INVITATION FOR BIDS (IFB)

FOR

THE TOWN OF LUDLOW
RADIO COMMUNICATIONS
P25 SYSTEM UPGRADE

Project # 612R2019

IMPORTANT DATES:

- **Preliminary Questions from Proposers Due: 02/20/2020 at 16:00 ET**
- **Mandatory Pre-Proposal Conference: 02/27/2020 at 10:00 ET**
- **Mandatory Site Visits for Proposers: 02/27/2020**
- **Deadline for Final Questions: 03/10/2020 at 16:00 ET**
- **Addendum with Town Response to Proposer Questions: 03/25/2020**
- **Proposal Responses Due: 04/21/2020 at 16:00 ET**
  - **Opening Date: 04/21/2020 at 16:00 ET**
  - **Vendor Presentations: 05/05/2020 (TBA)**
  - **Committee Evaluation: 05/27/2020**
- **Winning Proposer Selected: 06/02/2020**

Issued: 01/22/2019

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1 Introduction and Overview

The Town of Ludlow is located in Hampden County Massachusetts and covers a territory of approximately 28 square miles. As of the 2010 census, the population was 21,203. Ludlow is considered part of the Springfield Metropolitan Statistical Area and is located just northeast of Springfield across the Chicopee River.

During the bidding process, all prospective proposers are hereby prohibited from contacting any member of the Board of Selectmen, the Town Administrator, any member of the Radio Communications Advisory Committee, or any Town employee or agent regarding the solicitation in any respect during the solicitation period, and the Town Administrator or any Town 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 to a bid solicitation submitted by the violator. The no-contact rule set forth shall not apply to inquiries submitted to Town employees or agents in the manner specifically provided in the bid solicitation package regarding the distribution thereof, or to communications seeking clarification regarding instructions or specifications submitted to Town employees or agents in the manner specifically provided for in the bid solicitation package, or to pre-proposal conferences provided for in the bid solicitation package, or to formal presentations by finalists to the Radio Communications Advisory Committee or any committee thereof specifically contemplated in the bid solicitation package.

1.1 Project Scope

The Town of Ludlow (Town) currently operates a mix of VHF and UHF radio systems for police (LPD), fire/EMS (LFD), public works (LPW), schools (LPS), and Council on Aging (COA). The Town's current public safety radio systems are aged and provide limited functionality. The infrastructure equipment and technology have reached end-of-life. In addition, the Town intends to incorporate the Department of Public Works, the Town of Ludlow Public Schools, and the Council on Aging communications needs into the new P25 radio system. To that end, the Town requires that a single town wide unified UHF P25 replacement system be constructed and deployed. The new unified P25 digital system will result in the added benefits of seamless interoperability between Ludlow agencies, improved system coverage throughout the Town, improved performance and enhanced features. As part of their proposal, contractors are required to design, implement, test and warrant the new P25 system along with any additional tower sites as may be needed to achieve the required system coverage described later in this document. Channel capacity planning shall incorporate adequate capacity for Police, Fire, EMS, DPW, LPS, and COA units.

Technologies and services to be deployed as a result of this IFB include the following major components:

- Replacement of the current public safety VHF and UHF voice and paging radio system infrastructure with an interoperable, UHF, P25 Phase II TDMA, simulcast, public safety communications system and supporting network infrastructure.
- Provide and construct any supporting facilities such as shelters, compounds, and towers required to implement the Contractor's proposed P25 radio system.
- Provide and install a new IP Ethernet MPLS microwave backhaul network connectivity between all sites in the Contractor's proposed P25 network.
- File for all new UHF and microwave RF channels to be utilized for the implementation.
- Replacement of the existing mobiles, portables, control stations, and pagers with next generation P25 compliant radios and pagers. This is to include installation of all mobile and control station radios.
- Replacement of the Town's current inventory of thirty-five (35) fire pagers with new units capable of operating and being alerted through the new UHF P25 system.
- The Town will need to retain its present Police department UHF and fire department VHF systems for up to 6 months post Final System Acceptance (FSA). The vendor must include a detailed plan for the coexistence of the present systems until such time as it is removed. Additionally, the vendor needs to make all necessary provisions for decommission and removal of the system infrastructure at a time following FSA.
- Provide and install new emergency power consisting of both UPS and generators at all proposed sites in the P25 network. Emergency power is to include connecting and reporting generator and UPS alarms to the appropriate staff.
- The proposer shall provide a design and pricing for a backup dispatch position based on laptop technology.
- Replacement of the current recorder logging system. This replacement must connect to the proposed new P25 system and the existing phone system(s).
- The successful proposal will include a detailed network/system/channel utilization plan for the Town and all of its agencies that are planned to operate on the new unified system.
- The successful Contractor shall be responsible to provide a Turnkey Solution to the Town of Ludlow for all items in the Contractor's proposal.

1.2 Definitions

The meaning of certain words as used within this IFB 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 806 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 Ludlow
CAD: Computer Aided Dispatch
CAI: Common Air Interface for a P25 radio network
CAP: P25 Compliance Assessment Program
Console RESOURCE: a controllable radio channel (conventional) or talkgroup (trunking) which can be accessed via the dispatch console interface
Contractor: refers to the prospective bidder that is awarded the voice radio and paging project contract by The Town of Ludlow
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-RF Sub-System Interface for a P25 radio network
Network Site: a location proposed by the Contractor and approved by The Town for the installation of FNE or other system/network backbone equipment
NPSPAC: The National Public Safety Planning and Advisory Committee
NPSPAC Region 21: FCC authorized coordinating body with regulatory authority over The Town
P25 SOR: the P25 Statement of Requirements most current version as of the date of the proposal
Proposer: refers to prospective bidders prior to award of a contract
Repeater: an electronic device designed 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 IFB.
Replacement P25 system: all electronics, hardware, and software components routinely employed to operate the new P25 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 P25 digital trunked public safety radio communications capability meeting the requirements of and intended to be procured as a result of this IFB.
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
Talkgroup: a trunked radio system talk channel
TDMA: Time Division Multiple Access
TIA: Telecommunications Industry Association
Town or The Town: The Town of Ludlow Massachusetts
Turnkey Solution: the entire system including all tasks and services associated with deployment and installation of the system. This is to include 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.
UHF: The public safety radio spectrum between 450 and 470 Megahertz as currently authorized by the FCC
VHF: The public safety radio spectrum between 138-144/148/174 Megahertz as currently authorized by the FCC

2 Terms and Conditions

IFB:	The Town of Ludlow Radio Communications P25 System Upgrade
Bid Due Date:	April 21, 2020 at 16:00 ET
Bids Opened At:	488 Chapin Street, Ludlow, MA 01056

On Behalf of the
THE TOWN OF LUDLOW
Radio Communications Advisory Committee

Contact:
Ellie Villano, Chief Procurement Officer
t: 413-583-5600 Ext. 1201
evillano@ludlow.ma.us

2.1 Legal Notice

INVITATION FOR BIDS

Radio Communications System Upgrade

The Town of Ludlow invites bids for THE TOWN OF LUDLOW Radio Communications P25 System Upgrade. The TOWN OF LUDLOW seeks to purchase and install a P25 LMR system to provide communications for the town's first responders.

The equipment offered in the bid must be new and unused. The Bidder must furnish all equipment and accessories usually considered to be standard for the type of equipment specified. The Bidder must set forth in the space provided herein the information requested, and the bid must be accompanied by whatever published material is necessary to fully describe the

equipment and services being offered, in sufficient detail as to enable THE TOWN OF LUDLOW to fully evaluate the bid. IFB information packets will be available starting on **01/22/2020** on the Town's website at http://www.ludlow.ma.us/html/business/rfp.htm. Massachusetts Prevailing Wage Laws apply to all services. Bid bonds are required. Sealed bids will be opened on **04/21/2020** at THE TOWN OF LUDLOW, Selectmen office, 488 Chapin Street, Ludlow, MA 01056. The opened Proposals will be examined for conformance to specifications, tabulated, and preserved in the custody of the radio Committee. THE TOWN OF LUDLOW reserves the right to accept or reject any and all bids.

Advertisements placed as follows:

COMMBUYS Published:	**01/22/2020**
THE TOWN OF LUDLOW Website:	**01/22/2020**
Central Register Published:	**01/22/2020**
Newspaper	**01/22/2020**

General Information

2.1.1 Overview

This is an Invitation for Bids issued by THE TOWN OF LUDLOW to secure the provision of goods and/or services. THE TOWN OF LUDLOW Radio Advisory Committee (LRAC) was formed as a Town appointed advisory committee in connection with this purpose.

THE TOWN OF LUDLOW seeks bids for the purchase and installation of a Project 25 (P25) Land Mobile Radio System as defined in the specifications provided later in this IFB.

2.1.2 Bid Documents Available

Bid documents will be made available beginning **01/22/2020** at http://www.ludlow.ma.us/html/business/rfp.htm

2.1.3 Pre-Bid Conference

There will be a mandatory Pre-Bid Conference for this IFB on **02/27/2020**. The Pre-Bid conference will include site visits to current and potential site locations. See Section 12.7 for additional information.

2.1.4 Questions

Inquiries/Questions: Any questions regarding this proposal must be emailed to Ali Shahnami of ACD Telecom (ali.shahnami@acdtelecom.com). Responses to questions, clarifications, and addenda will be posted on the Town's public webpage at http://www.ludlow.ma.us/html/business/rfp.htm. It is the responsibility of interested Bidders to verify this information has been issued into addenda prior to submitting a bid. A copy of all addenda that are issued should be included in the bid package and each addendum should be signed and dated by the bidder.

Proposers have the opportunity to ask questions prior to the Pre-Proposal Conference. These questions should be emailed to Ali Shahnami (ali.shahnami@acdtelecom.com) no later than **02/20/2020 at 1600 ET.**

Questions regarding the radio system or facilities will be recorded and answered at the Pre-Proposal Conference. Answers to all questions involving the general requirements of the proposed radio system and any additional questions received after the Pre-Proposal Conference will be addressed in Addenda posted on the Town's website. The deadline for Final Questions is **03/10/2020 at 1600 ET.**

2.1.5 Addenda

Written addenda issued by the TOWN OF LUDLOW will be posted on the Town's website at http://www.ludlow.ma.us/html/business/rfp.htm. A copy of all addenda that are issued should be included in the bid package and each addendum should be signed and dated by the bidder.

2.1.6 Applicable Laws and Certifications

This Invitation for Bids (IFB) is issued pursuant to M.G.L. c.30, §39M.

