fixed Network Equipment.
  - Inventory the equipment with serial numbers and installation references.
  - Complete system documentation.
  - Provide a Factory Acceptance Test Plan.

- Perform Staging Acceptance Test Procedures

  - Test and validate system software and features.
  - Functional testing of standard system features.
  - Conduct site and system level testing.
  - Perform system burn-in 24 hours a day during staging to isolate and capture any defects.
  - Perform County-witnessed tests based upon Factory Acceptance Test Plan
  - Approve Factory Acceptance Testing.
  - Pack system for shipment to final destination.
  - Arrange for shipment to the field.

- For shipment and delivery, the selected Contractor will submit a bill of materials / packing list with two copies for each shipment of equipment. The packing list shall include the following information at a minimum for each component included in the packaging:

  - Manufacturer
  - Model

- Serial number
- Unique identification of the package containing the item

- All items shipped by the Contractor or their suppliers shall also include the above information in a barcode format.

8.13 Shelters, Generators, Antennas

8.13.1 Shelters

Shelters or enclosures must be included in the proposal to adequately protect and secure the communications equipment from unauthorized personnel and outside elements. An HVAC system must also be included in the proposal for the structure or enclosure to ensure normal operating temperatures are maintained throughout the year to protect and extend the life of the communications equipment. Proposers shall include the costs associated with adding new shelters at possible new sites. Proposers shall also provide a plan for sites where new shelters may be needed at current sites to house new equipment and legacy equipment simultaneously prior to cutover.

8.13.2 Generators

Before shipment of the equipment, the generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests of generators shall include, but not be limited to:

- Verification that all safety shutdowns are functioning properly
- Verification of single step load pick-up per latest version of NFPA 110
- Verification of transient and voltage dip responses and steady state voltage and speed (frequency) checks
- Full load test for a minimum of one hour

The Contractor shall provide a complete report detailing the performance of all generators tested. The supplier of the electric generating plant and associated items covered herein shall also provide factory trained technicians to review the completed installation and to perform an initial startup inspection to include:

- Ensuring the engine starts (both hot and cold) within the specified time
- Verification of engine parameters within specification
- Verification that no load frequency and voltage adjusting is required
- Test all automatic shutdowns of the generator
- Perform a simulation of power failure to test generator start-up and Automatic Transfer Switch (ATS) to pick up building load correctly
- Return to commercial power and test generator and ATS to demonstrate correct cycling to normal commercial power
- Perform a load test of the generator, to ensure full load frequency and voltage is within specification by using building load. This test shall be run for a minimum of one hour
- Test and verify all remote indicators and controls.

8.13.2.1 Automatic Transfer Switch (ATS)

The automatic transfer switch shall be compatible with the generator set so as to maintain system compatibility and local service responsibility for the complete emergency power system. Representative production samples of the transfer switch shall have demonstrated, through tests, the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is defined as the electrically operated transfer from normal to emergency power and back to normal power. Wiring must comply with NEC table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular automatic transfer switch and a typical wiring diagram for the entire system. The ATS shall also meet the following ratings and performance criteria:

- The ATS shall be adequately sized to match the generator and shelter electrical systems.
- The automatic transfer switch shall be a 2-pole design rated for 600 VAC 200 amps continuous operation in ambient temperatures of -20 degrees Fahrenheit (-30 degrees Celsius) to +140 degrees Fahrenheit (+60 degrees Celsius).
- The operating mechanism will be a single operating coil design, electrically operated and mechanically held in position.
- A provision will be supplied to be able to manually operate the switch in the event of logic or electrical coil failure.

The ATS shall also feature the following controls at a minimum:

- A solid-state under-voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs.
  - Pick-up and drop-out settings shall be adjustable from a minimum of 70% to a maximum of 95% of nominal voltage.
  - A utility sensing interface shall be used, stepping down system voltage of 120/240 VAC 1 phase to 24 VAC, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.
- Controls shall signal the generator set to start in the event of a power interruption.
  - A solid-state time delay start, adjustable, 0.1 to 10 seconds, shall delay this signal to avoid nuisance start-ups on momentary voltage dips or power outages.
- Controls shall transfer the load to the generator set after it reaches proper voltage
  - Adjustable from 70-90% of system voltage, and frequency
  - Adjustable from 80-90% of system frequency.
  - A solid-state time delay, adjustable from five seconds to three minutes, shall delay this transfer to allow the generator to warm up before application of load.
  - There shall be a switch to bypass this warm up timer when immediate transfer is required.
- Controls shall retransfer the load to the line after normal power restoration.

- A return to utility timer, adjustable from 1-30 minutes, shall delay this transfer to avoid short term normal power restoration.

- The operating power for transfer and retransfer shall be obtained from the source to which the load is being transferred.
- Controls shall signal the generator to stop after the load retransfers to normal.

  - A solid-state engine cool down timer, adjustable from 1-30 minutes, shall permit the engine to run unloaded to cool down before shutdown.
  - Should the utility power fail during this time, the switch will immediately transfer back to the generator.

- The transfer switch shall have a time delay neutral feature to provide a time delay, adjustable from 0.1-10 seconds, during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle.
- A switch will be provided to bypass all transition features when immediate transfer is required.
- The transfer switch shall have an in-phase monitor which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20 electrical degrees within 10 seconds of transfer initiation signal.

  - If the in-phase monitor will not allow such a transfer, the control must default to time delay neutral operation.

- Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays, FAST TEST mode which bypasses all time delays to allow for testing the entire system in less than one minute, or AUTOMATIC mode to set the system for normal operation.

  - The controls shall provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights must be energized from utility or the generator set.
  - The controls shall provide a manually operated handle to allow for manual transfer. This handle must be mounted inside the lockable enclosure and accessible only by authorized personnel.
  - The controls shall provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch will also be used for manual transfer switch operation.
  - The controls shall provide LED status lights to give a visual readout of the operating sequence including:

    - Utility on
    - Engine warm-up
    - Standby ready
    - Transfer to standby
    - In-phase monitor
    - Time delay neutral
    - Return to utility

- Engine cool down
- Engine minimum run

8.13.2.2 Uninterruptable Power Supply (UPS)

The Contractor shall provide single phase, online, double conversion, static type uninterruptible power supplies (UPSs) at each shelter with the following features:

- Surge suppression
- Input harmonics reduction
- Rectifier / charger
- Inverter
- Static bypass transfer switch
- Battery and battery disconnect device
- Internal maintenance bypass / isolation switch
- Output isolation transformer
- Remote UPS monitoring provisions
- Battery monitoring
- Remote monitoring

The Contractor shall perform electrical loading analysis for shelter equipment, excluding HVAC subsystems, during preliminary design to verify UPS size required. All electrical loading calculations shall include a 50% expansion factor, and all assumptions regarding power consumption and duty factor shall be thoroughly explained.

The Contractor shall meet the following quality assurance compliances:

- Electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- UL compliance shall be listed and labeled under UL 1778 by an NRTL.
- NFPA Compliance shall identify UPS components as suitable for installation in computer rooms according to NFPA 75.

The following lists the minimum operational requirements for the proposed UPS equipment.

- Automatic operation includes the following:

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

- When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
- If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.
- If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal AC supply circuit without disturbance or interruption.
- If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal AC supply circuit for fault clearing.
- When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
- If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

- Manual operation includes the following:

  - Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal AC supply circuit without disturbance or interruption.
  - Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

- Controls and Indications: Basic system controls shall be accessible on a common control panel on the front of the UPS enclosure.

The proposed UPS equipment shall meet the following performance requirements.

- Input:
  - Single phase, 3-wire
  - Voltage: 120/240V Nominal
  - Frequency: 50/60 Hz +/- 3 Hz

- Output:
  - Capacity: to be determined by selected Contractor during preliminary design
  - Voltage: 120/240V
  - Frequency: 60 Hz, +/- 3 Hz
  - Maximum Voltage Distortion: 5% at full load

- Minimum Duration of Supply -- If the battery is the sole energy source supplying rated full UPS load current at 80 percent power factor, duration of the supply is 30 minutes.
- Minimum Overload Capacity of UPS at Rated Voltage -- 125 percent of rated full load for 10 minutes, and 150 percent for 30 seconds in all operating modes.
- EMI Emissions -- Comply with FCC Rules and Regulations and with 47 CFR 15 for Class A equipment.
- Electronic Equipment -- Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, and system controls.
- Surge Suppression -- Protect internal UPS components from surges that enter at each AC power input connection and protect rectifier-charger, inverter, controls, and output components.

- Use factory-installed surge suppressors tested according to IEEE C62.41.1 and IEEE C62.41.2.
- Additional Surge Protection -- Protect internal UPS components from low-frequency, high-energy voltage surges described in IEEE C62.41.1 and IEEE C62.41.2. Circuits connecting with external power sources and select circuit elements, conductors, conventional surge suppressors, and rectifier components and controls shall be designed so input assemblies will have adequate mechanical strength and thermal and current-carrying capacity to withstand stresses imposed by 40-Hz, 180 percent voltage surges described in IEEE C62.41.1 and IEEE C62.41.2.

- Rectifier-Charger
  - Capacity -- Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for the duration of the supply under battery power at full load.
  - Output Ripple -- Limited by output filtration to less than 0.5 percent of rated current, peak-to-peak.
  - Battery Float-Charging Conditions -- Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life.

- Inverter -- Pulse-width modulated, with sinusoidal output.

The Proposed UPS system shall be subject to the following tests and inspections:

- Comply with manufacturer's written instructions
- Inspect interiors of enclosures, including the following:

  - Integrity of mechanical and electrical connections
  - Component type and labeling verification
  - Ratings of installed components

- Test manual and automatic operational features and system protective and alarm functions.
- Load the system using a variable-load bank to simulate kilovolt amperes, kilowatts, and power factor of loads for the unit's rating.
  - Simulate malfunctions to verify protective device operation.
  - Test duration of supply on emergency, low-battery voltage shutdown, and transfers and restoration due to normal source failure.
  - Test harmonic content of input and output current less than 25, 50, and 100 percent of rated loads.
  - Test output voltage under specified transient-load conditions.
  - Test efficiency at 50, 75, and 100 percent of rated loads.
- Provide inspection reports.

8.13.3 Antennas

The antennas shall be mounted to the tower using either galvanized or stainless-steel hardware. All support brackets and other installation hardware shall be hot-dip galvanized to provide a long service life. All support brackets and antennas shall be heavy-duty type and shall be installed vertically or down-tilted using the appropriate down-tilt brackets (Electrical down-tilt is preferred). The antennas shall be carefully located to minimize interference. The antennas shall be rugged and designed for a service life of at least twenty (20) years.

The antennas shall be of a high-quality construction commensurate with public safety applications and follow the guidelines below.

- The antenna support structure/tower must be bonded to the external ground system using an exothermic weld, if permitted by the tower manufacturer.
- All ground conductors that compose the external ground system shall be connected using exothermic welding.
- Appropriately sized grounding straps supplied by the transmission line manufacturer shall be installed at the top, bottom, and at mid-point(s) where appropriate, on the vertical runs of each transmission line. An additional grounding strap shall be installed outside the building at the point of entrance to the shelter. The ground strap connection with the transmission line shall be weatherproofed per manufacturer's instructions using the manufacturer's supplied material to preclude corrosion.
- The line shall be swept and return loss measured and documented. The Contractor is to describe the sweep method to be used. Delaware County may want to witness the sweep test, and the County is to get a complete copy of the sweep results.
- All transmission cables shall be labeled at the top, middle, and bottom of the cable to identify the cable. Labels shall be furnished and installed by the successful Contractor and shall be made of materials designed for continuous exposure to outdoor weather.
- Transmission lines should utilize adequate service loops and strain relief at cable interfaces and building entrances.

8.14 Vehicle Installation

The Proposer shall include a list of local contractors authorized to install and maintain mobile radios being proposed.

8.15 Removal of Decommissioned Equipment

8.15.1 Ownership

Delaware County shall maintain ownership of all equipment, accessories, material, racks and other items found in County-owned or leased facilities until such time that the County directs the Contractor to dispose of the property. Once property is released to the Contractor, the Contractor agrees to follow the disposal instructions listed in Section 8.11.4 of this RFP.

8.15.2 Removal of Active Equipment

The Contractor, Delaware County or current maintenance representatives of the County shall not turn off, redirect, reduce effectiveness or remove any active site equipment until such time that all parties agree in writing that taking such action shall not negatively impact the coverage foot print or otherwise place responders at risk.

It is understood that existing active equipment will be competing with new equipment and systems for shelter space, tower space, frequency use, connectivity, power and other resources. The Contractor shall provide a

written plan to the County as to illustrate how resource sharing and active equipment removal will be executed in a manner that protects emergency responders.
Delaware County, via the County technical staff or their maintenance contractor, shall provide the Contractor with technical support with regard to issues that will alter the performance of existing equipment.

8.15.3 Decommissioned Equipment with Resell Value

Delaware County shall clearly identify any and all decommissioned equipment they wish to sell prior to removal from site. Delaware County shall establish a storage location for said items so that the Contractor can remove it from the active site and complete the decommissioning process.

The Contractor shall decommission items for resell in such a manner as not to lessen the resale value. Delaware County shall be the sole recipient of cash from sale of used assets.

8.15.4 Decommissioned Equipment and General Refuse

The Contractor shall properly dispose of all decommissioned equipment, antennas, coaxial cables, packing material, old batteries and any other refuse from the commission/decommission activity associated with the voice radio project. The Contractor assumes full responsibility for proper disposal of refuse generated by themselves and any contractors or sub-contractors they utilize. The Contractor shall provide the County with documentation detailing and confirming what, how and where refuse was disposed. The Contractor shall be held accountable in either civil and or criminal court for illegal dumping of County assets. This documentation should include, but not be limited to, clearly identifying what was taken, the date removed from site, the date disposed of, the name and address of disposal facility and documentation of acceptance from the waste facility or recycle center.

The Contractor shall recycle where practical but must recycle spent batteries and scrap metals. The Contractor shall ensure hazardous materials are properly handled and disposed of; this includes, but is not limited to, beryllium tubes often used in radio final amps. Delaware County shall provide the Contractor with a list of hazmat parts requiring special handling. The Contractor may elect to keep abandoned items but must report this to Delaware County so that Delaware County has a complete record of disposal.

8.15.5 Money Recovered from Recycled Goods

Any monies recovered from the recycling or salvage process shall become the property of the Contractor.

9 Implementation and Payment Schedule

9.1 Project Schedule and Timetable

Due to the age of the County's current radio systems, the County wants to develop and implement the new system as soon as possible. The Proposer must provide a tentative project schedule and Gantt chart including, at a minimum, the below listed tasks.

- Contract Signing / Notice to Proceed
- Completion of system design review
- Training of the technicians responsible for system maintenance
- System staging completed
- Completion of infrastructure installations at end locations
- Infrastructure acceptance testing successfully completed
- Coverage testing successfully completed
- Test documentation submitted to the County
- Initial portable and mobile training
- Programming of all radios and mobile installation completed
- 60-day burn-in successfully completed
- Completion of transitioning the remaining County agencies to the system
- Punch list resolution
- Final System Acceptance
- Decommissioning and remove old equipment to centralized location
- Project completion

A detailed project schedule shall be provided as part of each Proposal. The project schedule shall be referenced to the Contract execution date. The project schedule shall clearly identify tasks to be performed by both the County and the Contractor. The project timeline shall include important milestones and logical breakpoints during which the County and Contractor shall assess the progress to date and prepare for the remaining project tasks.

9.2 Change Procedure

The County may order additions, deletions or revisions to the System by a Change Order or a Change Directive. Additional work performed by the Contractor without prior written authorization by the County will not entitle the Contractor to an increase in the Contract price or an extension of the time to complete the System under the Contract. Change Directives that require additional time, materials, or services to complete may result in an equitable adjustment in Contract price, project schedule, or both. If the County prefers to accept work which is not in accordance with the requirements of the specifications of the System as set forth in the successfully Proposal and the Contract, the County may do so instead of requiring its removal and correction, in which case

the Contract price will be reduced as appropriate and equitable as reasonably determined by the County. With respect to any Change Order for such work performed, Services provided or materials provided by subcontractors or third parties other than Contractor related to site design, construction and/or site development, including, without limitation, architectural and engineering services, towers, shelters, UPS's and generators, the proposed price quote for such Change Order shall be the amount of the subcontractor or third party's final total billing price to Contractor plus a mark-up amount for overhead and profit not to exceed ten percent (10%). With respect to any other Change Order for Services or materials provided by subcontractors or third parties other than Contractor, the proposed price quote for such Change Order shall be the amount of the subcontractor or third party's final total billing price to Contractor plus a mark-up amount for overhead and profit not to exceed fifteen percent (15%).

9.3 Migration and Cutover Plan

Within the telecommunications industry and especially with public safety, cutover is a logical, well-documented process designed to activate new communication systems while minimizing disruption to emergency responders. The Proposer's strategy as it relates to implementing the system will vary from project to project. A cutover plan will require a closely coordinated planning effort incorporating inputs of the County and all of the affected emergency responders.

The Proposer shall submit a detailed plan with a correlated schedule outlining the proposed procedure for migration and cutover. Each phase of project implementation and cutover is to be clearly identified with a detailed description of the tasks, services, activities, roles, responsibilities, milestones and deliverables associated with each phase of the project clearly stated. A complete plan that recognizes the impact of such disruptions is a critical part of the response to this RFP and must be fully described. The Contractor and the County will finalize a mutually agreed upon cutover plan based on discussions held during the contract negotiations.

The County will not accept downtime at a given site for more than fifteen (15) minutes. The Proposer shall specify in their plan how long sites will be down during cutover and migration. The County also limits the downtime of sites to between 2:00 AM and 4:00 AM. It is important that the proposed cutover plan limit disruptions to lower traffic hours. The plan shall also outline how many channels will be down at a given site at a given time and how this number is being minimized. Moreover, any site downtime shall be scheduled with County approval at least five (5) business days in advance. During cutover, the Contractor and any sub-contractors shall follow the plan that was agreed upon and implement the defined contingencies as required. The Contractor along with the County will conduct cutover meeting(s) with emergency responder representatives to address both how to mitigate any technical and communication problem impact to the emergency responders during cutover and during general operation of the system.

9.4 Payment Milestones

Proposers must submit a payment profile as part of the Proposal. This will illustrate those milestones and related deliverables that include a progress payment. The percentage of project payment due at each stage shall be clearly identified, along with the actual dollar amount. Payment profiles which defer significant payment milestones or create even distributions of payments will receive significant weighting in the evaluation process.

Payments will be made as key milestones are reached, in accordance with the following schedule:

Payment Schedule

Milestone	***Payment Percentage***
Design Review Document Complete	10%
System Factory Staging Testing Completes	15%
Infrastructure Delivered, Installed and Field Tested for Acceptance	20%
Mobiles and Portables Delivered and Programmed/Installed	20%
60-Day Burn-In Testing Completed	10%
Final System Acceptance	25%

10 Warranty and Maintenance

Proposers will be evaluated on how they address warranties and guarantees related to equipment and labor, quality of service and support, and proposed extended maintenance and preventative maintenance proposals. Past performance will be considered, as well as performance indicators proposed going forward.

10.1 General Warranty Requirements

The Contractor shall warrant all equipment, software and installation work for a minimum of two (2) years after System acceptance. Warranty shall include all parts, labor and travel necessary to return the equipment to its original working condition. The Contractor (or its representative) shall repair any major (traffic affecting) failure within two (2) hours of notification of a problem at any time (24x7).

Minor (non-traffic affecting) failures must be addressed within four (4) hours and repaired within 24 hours. The Contractor shall provide competent, experienced personnel to execute the required maintenance tasks during the warranty period. All maintenance personnel shall be trained and experienced in standard communications industry practices. Personnel who perform maintenance on the System shall have completed all required manufacturer-approved training for that equipment. Said training, or appropriate refresher courses, shall have been completed within the previous year and evidence thereof shall be provided to the County.

In its response, Proposers shall provide the County with the name, location and capabilities of service facilities that are authorized and certified by the Proposer to provide any or all of the installation, service and maintenance, both initial and continuing. This information is required to demonstrate to the County that the local service facilities are capable of installing, optimizing and maintaining the system provided by this procurement. .

Proposers shall describe the ongoing level of factory engineering and service support that will be available to the local service facility during the installation and maintenance of the system. The organization that provides such support shall be thoroughly described in the proposal.
Proposers shall also detail the response times of factory support, should it be required by the local service facility. The factory support referenced here will be provided directly to the local service facility for assistance in fulfilling the terms of the installation and maintenance agreements; costs for factory support shall be included in your proposal.

Malfunctions that cannot be immediately diagnosed and pinpointed to a certain item of equipment or service will require the participation of all service suppliers (County included) until responsibility for the problem has been established. In no instance shall the failure to resolve the issue of responsibility relieve any supplier of the mutual obligation to restore system operability with the least impact on the availability of the system to the emergency responders. The County reserves the right to adjudicate such matters after the fact and validate charges applicable to the provision of the Contractor. The Contractor shall be the sole point of responsibility to resolve all maintenance matters to the satisfaction of the County. Proposers shall include a list of recommended spare parts in its proposal for this system, to be acquired and stored by the County to expedite future system repairs. The Contractor will then be responsible to repair or replace any spare parts used from County stock within 30 days during the warranty period.

Mobile and portable radio and pager warranty will be extended to all Delaware County response agencies. Mobile and portable radio units must be replaced by spares, and then the failed units must be repaired and returned to the agency within 2 days. Proposers shall also certify that it maintains a stock of replacement parts, or has access to overnight replacement parts, for each item included in the equipment response and is capable of replacing such parts, assemblies, modules, and devices for all equipment included in the purchase as well as updating all appropriate software. In addition, Proposers shall certify that all replacement parts shall remain available to County response agencies for a period of ten (10) years following system acceptance. During the warranty period and subsequent maintenance, proposers shall have the necessary common and specialized test and repair equipment for the components and all ancillary hardware provided in this specification. This includes equipment and software carried to the site for preventative maintenance, troubleshooting and failure repair. It is the intent of the County to contract, for county owned equipment, for maintenance after expiration of warranty period. Proposers shall certify that the local service facility has the appropriate test and repair equipment. There shall be a maintenance log with sufficient detail on each failure or maintenance action to enable the maintenance personnel to analyze the problems within the communications system and take the required corrective or preventative action. This log shall be initiated at the start of equipment delivery and shall be maintained throughout the warranty maintenance period.

The log shall include all equipment purchased under this contract and shall include at a minimum the make, model, serial number, date put into service, unit cost, County asset number, and to whom the unit is assigned. The maintenance log shall be stored in an electronic database and be updateable.

10.2 Optional Extended Warranty

Proposers shall include an option to extend System maintenance on the entire System and provide a yearly cost of maintenance and warranty from year three (3) through year fifteen (15). Maintenance terms and conditions shall be the same as those described for the first two years of warranty coverage. The optional extended maintenance quotation shall be broken down by year, and divided into at least four major categories:

- Infrastructure Services
- Mobile and/or portable Equipment Depot Services
- Fire and EMS Pagers
- Software Maintenance Services

Maintenance proposals shall clearly identify those items covered under the agreement, and clearly delineate items that are not included or conditions that would invalidate the maintenance agreement.

10.3 Manufacturers Service Facilities

Proposers shall identify at least two (2) factory authorized service providers that have the full capability to support the System and components while in and out of warranty. Said providers shall be ranked by distance to Delaware County. Providers listed shall have the ability to meet emergency response times as described in Section 10.4.2 of this RFP. In the event a Proposer does not have two (2) authorized facilities that can meet response times the Proposer shall provide the two (2) closest facilities and identify response time. Delaware County and its representative(s) shall have the opportunity to interview service facilities listed by the Proposer. Delaware County reserves the right to choose the service facility from the selected list. The Proposer shall

ensure the selected factory authorized warranty shop is fully prepared to service the System completely and in a professional and timely manner as described in Section 10 of this RFP.

10.4 Service Response

10.4.1 Definitions

With respect to emergency and non-emergency events the following definitions shall be used.

- Emergency event (traffic effecting) – When a component of the System (excludes portable and mobile radios) fails in such a way as to reduce the effectiveness, reliability, coverage area or usability of the radio system.

- Non-emergency event (non-traffic effecting) – When a component of the System (excludes portable and mobile radios) fails in such a way that produces no harm or degradation of service but still requires timely attention, such as a fan failure. Scheduled event – When work on the radio system such as preventative maintenance, system upgrade or configuration change is likely to reduce radio service to a given area.

10.4.2 Response Times

In the warranty period, the Contractor shall provide emergency event response time of two (2) hours to arrive, four (4) hours to repair from time of first alarm or notification of an issue. The Contractor agrees to pay the County the sum of $1,000.00 per occurrence as liquidated damages, and not as a penalty, when this response time is missed. The obligation to pay the sum shall not relieve the Contractor of the obligation to repair or correct the issue in a timely manner. The purpose of the sum is to compensate the County for the loss of use of the System. The system alarm time stamp shall serve as the start time and the site door open alarm shall document on site status. Time to repair is based on the acceptance of the repair by both the County and the service provider. The County requires similar language in the post warranty maintenance contracts. In the warranty period, the Contractor shall provide non-emergency event response time of four (4) hours to arrive and 24 hours to repair. The County requires similar language in post warranty maintenance contracts.

10.4.3 Maintenance Windows

The Contractor shall request a maintenance window five (5) business days in advance for scheduled maintenance activities that may or may not negatively impact the System. The County shall reply within one (1) business day of request. Contractor can request an emergency maintenance window in the event an issue cannot wait 5 days. Scheduled work, such as routine preventative maintenance, shall have a long-term schedule acceptable to both the County and the service center.

10.4.4 System Availability Metrics

With regard to unscheduled downtime of any System equipment (excluding portable and mobile radios) the Contractor shall maintain a system availability goal of 99.9% over a 30 day period. Unscheduled downtime is not limited to radio equipment failure but includes any incident that disrupts normal radio service. The system

availability metrics shall be delivered by the Contractor or their maintenance provider to the County in the form of a weekly report. The system availability metrics will serve as an operational goal to track the performance and reliability of the System and associated support systems. It is not meant as a punitive tool but as a means of identifying areas where improvements may need to be made. In addition to tracking the system availability percentage, the report shall also identify the number of outages, where they occurred and categorize them as equipment, power, connectivity, access, tower and /or antenna.

10.4.5 Site Access

Repair facility staff shall escort the contractor's representatives upon entering or leaving a site for any reason.

10.4.6 Technical Support

The Contractor shall provide live technical support via phone and web for the entire warranty period in support of field equipment, radio system and components 24 hours per day 365 days per year. Delaware County also seeks this level of technical support in the post warranty period.

10.5 Manufacturers Pass through Warranty

The Contractor shall extend any warranty on any component of the System to comply with the two year requirement, in the form of time, including any pro-rata arrangement, which may be provided by the supplier of the component. All equipment and components installed by the Contractor shall be covered by the warranty of the manufacturer of such equipment or components. The actual manufacturer of any major component shall furnish such extended warranties, and full and complete information furnished to the purchaser to enable purchaser to determine the extent, availability, and equality of the warranty or warranties offered. Copies of such warranties shall be provided at time of delivery.

10.6 Warranty Activation

All warranties shall commence on the date that Delaware County signs the final acceptance agreement. A completed and signed copy of each type of warranty specified herein this document shall be provided to Delaware County at the time of delivery of the completed system.

10.7 Warranty Repair

10.7.1 Basic Warranty

Proposers shall provide Delaware County with a minimum two (2) year warranty on all components of the voice radio project. This warranty shall cover the extension of third party materials and contractor work. Proposers shall ensure that all materials, equipment and workmanship are new and free of all defects. Warranty starts upon final acceptance of the System. However, problems discovered prior to final acceptance as listed in Sections 10.7.2; 10.7.3 and 10.7.4 are expected to be addressed immediately.

10.7.2 Out of Box Failures

The Contractor shall immediately replace any and all out of box failures upon confirmation that an issue exists. The Contractor shall be ready to correct out of box failures in a manner that will not significantly delay the project. The Contractor is responsible for any cost involved in installation, removal, shipping, miscellaneous hardware or any expense generated by the need to make out of box repairs.

10.7.3 Workmanship

The Contractor shall repair/replace any equipment or installation deficiency that results from improper work techniques and practices. This includes the Contractor and sub-contractors. Furthermore, this includes items damaged by accidents and incidents on the job site. The Contractor shall ensure all work is neat, clean, and professional and meets all local, state, federal and industry codes.

10.7.4 Final Acceptance

The Contractor shall repair/replace any items or sub-standard installation practices found during the final acceptance testing and final site walks. The County shall not sign off on any site with outstanding issues.

10.7.5 Post Warranty

Proposers shall provide optional maintenance contracting costs for extending the basic warranty for an additional three (3) years. Maintenance levels and response times of the maintenance contract shall match the warranty requirements and shall include a preventative maintenance schedule. Proposers shall include post warranty maintenance plans their Proposals as an option for the County and realize the County has and reserves the right to choose another post warranty vendor or service facility.

10.8 Warranty Exceptions

Proposers shall provide a written exclusion and exception report upon submittal of the Proposal. Said report shall clearly identify what item(s) cannot meet the warranty requirements and why they should be considered for exemption. Furthermore, the warranty, if any, that does apply should be expressed.

10.9 Repair Parts and Service

Proposers shall demonstrate that they, or their assigned repair shop, have the resources to make all warranty and maintenance contract repairs. It is important for the Proposer to have a local repair shop.

10.9.1 Portable and Mobile Radios

All field units are to be repaired and returned within two (2) business days. Should the Contractor not be able to turn defective units around in two (2) business days, they shall provide the agency with spare.

10.9.2 Transmitter Sites

The Contractor shall make repairs to the transmitter sites in the time frames identified in Section 10.4.2. Should any major component or circuit board need to be removed from service, a spare part shall be installed within the agreed time frame. The damaged or defective part shall be repaired and returned to the spare stock within thirty (30) business days provided the vendor maintains enough spares in the area to meet repair needs.

10.9.3 Spare Parts

Proposers shall provide Delaware County with a list of spare parts and make recommendations on the number of spare units the County should maintain given the Proposer's experience and the size of the System. The spare parts list shall include part numbers, major component association and cost. Proposers shall identify where parts will be stored and ensure that proper storage arrangements have been made to protect parts from physical abuse, electrostatic shock or other such damage. Sparing of the System, its components (including third party items) and responder equipment shall be kept in sufficient quantity to ensure timely repairs of any and all aspects of the System. While the County is willing to purchase a reasonable number of spare parts for System as to ensure rapid repair of the System, the County also expects the Contractor or their representatives to maintain a spare parts cache that can be accessed 24 x 7, 365 days a year including weekends and holidays and expressed shipped within 24 hours in the event of an emergency outage.

10.10 Equipment and Product Support

Proposers shall warrant support in the form of replacement parts and technical support, for all replacement infrastructure equipment for a period of ten (10) years from the date of Final System Acceptance, and mobile and/or portable equipment for a period of seven (7) years from the last date of manufacture of the product. The Contractor shall use commercially reasonable efforts to identify and to obtain replacement parts to meet or exceed Delaware County's specific maintainability requirements. The Contractor shall electronically issue all product cancellation notices to the Delaware County Project Manager throughout the entire replacement implementation and maintenance periods. The Contractor shall provide product cancellation notices within two weeks of the official announcement. The Contractor shall be responsible throughout the project implementation and contract maintenance period for remedying and re-designing if necessary, and at no cost to Delaware County, any replacement system components affected by the cancellation of equipment or software which reduces the ten (10) year product support guarantee. Prior to final system acceptance, no equipment or software shall be included with the system offering that has been identified or announced for cancellation.

Proposers shall state any concerns they may have regarding compliance with this requirement. Along with establishing warranty and repair schedules with the manufacturer, the County request that Proposers outline preventative and extended maintenance schedules for the new equipment. One thing to consider in the development of the maintenance plans is the life cycle of the new equipment. Proposers should specifically outline the life cycle of the new equipment including how long the equipment will be supported and how long replacement parts will be manufactured for the equipment. Requiring life cycle and equipment replacement plans will be important in assuring that the County will not have to completely overhaul the system in the foreseeable future.

11 Training

Radio equipment training is very important to Delaware County. Proposers shall include the necessary training for Delaware County staff to become proficient in the operation and certified to maintain all provided equipment. Such training must include system operation, system management, interoperability and customer level maintenance.

11.1 General Training Requirements

Training shall include a pre-installation session to identify all the system features to be programmed by the Contractor as well as maintenance training after installation and acceptance.
The Contractor shall provide familiarization/maintenance training for all technical personnel during the equipment provisioning and installation phases of the project. This training will ensure familiarization with the system of project leaders and maintenance personnel from the County's staff.

The County seeks training to be provided in the following manner:

- Instructor led classes for County technical staff and trainers for the train the trainer program
- Access to updated web-based training materials throughout the life of the system
- Support materials to provide in house training

On-site training seminars shall be provided and shall include complete training, beginning with basic theory through comprehensive coverage of the operation and maintenance of the equipment supplied under this contract. The Contractor shall supply highly skilled instructing personnel (with extensive training and experience on the equipment supplied under this RFP) and all necessary instructional materials. All manuals, schematics, and other printed materials shall become the property of the attendees.

The training seminars shall include but not be limited to the following:

- Distribution of training literature
- A presentation of the general communications equipment/system theory, configuration, and features
- A description of routine communications procedures, features, and functions with demonstrations and hands-on participation
- Training for maintenance and troubleshooting of all equipment provided.
- Field optimization, maintenance, and repair
- Instructions for depot level maintenance of equipment units, circuit boards, modules, assemblies, etc.
- Troubleshooting to the appropriate level, utilizing County's test equipment provided by the Contractor as part of this procurement.
- Specific training on the simulcast system optimization equipment and procedures

Initial training must be scheduled to take place within two (2) weeks of initial deployment of the new equipment so that the personnel will retain the knowledge obtained. At the conclusion of the overall training program, there must be a performance-based test to validate the effectiveness of the training. In addition, the Contractor must develop and provide a web-based training plan to facilitate ongoing re-training of Delaware County personnel as deemed necessary by the County. The Contractor shall submit a resume, a list of training classes,

and prior client references that have been trained by the Contractor's training personnel. Delaware County may interview the Contractor's training team and shall mutually agree on the training package and the qualifications of the training personnel prior to the development and execution of the customized Delaware County training program. The training costs for the above categories shall be included in the training line items on the Price Sheets. The Contractor shall provide additional information on all applicable training classes for management, emergency responder and maintenance staff available at the Contractor's manufacturing facilities where appropriate.