2.2 How to Submit a Bid

2.2.1 Bid Submittal

Bid must be submitted in a sealed envelope clearly marked with the following information:

THE TOWN OF LUDLOW
IFB: THE TOWN OF LUDLOW RADIO COMMUNICATIONS P25 SYSTEM UPGRADE
Project # 612R2019
Bid Due Date: **April 21, 2020 at 16:00 ET**
Bidder's Name: _____

All external mailing/shipping packaging containing sealed bid envelopes must be clearly addressed as follows:

IFB: THE TOWN OF LUDLOW RADIO COMMUNICATIONS P25 SYSTEM UPGRADE
Project # 612R2019
THE TOWN OF LUDLOW
488 CHAPIN STREET
LUDLOW, MA 01056
c/o Ellie Villano, Chief Procurement Officer

Bid envelopes must contain three (3) hard copies of all required documents and two (2) electronic copies of the required documents in .pdf format.

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

Bids must be signed as follows:

- If the bidder is an individual, by her/him personally;
- If the bidder is a partnership, by the name of the partnership, followed by the signature of each general partner; and
- If the bidder is a corporation, by the name of the corporation, followed by the signature of an authorized officer, whose signature must be attested to by the Clerk/Secretary of the corporation with the corporate seal affixed.

2.2.2 Compliance with IFB

Bidders must comply with all requirements of this IFB in order to be eligible for contract award. Minor informalities will be waived, or the bidder will be allowed to correct them. If a mistake in a bid is evident and the intended bid is clear on the face of the Bid Price Sheets, the mistake will be corrected to reflect the intended correct bid and the bidder will be notified in writing. The bidder may not withdraw such a bid. THE TOWN OF LUDLOW may reject, or a bidder may withdraw a bid if a mistake is clearly evident on the face of the Bid Price Sheets, yet the intended correct bid is not similarly evident.

2.2.3 Form of Bid

Bids must include the Bid Price Sheets provided in Section 13. In addition, the response must contain all the required enclosures itemized below.

2.2.4 Required Bid Documents

All bids are required to contain the following forms fully completed and excepting Form E, signed (see Appendix D):

- ❑ Form A: General Bid Form
- ❑ Form B: Statement of Competency/Certification of Good Faith – with list of references
- ❑ Form C: Bid Price Sheets
- ❑ Form D: Labor Harmony and OSHA Certifications
- ❑ Form E: Sample Contract
- ❑ Bid Deposit; Performance Surety Bond; Payment Bond
- ❑ Debarment Certification (In lieu of the Certification form, the vendor must provide a statement under its letterhead attesting that they have never been debarred in the Commonwealth of Massachusetts and/or in any United States Federal Government programs and activities).

2.2.5 Modifications to Bids

A bidder may correct, modify, or withdraw a bid by written notice received by THE TOWN OF LUDLOW no later than the close of business on the day before the bid opening. Bid modifications must be submitted in a sealed envelope clearly labeled "Modification No.__". Each modification must be numbered in sequence, must reference the original IFB and must be

signed by the same person who signed the General Bid Form, or a surrogate so authorized in writing.

After the bid opening, a bidder may not change any provision of the bid in a manner prejudicial to the interests of THE TOWN OF LUDLOW, LRAC, or fair competition as determined by THE TOWN OF LUDLOW.

2.2.6 Bid Opening

Sealed bids will be accepted at THE TOWN OF LUDLOW, 488 Chapin Street, Selectman's Office, 3rd floor, Ludlow, MA until **04/21/2020 at 16:00 ET** as read on the clock in the 3rd floor of THE TOWN OF LUDLOW Selectmen's Office where they will be publicly opened and read aloud the following day. Bids will be made available for inspection on-site for a reasonable period of time after all bids are opened.

Unforeseeable Deterrents - If at the time of the scheduled bid opening, the designated site is unavailable due to circumstances beyond the control of THE TOWN OF LUDLOW, the bid opening will be automatically postponed (with or without notice to potential bidders) until 12:00 Noon at the same location on the next normal business day. In the event the same location cannot be used to accommodate a postponement, the bid opening will be formally postponed with notification to all parties provided bid documents by THE TOWN OF LUDLOW. Bids will be accepted until any postponement time.

2.3 Award and Contract

2.3.1 Rule of Award

An award will be made as follows:

- An award will be made based on the Bid Price Form to the responsive and eligible bidder offering the lowest total bid price for all items listed in the IFB.

The term "lowest responsible and eligible bidder" shall mean the bidder: (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; (4) who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and (5) who obtains within 10 days of the notification of contract award the security by bond required under section 29 of chapter 149; provided that for the purposes of this section the term "security by bond" shall

mean the bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority; and provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable [M.G.L. c.30, §39M(c)].

2.3.2 Tie Breaker

In the event of a tie, the low Bidder shall be the Bidder who wins a coin toss to take place immediately after the bid opening.

2.3.3 Timeframe for Award

All bid prices submitted in response to this IFB must remain firm for 90 (ninety days following the bid opening or until a contract is executed, whichever occurs last.

2.3.4 Reserved Rights

THE TOWN OF LUDLOW reserves the right to:

1. Cancel this IFB at any time, with or without notice to prospective bidders. Reasonable efforts will be made to give timely notice.
2. Accept or reject, in whole or in part, any and all bids as permitted by law.
3. Award contracts as it deems best serves the interests of THE TOWN OF LUDLOW and/or LRAC.
4. Waive or adjust non-statutory bid requirements before or after bids are opened in whatever ways it deems best serves the interests of THE TOWN OF LUDLOW and/or LRAC, while also being non-prejudicial to the interests of fair competition.

2.3.5 Contract

A signed contract will result from this IFB and will remain in effect for up to two (2) years or until the purpose of the contract is fully realized.

2.4 Bidder Qualification Requirements

2.4.1 Performance Capabilities

Bidders must be capable of designing and providing the specified goods on schedule, in working order, in an intact and undamaged condition, and providing any support services in a professional and workmanlike manner.

Time of performance is critical to this IFB. Bidders must reassure THE TOWN OF LUDLOW of their capacity to perform within the timeframe set out in this IFB.

2.4.2 Experience

Bidders must demonstrate competency in the business of providing the goods and/or services specified in this IFB by conformance with the following criteria. Bidders must meet these minimum qualifications to be considered responsive and eligible.

a. In business for a minimum of 3 years.
b. Provision of the specified goods and/or services is consistent with normal lines of business.
c. Receive favorable ratings from references.

2.4.3 References

Bidders must provide a comprehensive list of ongoing projects and recent projects completed within the last 2 years, as well as project contact names and telephone numbers. Use a separate sheet(s) clearly marked "REFERENCES" to provide this information for each reference. Additional information can be found below in Section 12.1.

2.4.4 Subcontractors

The use of subcontractors with specialties in the areas referenced in Section 2.4.2 is acceptable. If the Vendor intends to perform any or all work related to this contract through subcontractor(s), said subcontractor(s) names, business affiliations, and addresses must be attached with the bid and referenced to the appropriate work to be performed. Bidders agree to be responsible to ensure the legal and contractual compliance of named subcontractor(s). Use of subcontractor(s) not named in the Bidder's bid is prohibited. Both the Owner's Project Manager, ACD Telecom and the Town of Ludlow may approve or reject the sub-contractor(s) selected by the bidder.

2.4.5 Performance Surety Bond Required

Bidder awarded the contract will be required to furnish a Performance Bond with surety in the amount of 100% of the specific award. Bond shall be conditioned upon the faithful performance of the contract. This guarantee shall be submitted in the form of a good and sufficient bond drawn upon an Insurance or Bonding Company authorized to do business in the Commonwealth of Massachusetts.

2.4.6 Payment Bond Required

If the contract price exceeds $25,000, a payment bond will be required from the Bidder awarded the contract. The payment bond must be in the amount of 100% of the contract price. Bond shall be conditioned upon the faithful performance of the contract. The bond must be obtained by the Bidder from a surety company and guarantee payment to materials suppliers and/or subcontractors in the event that the Bidder fails to pay the materials suppliers and/or

subcontractors. This guarantee shall be submitted in the form of a good and sufficient bond drawn upon an Insurance or Bonding Company authorized to do business in the Commonwealth of Massachusetts. The Bidder has 10 days from the date of notification of contract award to obtain the payment bond.

2.4.7 Employment and Labor Rates

The Bidder must comply with the Massachusetts law regarding prevailing wage rates, as well as any other provisions related to employment conditions referenced in M.G.L. c.149, §§26-27. See Appendix B for prevailing wage rates. Winning bidders must provide THE TOWN OF LUDLOW with certified payroll records within fifteen days after completion of its portion of the work. See Appendix C for a sample statement of compliance.

2.4.8 Responsibility for Safety, Health, and First Aid

The Bidder shall ensure that their employees and agents comply with all applicable health and safety laws, rules and regulations without limitation, including but not limited to the Federal, Commonwealth of Massachusetts, Occupational Safety and Health Act of 1970 (OSHA), and Bidder's company safety regulations as issued and included with this bid.

The Bidder shall be responsible for ensuring that all work performed under his supervision, or work that the Bidder subcontracts, in conjunction with this procurement is in compliance with all applicable safety, building and electrical codes.

2.4.9 Insurance

The selected contractor shall at all times during the term of the contract maintain insurance in full force and effect acceptable to THE TOWN OF LUDLOW and the LRAC that satisfies the minimum requirements outlined below. The selected contractor agrees to furnish THE TOWN OF LUDLOW with certificates of insurance or other evidence satisfactory to THE TOWN OF LUDLOW if requested.

WORKER'S COMPENSATION	
Workers Compensation & Employers Liability	Per M.G.L. c. 149, s. 34 and c. 152 as amended.
COMMERCIAL GENERAL LIABILITY	
Personal Injury	$500,000 each occurrence $1,000,000 aggregate
Property Damage	$500,000 each occurrence $1,000,000 aggregate
VEHICLE LIABILITY	
Personal Injury	$500,000 each person $1,000,000 aggregate

Property Damage $300,000

2.4.10 Permits

All permits needed to complete installation shall be the responsibility of the contractor.

2.5 Product and Performance Terms

2.5.1 Quality Requirements

All products must be new and fully serviceable and suited to their intended use consistent with the manufacturers' specifications and representations, and any representations made by selected vendor(s). Used and previously opened items will not be accepted.

2.5.2 "Or Equal"

An item at least equal to one or more that are named or described in the Specifications may be offered by a Bidder.

The naming of any commercial name, trademark, or other identification shall not be construed to exclude any item or manufacturer not mentioned by name or as limiting competition but shall establish a standard of quality only. An item equal to one or more that are named or described in the Specifications may be offered by a vendor. An item shall be considered equal to the item so named or described if (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the use intended, and (3) it conforms substantially to the requirements of the specifications with only minor deviations immaterial to the requirements of the preceding conditions (1) and (2). The name and manufacturer's published product specifications establishing product equality must accompany "Or Equal" Bids. Acceptance of "Or Equal" Bids shall be at the sole discretion of THE TOWN OF LUDLOW whose decision shall be final.

2.5.3 Warranty

Vendor is required to provide a manufacturer warranty on all purchased parts as defined below in Section 10.

2.5.4 Method of Acquisition

All purchases shall be outright purchases. Leases, lease-purchases and credit-based purchases are specifically not authorized.

THE TOWN OF LUDLOW will issue purchase orders.

2.5.5 Delivery

All goods and/or services must be delivered per THE TOWN OF LUDLOW "Ship To" instructions.

All deliveries must be signed for by a properly authorized person at the "Ship To" address on the purchase order. Vendors will not be paid for deliveries left without proper signatures.

2.5.6 Returns

Selected vendor(s) shall unconditionally accept and pick-up or ship, at the vendor's expense, any and all items found to be damaged or not in compliance with the specifications, model numbers, descriptions or other representations upon which a contract is awarded. Returns shall be promptly credited. Cash returns shall not be tendered.

2.5.7 Invoicing

Selected Vendors must direct all invoices to:

THE TOWN OF LUDLOW
Attn: Chief Ryan Pease, Fire Chief
Ludlow Radio Advisory Committee
564 Center Street
Ludlow, MA 01056
lfdc1@ludlow.ma.us

LRAC and THE TOWN OF LUDLOW are tax-exempt. Sales taxes and finance charges will not be paid. All invoices must be approved by ACD Telecom, the Owner's Project Manager (OPM) before THE TOWN OF LUDLOW begins processing the payment.

Invoices must contain, or be accompanied by, the following information:

- THE TOWN OF LUDLOW Purchase Order Number
- THE TOWN OF LUDLOW Contract Number
- Quantity Purchased
- Item Number and Description
- Unit Price per Vendor's Bid
- Extended Price
- Total Price
- Total Amount Payable
- Drop-ship Address
- Delivery Date
- Record of Receiver's Sign-off

2.5.8 Change Orders and Adjustments

Without invalidating the Agreement and without notice to any Surety, if applicable, the Town may, at any time or from time to time, order additions, deletions or revisions to the System within the general scope of the Agreement by a Change Order (as defined below) or a Change Directive (as defined below). Upon receipt of a Change Order or a Change Directive from the Town, Vendor shall promptly proceed with the changes to the System which will be performed under the applicable provisions of the Specifications (except as otherwise specifically provided in the Change Order or Change Directive); provided, however, where the parties cannot agree as to the amount of compensation or additional time, if any, that the Vendor should receive for a Change Directive, the Vendor shall proceed as directed by the Town and by so proceeding the Vendor does not waive, but expressly reserves, any and all rights to make a claim with respect to such Change Directive. Additional work performed by the Vendor without prior written authorization by the Town as set forth in the Specifications will not entitle the Vendor to an increase in the Contract Price or an extension of the contract time. Change Directives that require additional time, materials, or services to complete may result in an equitable adjustment in contract price, project schedule, or both. The Town shall comply with all applicable procurement laws, statutes, and ordinances with respect to the administration of the Change Directive process.

If the Town prefers to accept work which is not in accordance with the requirements of the Specifications, the Town may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable. Such adjustments shall be affected whether or not final payment has been made.

If the Town approves a Change Order for Services or Equipment, neither specifically nor generally included in the Agreement or in the attachments hereto, the parties shall enter into an amendment of this Agreement for the performance of work associated with the Change Order. With respect to any Change Order for such work performed, Services provided or materials provided by subcontractors or other third parties other than Vendor, the Vendor hereby agrees that its proposed price quote for such Change Order shall be the amount of the subcontractor or third party's final total billing price to Vendor plus a margin amount for overhead and profit not to exceed fifteen percent (15%) based on level of effort required by Vendor. Upon request and with respect to only such Change Orders, Vendor shall provide a copy of the subcontractor or third party's total bill for verification purposes to the Town.

For purposes of this Agreement, a "Change Order" shall mean a written order signed by the Town and Vendor and issued to the Vendor after execution of this Agreement 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.

For purposes of this Agreement, a "Change Directive" shall mean a written directive issued by the Town to Vendor, issued after execution of this Agreement and before Final System Acceptance and signed by the Town ordering an addition, deletion or revision to the System. The

Town acknowledges and agrees that use of the Change Directive process is intended as a measure reasonably necessary to ensure the efficient installation and implementation of the System pursuant to the Project Schedule with the goal of reducing or eliminating potential project delays. Vendor agrees that third party costs associated with such Change Directives shall be invoiced to the Town based on the third party's final total billing price to Vendor plus a margin amount for overhead and profit not to exceed fifteen percent (15%).

2.5.9 Payment

The goods and/or services procured through this IFB are funded by the Town of Ludlow. Payment to the selected vendor will not be made until goods and/or services are received in full and receipt is confirmed by LRAC. Payments shall be made in accordance with the milestones identified in the payment schedule defined in Section 9.4. The standard turnaround time for payment to the selected vendor from the time of invoice approval and goods and/or services acceptance is a minimum of 60 days. THE TOWN OF LUDLOW will make all necessary effort to expedite payment cycles but will not be liable for slow payment cycles.

2.6 Appendix A – Product Description & Specifications

The TOWN OF LUDLOW seeks to purchase and install a P25 LMR system to provide communications for the town's first responders. This bid will be awarded to the responsive low bidder who meets all required performance specifications delineated in this IFB.

The equipment offered in the bid must be new and unused. The Bidder must furnish all equipment and accessories usually considered to be standard for the type of equipment specified. The Bidder must set forth in the space provided herein the information requested, and the bid must be accompanied by whatever published material is necessary to fully describe the equipment and services being offered, in sufficient detail as to enable THE TOWN OF LUDLOW to fully evaluate the bid.

If the Bidder is submitting an alternate to what has been specified, please note that on the bid and send literature to document Bidder's proposed substitute so that THE TOWN OF LUDLOW may evaluate accordingly. Failure to submit supporting documentation could result in the bid being rejected.

Pricing must include delivery costs F.O.B. delivery location.

2.7 Appendix B – Prevailing Wage Sheets

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

ROSALIN ACOSTA
Secretary

WILLIAM D MCKINNEY
Director

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

Awarding Authority: Town of Ludlow

Contract Number:

City/Town: LUDLOW

Description of Work: 612R2019 Single town wide unified UHF P25 radio system to be constructed and deployed. Design, implement, test and warrant the P25 with any additional tower sites

Job Location: 612 Chapin Street/ 564 Center Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and

Issue Date: 11/26/2019 **Wage Request Number:** 20191125-052

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.25	$12.41	$12.70	$0.00	$59.36
	12/01/2019	$34.25	$12.41	$13.72	$0.00	$60.38
	06/01/2020	$35.15	$12.41	$13.72	$0.00	$61.28
	08/01/2020	$35.15	$12.91	$13.72	$0.00	$61.78
	12/01/2020	$35.15	$12.91	$14.82	$0.00	$62.88
	06/01/2021	$35.95	$12.91	$14.82	$0.00	$63.68
	08/01/2021	$35.95	$13.41	$14.82	$0.00	$64.18
	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.32	$12.41	$12.70	$0.00	$59.43
	12/01/2019	$34.32	$12.41	$13.72	$0.00	$60.45
	06/01/2020	$35.22	$12.41	$13.72	$0.00	$61.35
	08/01/2020	$35.22	$12.91	$13.72	$0.00	$61.85
	12/01/2020	$35.22	$12.91	$14.82	$0.00	$62.95
	06/01/2021	$36.02	$12.91	$14.82	$0.00	$63.75
	08/01/2021	$36.02	$13.41	$14.82	$0.00	$64.25
	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.44	$12.41	$12.70	$0.00	$59.55
	12/01/2019	$34.44	$12.41	$13.72	$0.00	$60.57
	06/01/2020	$35.34	$12.41	$13.72	$0.00	$61.47
	08/01/2020	$35.34	$12.91	$13.72	$0.00	$61.97
	12/01/2020	$35.34	$12.91	$14.82	$0.00	$63.07
	06/01/2021	$36.14	$12.91	$14.82	$0.00	$63.87
	08/01/2021	$36.14	$13.41	$14.82	$0.00	$64.37
	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2019	$102.78	$9.90	$21.15	$0.00	$133.83
AIR TRACK OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$32.25	$7.85	$14.22	$0.00	$54.32
	12/02/2019	$32.25	$8.10	$14.78	$0.00	$55.13
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$32.25	$7.85	$12.18	$0.00	$52.28
	12/01/2019	$32.25	$8.10	$12.72	$0.00	$53.07
	06/01/2020	$33.06	$8.10	$12.72	$0.00	$53.88
	12/01/2020	$33.87	$8.10	$12.72	$0.00	$54.69
	06/01/2021	$34.71	$8.10	$12.72	$0.00	$55.53
	12/01/2021	$35.54	$8.10	$12.72	$0.00	$56.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	06/01/2019	$32.40	$12.50	$8.35	$0.00	$53.25
	12/01/2019	$33.30	$12.50	$8.35	$0.00	$54.15
	06/01/2020	$34.20	$12.50	$8.35	$0.00	$55.05
	12/01/2020	$35.10	$12.50	$8.35	$0.00	$55.95
ASPHALT RAKER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
AUTOMATIC GRADER-EXCAVATOR (RECLAIMER) *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$35.05	$11.69	$14.08	$0.00	$60.82
	12/01/2019	$35.40	$11.94	$14.35	$0.00	$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$35.05	$11.69	$14.08	$0.00	$60.82
	12/01/2019	$35.40	$11.94	$14.35	$0.00	$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						
BATCH/CEMENT PLANT - ON SITE *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$34.52	$11.69	$14.08	$0.00	$60.29
	12/01/2019	$34.87	$11.94	$14.35	$0.00	$61.16
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$32.25	$7.85	$14.22	$0.00	$54.32
	12/02/2019	$32.25	$8.10	$14.78	$0.00	$55.13
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$32.25	$7.85	$12.18	$0.00	$52.28
	12/01/2019	$32.25	$8.10	$12.72	$0.00	$53.07
	06/01/2020	$33.06	$8.10	$12.72	$0.00	$53.88
	12/01/2020	$33.87	$8.10	$12.72	$0.00	$54.69
	06/01/2021	$34.71	$8.10	$12.72	$0.00	$55.53
	12/01/2021	$35.54	$8.10	$12.72	$0.00	$56.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2019	$44.71	$7.07	$17.72	$0.00	$69.50
	01/01/2020	$46.10	$7.07	$17.98	$0.00	$71.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.06	$7.07	$11.52	$0.00	$47.65
2	65	$29.06	$7.07	$11.52	$0.00	$47.65
3	70	$31.30	$7.07	$12.40	$0.00	$50.77
4	75	$33.53	$7.07	$13.30	$0.00	$53.90
5	80	$35.77	$7.07	$14.18	$0.00	$57.02
6	85	$38.00	$7.07	$15.07	$0.00	$60.14
7	90	$40.24	$7.07	$15.95	$0.00	$63.26
8	95	$42.47	$7.07	$16.84	$0.00	$66.38