11.2 Radio System Operational Training

The Contractor shall provide on-site, customized operational training for up to forty (40) members of Delaware County's staff. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. Proposers shall provide a training schedule that correlates to the implementation schedule. The Contractor's highly skilled personnel, familiar with the same equipment as that being implemented, shall conduct the training. This training shall be designed for administrators, agency coordinators, and system managers that require a solid, high-level understanding of the radio system and all supporting infrastructure. The Contractor shall provide one (1) set of manuals per student plus an additional five (5) sets of manuals. All manuals shall be provided in an electronic version such as *.PDF format. Five (5) CD-ROM/DVD copies shall be supplied. The Contractor's program shall include training in orientation, management, and operation of all equipment provided under the following items:

- Overview of the Replacement System
  - Basic operation of system, system components and responder equipment
  - Basic use of the portable and mobile radios
- Use of Replacement System
- Use of Diagnostic Tools
- Fleet mapping
- Database Management and Network Administration
- Use of Network Control and Management System / Alarm Monitoring
- Familiarization and Orientation with Communication Facilities
- Reporting and Utilization Analysis
- Interoperability
  - Implementing interoperability functionality
  - Implementing interoperability functionality of the radio console

The training shall be designed so that, upon completion, a technical staff member will be qualified to comprehend radio system management, the network, fallback design, perform system diagnostics, and operate the mobile and/or portable units. Instruction material should be included as a part of each course and shall become property of Delaware County.

11.3 Radio System Management Training

The Contractor shall provide on-site training for up to five (5) members of Delaware County's technical staff. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. Ongoing training opportunities for new or updated components via internet developed by the

Contractor are also encouraged by the County. The Contractor shall provide on-site training in orientation, management, operation, and maintenance of all radio system management subsystems and associated network elements. The training shall include education on the theory of operation and practical administration and maintenance procedures for the entire system infrastructure and all systems contained therein.

Delaware County may choose to self-maintain all are part of the radio system. The Contractor shall conduct comprehensive training to certify communications personnel who may be maintaining and administering the new radio system. This training shall be conducted in a classroom and lab environment, using training aids, and a comprehensive model of the entire radio system. Training aids such as videos, system diagrams, training manuals showing working functionality, and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a customized system management training manual. In addition to the system management training manual, an electronic version such as *.PDF shall be provided. Twelve (12) hard copies and twelve (12) CD-ROM/DVD copies shall be supplied. The Contractor shall provide, in addition to the customized training plan, and handout material, twelve (12) video DVD copies that would instruct a technical staff member on the operational functions and features of the proposed radio system and mobile and/or portable fleet.
The course content shall include the following, at a minimum, for all network subsystems:

- As-Built documentation structure, numbering system, and configuration control system
- Block diagram and system description
- System and radio programming and fleet mapping
- Use of software applications
- Logging recorder configuration and management
- Database development, optimization, and management
- Client level maintenance

11.4 Emergency Responder Training – Train the Trainer

The Contractor shall provide on-site, “Train the Trainer” type courses for the following categories of equipment if provided:

- Mobile Radios
- Portable Radios
- Control Stations
- Vehicular Repeaters (if utilized)
- Alternative Support Systems and Specialized Equipment (if utilized)

Training shall include system orientation and familiarization that includes theory of operation discussion and equipment demonstration. The training shall be designed so that, upon completion, each student will be qualified to train system emergency responders on the customized Delaware County operation of the specific equipment. For example, the student shall be qualified to train Delaware County first-responders and general government users on the operation of all proposed mobiles and portables. The Contractor shall customize all “Train the Trainer” courses per the County’s satisfaction in conjunction with the specific programming and configuration parameters utilized by Delaware County. Training shall also include programming and installation of the mobile and portable equipment.

The Contractor shall provide training for up to four (4) classes of thirty-five (35) students per class. The Contractor's highly skilled personnel shall conduct the training. Instructional material shall be included as parts of each course and will become property of Delaware County. These courses should include the following topics:

- Implementing all features and functions of the radio
- Basic use of the portable and mobile radios
- Implementing interoperability functionality

Training aids such as videos, system diagrams, training manuals showing working functionality and a qualified instructor shall be available for these classes. There shall be handouts available for all attendees. Each student shall receive a personal "Trainer's Guide" training manual. In addition to the "Trainer's Guide" training manual, an electronic version such as *.PDF (Portable Document Format) readable with the Adobe Acrobat Reader software shall be provided. The Contractor shall provide, in addition to the training plan, and handout material, five (5) video DVD copies that would instruct an emergency responder on the operational functions and features of all proposed radio system mobiles and portables.

11.5 On-Site Radio Usage Training

Delaware County shall provide most of the on-site radio usage training via the train the trainer program identified in Section 11.4 of this RFP. Delaware County does request technical support on site during periods of equipment rollout to ensure that all responders confident in the use of the radio system. This will not be a training class, but rather a technical resource to answer specific questions and concerns that may arise upon rollout. The Delaware County trainers shall take the lead on initial and continued field training.

11.6 Ongoing Training

In addition, the Contractor must develop and provide a web-based training plan to facilitate ongoing re-training of Delaware County personnel as deemed necessary by the County.

12 Proposal Requirements

12.1 Proposer's Background and Qualifications

As part of the response, Proposers shall submit a description of the Proposer's background, qualifications, history and experience in large-scale county and city projects of a similar nature and with the proposed system technology. The County would like to see three (3) references of public safety projects of similar size and scope that have been completed in the State of Pennsylvania or throughout the United States.

Proposers must submit a high-level company organizational chart, as well as a team organizational chart including the members of the proposed project team for the Delaware County Voice Radio Project. Proposers must include resumes, certifications and licenses of all key personnel who will be responsible for the delivery, installation, and services of associated with the project. Proposers shall also identify and describe the experience of any sub-contractors and what their role will be in the project.

12.2 Statement of Work

Sections 4-11 of this RFP outline the statement of work for the Delaware County Voice Radio Project.

12.3 Exceptions and Clarifications

All official clarifications, exceptions or interpretations of the RFP document will be made available as set forth under Section 1.3 – "Inquiries and Questions." The County shall not be held responsible for oral interpretations. Should any apparent discrepancies, omissions, or doubt as to meaning be found in the document the respondent shall at once notify the County as set forth in Section 1.3 – "Inquiries and Questions."

12.4 Manufacturing and Staging

It is the intent of this RFP to purchase a comprehensive P25 Phase II radio system to replace the current countywide system in which the Contractor will be responsible for the new system's entire completion. Proposers who sub-contract any of these components shall be expected to fully comply. System and equipment staging is further described in Section 7.2.1 of this RFP.

12.5 Criteria to Determine if the Proposal is Responsive and Responsible

A requirement for Proposals is that Proposers must be responsible and must submit a responsive offer, as determined by the County in its sole discretion. To be responsive, a Proposal must conform to the criteria described in this RFP. To be responsible means the Proposer has the requisite business integrity, as well as financial and organizational capabilities, to ensure good-faith performance. The evaluation committee and/or Council reserves the right to request additional information and/or presentations that may be necessary in assisting with the selection process.

In addition, the following criteria will be used to determine if a Proposal is responsive:

- Does the Proposer demonstrate an understanding of Delaware County's needs and proposed approach to the project?
- Proposer's demonstrated capabilities and qualifications as determined by reference checks, evaluation of materials, evaluation of construction techniques, and other evaluations.
- Proposer's design, engineering, reliability factors, and equipment capability
- Does the Proposer possess the ability, capacity, skill, and financial resources to provide the service?
- Can the Proposer take upon itself the responsibilities set forth in the RFP (and resultant contract) and produce the required outcomes timely?
- Does the Proposer have the character, integrity, reputation, judgment, experience, and efficiency required by the contract?
- Proposers past performance on similar proposals
- Has the Proposer performed satisfactorily in previous contracts of similar size and scope; or, if the prime Contractor has not performed a contract of similar size and scope, has it (and/or its team members) otherwise demonstrated its capability to perform the contract Delaware County seeks to establish through this RFP?
- Does the Proposer propose to perform the work at a fair and reasonable cost?
- Proposer and its subcontractors are authorized and certified to perform work in the State of Pennsylvania.

12.6 Delivery Dates and Exclusions

Any delivery dates and/or exclusions shall be duly noted in proposers RFP submission and clearly defined in the resulting contract with Delaware County.

12.7 Proposer Responsibilities

Proposer's responsibilities are as follows:

- Provide an on-sight project manager throughout project
- Take responsibility for all contractors and sub-contractors with respect to the quality of work as well as safety and site cleanup
- Design a system that meets the requirements of this RFP
- Attend a pre-proposal conference and facilities tour
- Develop a migration plan from the existing system to the new system that includes shared space and resources through installation, testing, cutover and acceptance
- Clean up all construction and installation trash
- Identify new site locations if any are required
- Site acquisition process including obtaining all zoning, FAA permits and modification of FCC 700 MHz licenses (if necessary) approvals and licenses
- Performing all MPE and RF radiation studies for new and existing sites where required
- Provide all systems, sub-systems, components and responder equipment required to support system design
- Provide warranty for all parts and labor including third party items
- Provide all specialized tools, test equipment, cables, software, templates and other critical items needed to properly and fully use, diagnose and maintain the radio system

- Expand and redirect (if needed) the microwave system to provide backhaul to new sites
- Follow all local, state, federal codes and laws governing the construction and implementation of a radio network to include but not limited to building, zoning, FAA and FCC regulations.
- Provide multilevel training to technical staff, dispatchers and responders
- Coordinate the activities of third party contractors and vendors

12.8 Mandatory Pre-Proposal Conference

All potential vendors must attend the pre-Proposal conference scheduled for **September 1, 2021, at 9:00 AM ET.** This meeting will be held at the Delaware County Department of Emergency Services, 360 N. Middletown Rd. Media, PA 19063. Proposers are responsible for any and all travel and meeting preparation expenses. Anyone planning to attend the pre-proposal conference must register five (5) calendar days in advance to allow the County to properly prepare for the conference. Failure to do so, shall result in disqualification of the vendor (s) participation in mandatory pre-bid conference. The pre-proposal conference is open to all potential Proposers, but no proposals shall be considered by any vendor who fails to send representation to the mandatory pre-proposal conference. To register for the pre-proposal conference, please send the names and contact information of the personnel representing the Proposer, on company letterhead to Director Delaware County Central Purchasing Department CentralPurchasing@co.delaware.pa.us and Ali Shahnami of ACD Telecom at ali.shahnami@acdtelecom.com no later than **August 27, 2021, at 5:00 PM ET**. Proposers have the opportunity to ask questions prior to the pre-Proposal meeting. These questions should be emailed to Director Delaware County Central Purchasing Department CentralPurchasing@co.delaware.pa.us and Ali Shahnami of ACD Telecom at ali.shahnami@acdtelecom.com no later than **August 27, 2021, at 5:00 PM ET**. Questions regarding the radio system or facilities may be answered at the pre-Proposal conference. Answers to all questions involving the general requirements of the proposed radio system will be shared with all potential Proposers as described under Section 1.3 – "Inquiries and Questions."

12.9 Mandatory Site Locations and Pre-Proposal Inspection Visits

All potential vendors must attend the mandatory site visits that are scheduled for September 1 – September 3, 2021. Further instructions for mandatory site visits will be provided at the Mandatory Pre-Proposal Conference. Due to capacity and spacing, please make sure there are no more than two (2) representatives per firm attending site visits. Two of the sites are within secure areas, as a result, the Name, Date of Birth and Social Security Number of those attending the site visits will be required for access. This information must be provided three (3) business days prior to the start of the pre-proposal conference to John Haynes, Project Manager ACD Telecommunications (484) 364-0887 or John.Haynes@ACDtelecom.com. Delaware County will conduct a tour of key facilities, including locations that are expected to house radio equipment. This tour and the opportunity to ask questions shall be included in the mandatory pre-proposal conference. Proposers should ensure the proper personnel attend. The primary purpose of these visits is driven by the fact the County has elected to reuse facilities wherever possible. Of particular concern to the County is the need to have new equipment co-located with existing equipment during the installation, cutover and acceptance phases of the project.

It is imperative that Proposers understand the existing facilities and fully appreciate the limited resources that the new system will be sharing with the existing system during the critical switchover time. Systems will need to share items such as but not limited to, tower space, spectrum, floor space, power, HVAC load and microwave

bandwidth. It is expected that the site visits will take 2-3 days to complete. Proposers are responsible for designing a county-wide radio system for the County that meets or exceeds the requirements established throughout this RFP. These site visits are intended to provide proposers with firsthand knowledge of the existing facilities and resources available and insight to possible problems and concerns that could influence system design.

12.10 Local Support

Local support is vital to the success of this project both during and after implementation. The Contractor shall have a project manager on site during the installation, construction, cutover and acceptance phases of the voice radio project. The Contractor shall have the local authorized service center fully involved in the installation, cutover and acceptance process. Where possible and economically practical, the Contractor shall utilize local contractors for electrical, HVAC, general construction, tower construction and other tasks where the Contractor intends to employ third party labor.

12.11 Authorized Service

The Contractor shall provide factory authorized service for the entire warranty period on the System, sub-systems, components and third-party equipment. The Contractor shall also provide the County with a post warranty service contract with a factory authorized service center. Proposers shall provide the County with the name and location of the two closest authorized service centers and provide the County with the option to inspect, interview and select the facility of their choice. Factory authorized service shall respond 24 hour per day, 7 days per week, 365 days per year to all emergency situations. The service shop shall also provide technical support to County Radio staff as needed during the warranty or any post warranty maintenance contract period. Authorized service facilities shall be capable of meeting the response times indicated in Section 10.4 of this RFP.

12.12 Test Equipment

The Contractor shall ensure that both the factory authorized service center and Delaware County's technical staff have access to any specialized tools, test equipment, cables and software needed to diagnose and maintain the proposed radio system, sub-systems and components to its fullest capability.

Delaware County is to have all customer-level maintenance tools and test equipment and the authorized service shop is to have the full support of the Contractor to ensure they can make timely and proper repairs to the system. The Contractor shall ensure that any post warranty service facility has an equal opportunity to purchase specialized tools, test equipment, cables and software to support diagnostic and maintenance activities beyond the warranty period.

12.13 Life Cycle

Proposers shall provide realistic life cycle data on the proposed radio system, sub-systems, components and third-party equipment. Delaware County expects the proposed radio system as a whole to remain in service no less than twenty (20) years. Understanding that some components may have a shorter life, the County has elected to utilize P25 technology to allow upgradability and scalability of the radio system over the years. Proposers shall provide the County with the anticipated last date of manufacture and sale of the proposed radio system. If a Proposer cannot provide a specific date, the Proposer shall guarantee manufacture beyond twenty (20) years. Additionally, the Contractor shall support available software and firmware upgrades for two (2) additional years after last date of manufacture. Furthermore, the Contractor shall manufacture and provide spare parts for ten (10) years after last date of system manufacture and shall provide end of life notification in writing of any and all components two (2) years prior to last day of manufacture. The Contractor shall provide the County with the opportunity to purchase additional spare parts upon notification of end of manufacturer's support prior to the actual end of production of any component of the radio system.

12.14 Project Manager

Proposers shall designate a single point of contact as the Project Manager for the project. The County reserves the right to accept or reject the proposed PM at its discretion.

12.14.1 Duties

The Project Manager (PM) is assigned the management of the project and the work performed under assigned purchase orders. The PM will perform day-to-day management of the project, identify issues and risks and recommend possible issue and risk mitigation strategies associated with the project. The PM will act as a facilitator between the County representative / PM and the Contractor and is responsible for ensuring that work performed under POs is within scope, consistent with requirements, and delivered on time and on budget. The PM will identify critical paths, tasks, dates, testing, and acceptance criteria, and provide solutions to improve efficiency (e.g., reduce costs while maintaining or improving performance levels). The PM will also monitor issues and provide resolutions for up-to-date status reports and must demonstrate excellent writing and oral communications skills.

12.14.2 Experience

The proposed PM shall have at least ten (10) years of experience in project management. The PM shall also have at least five (5) years of experience in managing large-scale system projects Public Safety related LMR and must demonstrate a leadership role in at least five (5) successful projects that were delivered on time and within budget. The PM's resume must be included in the proposal.