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.97	$7.07	$11.69	$0.00	$48.73
2	65	$29.97	$7.07	$11.69	$0.00	$48.73
3	70	$32.27	$7.07	$12.59	$0.00	$51.93
4	75	$34.58	$7.07	$13.49	$0.00	$55.14
5	80	$36.88	$7.07	$14.38	$0.00	$58.33
6	85	$39.19	$7.07	$15.29	$0.00	$61.55
7	90	$41.49	$7.07	$16.18	$0.00	$64.74
8	95	$43.80	$7.07	$17.09	$0.00	$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	08/01/2019	$42.81	$10.75	$19.41	$0.00	$72.97
	02/01/2020	$43.36	$10.75	$19.41	$0.00	$73.52
	08/01/2020	$44.71	$10.75	$19.56	$0.00	$75.02
	02/01/2021	$45.26	$10.75	$19.56	$0.00	$75.57
	08/01/2021	$46.66	$10.75	$19.72	$0.00	$77.13
	02/01/2022	$47.19	$10.75	$19.72	$0.00	$77.66

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield*

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.41	$10.75	$19.41	$0.00	$51.57
2	60	$25.69	$10.75	$19.41	$0.00	$55.85
3	70	$29.97	$10.75	$19.41	$0.00	$60.13
4	80	$34.25	$10.75	$19.41	$0.00	$64.41
5	90	$38.53	$10.75	$19.41	$0.00	$68.69

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.68	$10.75	$19.41	$0.00	$51.84
2	60	$26.02	$10.75	$19.41	$0.00	$56.18
3	70	$30.35	$10.75	$19.41	$0.00	$60.51
4	80	$34.69	$10.75	$19.41	$0.00	$64.85
5	90	$39.02	$10.75	$19.41	$0.00	$69.18

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$35.05	$11.69	$14.08	$0.00	$60.82
	12/01/2019	$35.40	$11.94	$14.35	$0.00	$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$40.25	$7.85	$16.05	$0.00	$64.15
	12/01/2019	$40.25	$8.10	$16.80	$0.00	$65.15
	06/01/2020	$41.24	$8.10	$16.80	$0.00	$66.14
	12/01/2020	$42.22	$8.10	$16.80	$0.00	$67.12
	06/01/2021	$43.24	$8.10	$16.80	$0.00	$68.14
	12/01/2021	$44.25	$8.10	$16.80	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$39.10	$7.85	$16.05	$0.00	$63.00
	12/01/2019	$39.10	$8.10	$16.80	$0.00	$64.00
	06/01/2020	$40.09	$8.10	$16.80	$0.00	$64.99
	12/01/2020	$41.07	$8.10	$16.80	$0.00	$65.97
	06/01/2021	$42.09	$8.10	$16.80	$0.00	$66.99
	12/01/2021	$43.10	$8.10	$16.80	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$39.10	$7.85	$16.05	$0.00	$63.00
	12/01/2019	$39.10	$8.10	$16.80	$0.00	$64.00
	06/01/2020	$40.09	$8.10	$16.80	$0.00	$64.99
	12/01/2020	$41.07	$8.10	$16.80	$0.00	$65.97
	06/01/2021	$42.09	$8.10	$16.80	$0.00	$66.99
	12/01/2021	$43.10	$8.10	$16.80	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS LOCAL 336 - HAMPDEN HAMPSHIRE FRANKLIN*	09/02/2019	$37.54	$7.84	$16.87	$0.00	$62.25
	03/01/2020	$38.04	$7.84	$16.87	$0.00	$62.75
	09/01/2020	$38.54	$7.84	$16.87	$0.00	$63.25
	03/01/2021	$39.04	$7.84	$16.87	$0.00	$63.75
	09/01/2021	$39.54	$7.84	$16.87	$0.00	$64.25
	03/01/2022	$40.04	$7.84	$16.87	$0.00	$64.75
	09/01/2022	$40.54	$7.84	$16.87	$0.00	$65.25
	03/01/2023	$41.04	$7.84	$16.87	$0.00	$65.75

Apprentice - *CARPENTER - Local 336 Hampden Hampshire Franklin*

Effective Date - 09/02/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.77	$7.84	$1.32	$0.00	$27.93
2	60	$22.52	$7.84	$1.32	$0.00	$31.68
3	70	$26.28	$7.84	$12.91	$0.00	$47.03
4	75	$28.16	$7.84	$12.91	$0.00	$48.91
5	80	$30.03	$7.84	$14.23	$0.00	$52.10
6	80	$30.03	$7.84	$14.23	$0.00	$52.10
7	90	$33.79	$7.84	$15.55	$0.00	$57.18
8	90	$33.79	$7.84	$15.55	$0.00	$57.18

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.02	$7.84	$1.32	$0.00	$28.18
2	60	$22.82	$7.84	$1.32	$0.00	$31.98
3	70	$26.63	$7.84	$12.91	$0.00	$47.38
4	75	$28.53	$7.84	$12.91	$0.00	$49.28
5	80	$30.43	$7.84	$14.23	$0.00	$52.50
6	80	$30.43	$7.84	$14.23	$0.00	$52.50
7	90	$34.24	$7.84	$15.55	$0.00	$57.63
8	90	$34.24	$7.84	$15.55	$0.00	$57.63

Notes:
% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $26.05/ 3&4 $31.09/ 5&6 $48.35/ 7&8 $53.42

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS LOCAL 336 - HAMPDEN HAMPSHIRE FRANKLIN*	10/01/2019	$23.49	$7.07	$7.86	$0.00	$38.42
All Aspects of New Wood Frame Work						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - 336 Hampden Hampshire*

Effective Date - 10/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.09	$7.07	$0.00	$0.00	$21.16
2	60	$14.09	$7.07	$0.00	$0.00	$21.16
3	65	$15.27	$7.07	$7.86	$0.00	$30.20
4	70	$16.44	$7.07	$7.86	$0.00	$31.37
5	75	$17.62	$7.07	$7.86	$0.00	$32.55
6	80	$18.79	$7.07	$7.86	$0.00	$33.72
7	85	$19.97	$7.07	$7.86	$0.00	$34.90
8	90	$21.14	$7.07	$7.86	$0.00	$36.07

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.64/ 3&4 $24.74/ 5&6 $31.37/ 7&8 $33.72

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)*	07/01/2019	$40.46	$12.70	$17.64	$0.62	$71.42
	01/01/2020	$41.94	$12.70	$17.64	$0.62	$72.90

Apprentice - *CEMENT MASONRY/PLASTERING - Springfield/Pittsfield*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.23	$12.70	$15.41	$0.00	$48.34
2	60	$24.28	$12.70	$17.64	$0.62	$55.24
3	65	$26.30	$12.70	$17.64	$0.62	$57.26
4	70	$28.32	$12.70	$17.64	$0.62	$59.28
5	75	$30.35	$12.70	$17.64	$0.62	$61.31
6	80	$32.37	$12.70	$17.64	$0.62	$63.33
7	90	$36.41	$12.70	$17.64	$0.62	$67.37

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.97	$12.70	$15.41	$0.00	$49.08
2	60	$25.16	$12.70	$17.64	$0.62	$56.12
3	65	$27.26	$12.70	$17.64	$0.62	$58.22
4	70	$29.36	$12.70	$17.64	$0.62	$60.32
5	75	$31.46	$12.70	$17.64	$0.62	$62.42
6	80	$33.55	$12.70	$17.64	$0.62	$64.51
7	90	$37.75	$12.70	$17.64	$0.62	$68.71

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019	$34.52	$11.69	$14.08	$0.00	$60.29
	12/01/2019	$34.87	$11.94	$14.35	$0.00	$61.16
CRANE OPERATOR *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019	$38.55	$11.69	$14.08	$0.00	$64.32
	12/01/2019	$38.90	$11.94	$14.35	$0.00	$65.19
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2019	$50.66	$8.20	$21.45	$0.00	$80.31
	01/01/2020	$50.96	$8.20	$22.10	$0.00	$81.26
	07/01/2020	$52.06	$8.20	$22.10	$0.00	$82.36
	01/01/2021	$53.16	$8.20	$22.10	$0.00	$83.46

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.33	$8.20	$0.00	$0.00	$33.53
2	55	$27.86	$8.20	$5.78	$0.00	$41.84
3	60	$30.40	$8.20	$6.30	$0.00	$44.90
4	65	$32.93	$8.20	$6.83	$0.00	$47.96
5	70	$35.46	$8.20	$18.30	$0.00	$61.96
6	75	$38.00	$8.20	$18.83	$0.00	$65.03
7	80	$40.53	$8.20	$19.35	$0.00	$68.08
8	90	$45.59	$8.20	$20.40	$0.00	$74.19

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.48	$8.20	$0.00	$0.00	$33.68
2	55	$28.03	$8.20	$5.94	$0.00	$42.17
3	60	$30.58	$8.20	$6.48	$0.00	$45.26
4	65	$33.12	$8.20	$7.02	$0.00	$48.34
5	70	$35.67	$8.20	$18.51	$0.00	$62.38
6	75	$38.22	$8.20	$19.05	$0.00	$65.47
7	80	$40.77	$8.20	$19.59	$0.00	$68.56
8	90	$45.86	$8.20	$20.67	$0.00	$74.73

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 3 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	06/01/2019	$39.30	$7.85	$15.85	$0.00	$63.00
	12/01/2019	$39.30	$8.10	$16.60	$0.00	$64.00
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$40.30	$7.85	$15.85	$0.00	$64.00
	12/01/2019	$40.30	$8.10	$16.60	$0.00	$65.00