13 Required Forms

CORPORATE DETAILS:

COMPANY NAME: _____

ADDRESS: _____

_____

TELEPHONE: _____

FAX #: _____

E-MAIL: _____

Name of Person submitting Bid: _____

Title: _____

Signature: _____

Date: _____

Area Representative Contact Information: _____

ADDENDA ACKNOWLEDGMENT:
Bidder acknowledges receipt of the following addendum:

Addendum No. _____ Date: _____ Acknowledged by: _____
Addendum No. _____ Date: _____ Acknowledged by: _____
Addendum No. _____ Date: _____ Acknowledged by: _____

Price Sheet – Control Site Equipment and Services

Description	QTY	Unit Cost	Extended Cost
Control site Trunking Controller		$	$
Control Site Audio Switch LAN/WAN Equipment		$	$
Control Site Server/Client Equipment		$	$
Control Site Alarm Monitoring Equipment		$	$
Control Site Other Equipment		$	$
Control site Microwave Equipment		$	$
System Management & Alarm Terminals		$	$
Computer Based Logging Computer Costs		$	$
Services: Upgrade of Equipment Room/Shelter		$	$
Services: Installation, Project Management, Engineering, Optimization, Programming, and other services related to Control site		$	$
Total Control Site Equipment and Services		$	$

Price Sheet – Simulcast Site Equipment and Services

Description	QTY	Unit Cost	Extended Cost
Simulcast Trunking Controller		$	$
Simulcast LAN/WAN Equipment		$	$
Simulcast Audio Distribution		$	$
Simulcast Receiver Voting		$	$
Simulcast Sync Equipment		$	$
Simulcast Microwave Equipment		$	$
Simulcast DC Power System		$	$
Simulcast Tower		$	$
Simulcast Site Equipment Shelter		$	$
Simulcast Site Work		$	$
Services: Installation, Project Management, Engineering, Optimization, Programming, and other services related to Control site		$	$
Total Simulcast Site Equipment and Services		$	$

Price Sheet – Recommended Spare Infrastructure Equipment

In the following price sheet, list Proposer-recommended spare equipment separately so that the County understands the extent of spare equipment contained in the system. As stated in the RFP, the County requests proposers to recommend spare equipment that will be required for proper warranty service and ongoing maintenance of the system.

Spare Equipment (Itemize)	Quantity	Price
Total Recommended Spare Equipment		

Price Sheet – Emergency Responder Mobile Radios

Description	Quantity	Unit Cost	Extended Cost
Digital P25 Mobile Radio			
Dash Mount			
Remote Mount			
Dual Control Head			
Digital P25 Multiband Mobile Radio			
Dash Mount			
Remote Mount			
Dual Control Head			
Alphanumeric Display			
Partial Keypad			
PTT-ID			
Emergency Alert			
Priority Scan			
Individual Call and Call Alert			
Signal Level Indicator			
AES Single-Key Encryption			
AES Over-the-Air-Rekeying (OTAR) (Optional)			
External Speaker			
Over-the-Air-Programing (OTAP)			
GPS Location (Optional)			
Services: Installation, Programing and other services related to mobile radios			
Total Mobile Radios and Related Services			

Price Sheet – Emergency Responder Portable Radios

Description	Quantity	Unit Cost	Extended Cost
Digital P25 Portable radio			
Digital P25 Multiband Portable radio			
Alphanumeric display			
Full Keypad			
PTT-ID			
Emergency alert			
Priority scan			
Individual Call and call Alert			
Battery Power Level Indicator			
Signal Level Indicator			
AES Single-Key Voice Encryption			
AES Over-the-Air Rekeying (OTAR0 (Optional)			
Intrinsically safe (Optional)			
Single Unit Charger			
Vehicular Charger			
Muli-Unit Charger			
Battery Analyzer/Conditioner			
Standard Speaker Microphone			
Heavy Duty Speaker Microphone (Fire)			
Spare Batteries			
Over-the-Air-Programming (OTAP)			

GPS Location (Optional)			
Blue Tooth			
Services: Installation, Programming and other services related to portable radios			
Total Portable Radios and Related Services			

Price Sheet – Emergency Responder Control Station Radios

Description	Quantity	Unit Cost	Extended Cost
P25 Control Station radio			
Tone Remote Desk set for Control Station Radio			
Alphanumeric Display			
Partial Keypad			
PTT-ID			
Emergency Alert			
Priority Scan			
Individual Call and call alert			
Signal Level Indicator			
AES Single-Key Encryption			
AES Over-the-Air-Rekeying (OTAR) (Optional)			
Over-the-Air-Programming (OTAP)			
Battery Backup (UPS)			
Antenna System, Lightening Protection, Grounding			
Services: Installation, Programming and other services related to control station radios			
Total Control Station Radios and Related services			

Price Sheet – Fire and EMS Alerting

Description	Quantity	Unit Cost	Extended Cost
System design and installation			
Programming Cables and software			
Pagers	1,000		
Desk Chargers	1,000		
Amplified chargers with relay output (station alerting)	100		
Engineering			
Project Management			

Price Sheet – Training

Description		Cost per Session	Extended Cost
Pre-Installation	11.1		
Maintenance	11.1		
Radio System Operational Training	11.2		
Radio System Management	11.3		
Emergency Responder	11.4		
On-Site Radio Usage	11.5		
Ongoing Training	11.6		
Total Training			

Pricing Summary

The following price sheet summarizes the previous price sheets to enumerate the total project cost. This Price sheet also specifies any cost reduction measures that may be offered by the Proposer. Proposers are encouraged to include any creative cost reduction options that may be available. For services see second table on this page.

Control site equipment and services	
Simulcast Site equipment and Services	
Recommended spare Infrastructure Equipment	
Emergency Responder Mobile radios	
Emergency Responder Portable radios	
Control station radios	
Fire and EMS Alerting	
Training	
Total Base Project Cost (before adjustments)	
Cost Reduction Incentives	
Cost Reduction Incentives	
Cost Reduction Incentives	
Cost Reduction Incentives	
Cost Reduction Incentives	
Total Base Project Cost after adjustments	
Total Base Project Cost with Options	

Breakdown of Services

While it is understood that the costs of services have been included and distributed throughout the preceding price sheets, the County would like to know how the services are broken down for informational purposes. Please add any additional categories as needed.

Project Management	
MPE Study for all Sites	
Visual Impact Study for Proposed New Sites	
Zoning and Building Permits for Proposed New Sites	
Microwave Path analysis for all sites	
Historical Impact Analysis for Proposed New Sites	
Environmental Impact Study for Proposed New Sites	
Engineering	
System Staging	
Installation	
Functional Acceptance Testing	
Coverage Acceptance Testing	

Pricing for Recommended Maintenance

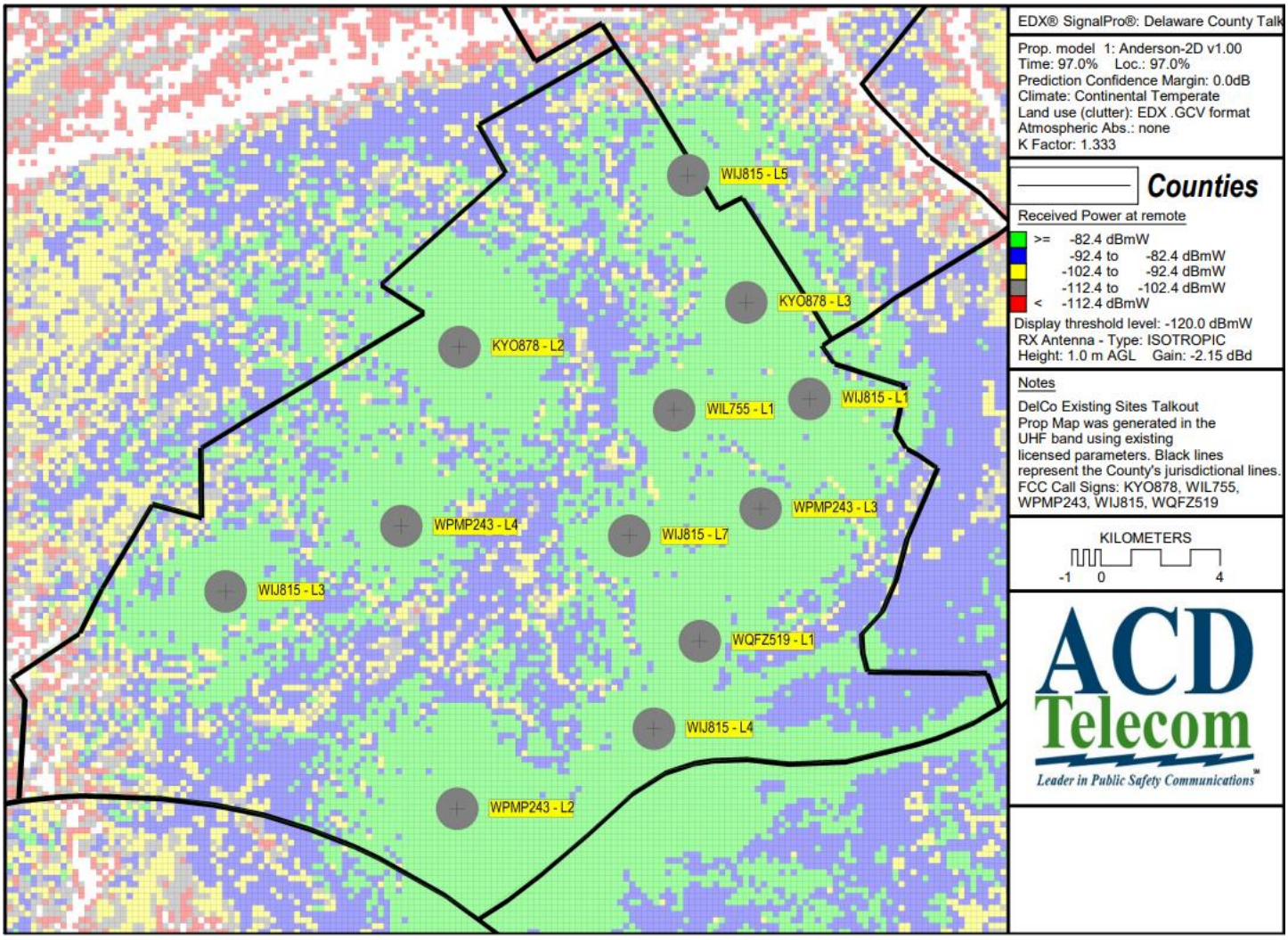
The following price sheet is for additional years of maintenance following the proposed 2 year warranty period

	Corrective Maintenance	Preventive Maintenance	Total Maintenance
Year 3			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 4			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 5			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 6			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 7			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 8			
Labor for Infrastructure Equipment			

Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 9			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 10			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 11			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 12			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 13			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 14			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			

Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
Year 15			
Labor for Infrastructure Equipment			
Labor for Microwave Equipment			
Labor for Dispatch Equipment			
Labor for Mobile, Portable, Paging and Control Station Equipment			
Cost of Parts			
% Discount off list Price for ongoing Service and Maintenance Equipment			%

Appendix A – Current System Overview Map



Appendix B – Current and Potential Site Parameters

App Stat

Exisitng Sites per FCC Licenses + Proposed Sites for Delaware County New 700MHz System

ly	TCAP21051715006228
ready	TCAP21030216006068
Ready	TCAP21051710006226
Ready	TCAP21052410006236

quencies 772.50625MHz & 772.05625MHz were obtained from F

Loc #	FCC License - LOC #	Site Name	ASR#	Lat	Long	AAT (m)	Site Elevation (m)	Ant Ht (m)	Ant Type	Azimuth (deg)	Ant Model	ERP (W)	Transmit Freqs (MHz)	Receive Freqs (MHz)	Emission Designators
1	KYO878 - LOC 2	NEWTON SQUARE	N/A	39 58 29.00 N	75 25 21.00 W	192.00	126.00	152.10	Directiona	90	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
2	KYO878 - LOC 3	HAVERTOWN	N/A	39 59 17.40 N	75 18 35.70 W	75.50	102.00	47.20	Directiona	180	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
3	WIJ815 - LOC 1	UPPER DARBY	1025296	39 57 33.00 N	75 17 06.70 W	69.10	60.00	65.80	Directiona	180	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
4	WIJ815 - LOC 3	THORTON	1025298	39 54 03.50 N	75 30 51.70 W	123.30	132.90	85.00	Directiona	0	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
5	WIJ815 - LOC 4	EDDYSTONE	N/A	39 51 34.40 N	75 20 46.70 W	28.30	6.00	58.00	Directiona	330	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
1	WIJ815 - LOC 5	LANCASTER ST.	N/A	40 01 35.40 N	75 19 57.70 W	83.10	123.00	58.00	Directiona	220	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
2	WIJ815 - LOC 7	SPRINGFIELD	1040068	39 55 4.00 N	75 21 21.20 W	72.50	66.40	65.50	Directiona	270	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
3	WIL755 - LOC 1	BROOMALL	N/A	39 57 20.40 N	75 20 17.70 W	64.80	86.00	60.00	Directiona	250	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
4	WPMP243 - LOC 2	TWIN OAKS	1031114	39 50 9.60 N	75 25 26.50 W	99.70	33.20	113.40	Directiona	45	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
5	WPMP243 - LOC 3	BALTIMORE PIKE ST.	N/A	39 55 33.40 N	75 18 15.70 W	71.00	58.00	61.00	Directiona	285	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
6	WPMP243 - LOC 4	LIMA	1025297	39 55 14.0 N	75 26 43.00 W	118.70	106.70	97.50	Directiona	310	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
1	WQFZ519 - LOC 1	FOLSOM	N/A	39 53 9.4 N	75 19 41.70 W	34.00	34.00	40.00	Directiona	300	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
2	RADNOR	RADNOR	1026794	40 02 9.50 N	75 22 20.90 W	88.20	110.00	67.60	Omni	0	SC479-HF1LDF (D00)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
3	FITZ HOSPITAL	FITZ HOSPITAL	1262041	39 55 25.10 N	75 16 07.00 W	7.30	8.20	39.00	Directiona	180	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
4	SMART PARK	SMART PARK	1271425	39 51 47.70 N	75 17 33.20 W	30.00	3.70	52.40	Directiona	20	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
5	CHESTER TWP	CHESTER TWP	1037841	39 51 30.50 N	75 23 34.70 W	36.00	30.40	65.60	Directiona	300	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
6	MILLBOURNE MONOPOLE	MILLBOURNE MONOPOLE	N/A	39 57 49.30 N	75 15 00.51 W	22.50	22.00	50.30	Directiona	200	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
1	ASTON	ASTON	1025868	39 52 39.70 N	75 27 20.00 W	147.40	94.20	125.00	Directiona	270	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
2	BETHEL	BETHEL	1054989	39 50 17.30 N	75 29 49.40 W	121.10	120.40	66.40	Directiona	330	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
3	CHADDS FORD	CHADDS FORD	N/A	39 52 21.3 N	75 37 15.10 W	30.00	84.00	46.60	Directiona	90	SE414-SWBP4LDF (D00)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
4	BRANDYWINE	BRANDYWINE	1057572	39 53 22.00 N	75 31 35.70 W	152.30	120.40	124.70	Directiona	45	SE414-SWBPALDF (D06)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W
5	MIDDLETOWN FIRE	MIDDLETOWN FIRE	1060722	39 52 38.40 N	75 24 22.70 W	49.60	44.10	63.10	Directiona	200	SE414-SWBPALDF (D00)	175.00	771.33125	801.33125	8K10F1D, 8K10F1E, 9K80D7W

NOTE: The EDX software includes a 18dB building loss & 8dB body loss in the propagation maps

This system is a 9 channel 700MHz simulcast trunking system with the following recommended frequency pairs:

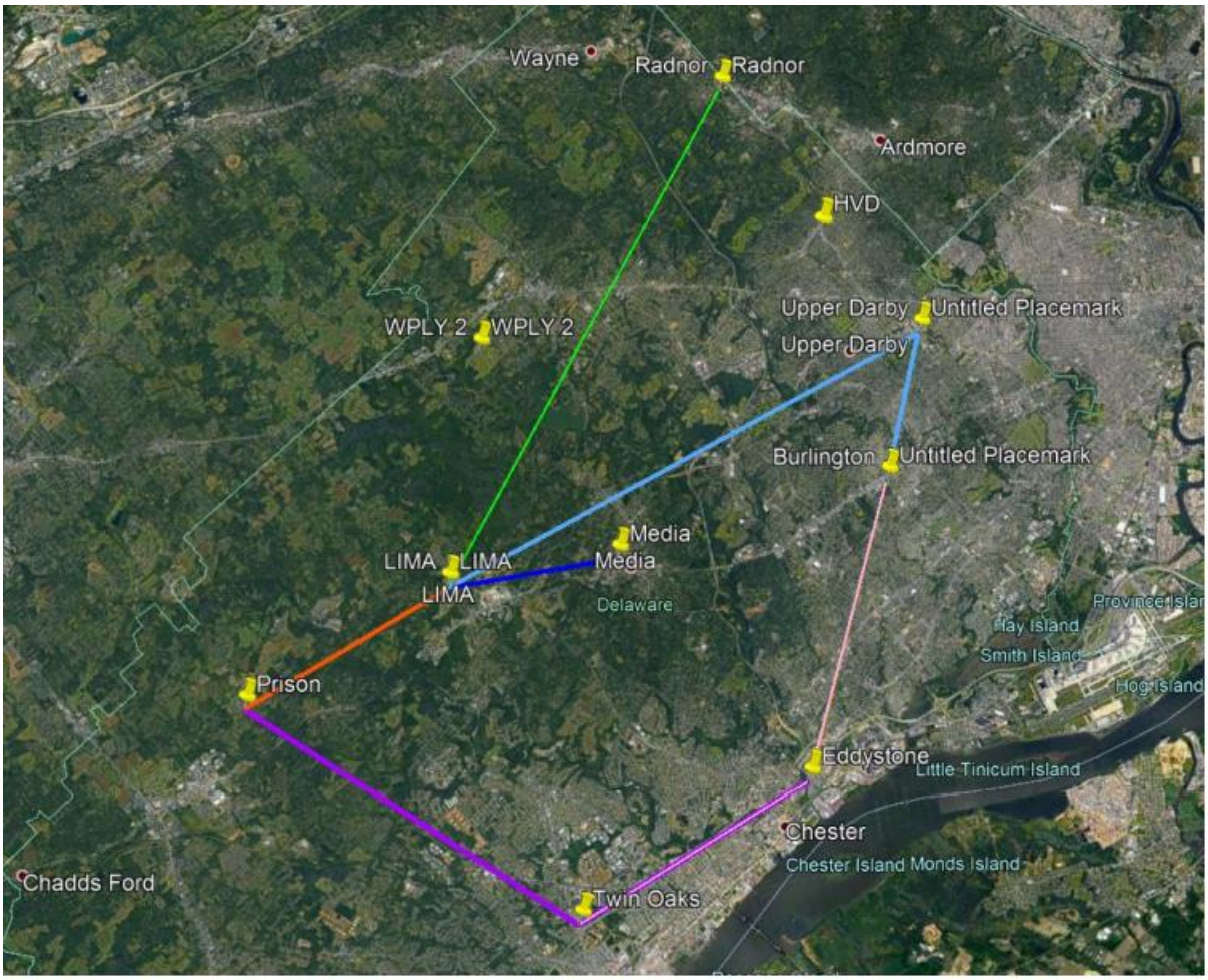
- 771/801.33125
- 770/800.10625
- 770/800.53125
- 770/800.79375
- 771/801.09375
- 771/801.95625
- 772/802.38125
- 773/803.20625
- 773/803.63125

Delaware County's FCC Registration Number (FRN) is 3233723

Appendix C – Current System Receive Sites

Aston Twp	5021 Pennell Road, Aston PA 19014
Bethel Twp	3737 Foulk Road, Bethel Township, PA 19061
Brandywine	Rt. 1 & Rt. 202, Condord Twp 19331
Chester Crozer	1 Medical Center Blvd, Upland, PA 19013
Darby Twp	50 Hook Rd, Darby Twp 19023
Fitzgerald Mercy	1500 Lansdowne Ave, Darby Pa 19023
Rose Tree Park	1521 N Providence Rd, Media PA 19063
Beverly School	1400 Garrett Rd, Upper Darby, PA 19023
Courthouse	201 W Front St, Media PA 19063
Newtown Sq. FC	8 N Newtown St Rd, Newtown Square PA 19073
Ridley Twp	100 E. MacDade Blvd, Folsom PA 19033
International Plaza	Industrial Blvd, Tinicum, PA 19113
Interboro HS	500 16th Ave, Prospect Park PA 19076
SEPTA	110 Victory Avenue / 69th St Terminal, Upper Darby PA 19082
Wayne Hotel	139 E. Lancaster Ave, Wayne PA 19087
Notre Dame Academy	560 Sproul Rd, Villanova PA 19085
Drexeline Apts	4980 State Road, Drexel Hill PA 19026
Haverford Twp	9002 Parkview Drive, Haverford PA 19041
Manoa FC	115 S. Eagle Road, Havertown PA 19083
Community	2600 W. 9th Street, Chester PA 19013
Chestnut Ridge	2700 Chestnut Parkway, Chester PA 19013
Upper Chi PD	8400 Furey Rd, Aston PA 19014
Collingdale PD	800 MacDade Blvd, Collingdale PA 19023
Darby Boro PD	1020 Ridge Ave, Darby PA 19023
Folcroft PD	1555 N. Elmwood Ave, Folcroft PA 19032
Lansdowne PD	12 E. Baltimore Ave, Lansdowne, PA 19050
Cardington Stonehurst	350 Harrison Ave, Upper Darby PA 19082
Highland Park FC	24 Park Ave, Upper Darby PA 19082
Upper Providence PD	939 N. Providence Rd, Media PA 19063
Brookhaven	2 Cambridge Dr, Brookhaven PA 19015

Appendix D-Current Microwave Hops

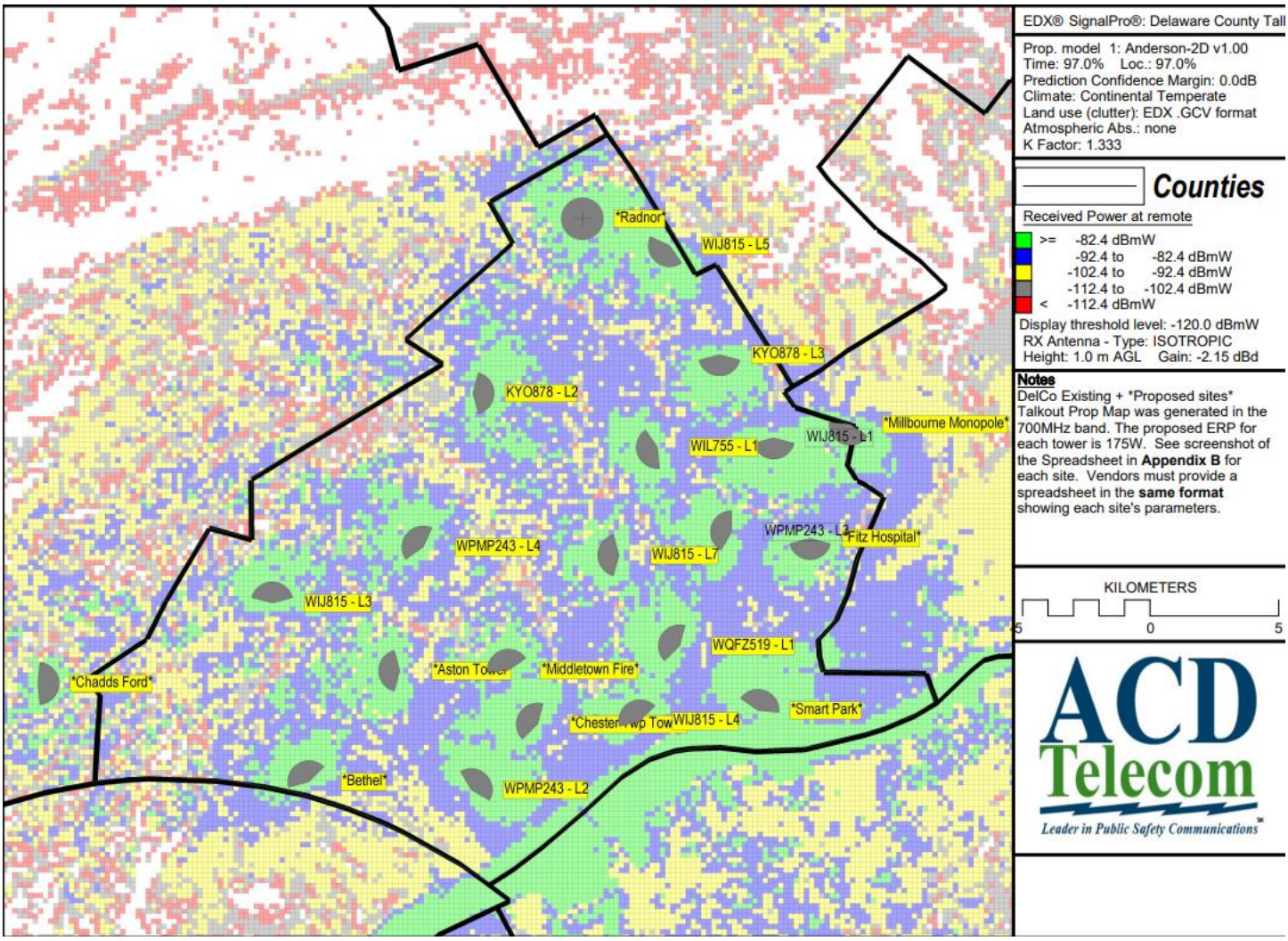


Appendix E – Microwave Licensed Links

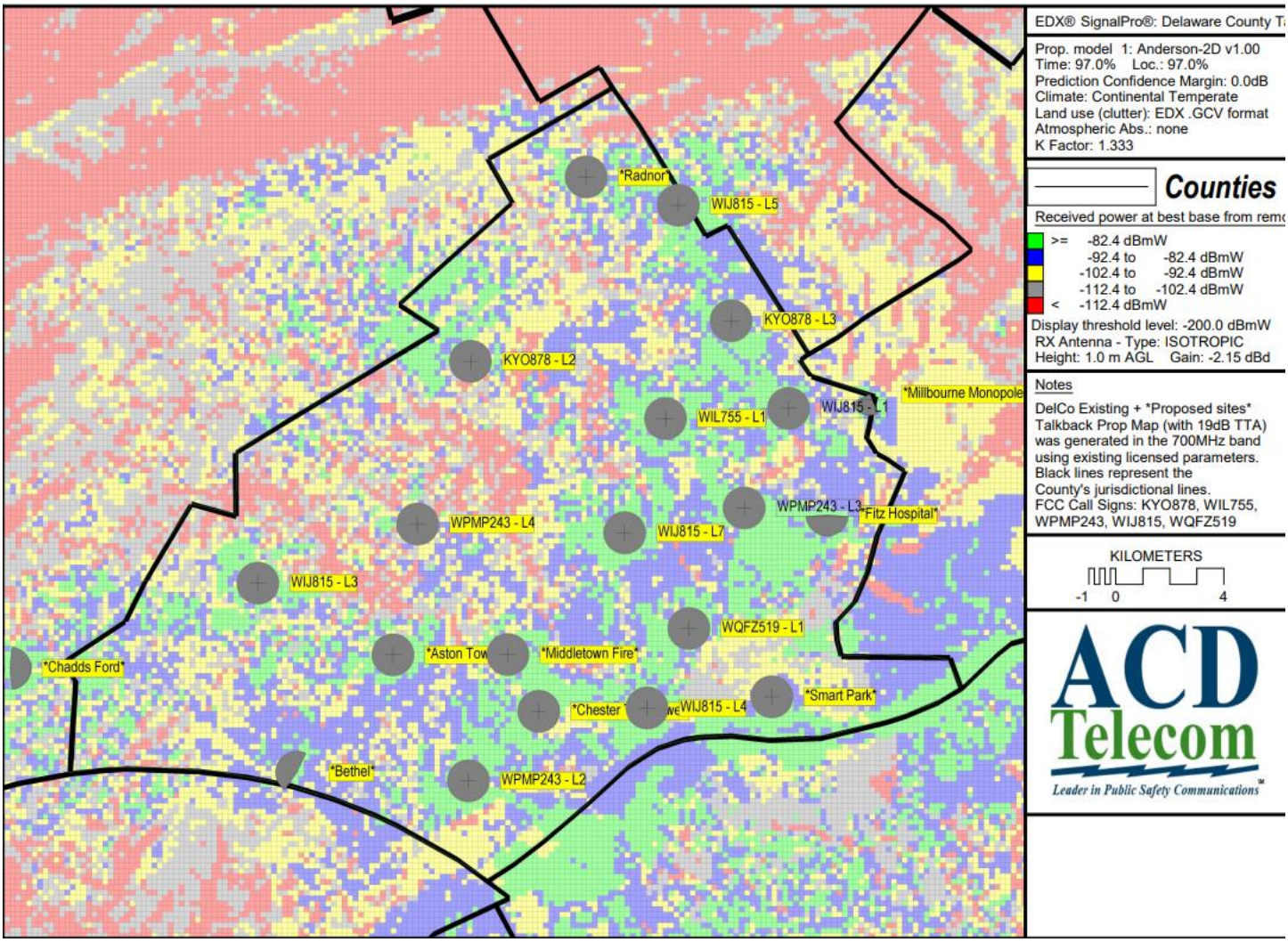
Call Sign	Licensed Site/ Anchor Site	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6	Path 7
KEP26	Prison	Lima						
WNTP976	Eddystone	Lima	Twin Oaks	Burlington				
WNTP977	Upper Darby HS	Lima	Burlington					
WNTP978	Lima	Upper Darby HS	Eddystone	Prison	Radnor	Twin Oaks	Prison	WPLY2
WPNC643	Radnor	Lima	WPLY2					
WPNC644	Twin Oaks	Lima	Prison	Eddystone				
WPQQ800	Burlington	Lima	Upper Darby HS	Eddystone				
WQUJ342	Media	Lima						
QQUJ345	Prison	Twin Oaks	Lima					
WQUJ390	WPLY2	Radnor	Lima					

NOTE: Paths that are licensed, but have not been installed are highlighted

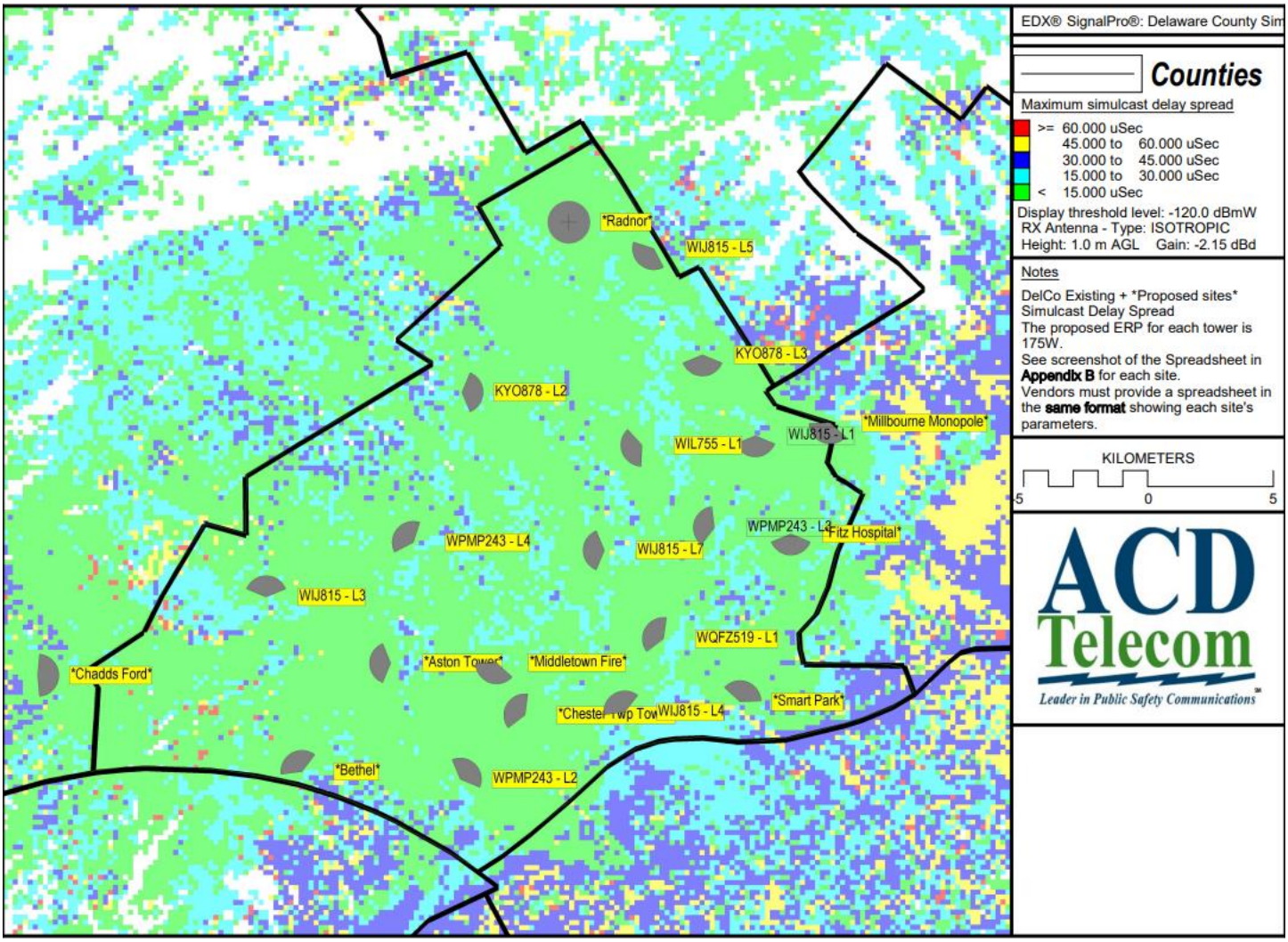
Appendix F - 700MHz Concept 97% Talk Out Portable On-Street Coverage with 18db building loss