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$40.05	$7.85	$15.85	$0.00	$63.75
	12/01/2019	$40.05	$8.10	$16.60	$0.00	$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$40.30	$7.85	$15.85	$0.00	$64.00
	12/01/2019	$40.30	$8.10	$16.60	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$40.05	$7.85	$15.85	$0.00	$63.75
	12/01/2019	$40.05	$8.10	$16.60	$0.00	$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$39.30	$7.85	$15.85	$0.00	$63.00
	12/01/2019	$39.30	$8.10	$16.60	$0.00	$64.00
For apprentice rates see "Apprentice- LABORER"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2019	$68.52	$9.90	$21.15	$0.00	$99.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2019	$48.94	$9.90	$21.15	$0.00	$79.99
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2019	$73.41	$9.90	$21.15	$0.00	$104.46
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2019	$102.78	$9.90	$21.15	$0.00	$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
ELECTRICIAN (Including Core Drilling) *ELECTRICIANS LOCAL 7*	06/30/2019	$42.66	$10.75	$12.33	$0.00	$65.74
	12/29/2019	$43.41	$11.00	$12.60	$0.00	$67.01

Apprentice - *ELECTRICIAN - Local 7*

Effective Date - 06/30/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.06	$5.85	$0.51	$0.00	$23.42
2	45	$19.20	$5.85	$0.58	$0.00	$25.63
3	50	$21.33	$10.75	$6.94	$0.00	$39.02
4	55	$23.46	$10.75	$7.00	$0.00	$41.21
5	65	$27.73	$10.75	$8.13	$0.00	$46.61
6	70	$29.86	$10.75	$9.20	$0.00	$49.81

Notes:
Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

Apprentice to Journeyworker Ratio:2:3****

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2019	$53.11	$15.58	$17.51	$0.00	$86.20
	01/01/2020	$54.85	$15.73	$18.41	$0.00	$88.99
	01/01/2021	$56.69	$15.88	$19.31	$0.00	$91.88
	01/01/2022	$58.62	$16.03	$20.21	$0.00	$94.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 41*

Effective Date - 01/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.56	$15.58	$0.00	$0.00	$42.14
2	55	$29.21	$15.58	$17.51	$0.00	$62.30
3	65	$34.52	$15.58	$17.51	$0.00	$67.61
4	70	$37.18	$15.58	$17.51	$0.00	$70.27
5	80	$42.49	$15.58	$17.51	$0.00	$75.58

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$15.73	$0.00	$0.00	$43.16
2	55	$30.17	$15.73	$18.41	$0.00	$64.31
3	65	$35.65	$15.73	$18.41	$0.00	$69.79
4	70	$38.40	$15.73	$18.41	$0.00	$72.54
5	80	$43.88	$15.73	$18.41	$0.00	$78.02

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 41*	01/01/2019	$37.18	$15.58	$17.51	$0.00	$70.27
	01/01/2020	$38.40	$15.73	$18.41	$0.00	$72.54
	01/01/2021	$39.68	$15.88	$19.31	$0.00	$74.87
	01/01/2022	$41.03	$16.03	$20.21	$0.00	$77.27
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST/ROD-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$18.84	$4.80	$4.10	$0.00	$27.74
FIELD ENG.PARTY CHIEF:BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$21.33	$4.80	$4.10	$0.00	$30.23
FIELD ENG.SURVEY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 98*	06/01/1999	$22.33	$4.80	$4.10	$0.00	$31.23
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 7*	06/30/2019	$42.66	$10.75	$12.33	$0.00	$65.74
	12/29/2019	$43.41	$11.00	$12.60	$0.00	$67.01
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS LOCAL 7* For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"	06/30/2019	$42.66	$10.75	$12.33	$0.00	$65.74
	12/29/2019	$43.41	$11.00	$12.60	$0.00	$67.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIREMAN *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$34.52	$11.69	$14.08	$0.00	$60.29
	12/01/2019	$34.87	$11.94	$14.35	$0.00	$61.16

Apprentice - *OPERATING ENGINEERS - Local 98 Class 3*

Effective Date - 06/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.71	$11.69	$14.08	$0.00	$46.48
2	70	$24.16	$11.69	$14.08	$0.00	$49.93
3	80	$27.62	$11.69	$14.08	$0.00	$53.39
4	90	$31.07	$11.69	$14.08	$0.00	$56.84

Effective Date - 12/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.92	$11.94	$14.35	$0.00	$47.21
2	70	$24.41	$11.94	$14.35	$0.00	$50.70
3	80	$27.90	$11.94	$14.35	$0.00	$54.19
4	90	$31.38	$11.94	$14.35	$0.00	$57.67

Notes:
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

Apprentice to Journeyworker Ratio:1:6

FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$22.50	$7.85	$12.18	$0.00	$42.53
	12/01/2019	$23.50	$8.10	$12.72	$0.00	$44.32
	06/01/2020	$23.50	$8.10	$12.72	$0.00	$44.32
	12/01/2020	$24.50	$8.10	$12.72	$0.00	$45.32
	06/01/2021	$24.50	$8.10	$12.72	$0.00	$45.32
	12/01/2021	$24.50	$8.10	$12.72	$0.00	$45.32
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE III*	09/01/2019	$37.44	$7.84	$16.87	$0.00	$62.15

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone III*

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.72	$7.84	$1.32	$0.00	$27.88
2	55	$20.59	$7.84	$1.32	$0.00	$29.75
3	60	$22.46	$7.84	$12.91	$0.00	$43.21
4	65	$24.34	$7.84	$12.91	$0.00	$45.09
5	70	$26.21	$7.84	$14.23	$0.00	$48.28
6	75	$28.08	$7.84	$14.23	$0.00	$50.15
7	80	$29.95	$7.84	$15.55	$0.00	$53.34
8	85	$31.82	$7.84	$15.55	$0.00	$55.21

Notes: Steps are 750 hrs.
% After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $26.01/ 3&4 $31.03/ 5&6 $48.28/ 7&8 $53.34

Apprentice to Journeyworker Ratio:1:1

FORK LIFT *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$34.74	$11.69	$14.08	$0.00	$60.51
	12/01/2019	$35.09	$11.94	$14.35	$0.00	$61.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATORS/LIGHTING PLANTS *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$31.29	$11.69	$14.08	$0.00	$57.06
	12/01/2019	$31.64	$11.94	$14.35	$0.00	$57.93
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2019	$38.18	$10.60	$9.90	$0.00	$58.68
	06/01/2020	$39.18	$10.80	$10.45	$0.00	$60.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.09	$10.60	$1.80	$0.00	$31.49
2	56	$21.48	$10.60	$1.80	$0.00	$33.88
3	63	$23.86	$10.60	$2.40	$0.00	$36.86
4	69	$26.25	$10.60	$2.40	$0.00	$39.25
5	75	$28.64	$10.60	$2.90	$0.00	$42.14
6	81	$31.02	$10.60	$2.90	$0.00	$44.52
7	88	$33.41	$10.60	$9.90	$0.00	$53.91
8	94	$35.79	$10.60	$9.90	$0.00	$56.29

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.59	$10.80	$1.80	$0.00	$32.19
2	56	$22.04	$10.80	$1.80	$0.00	$34.64
3	63	$24.49	$10.80	$2.45	$0.00	$37.74
4	69	$26.94	$10.80	$2.45	$0.00	$40.19
5	75	$29.39	$10.80	$3.15	$0.00	$43.34
6	81	$31.83	$10.80	$3.15	$0.00	$45.78
7	88	$34.28	$10.80	$10.45	$0.00	$55.53
8	94	$36.73	$10.80	$10.45	$0.00	$57.98

Notes:

Apprentice to Journeyworker Ratio:1:3

GRADER/TRENCHING MACHINE/DERRICK *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$35.05	$11.69	$14.08	$0.00	$60.82
	12/01/2019	$35.40	$11.94	$14.35	$0.00	$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 63*	07/01/2019	$35.74	$10.64	$16.22	$1.77	$64.37
	01/01/2020	$36.99	$10.64	$16.22	$1.77	$65.62
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 7*	06/30/2019	$42.66	$10.75	$12.33	$0.00	$65.74
	12/29/2019	$43.41	$11.00	$12.60	$0.00	$67.01
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 63*	07/01/2019	$35.74	$10.64	$16.22	$1.77	$64.37
	01/01/2020	$36.99	$10.64	$16.22	$1.77	$65.62
For apprentice rates see "Apprentice- SHEET METAL WORKER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2019	$41.21	$8.75	$16.35	$0.00	$66.31
	03/17/2020	$42.21	$8.75	$16.35	$0.00	$67.31
	09/17/2020	$43.21	$8.75	$16.35	$0.00	$68.31
	03/17/2021	$44.21	$8.75	$16.35	$0.00	$69.31
	09/17/2021	$45.21	$8.75	$16.35	$0.00	$70.31
	03/17/2022	$46.46	$8.75	$16.35	$0.00	$71.56
	09/17/2022	$47.46	$8.75	$16.35	$0.00	$72.56
	03/17/2023	$48.71	$8.75	$16.35	$0.00	$73.81
	09/17/2023	$49.71	$8.75	$16.35	$0.00	$74.81
	03/17/2024	$50.96	$8.75	$16.35	$0.00	$76.06
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2019	$41.21	$8.75	$16.35	$0.00	$66.31
	03/17/2020	$42.21	$8.75	$16.35	$0.00	$67.31
	09/17/2020	$43.21	$8.75	$16.35	$0.00	$68.31
	03/17/2021	$44.21	$8.75	$16.35	$0.00	$69.31
	09/17/2021	$45.21	$8.75	$16.35	$0.00	$70.31
	03/17/2022	$46.46	$8.75	$16.35	$0.00	$71.56
	09/17/2022	$47.46	$8.75	$16.35	$0.00	$72.56
	03/17/2023	$48.71	$8.75	$16.35	$0.00	$73.81
	09/17/2023	$49.71	$8.75	$16.35	$0.00	$74.81
	03/17/2024	$50.96	$8.75	$16.35	$0.00	$76.06
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$32.25	$7.85	$12.18	$0.00	$52.28
	12/01/2019	$32.25	$8.10	$12.72	$0.00	$53.07
	06/01/2020	$33.06	$8.10	$12.72	$0.00	$53.88
	12/01/2020	$33.87	$8.10	$12.72	$0.00	$54.69
	06/01/2021	$34.71	$8.10	$12.72	$0.00	$55.53
	12/01/2021	$35.54	$8.10	$12.72	$0.00	$56.36
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SPRINGFIELD)*	09/01/2019	$38.75	$12.80	$16.40	$0.00	$67.95

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield*

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.38	$12.80	$11.90	$0.00	$44.08
2	60	$23.25	$12.80	$12.80	$0.00	$48.85
3	70	$27.13	$12.80	$13.70	$0.00	$53.63
4	80	$31.00	$12.80	$14.60	$0.00	$58.40

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (SPRINGFIELD AREA)*	09/16/2019	$35.10	$8.00	$20.75	$0.00	$63.85
	03/16/2020	$35.95	$8.00	$20.75	$0.00	$64.70
	09/16/2020	$36.85	$8.00	$20.75	$0.00	$65.60
	03/16/2021	$37.70	$8.00	$20.75	$0.00	$66.45

Apprentice - *IRONWORKER - Local 7 Springfield*

Effective Date - 09/16/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.06	$8.00	$20.75	$0.00	$49.81
2	70	$24.57	$8.00	$20.75	$0.00	$53.32
3	75	$26.33	$8.00	$20.75	$0.00	$55.08
4	80	$28.08	$8.00	$20.75	$0.00	$56.83
5	85	$29.84	$8.00	$20.75	$0.00	$58.59
6	90	$31.59	$8.00	$20.75	$0.00	$60.34

Effective Date - 03/16/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.57	$8.00	$20.75	$0.00	$50.32
2	70	$25.17	$8.00	$20.75	$0.00	$53.92
3	75	$26.96	$8.00	$20.75	$0.00	$55.71
4	80	$28.76	$8.00	$20.75	$0.00	$57.51
5	85	$30.56	$8.00	$20.75	$0.00	$59.31
6	90	$32.36	$8.00	$20.75	$0.00	$61.11

Notes:
Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)* For apprentice rates see "Apprentice- LABORER"	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
LABORER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.50	$7.85	$14.22	$0.00	$53.57
	12/02/2019	$31.50	$8.10	$14.78	$0.00	$54.38

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 3 Building & Site*

Effective Date - 06/03/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.90	$7.85	$14.22	$0.00	$40.97
2	70	$22.05	$7.85	$14.22	$0.00	$44.12
3	80	$25.20	$7.85	$14.22	$0.00	$47.27
4	90	$28.35	$7.85	$14.22	$0.00	$50.42

Effective Date - 12/02/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.90	$8.10	$14.78	$0.00	$41.78
2	70	$22.05	$8.10	$14.78	$0.00	$44.93
3	80	$25.20	$8.10	$14.78	$0.00	$48.08
4	90	$28.35	$8.10	$14.78	$0.00	$51.23

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.50	$7.85	$12.18	$0.00	$51.53
	12/01/2019	$31.50	$8.10	$12.72	$0.00	$52.32
	06/01/2020	$32.31	$8.10	$12.72	$0.00	$53.13
	12/01/2020	$33.12	$8.10	$12.72	$0.00	$53.94
	06/01/2021	$33.96	$8.10	$12.72	$0.00	$54.78
	12/01/2021	$34.79	$8.10	$12.72	$0.00	$55.61

Apprentice - *LABORER (Heavy & Highway) - Zone 3*

Effective Date - 06/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.90	$7.85	$12.18	$0.00	$38.93
2	70	$22.05	$7.85	$12.18	$0.00	$42.08
3	80	$25.20	$7.85	$12.18	$0.00	$45.23
4	90	$28.35	$7.85	$12.18	$0.00	$48.38

Effective Date - 12/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.90	$8.10	$12.72	$0.00	$39.72
2	70	$22.05	$8.10	$12.72	$0.00	$42.87
3	80	$25.20	$8.10	$12.72	$0.00	$46.02
4	90	$28.35	$8.10	$12.72	$0.00	$49.17

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.50	$7.85	$14.22	$0.00	$53.57
	12/02/2019	$31.50	$8.10	$14.78	$0.00	$54.38
For apprentice rates see "Apprentice- LABORER."						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER."						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/01/2019	$31.60	$7.85	$14.22	$0.00	$53.67
	12/01/2019	$31.60	$8.10	$14.78	$0.00	$54.48
For apprentice rates see "Apprentice- LABORER."						
LABORER: MASON TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$32.50	$7.85	$14.22	$0.00	$54.57
	12/02/2019	$32.50	$8.10	$14.78	$0.00	$55.38
For apprentice rates see "Apprentice- LABORER."						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.50	$7.85	$14.22	$0.00	$53.57
	12/02/2019	$31.50	$8.10	$14.78	$0.00	$54.38
For apprentice rates see "Apprentice- LABORER."						
LABORER: TREE REMOVER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.50	$7.85	$14.22	$0.00	$53.57
	12/02/2019	$31.50	$8.10	$14.78	$0.00	$54.38
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER."						
LASER BEAM OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER."						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2019	$35.17	$10.75	$18.87	$0.00	$64.79
	02/01/2020	$35.67	$10.75	$18.87	$0.00	$65.29
	08/01/2020	$36.67	$10.75	$18.99	$0.00	$66.41
	02/01/2021	$37.17	$10.75	$18.99	$0.00	$66.91
	08/01/2021	$38.17	$10.75	$19.12	$0.00	$68.04
	02/01/2022	$38.62	$10.75	$19.12	$0.00	$68.49

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE FINISHER-Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.59	$10.75	$18.87	$0.00	$47.21
2	60	$21.10	$10.75	$18.87	$0.00	$50.72
3	70	$24.62	$10.75	$18.87	$0.00	$54.24
4	80	$28.14	$10.75	$18.87	$0.00	$57.76
5	90	$31.65	$10.75	$18.87	$0.00	$61.27

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.84	$10.75	$18.87	$0.00	$47.46
2	60	$21.40	$10.75	$18.87	$0.00	$51.02
3	70	$24.97	$10.75	$18.87	$0.00	$54.59
4	80	$28.54	$10.75	$18.87	$0.00	$58.16
5	90	$32.10	$10.75	$18.87	$0.00	$61.72

Notes:

Apprentice to Journeyworker Ratio:1:5

MARBLE MASON/TILE LAYER(SP/PT)SeeBrick *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE* See "BRICK/STONE/ARTIFICIAL MASONRY(INCL MASONRY WATERPROOFING)						
MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019 12/01/2019	$35.05 $35.40	$11.69 $11.94	$14.08 $14.35	$0.00 $0.00	$60.82 $61.69
MECHANIC/WELDER/BOOM TRUCK *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019 12/01/2019	$34.52 $34.87	$11.69 $11.94	$14.08 $14.35	$0.00 $0.00	$60.29 $61.16
MILLWRIGHT (Zone 3) *MILLWRIGHTS LOCAL 1121 - Zone 3*	04/01/2019	$37.11	$9.90	$18.50	$0.00	$65.51

Apprentice - *MILLWRIGHT - Local 1121 Zone 3*

Effective Date - 04/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$20.41	$9.90	$5.31	$0.00	$35.62
2	65	$24.12	$9.90	$15.13	$0.00	$49.15
3	75	$27.83	$9.90	$16.10	$0.00	$53.83
4	85	$31.54	$9.90	$17.06	$0.00	$58.50

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MORTAR MIXER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						
OILER *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$30.21	$11.69	$14.08	$0.00	$55.98
	12/01/2019	$30.56	$11.94	$14.35	$0.00	$56.85
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS VI *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$28.23	$11.69	$14.08	$0.00	$54.00
	12/01/2019	$28.58	$11.94	$14.35	$0.00	$54.87
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2019	$50.66	$8.20	$21.45	$0.00	$80.31
	01/01/2020	$50.96	$8.20	$22.10	$0.00	$81.26
	07/01/2020	$52.06	$8.20	$22.10	$0.00	$82.36
	01/01/2021	$53.16	$8.20	$22.10	$0.00	$83.46

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.33	$8.20	$0.00	$0.00	$33.53
2	55	$27.86	$8.20	$5.78	$0.00	$41.84
3	60	$30.40	$8.20	$6.30	$0.00	$44.90
4	65	$32.93	$8.20	$6.83	$0.00	$47.96
5	70	$35.46	$8.20	$18.30	$0.00	$61.96
6	75	$38.00	$8.20	$18.83	$0.00	$65.03
7	80	$40.53	$8.20	$19.35	$0.00	$68.08
8	90	$45.59	$8.20	$20.40	$0.00	$74.19

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.48	$8.20	$0.00	$0.00	$33.68
2	55	$28.03	$8.20	$5.94	$0.00	$42.17
3	60	$30.58	$8.20	$6.48	$0.00	$45.26
4	65	$33.12	$8.20	$7.02	$0.00	$48.34
5	70	$35.67	$8.20	$18.51	$0.00	$62.38
6	75	$38.22	$8.20	$19.05	$0.00	$65.47
7	80	$40.77	$8.20	$19.59	$0.00	$68.56
8	90	$45.86	$8.20	$20.67	$0.00	$74.73

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SIGN, PICTORIAL & DISPLAY) *PAINTERS LOCAL 35 - ZONE 3*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER SIGN - Local 35 Zone 3*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:
Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2019	$34.03	$8.20	$17.55	$0.00	$59.78
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 3*	01/01/2020	$34.33	$8.20	$18.20	$0.00	$60.73
	07/01/2020	$35.43	$8.20	$18.20	$0.00	$61.83
	01/01/2021	$36.53	$8.20	$18.20	$0.00	$62.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - New*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.02	$8.20	$0.00	$0.00	$25.22
2	55	$18.72	$8.20	$3.63	$0.00	$30.55
3	60	$20.42	$8.20	$3.96	$0.00	$32.58
4	65	$22.12	$8.20	$4.29	$0.00	$34.61
5	70	$23.82	$8.20	$15.57	$0.00	$47.59
6	75	$25.52	$8.20	$15.90	$0.00	$49.62
7	80	$27.22	$8.20	$16.23	$0.00	$51.65
8	90	$30.63	$8.20	$16.89	$0.00	$55.72

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.17	$8.20	$0.00	$0.00	$25.37
2	55	$18.88	$8.20	$3.80	$0.00	$30.88
3	60	$20.60	$8.20	$4.14	$0.00	$32.94
4	65	$22.31	$8.20	$4.49	$0.00	$35.00
5	70	$24.03	$8.20	$15.78	$0.00	$48.01
6	75	$25.75	$8.20	$16.13	$0.00	$50.08
7	80	$27.46	$8.20	$16.47	$0.00	$52.13
8	90	$30.90	$8.20	$17.16	$0.00	$56.26