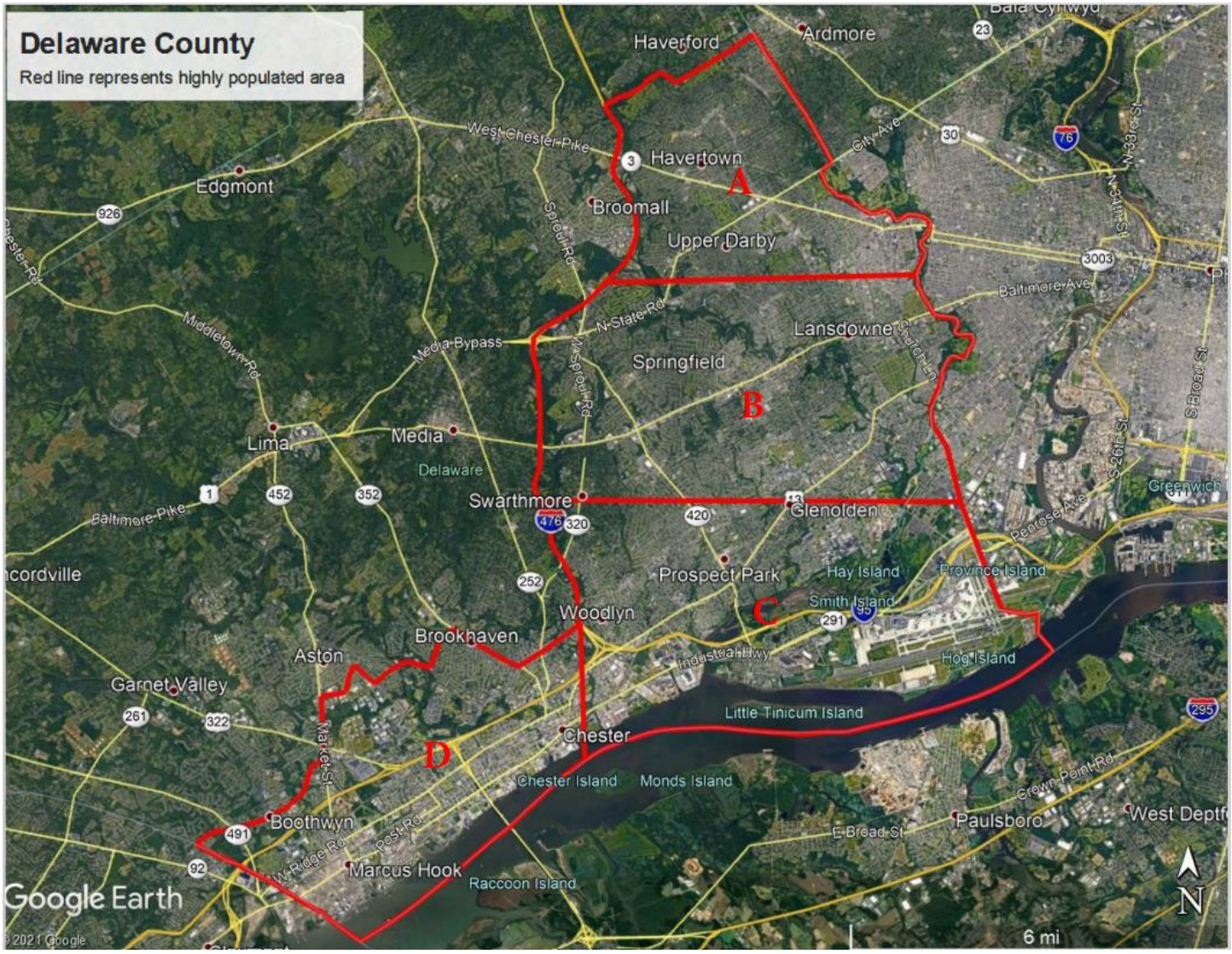
Appendix G – 700MHz Concept 97% Talk Back Portable On-Street Coverage



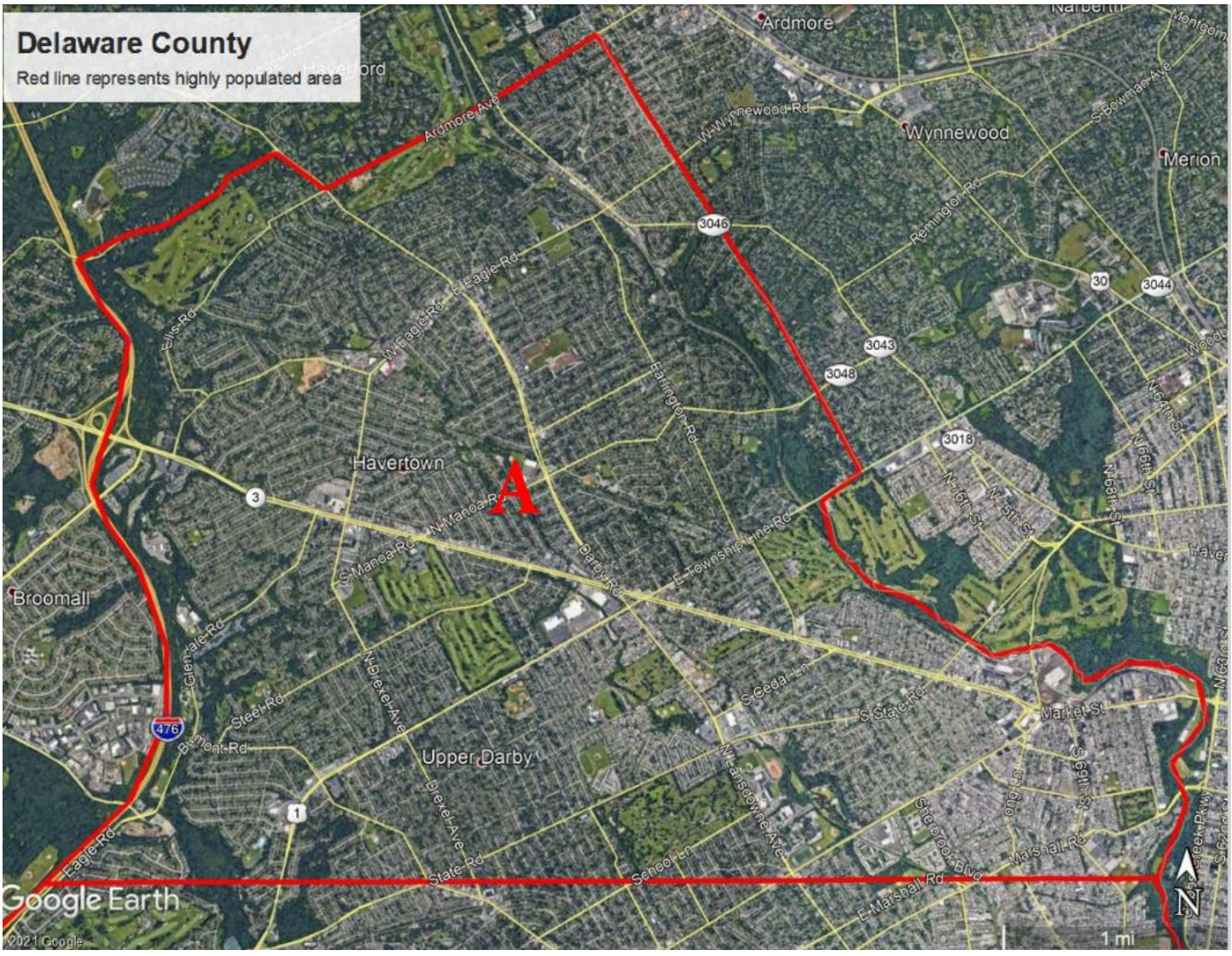
Appendix H - Simulcast Delay Spread Propagation

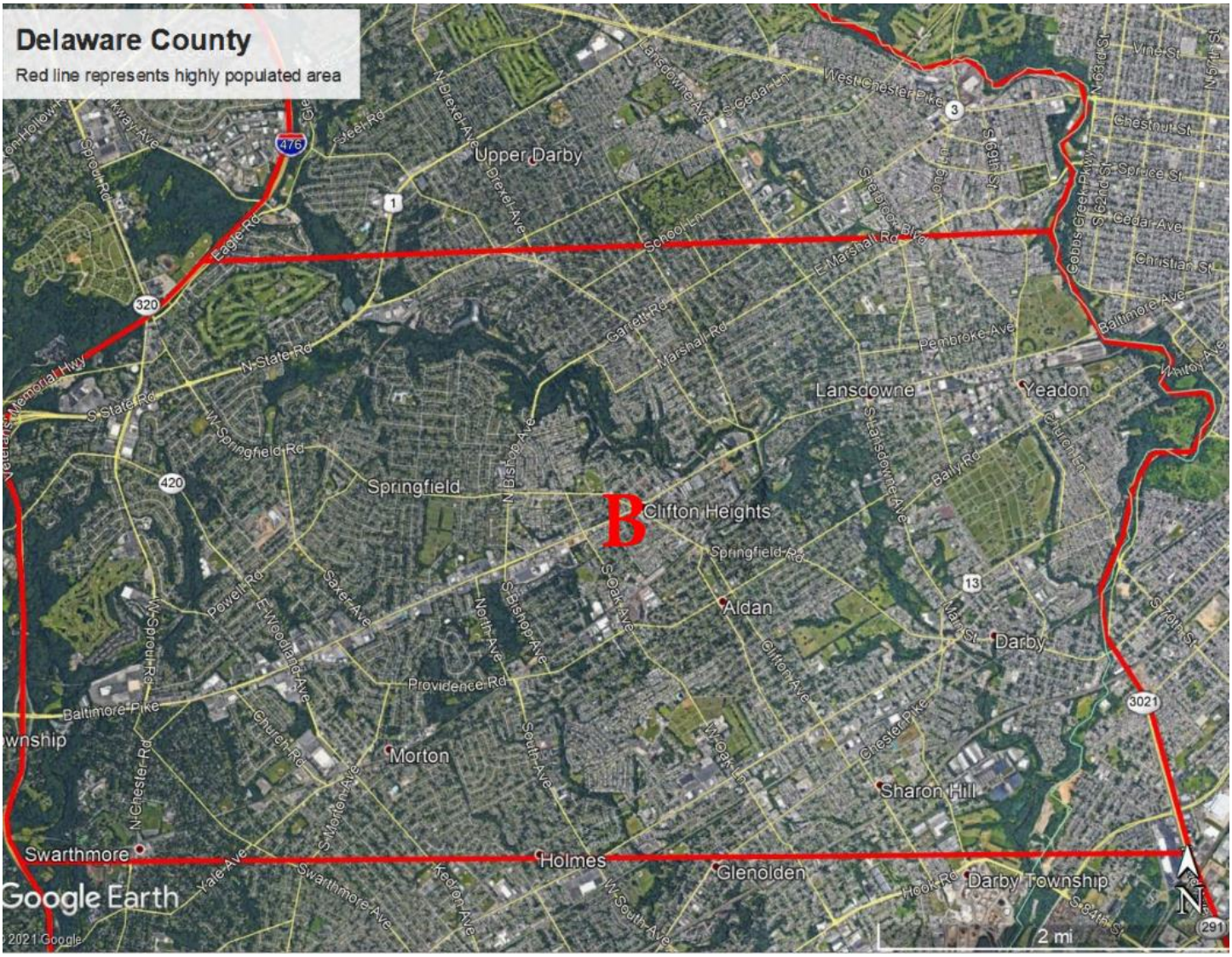


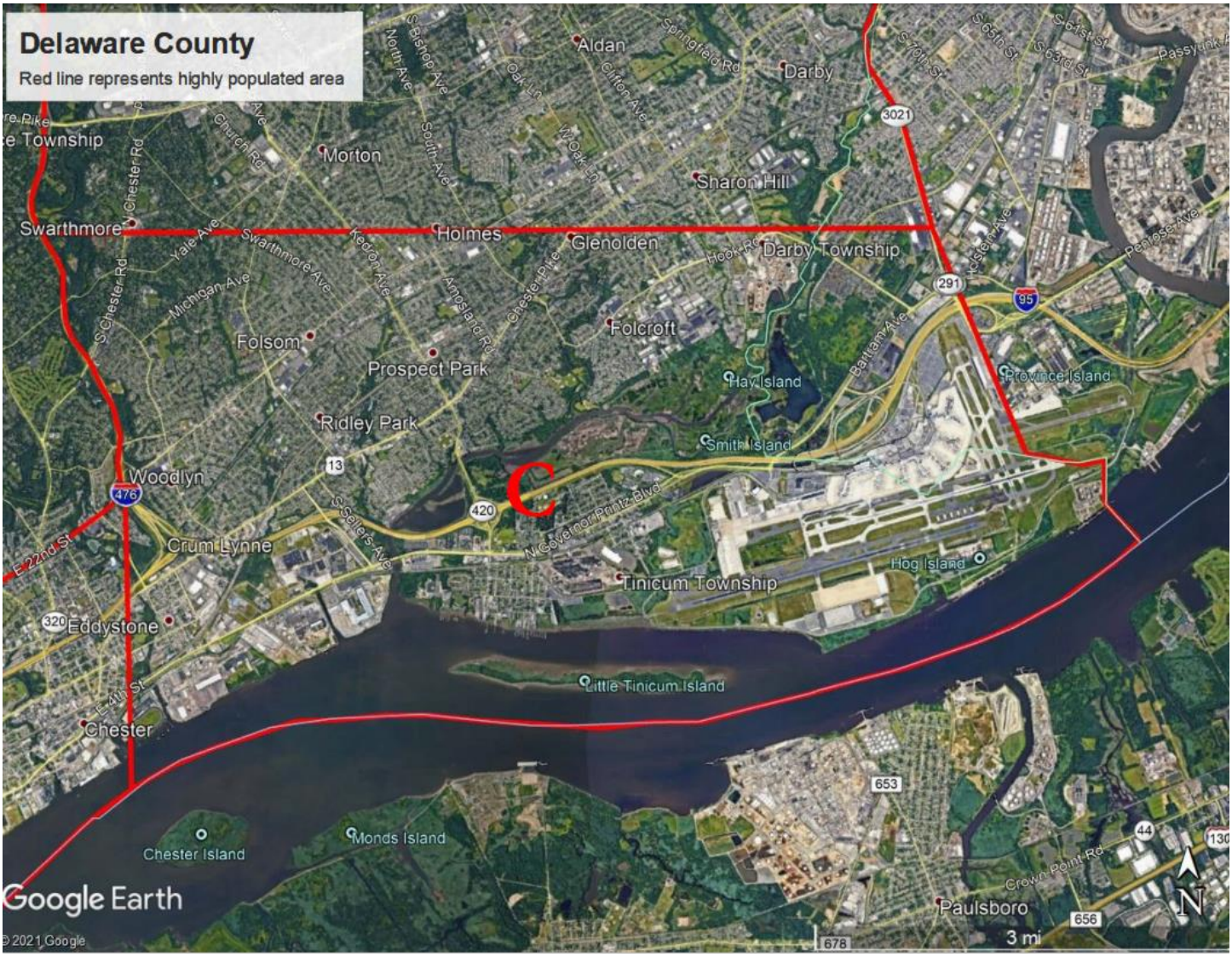
Appendix I - Enhanced Testing Area (Area 1)



Appendix J – Sectional Maps of Area 1




Delaware County
Red line represents highly populated area
B
Upper Darby
Lansdowne
Yeadon
Springfield
Clifton Heights
Aldan
Darby
Morton
Sharon Hill
Swarthmore
Holmes
Glenolden
Darby Township
Google Earth
2 mi