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2019	$31.35	$8.20	$17.55	$0.00	$57.10
	01/01/2020	$31.65	$8.20	$18.20	$0.00	$58.05
	07/01/2020	$32.75	$8.20	$18.20	$0.00	$59.15
	01/01/2021	$33.85	$8.20	$18.20	$0.00	$60.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$15.68	$8.20	$0.00	$0.00	$23.88
2	55	$17.24	$8.20	$3.63	$0.00	$29.07
3	60	$18.81	$8.20	$3.96	$0.00	$30.97
4	65	$20.38	$8.20	$4.29	$0.00	$32.87
5	70	$21.95	$8.20	$15.57	$0.00	$45.72
6	75	$23.51	$8.20	$15.90	$0.00	$47.61
7	80	$25.08	$8.20	$16.23	$0.00	$49.51
8	90	$28.22	$8.20	$16.89	$0.00	$53.31

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$15.83	$8.20	$0.00	$0.00	$24.03
2	55	$17.41	$8.20	$3.80	$0.00	$29.41
3	60	$18.99	$8.20	$4.14	$0.00	$31.33
4	65	$20.57	$8.20	$4.49	$0.00	$33.26
5	70	$22.16	$8.20	$15.78	$0.00	$46.14
6	75	$23.74	$8.20	$16.13	$0.00	$48.07
7	80	$25.32	$8.20	$16.47	$0.00	$49.99
8	90	$28.49	$8.20	$17.16	$0.00	$53.85

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	07/01/2019	$32.63	$8.20	$17.55	$0.00	$58.38
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 3*	01/01/2020	$32.93	$8.20	$18.20	$0.00	$59.33
	07/01/2020	$34.03	$8.20	$18.20	$0.00	$60.43
	01/01/2021	$35.13	$8.20	$18.20	$0.00	$61.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 3 - BRUSH NEW*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.32	$8.20	$0.00	$0.00	$24.52
2	55	$17.95	$8.20	$3.63	$0.00	$29.78
3	60	$19.58	$8.20	$3.96	$0.00	$31.74
4	65	$21.21	$8.20	$4.29	$0.00	$33.70
5	70	$22.84	$8.20	$15.57	$0.00	$46.61
6	75	$24.47	$8.20	$15.90	$0.00	$48.57
7	80	$26.10	$8.20	$16.23	$0.00	$50.53
8	90	$29.37	$8.20	$16.89	$0.00	$54.46

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.47	$8.20	$0.00	$0.00	$24.67
2	55	$18.11	$8.20	$3.80	$0.00	$30.11
3	60	$19.76	$8.20	$4.14	$0.00	$32.10
4	65	$21.40	$8.20	$4.49	$0.00	$34.09
5	70	$23.05	$8.20	$15.78	$0.00	$47.03
6	75	$24.70	$8.20	$16.13	$0.00	$49.03
7	80	$26.34	$8.20	$16.47	$0.00	$51.01
8	90	$29.64	$8.20	$17.16	$0.00	$55.00

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 3*	07/01/2019	$29.95	$8.20	$17.55	$0.00	$55.70
	01/01/2020	$30.25	$8.20	$18.20	$0.00	$56.65
	07/01/2020	$31.35	$8.20	$18.20	$0.00	$57.75
	01/01/2021	$32.45	$8.20	$18.20	$0.00	$58.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 3 - BRUSH REPAINT*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$14.98	$8.20	$0.00	$0.00	$23.18
2	55	$16.47	$8.20	$3.63	$0.00	$28.30
3	60	$17.97	$8.20	$3.96	$0.00	$30.13
4	65	$19.47	$8.20	$4.29	$0.00	$31.96
5	70	$20.97	$8.20	$15.57	$0.00	$44.74
6	75	$22.46	$8.20	$15.90	$0.00	$46.56
7	80	$23.96	$8.20	$16.23	$0.00	$48.39
8	90	$26.96	$8.20	$16.89	$0.00	$52.05

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$15.13	$8.20	$0.00	$0.00	$23.33
2	55	$16.64	$8.20	$3.80	$0.00	$28.64
3	60	$18.15	$8.20	$4.14	$0.00	$30.49
4	65	$19.66	$8.20	$4.49	$0.00	$32.35
5	70	$21.18	$8.20	$15.78	$0.00	$45.16
6	75	$22.69	$8.20	$16.13	$0.00	$47.02
7	80	$24.20	$8.20	$16.47	$0.00	$48.87
8	90	$27.23	$8.20	$17.16	$0.00	$52.59

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.50	$7.85	$12.18	$0.00	$51.53
	12/01/2019	$31.50	$8.10	$12.72	$0.00	$52.32
	06/01/2020	$32.31	$8.10	$12.72	$0.00	$53.13
	12/01/2020	$33.12	$8.10	$12.72	$0.00	$53.94
	06/01/2021	$33.96	$8.10	$12.72	$0.00	$54.78
	12/01/2021	$34.79	$8.10	$12.72	$0.00	$55.61
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.08	$12.41	$12.70	$0.00	$59.19
	12/01/2019	$34.08	$12.41	$13.72	$0.00	$60.21
	06/01/2020	$34.98	$12.41	$13.72	$0.00	$61.11
	08/01/2020	$34.98	$12.91	$13.72	$0.00	$61.61
	12/01/2020	$34.98	$12.91	$14.82	$0.00	$62.71
	06/01/2021	$35.78	$12.91	$14.82	$0.00	$63.51
	08/01/2021	$35.78	$13.41	$14.82	$0.00	$64.01
	12/01/2021	$35.78	$13.41	$16.01	$0.00	$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 3)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2019	$43.79	$9.90	$21.15	$0.00	$74.84

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 3)*	08/01/2019	$43.79	$9.90	$21.15	$0.00	$74.84

Apprentice - *PILE DRIVER - Local 56 Zone 3*

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1$54.34/2$58.99/3$63.65/4$65.98/5$68.31/6$68.31/7$72.96/8$72.96

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2019	$41.21	$8.75	$16.35	$0.00	$66.31
	03/17/2020	$42.21	$8.75	$16.35	$0.00	$67.31
	09/17/2020	$43.21	$8.75	$16.35	$0.00	$68.31
	03/17/2021	$44.21	$8.75	$16.35	$0.00	$69.31
	09/17/2021	$45.21	$8.75	$16.35	$0.00	$70.31
	03/17/2022	$46.46	$8.75	$16.35	$0.00	$71.56
	09/17/2022	$47.46	$8.75	$16.35	$0.00	$72.56
	03/17/2023	$48.71	$8.75	$16.35	$0.00	$73.81
	09/17/2023	$49.71	$8.75	$16.35	$0.00	$74.81
	03/17/2024	$50.96	$8.75	$16.35	$0.00	$76.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PLUMBER/PIPEFITTER - Local 104*

Effective Date - 09/17/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.54	$8.75	$9.60	$0.00	$36.89
2	50	$20.61	$8.75	$9.60	$0.00	$38.96
3	55	$22.67	$8.75	$9.60	$0.00	$41.02
4	60	$24.73	$8.75	$9.60	$0.00	$43.08
5	65	$26.79	$8.75	$9.60	$0.00	$45.14
6	70	$28.85	$8.75	$9.60	$0.00	$47.20
7	75	$30.91	$8.75	$9.60	$0.00	$49.26
8	80	$32.97	$8.75	$9.60	$0.00	$51.32
9	80	$32.97	$8.75	$16.35	$0.00	$58.07
10	80	$32.97	$8.75	$16.35	$0.00	$58.07

Effective Date - 03/17/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.99	$8.75	$9.60	$0.00	$37.34
2	50	$21.11	$8.75	$9.60	$0.00	$39.46
3	55	$23.22	$8.75	$9.60	$0.00	$41.57
4	60	$25.33	$8.75	$9.60	$0.00	$43.68
5	65	$27.44	$8.75	$9.60	$0.00	$45.79
6	70	$29.55	$8.75	$9.60	$0.00	$47.90
7	75	$31.66	$8.75	$9.60	$0.00	$50.01
8	80	$33.77	$8.75	$9.60	$0.00	$52.12
9	80	$33.77	$8.75	$16.35	$0.00	$58.87
10	80	$33.77	$8.75	$16.35	$0.00	$58.87

Notes: **1:1,2:5,3:9,4:12

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2019	$41.21	$8.75	$16.35	$0.00	$66.31
	03/17/2020	$42.21	$8.75	$16.35	$0.00	$67.31
	09/17/2020	$43.21	$8.75	$16.35	$0.00	$68.31
	03/17/2021	$44.21	$8.75	$16.35	$0.00	$69.31
	09/17/2021	$45.21	$8.75	$16.35	$0.00	$70.31
	03/17/2022	$46.46	$8.75	$16.35	$0.00	$71.56
	09/17/2022	$47.46	$8.75	$16.35	$0.00	$72.56
	03/17/2023	$48.71	$8.75	$16.35	$0.00	$73.81
	09/17/2023	$49.71	$8.75	$16.35	$0.00	$74.81
	03/17/2024	$50.96	$8.75	$16.35	$0.00	$76.06

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER."