Delaware County
Red line represents highly populated area
Aldan
Darby
Morton
Sharon Hill
Swarthmore
Holmes
Glenolden
Darby Township
Folcroft
Folsom
Prospect Park
Ridley Park
Woodlyn
Crum Lynne
Eddystone
Tinicum Township
Hog Island
Little Tinicum Island
Chester
Chester Island
Monds Island
Paulsboro
Hay Island
Smith Island
Province Island
Google Earth
© 2021 Google
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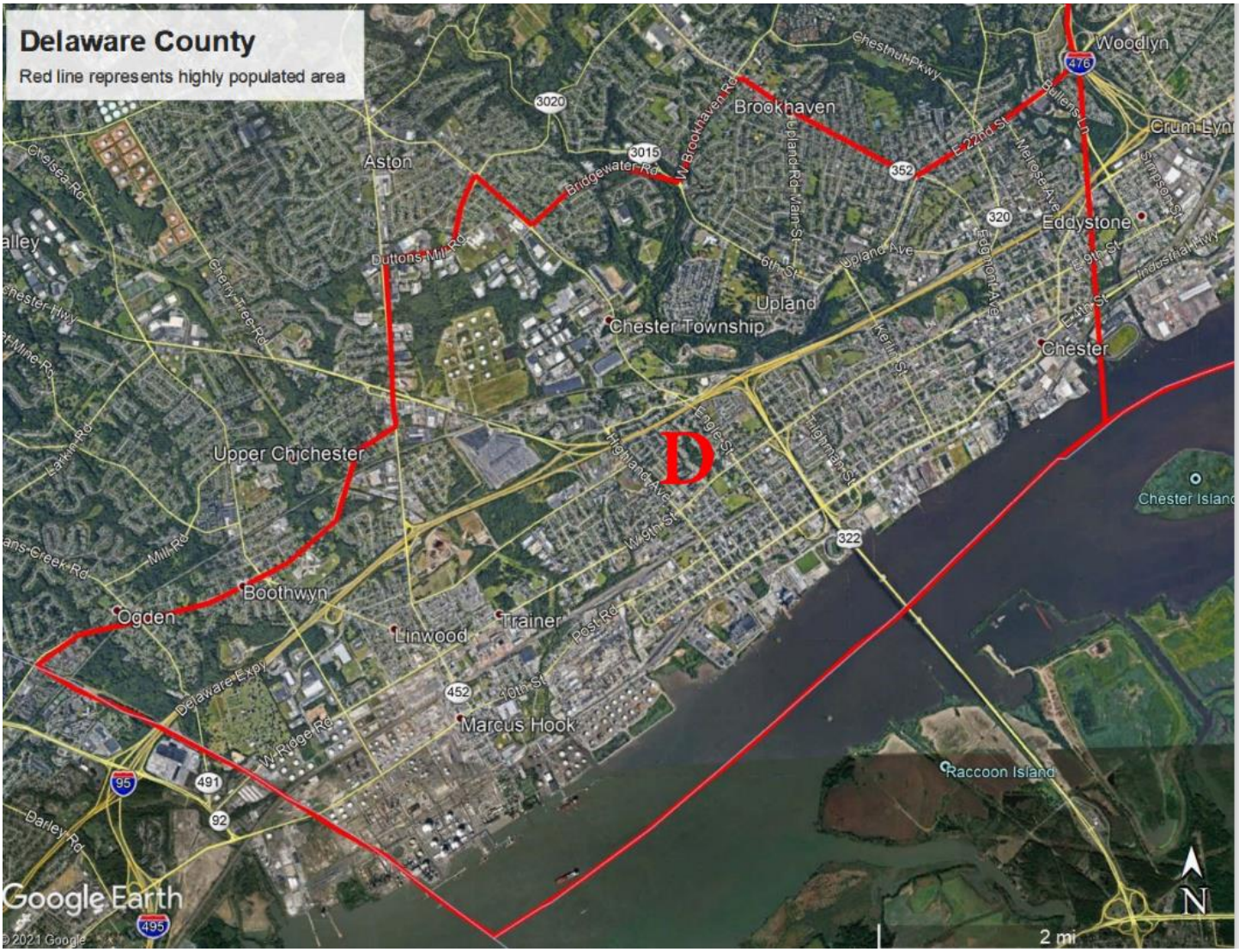
Delaware County
Red line represents highly populated area
D
Aston
Brookhaven
Woodlyn
Eddystone
Crum Lyn
Upland
Chester Township
Chester
Upper Chichester
Boothwyn
Ogden
Linwood
Trainer
Marcus Hook
Raccoon Island
Chester Island
Google Earth
© 2021 Google
2 mi
N

Appendix K - Mandatory Items

Mandatory Item	Section(s)	Yes/No	Comment
Dispatch Consoles	3.2		
Backup Dispatch Center Dispatch Equipment	3.2		
Fire and EMS Alerting. Minimum pagers, Priority Scan, Station Alerting.	3.4, 4.4, 5.5		
Digital Microwave	3.7, 5.4		
Interoperability	4		
Simulcast	4.2		
Radio Features. 700 MHz and 800 MHz, Scanning analog and trunked, Min. 12-hour battery	4.3.2		
NCMS Security	4.13, 4.13.3		
Base Station Repeaters and Controllers	5.1.1.10		
Dynamic Regrouping	5.1.5		
Talk Group/ Channel priority	5.1.6		
Reliability and Redundancy	5.2		
Single Point Failure Modes	5.2.1		
Equipment Redundancy	5.2.2		
Failsoft Less than fifteen (15) seconds	5.2.6		
Coverage Maps Legend must match examples	6.6		

Appendix L - Responsibility Matrix

Responsibilities Matrix defines the principal activities and responsibilities of all parties for the implementation of the System for Delaware county. Contractor is providing a Turnkey System based upon the proposed System design. Visual inspections were performed by Contractor on all available sites. This Responsibilities Matrix is also based upon Contractor's site surveys and Contractor's best practices. Any Change Orders to this scope would only be for additional work that is: (i) beyond that already included herein; and (ii) such additional work is beyond the scope of work that Contractor should have reasonably included herein based upon Vendor's visual inspections, site surveys and Contractor's best practices.

The following sections of responsibility matrices will show responsibilities for each party for the various project tasks. Comments have been added, where needed, for additional clarification.

Task	Contractor	County	Comments
Participate in weekly Project Review Meetings, Submit weekly status reports	X	X	Contractor to provide weekly status reports, County to review
Establish Project Communications protocol, maintain communications log	X		
Participate in Monthly Project Reviews	X	X	Contractor to provide monthly update material, County to review
Provide report results to County	X		Grounding Reports, (Staging) Factory Acceptance Test results, Acceptance Test Plan results
Update Project Schedule Monthly	X		
Submit Change Order forms to County	X		
Review and Approve Change Order		X	
Designate individual to be County 's Project Manager		X	
Review all submitted material		X	
Provide written approval for key submittals and milestones		X	
Provide timely responses to issues and questions		X	

Obtain approvals with State & local governments as required for the desired interoperability connections		X	
Tasks	**Contractor**	**County**	**Comments**
Prepare FCC 601 form(s) and ensure that all county's towers meet FCC Docket 10-88.	X	X	If the Contractor choses to add more sites or modify the licenses in this document. It is Contractor responsibility to get the new site(s) licensed.
Create the contour maps and propagation maps required for regional coordination, submit to the County	X		
Provide technical data to County to support regional frequency coordination	X		
Prepare microwave frequency searches and license applications	X		
Sign license applications for 700 & 800 MHz		X	
Sign microwave frequency application		X	
Obtain all required FCC licensed frequencies as per the system design	X		700MHz, 800 MHz & MW
Modify existing site leases for the new system antennas as per system design	X	X	
Obtain all site leases for sites not currently under lease by the County as per the final system design	X	X	
Prepare site owner forms for antenna placement on tower	X		Such as Crown Castle & American Tower electronic forms
Prepare "Lease Exhibit" drawings and tower drawings	X		Drawing package for County to use in its lease negotiation process
Perform a "Metes and Bounds" site survey for new Greenfield Sites	X		
Perform a "Metes and Bounds" site survey for any proposed site that need a compound expansion	X		
Obtain all permits and approvals required for the work at each site	X		

Obtain Zoning Permits and Land Development Approvals as required	X		Does not include the County participation of legal support and legal fees
Run RF EME (Electro Magnetic Energy) studies	X		At those sites where required
Designate system administrators		X	
Provide access to all buildings and sites, including temporary ID badges for Contractor team		X	

Tasks	Contractor	County	Comments
Kickoff Meeting & Preliminary Design Review			
Assemble project team and travel to the County location.	X		
Present preliminary information on sites and design	X		
Provide a team to go on scheduled site surveys	X		
Assemble County team for kickoff meeting		X	
Provide location in appropriate conference room or training facility		X	
Provide information and status on sites, frequencies, leases etc.		X	
Schedule and provide site knowledgeable person to answer Contractor site questions on site surveys		X	
Prepare for Customer Design Review			
Develop required drawings for the System and site development	X		
Develop network plans	X		
Develop site plot drawings	X		
Develop tower antenna placement plans	X		
Develop Intermodulation studies for each site	X		
Develop frequency plans	X		
Develop coverage maps	X		
Develop site electrical loads	X		
Develop preliminary cutover plan	X		
Develop formal project schedule	X		

Prepare acceptance test procedures (ATP) documents	X		
Provide answers to Contractor questions		X	
Complete site leases for any non-County owned sites	X	X	New Site leases and modifications of current leases

Customer Design Review			
Tasks	**Contractor**	**County**	**Comments**
System block diagrams	X		
List of deliverable equipment for each site	X		
Network connection/microwave plan			
Tower antenna placement drawings	X		
Antenna system drawings	X		
Coverage prediction maps	X		
Frequency	X		
Present Intermodulation study results	X		
700/800 MHz Combiner plans	X		
Site plot	X		
Shelter floor plan drawings	X		
Rack elevation drawings	X		
AC power and BTU loads	X		
Develop preliminary cutover plan	X		
Develop acceptance test plans	X		
Project schedule	X		
Provide location for CDR meeting		X	
Approve the design following CDR meeting.		X	

The CDR will be conducted in Delaware county in a location provided by the county for up to 5 business days. The contractor will need to give at least two weeks' notice in advance to the meeting. All CDR documentations and presentations will be provided at least two weeks before the meeting for questions and approval by the county.

Appendix M – Form W-9

Form **W-9**
(Rev. August 2013)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

Business name/disregarded entity name, if different from above

Check appropriate box for federal tax classification:
☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____

☐ Other (see instructions) ▶

Exemptions (see instructions):
Exempt payee code (if any) _____
Exemption from FATCA reporting code (if any) _____

Address (number, street, and apt. or suite no.)

Requester's name and address (optional)

City, state, and ZIP code

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number
☐☐☐ - ☐☐ - ☐☐☐☐

Employer identification number
☐☐ - ☐☐☐☐☐☐☐

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below), and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here Signature of U.S. person ▶ Date ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. The IRS has created a page on IRS.gov for information about Form W-9, at *www.irs.gov/w9*. Information about any future developments affecting Form W-9 (such as legislation enacted after we release it) will be posted on that page.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, payments made to you in settlement of payment card and third party network transactions, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct.

Note. If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

Cat. No. 10231X Form **W-9** (Rev. 8-2013)

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States:

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity,
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust, and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS a percentage of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code* on page 3 and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships* on page 1.

What is FATCA reporting? The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code* on page 3 and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account, for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name/disregarded entity name" line.

Partnership, C Corporation, or S Corporation. Enter the entity's name on the "Name" line and any business, trade, or "doing business as (DBA) name" on the "Business name/disregarded entity name" line.

Disregarded entity. For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulation section 301.7701-2(c)(2)(iii). Enter the owner's name on the "Name" line. The name of the entity entered on the "Name" line should never be a disregarded entity. The name on the "Name" line must be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on the "Name" line. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on the "Business name/disregarded entity name" line. If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Note. Check the appropriate box for the U.S. federal tax classification of the person whose name is entered on the "Name" line (Individual/sole proprietor, Partnership, C Corporation, S Corporation, Trust/estate).

Limited Liability Company (LLC). If the person identified on the "Name" line is an LLC, check the "Limited liability company" box only and enter the appropriate code for the U.S. federal tax classification in the space provided. If you are an LLC that is treated as a partnership for U.S. federal tax purposes, enter "P" for partnership. If you are an LLC that has filed a Form 8832 or a Form 2553 to be taxed as a corporation, enter "C" for C corporation or "S" for S corporation, as appropriate. If you are an LLC that is disregarded as an entity separate from its owner under Regulation section 301.7701-3 (except for employment and excise tax), do not check the LLC box unless the owner of the LLC (required to be identified on the "Name" line) is another LLC that is not disregarded for U.S. federal tax purposes. If the LLC is disregarded as an entity separate from its owner, enter the appropriate tax classification of the owner identified on the "Name" line.

Other entities. Enter your business name as shown on required U.S. federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name/disregarded entity name" line.

Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the *Exemptions* box, any code(s) that may apply to you. See *Exempt payee code* and *Exemption from FATCA reporting code* on page 3.

Exempt payee code. Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends. Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

The following codes identify payees that are exempt from backup withholding:

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney, and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Reg. section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Reg. section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited Liability Company (LLC)* on page 2), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at *www.ssa.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting IRS.gov or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: *A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.*

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, or 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on the "Name" line must sign. Exempt payees, see *Exempt payee code* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account [1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor [2]
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee [1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner [1]
5. Sole proprietorship or disregarded entity owned by an individual	The owner [3]
6. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulation section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
7. Disregarded entity not owned by an individual	The owner
8. A valid trust, estate, or pension trust	Legal entity [4]
9. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
10. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
11. Partnership or multi-member LLC	The partnership
12. A broker or registered nominee	The broker or nominee
13. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
14. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulation section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or "DBA" name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 1.

*Note. Grantor also must provide a Form W-9 to trustee of trust.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records from Identity Theft

Identity theft occurs when someone uses your personal information such as your name, social security number (SSN), or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Publication 4535, Identity Theft Prevention and Victim Assistance.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: *spam@uce.gov* or contact them at *www.ftc.gov/idtheft* or 1-877-IDTHEFT (1-877-438-4338).

Visit IRS.gov to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

Attachment A - Standard Terms and Conditions

1. Contractor, in consideration for the acceptance of its proposal and/or bid and the award of the contract thereunder and the payment hereinafter to be made, covenants, proposes, and agrees with County to furnish and deliver the labor, supplies, materials and equipment and to do and perform services, labor, and work as more particularly set forth and specified in all items of the general specifications and/or instructions to bidders and bid of the contractor and all in strict accordance therewith.

2. Contractor covenants and agrees to assume, and does hereby assume, all liability for and shall and does agree to indemnify, save harmless and defend County and its officials, officers, agents and employees against any and all loss, costs, suits, claims, charges, or damages of any kind and nature by any party arising from (i) injuries sustained by mechanics, laborers, workmen or by any person or persons whatsoever, to their person or property, whether employed in and about the said work or otherwise, by reason of any accidents, damages, or injuries, torts or trespasses happening in and about, or in any way incident to or by reason of the furnishing and delivery of the said materials, supplies, services and equipment or the performance of the said work and labor or (ii) negligent acts or omissions of Contractor or its employees, agents or subcontractors, including, in each case, costs, counsel fees and all expenses of a defense, and shall defend any and all actions brought against the County based upon any such claims or demands.

3. Contractor agrees that neither Contractor nor any permitted subcontractor nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance or work under this Contract. Non-Discrimination: Contractor expressly agrees to comply all applicable Federal, State and/or Local Laws, ordinances, rules, regulations and orders prohibiting discrimination in hiring or employment opportunities. Compliance is not delegable to any union, training program or other source of recruitment which prevents the Contractor from meeting its obligations under the Agreement. Americans with Disabilities Act: It shall be the sole responsibility of the Contractor to investigate the applicability of the Americans with Disabilities Act of 1990 and to comply with all respects of these provisions and any amendments thereto.

4. Contractor agrees to comply with the insurance provision set forth below.

5. The Agreement shall be binding upon the successors and permitted assigns of the parties hereto. Contractor covenants and agrees not to assign, transfer or subcontract this Contract without first obtaining the prior written consent of the County, and any attempted assignment, transfer or subcontract to which the County does not consent shall be null and void.

6. Contractor certifies, for itself and all its permitted subcontractors, that as of the date of its execution of this the Agreement, that neither Contractor, nor any subcontractor, nor any suppliers are under suspension or debarment by the Commonwealth or any governmental entity, instrumentality, or authority and, if Contractor cannot so certify, then it agrees to submit a written explanation of why such certification cannot be made. Contractor also certifies, that as of the date of its execution of the Agreement, it has no tax liabilities or other Commonwealth obligations. A current list of suspended and debarred entities can be obtained by contacting: Department of General Services, Office of Chief Counsel, 603 North Office Building, Harrisburg, PA 17125, Telephone No. (717) 783-6472 / FAX No. (717) 787-9138.

7. Contractor covenants that only persons legally present and able to work in the United States shall be employed in any capacity in the performance of this contract. Responsibility for verification of identity and employment eligibility in connection with Contractor's own agent/servants, workers and employees is assumed and continues to be assumed by the Contractor.

8. At the County's request, Contractor hereby agrees to provide statements to the County reflecting the work performed and materials supplied to date and the cost thereof.

9. The Agreement shall be governed in all respects by the laws of the Commonwealth of Pennsylvania without giving effect to its rules relating to conflicts of laws. The exclusive venue for any action and/or

proceeding concerning, arising from, and/or relating to the Agreement shall be the state and federal courts located, respectively, within the Commonwealth of Pennsylvania, Delaware County and/or the United States District Court for the Eastern District of Pennsylvania. Each party hereto waives any and all objections to the foregoing designated jurisdiction(s), including without limitation those that may be based on the theory of an inconvenient forum.

10. The Contract for Service executed by the County and Contractor, and all attachments, forms the entire agreement between the parties and there are no other agreements, either written or oral, between them.

11. Any provision of the Agreement which is in violation of any State or Federal law or regulation shall be deemed amended to conform with such law or regulation, except that if such change would materially and substantially alter the obligations of the parties under the Agreement. Contractor acknowledges that the Agreement may be funded by grants from Federal or State sources, and Contractor agrees that it shall comply with all applicable requirements of any grant agreement.

12. Contractor shall maintain books, records, documents, correspondence, and other data pertaining to the costs and expenses of the Agreement (hereinafter referred to collectively as "the records"), to the extent and in such detail as will properly reflect all costs, direct and operating of materials, equipment, supplies, and services, and other costs and expenses of whatever nature for which funding has been provided under the provisions of the Agreement. The books and records shall be maintained in accordance with generally accepted accounting principles. Contractor agrees to require any permitted subcontractors to comply with the record keeping and retention requirements of this paragraph.

13. The Agreement may be amended only by a written instrument signed by both County and the Contractor.

14. The parties do not intend, nor shall any clause be interpreted to create in any third party, any obligations to, or right or benefit by, such third party under the Agreement from either the County or the Contractor.

15. The Agreement shall be binding upon the successors, administrators and permitted assigns of Contractor.

16. All government and business information disclosed by County to Contractor in connection with the Agreement shall be treated as confidential information unless it is or later becomes publicly available through no fault of Contractor, or it was or later is rightfully developed or obtained by Contractor from independent sources free from any duty of confidentiality. County's confidential information shall be held in strict confidence by Contractor and shall not be used or disclosed by Contractor for any purpose except as reasonably necessary to implement or perform the Agreement, or except as required by law or governmental agency, provided that County is given a reasonable opportunity to obtain a protective order at its cost and expense.

17. County may terminate the Agreement at any time without cause by giving thirty (30) days written notice to Contractor. County may terminate the Agreement immediately at any time by giving written notice of termination to Contractor and without prejudice to any other rights or remedies County may have, if Contractor breaches any of its material obligations under the Agreement and does not cure the breach within five (5) business days after Contractor's receipt of County's notice of the breach which notice shall specify in reasonable detail the nature of the breach.

18. The County may terminate the Agreement on five (5) business days' written notice if County Council determines that entering into the Agreement resulted in a violation of Section 6-12.D of the County's Administrative Code and imposes termination of the Agreement as a penalty for such violation. County Council may also require repayment to the County of any profit made by Contractor under the Agreement as a penalty for such violation. Contractor agrees to send County a written affidavit in reasonable detail calculating such profit within fifteen (15) days of written notice of the imposition of such penalty together with repayment of such profit.

19. Payment Provisions

A. After execution of the Agreement by Contractor and County, each month after receipt of Contractor's invoice with respect to Services performed in the prior month, County will pay Contractor amounts due Contractor under the Agreement. Contractor shall submit monthly invoices within thirty (30) days from the last day of the month within which the work is performed. The final invoice shall be submitted within forty-five (45) days of the Agreement's termination date. County will neither honor nor be liable for invoices not submitted in compliance with the time requirements in this paragraph unless County agrees otherwise in writing. Contractor shall be paid only for services acceptable to County. Contractor agrees to reimburse County for overpayments resulting from any reason, including but not limited to errors, contract limitations, actual or audited cost adjustments or non-compliance with applicable policies and procedures.

B. County will pay Contractor undisputed amounts due under the Agreement within forty five (45) days of receipt of each invoice.

20. THE COUNTY SHALL NOT BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR INCIDENTAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOST PROFITS OR INJURY OF ANY KIND IN CONNECTION WITH THE AGREEMENT.

21. Contractor certifies that to the best of its knowledge, no County official or employee has a vested interest, financial or otherwise in the Agreement. Contractor agrees to comply in all respects with the Public Official and Employees Ethics Act (65 P.S. Section 1101 et seq.). Contractor will inform the County in writing immediately if any potential conflict of interest arises during the performance of the Agreement. Conflict of interest may constitute grounds for termination of any Agreement following notification by County to Contractor where same is not corrected by Contractor within the time period established by County in such notice.

22. Contractor agrees not to solicit, hire, contract with or engage the employment or services of any employee or former employee of County during the period of and for one year after the termination of the Agreement without written approval by the County. This provision shall be specifically enforceable.

INSURANCE REQUIREMENTS

The Contractor shall, at its sole cost and expense, procure the following minimum types and limits of insurance, on forms reasonably acceptable to the County. Such insurance shall be maintained in full force and effect until completion of the Services or final acceptance of the entire project or the completion of all post-acceptance warranty or related work by Contractor, whichever is later.

Coverage shall be obtained from reputable insurance carriers authorized to transact that class of business in the state where the work will be performed, or otherwise acceptable to the County, having an A.M. Best Rating of A- VII or better.

All insurance required herein shall be written on an "occurrence" basis, not "claims-made", with the exception of Professional Liability insurance, unless specifically approved by the County in writing.

General Liability. Commercial General Liability, written on an occurrence basis, covering bodily injury including death, and/or property damage to third parties, which may arise from ongoing and completed operations under the contract, whether such operations are performed by the Contractor or its subcontractors/subconsultants, anyone directly or indirectly employed by them, or anyone for whom they may be liable, with limits not less than:
Each Occurrence $1,000,000
Personal and Advertising Injury $1,000,000

Products/Completed Operations Aggregate $2,000,000
Per Project Aggregate $2,000,000
Damage to Rented Premises $ 50,000
Medical Payments $ 10,000
Abuse/Molestation (if applicable to services provided) $1,000,000

The General Liability policy shall include contractual liability, covering liability assumed by the Contractor under the Indemnification and other provisions of the contract. Any deductible under this coverage is subject to the County's approval and shall be the sole responsibility of the Contractor.

Business Automobile Liability. Business Automobile Liability coverage for bodily injury and property damage arising out of the ownership, maintenance, or use of owned, non-owned, hired, and leased vehicles, including uninsured/underinsured motorists coverage, with limits not less than: $1,000,000 (Combined Single Limit) and $1,000,000 (Uninsured/Underinsured Motorists Liability Limit).

Workers' Compensation and Employers Liability. Workers' Compensation and Employers Liability as required by the state in which the work will be performed, including "other states" coverage (if applicable), and USL&H and Jones Act coverage (if applicable). If Contractor is an exempt self-insurer, sole proprietor, or independent contractor in Pennsylvania, a current exemption certificate shall be provided in lieu of evidence of Workers' Compensation coverage. Contractor accepts full responsibility for the payment of premiums for Worker's Compensation Insurance and Social Security, as well as income tax withholding and any other taxes or payroll deductions required by law for its employees who are performing services related to the project.

Umbrella Liability. Umbrella Liability applying excess of the General Liability, Automobile Liability, and Employers Liability policies, on a following-form basis, with limits not less than: $5,000,000 (each occurrence) and $5,000,000 (aggregate). Hazardous work may require higher limits, as requested by the County.

All Risk Builders Risk. All Risk (Special Form) Builders Risk insurance, including Earthquake and Flood to the extent reasonably commercially available, providing protection for building, structures, and materials or equipment to be installed in the project, while in the course of construction, in transit to the project site, and while being retained in off-site storage. If the project is wholly or partially within a floodplain, proof of sufficient flood insurance coverage must be provided. In any case, Contractor shall provide a copy of a floodplain map of the project area(s), with the project site(s) being delineated thereon.

The Builders Risk policy shall be written to cover 100% of the completed value of the project, at replacement cost valuation, with an agreed amount provision (coinsurance waived). Any deductible under this coverage shall be no more than $25,000, and shall be the sole responsibility of the Contractor.

The policy shall cover the insurable interests of the County, Contractor and Subcontractors in the Work. The County and Contractor waive all rights against each other for damages caused by fire or other perils to the extent payment is actually made under insurance provided under this paragraph, except such rights as they may have to the proceeds of such insurance held by the County. The Contractor shall require similar waivers by Subcontractors.

Professional Liability/ Errors & Omissions Insurance. All Contractors who will perform, or retain others to perform, professional services in connection with the work (including but not limited to Consultants, Architects, Engineers, Design-Build, Project/Construction Managers) shall provide Professional Liability insurance covering negligent acts, errors, or omissions in the performance of their work, with limits not less than: $3,000,000 (each claim) and $3,000,000 (annual aggregate). Any deductible under this coverage is subject to the County's reasonable approval and shall be the sole responsibility of the Contractor.

Cyber Insurance. Contractor shall maintain, at its own expense throughout the Term, cyber liability insurance coverage or a cyber liability insurance rider in the Errors and Omissions policy providing privacy response coverage and third party liability coverage covering Contractor for claims, losses, liabilities, judgements, settlements, lawsuits, regulatory actions, and other costs or damages arising out of its performance under the Agreement, including any negligent or otherwise wrongful acts or omissions by Contractor or any employee or agent thereof in such amounts and on such terms as are reasonably acceptable to Client, but in no event less than $3,000,000. This includes, but is not limited to: any breach of any law or regulation governing confidentiality of PHI (as defined under the Health Insurance Portability and Accountability Act of 1996, as amended) and Personal Information (as defined under Pennsylvania law). Upon request, Contractor shall furnish Client, upon request, as evidence of coverage, a certificate of insurance for Cyber Liability and/or Errors and Omissions insurance. Contractor shall not cancel or reduce any such insurance without prior written consent of Client. Contractor shall notify Client in writing within five business days if it receives notice that its insurance carrier intends to terminate, cancel, non-renew or rescind cyber liability insurance or errors and omissions insurance.

Contractors Pollution Liability (if applicable). All Contractors who will perform environmental services (including but not limited to asbestos or lead abatement, testing or remediation) shall provide Contractors Pollution Liability with limits not less than: $5,000,000 (Each Claim or Occurrence) and $5,000,000 (Annual Aggregate). The Contractors Pollution Liability policy shall include coverage for Emergency Response Costs, Contingent Transportation, Non-Owned Disposal Sites, and Natural Resource Damage. If coverage is written on a claims-made basis, an Extended Reporting Period, or tail coverage, shall be provided for two (2) years following completion of the insured's services. In the alternative, the Contractors Pollution Liability policy shall be renewed for not less than two years following completion. The policy retroactive date shall be no later than the effective date of the Agreement.

General Insurance Provisions

All policies required hereunder other than Workers Compensation, Professional Liability, and Builders Risk (but including any required flood insurance) shall name the County of Delaware and its departments, county offices or agencies as applicable, and their officers, directors, agents, employees, and volunteers as well as the Commonwealth of Pennsylvania as additional insureds on a primary and noncontributory basis, for losses arising from the negligence of the Contractor or its subcontractors, or anyone for whom they may be liable. Additional insured status shall apply to Completed Operations. Contact information for the Commonwealth of Pennsylvania is as follows:

Commonwealth of Pennsylvania
Redevelopment Assistance Capital Program
Bureau of Revenue, Capital and Debt
Office of the Budget
Commonwealth of Pennsylvania333 Market Street, 18th Floor
Harrisburg, PA 17101- 2210

All policies shall provide a Waiver of Subrogation in favor of the County of Delaware and its departments, county offices or agencies as applicable, and their officers, directors, agents, employees, and volunteers, and/or other parties designated by the County.

Policies shall not be canceled, terminated, or non-renewed unless sixty (60) days prior written notice is sent by the insurer to the insured Contractor. Contractor shall immediately forward any such notice to County.

Contractor shall furnish to County Certificates of Insurance prior to the start of work indicating any changes from that provided with Contractor's RFP response, evidencing that all requirements have been met, and detailing the insurers providing coverage, types and limits of coverage, class of operations covered, and effective and expiration dates of coverage. Certificates shall specifically confirm the terms of coverage required herein, including Additional Insured status, waiver of subrogation, and that coverage is included for Abuse/Molestation (if applicable). A copy of the Additional Insured, Waiver of Subrogation, and Abuse/Molestation policy provisions or endorsements must be submitted with the Certificate. A renewal Certificate must be provided to County prior to the expiration date thereof. Without limiting the foregoing, upon request either by the County or the Commonwealth of Pennsylvania, Office of the Budget, Contractor shall provide proof of required insurance coverages.

Contractor shall require each subcontractor or subconsultant to provide insurance as outlined above. Such policies shall name the Commonwealth of Pennsylvania, to the extent required, the County of Delaware and its departments, offices, and agencies; Contractor; and the officers, directors, employees, agents, and volunteers of both, as additional insureds on a primary/noncontributory basis, for losses arising from the negligence of the subcontractor/subconsultant. Additional insured status shall apply to Completed Operations.

All policies shall provide a Waiver of Subrogation in favor of the Additional Insured parties.

Contractor shall be responsible for securing and maintaining certificates of insurance from all subcontractors/subconsultants evidencing the insurance coverages required herein.

The insurance coverages and limits required herein are designed to meet the minimum requirements of the County. They are not designed as a recommended insurance program for Contractor or its subcontractors/subconsultants. Meeting these minimum requirements shall in no way limit or relieve the Contractor liability and obligations under any other provision of the Contract. The Contractor shall acquire, at its own expense, any other Additional Insurance coverage it deems necessary for the protection of its work under this contract.

Self-Insurance

If Contractor maintains a self-insured program or a limited self-insurance program for any or all of the coverages listed above, a complete description of the program, with information on excess carriers and funding arrangements, and a copy of the Contractor's most recent audited financial statement, must be provided to County for review and approval, such approval not to be unreasonably withheld.

If County grants such approval, Contractor understands and agrees that the County of Delaware, county offices or agencies as applicable, and their officers, directors, agents, employees, and volunteers shall receive the same coverages and benefits under Contractor self-insurance program that they would have received had the insurance requirements set forth above been satisfied with coverage provided by a commercial insurance company.

Non-Waiver of Indemnification

The insurance (including self-insurance) requirements set forth herein are not intended and shall not be construed to modify, limit, or reduce the indemnifications required of Contractor, nor to limit Contractor liability under this contract to the limits of the policies of insurance (or self-insurance) required to be maintained by Contractor hereunder.

Attachment B – Redevelopment Assistance Capital Program Mandatory Terms and Conditions

A. The Contractor (and any subcontractors) shall comply in all aspects with requirements of the Pennsylvania Steel Products Procurement Act ("SPPA") and the Trade Practices Act (July 23, 1968, P.L. 686, 71 P.S. §773.101 et seq.). The following RACP requirements relate to steel certification only:

- *Structural* - All structural steel on a RACP construction project shall be made and milled in the United States. **Steel Mill certificates (in form and substance satisfactory to the County) that attest to where the steel was procured and melted shall be required on all structural steel products before accepting delivery of any product to avoid non-compliance and in order to receive payment for those products.**

- *Non- Structural* – For steel that is not structural, properly completed ST- 2 and ST- 3 forms only shall be required. **These certifications must be provided for all products/materials that have steel components and the ST forms must be provided no later than delivery of product in order to receive payment.**

- *Other instances* – Written requests for exemption from steel certification only for products listed on the Pennsylvania Department of General Services current Exemption List may be accepted. **Written requests must be on the Contractor's letterhead, paper copy, detailing the product(s) for which the exemption is requested and provided upon delivery in order for Contractor to receive payment.**

In addition to the above, the following countries have been found to discriminate against aluminum and/or steel products manufactured in Pennsylvania. In accordance with the Pennsylvania Trade Practices Act of 1968, for this project, it is not allowable for vendor to provide aluminum or steel products that originate in the following countries: Argentina, Brazil, South Korea, and Spain.

B. The Contractor shall comply in all aspects with the requirements of the Pennsylvania Prevailing Wage Act (PWA). In furtherance of the project, the County will apply for a wage determination letter prior to entering into the Agreement with the Contractor by registering the project with the Pennsylvania Department of Labor and Industry to obtain the prevailing wage rates relevant to the project. This determination sheet will provide the necessary trade classifications for the project, along with their corresponding hourly wage and hourly fringe rates that are required for the certified payrolls required as part of RACP. The wage determination will be obtained within 120 days of the award of contract, and shall be attached as an exhibit to the Agreement between the Contractor and the County.

C. Contractor shall provide for 100% payment and performance (P&P) bonds. A performance bond must be obtained at 100% of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications, and conditions of the contract. Such bond shall be solely for the protection of the contracting body which awarded said contract. A payment bond must be obtained at 100% of the contract amount. Such bond shall be solely for the protection of claimants

supplying labor or materials to the project, in the prosecution of the work provided for in such contract, and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the work of the project. "Labor or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used as part of the project.

D. Requirements related to required insurance coverages and compliance with the Americans with Disabilities Act are set forth in the County's Standard Terms and Conditions contained in Attachment A, which requirements are mandatory and not waivable.

E. Identification of Sub- Contractors. Contractor shall provide a list to the County and the RACP State Assigned Consultant of all sub- contractors on the project, which list shall include the name of the company, the primary contact, address, phone, and trade.

F. Construction Responsibility Task Chart. Contractor shall provide a responsibility task chart to the County and the RACP State Assigned Consultant.

G. **Submittal Logs and Meeting Minutes**. Contractor shall provide submittal logs in a form and at times satisfactory to the County and the RACP State Assigned Consultant. Construction meeting minutes shall also be submitted to the County and the RACP State Assigned Consultant upon request.

H. **Contractor AIA Invoices**. Contractor AIA invoices with continuation sheets shall be submitted for review to the Delaware County Commerce Office and RACP State Assigned Consultant in order for the County to prepare reimbursement requests to the Commonwealth. AIA document or type document should be completed in full and continuation sheets are required and shall be approved by RACP State Assigned Consultant.

I. **Change Orders**. Any approved change orders for the project shall be provided to the Commonwealth.

J. **Project Photos**. Contractor shall take photographs of the project and provide the photographs to the County and RACP State Assigned Consultant at all required construction review meetings. The required photographs shall include at least one photograph of the project sign on project site(s) containing the required RACP and Governor identification information.

THE REQUIREMENTS IDENTIFIED IN THIS ATTACHMENT ARE NOT EXHAUSTIVE OF THE PROVISIONS, TERMS AND CONDITIONS OF THE RACP GRANT, AND ARE SUBJECT TO CHANGES MADE TO POLICY OR LEGISLATION DURING CONSTRUCTION PERIOD.