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWDERMAN & BLASTER *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$32.50	$7.85	$14.22	$0.00	$54.57
	12/02/2019	$32.50	$8.10	$14.78	$0.00	$55.38
For apprentice rates see "Apprentice- LABORER."						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$32.50	$7.85	$12.18	$0.00	$52.53
	12/01/2019	$32.50	$8.10	$12.72	$0.00	$53.32
	06/01/2020	$33.31	$8.10	$12.72	$0.00	$54.13
	12/01/2020	$34.12	$8.10	$12.72	$0.00	$54.94
	06/01/2021	$34.96	$8.10	$12.72	$0.00	$55.78
	12/01/2021	$35.79	$8.10	$12.72	$0.00	$56.61
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$35.05	$11.69	$14.08	$0.00	$60.82
	12/01/2019	$35.40	$11.94	$14.35	$0.00	$61.69
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$34.52	$11.69	$14.08	$0.00	$60.29
	12/01/2019	$34.87	$11.94	$14.35	$0.00	$61.16
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 404 - Construction Service (Northampton)*	05/01/2016	$20.54	$10.57	$8.39	$0.00	$39.50
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER."						
ROLLER OPERATOR *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$33.91	$11.69	$14.08	$0.00	$59.68
	12/01/2019	$34.26	$11.94	$14.35	$0.00	$60.55
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Coal tar pitch) *ROOFERS LOCAL 248*	07/16/2019	$32.66	$10.05	$16.20	$0.00	$58.91
For apprentice rates see "Apprentice- ROOFER"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 248*	07/16/2019	$32.16	$10.05	$15.70	$0.00	$57.91

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 248*
Effective Date - 07/16/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$19.30	$10.05	$0.00	$0.00	$29.35
2	65	$20.90	$10.05	$15.70	$0.00	$46.65
3	70	$22.51	$10.05	$15.70	$0.00	$48.26
4	75	$24.12	$10.05	$15.70	$0.00	$49.87
5	80	$25.73	$10.05	$15.70	$0.00	$51.48
6	85	$27.34	$10.05	$15.70	$0.00	$53.09
7	90	$28.94	$10.05	$15.70	$0.00	$54.69
8	95	$30.55	$10.05	$15.70	$0.00	$56.30

Notes:
Steps are 750 hrs Roofer(Tear Off)1:1; Same as above

Apprentice to Journeyworker Ratio:1:3

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 248* For apprentice rates see "Apprentice- ROOFER"	07/16/2019	$32.66	$10.05	$16.20	$0.00	$58.91
SCRAPER *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019	$34.52	$11.69	$14.08	$0.00	$60.29
	12/01/2019	$34.87	$11.94	$14.35	$0.00	$61.16
SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS) *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019	$33.91	$11.69	$14.08	$0.00	$59.68
	12/01/2019	$34.26	$11.94	$14.35	$0.00	$60.55
SELF-PROPELLED POWER BROOM *OPERATING ENGINEERS LOCAL 98* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2019	$31.29	$11.69	$14.08	$0.00	$57.06
	12/01/2019	$31.64	$11.94	$14.35	$0.00	$57.93
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 63*	07/01/2019	$35.74	$10.64	$16.22	$1.77	$64.37
	01/01/2020	$36.99	$10.64	$16.22	$1.77	$65.62

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 63*

Effective Date - 07/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$16.08	$6.21	$4.67	$0.00	$26.96
2	50	$17.87	$6.55	$5.19	$0.00	$29.61
3	55	$19.66	$6.88	$9.33	$1.08	$36.95
4	60	$21.44	$7.22	$9.33	$1.14	$39.13
5	65	$23.23	$7.55	$9.33	$1.20	$41.31
6	70	$25.02	$7.88	$9.33	$1.27	$43.50
7	75	$26.81	$8.22	$9.33	$1.33	$45.69
8	80	$28.59	$9.30	$15.18	$1.59	$54.66
9	85	$30.38	$9.64	$15.18	$1.66	$56.86
10	90	$32.17	$9.98	$15.18	$1.72	$59.05

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$16.65	$6.21	$4.67	$0.00	$27.53
2	50	$18.50	$6.55	$5.19	$0.00	$30.24
3	55	$20.34	$6.88	$9.33	$1.08	$37.63
4	60	$22.19	$7.22	$9.33	$1.14	$39.88
5	65	$24.04	$7.55	$9.33	$1.20	$42.12
6	70	$25.89	$7.88	$9.33	$1.27	$44.37
7	75	$27.74	$8.22	$9.33	$1.33	$46.62
8	80	$29.59	$9.30	$15.18	$1.59	$55.66
9	85	$31.44	$9.64	$15.18	$1.66	$57.92
10	90	$33.29	$9.98	$15.18	$1.72	$60.17

Notes:

Apprentice to Journeyworker Ratio:1:3

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.54	$12.41	$12.70	$0.00	$59.65
	12/01/2019	$34.54	$12.41	$13.72	$0.00	$60.67
	06/01/2020	$35.44	$12.41	$13.72	$0.00	$61.57
	08/01/2020	$35.44	$12.91	$13.72	$0.00	$62.07
	12/01/2020	$35.44	$12.91	$14.82	$0.00	$63.17
	06/01/2021	$36.24	$12.91	$14.82	$0.00	$63.97
	08/01/2021	$36.24	$13.41	$14.82	$0.00	$64.47
	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.83	$12.41	$12.70	$0.00	$59.94
	12/01/2019	$34.83	$12.41	$13.72	$0.00	$60.96
	06/01/2020	$35.73	$12.41	$13.72	$0.00	$61.86
	08/01/2020	$35.73	$12.91	$13.72	$0.00	$62.36
	12/01/2020	$35.73	$12.91	$14.82	$0.00	$63.46
	06/01/2021	$36.53	$12.91	$14.82	$0.00	$64.26
	08/01/2021	$36.53	$13.41	$14.82	$0.00	$64.76
	12/01/2021	$36.53	$13.41	$16.01	$0.00	$65.95
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 669*	01/01/2019	$41.51	$10.02	$13.08	$0.00	$64.61

Apprentice - *SPRINKLER FITTER - Local 669*

Effective Date - 01/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.68	$7.75	$0.00	$0.00	$26.43
2	50	$20.76	$7.75	$0.00	$0.00	$28.51
3	55	$22.83	$10.02	$7.25	$0.00	$40.10
4	60	$24.91	$10.02	$7.25	$0.00	$42.18
5	65	$26.98	$10.02	$7.50	$0.00	$44.50
6	70	$29.06	$10.02	$7.50	$0.00	$46.58
7	75	$31.13	$10.02	$7.50	$0.00	$48.65
8	80	$33.21	$10.02	$7.50	$0.00	$50.73
9	85	$35.28	$10.02	$7.50	$0.00	$52.80
10	90	$37.36	$10.02	$7.50	$0.00	$54.88

Notes:

Apprentice to Journeyworker Ratio:1:1

TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 7*	06/30/2019	$42.66	$10.75	$12.33	$0.00	$65.74
	12/29/2019	$43.41	$11.00	$12.60	$0.00	$67.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 7*

Effective Date - 06/30/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.06	$5.85	$0.51	$0.00	$23.42
2	45	$19.20	$5.85	$0.58	$0.00	$25.63
3	50	$21.33	$10.75	$6.94	$0.00	$39.02
4	55	$23.46	$10.75	$7.00	$0.00	$41.21
5	65	$27.73	$10.75	$8.13	$0.00	$46.61
6	70	$29.86	$10.75	$9.20	$0.00	$49.81

Notes:
Steps are 800 hours

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2019	$53.34	$10.75	$21.30	$0.00	$85.39
	02/01/2020	$53.98	$10.75	$21.30	$0.00	$86.03
	08/01/2020	$55.33	$10.75	$21.45	$0.00	$87.53
	02/01/2021	$55.97	$10.75	$21.45	$0.00	$88.17
	08/01/2021	$57.37	$10.75	$21.61	$0.00	$89.73
	02/01/2022	$57.96	$10.75	$21.61	$0.00	$90.32

Apprentice - *TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Ptt)*

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.67	$10.75	$21.30	$0.00	$58.72
2	60	$32.00	$10.75	$21.30	$0.00	$64.05
3	70	$37.34	$10.75	$21.30	$0.00	$69.39
4	80	$42.67	$10.75	$21.30	$0.00	$74.72
5	90	$48.01	$10.75	$21.30	$0.00	$80.06

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.99	$10.75	$21.30	$0.00	$59.04
2	60	$32.39	$10.75	$21.30	$0.00	$64.44
3	70	$37.79	$10.75	$21.30	$0.00	$69.84
4	80	$43.18	$10.75	$21.30	$0.00	$75.23
5	90	$48.58	$10.75	$21.30	$0.00	$80.63

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO MECHANIC *BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE*	08/01/2019	$54.42	$10.75	$21.30	$0.00	$86.47
	02/01/2020	$55.05	$10.75	$21.30	$0.00	$87.10
	08/01/2020	$56.40	$10.75	$21.45	$0.00	$88.60
	02/01/2021	$57.04	$10.75	$21.45	$0.00	$89.24
	08/01/2021	$58.44	$10.75	$21.61	$0.00	$90.80
	02/01/2022	$59.01	$10.75	$21.61	$0.00	$91.37

Apprentice - *TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)*

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.21	$10.75	$21.30	$0.00	$59.26
2	60	$32.65	$10.75	$21.30	$0.00	$64.70
3	70	$38.09	$10.75	$21.30	$0.00	$70.14
4	80	$43.54	$10.75	$21.30	$0.00	$75.59
5	90	$48.98	$10.75	$21.30	$0.00	$81.03

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.53	$10.75	$21.30	$0.00	$59.58
2	60	$33.03	$10.75	$21.30	$0.00	$65.08
3	70	$38.54	$10.75	$21.30	$0.00	$70.59
4	80	$44.04	$10.75	$21.30	$0.00	$76.09
5	90	$49.55	$10.75	$21.30	$0.00	$81.60

Notes:

Apprentice to Journeyworker Ratio:1:5

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$40.50	$7.85	$16.05	$0.00	$64.40
	12/01/2019	$40.50	$8.10	$16.80	$0.00	$65.40
	06/01/2020	$41.49	$8.10	$16.80	$0.00	$66.39
	12/01/2020	$42.47	$8.10	$16.80	$0.00	$67.37
	06/01/2021	$43.49	$8.10	$16.80	$0.00	$68.39
	12/01/2021	$44.50	$8.10	$16.80	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$39.22	$7.85	$16.05	$0.00	$63.12
	12/01/2019	$39.22	$8.10	$16.80	$0.00	$64.12
	06/01/2020	$40.21	$8.10	$16.80	$0.00	$65.11
	12/01/2020	$41.19	$8.10	$16.80	$0.00	$66.09
	06/01/2021	$42.21	$8.10	$16.80	$0.00	$67.11
	12/01/2021	$43.22	$8.10	$16.80	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2019	$39.10	$7.85	$16.05	$0.00	$63.00
	12/01/2019	$39.10	$8.10	$16.80	$0.00	$64.00
	06/01/2020	$40.09	$8.10	$16.80	$0.00	$64.99
	12/01/2020	$41.07	$8.10	$16.80	$0.00	$65.97
	06/01/2021	$42.09	$8.10	$16.80	$0.00	$66.99
	12/01/2021	$43.10	$8.10	$16.80	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS *OPERATING ENGINEERS LOCAL 98*	06/01/2019	$33.91	$11.69	$14.08	$0.00	$59.68
	12/01/2019	$34.26	$11.94	$14.35	$0.00	$60.55
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$35.12	$12.41	$12.70	$0.00	$60.23
	12/01/2019	$35.12	$12.41	$13.72	$0.00	$61.25
	06/01/2020	$36.02	$12.41	$13.72	$0.00	$62.15
	08/01/2020	$36.02	$12.91	$13.72	$0.00	$62.65
	12/01/2020	$36.02	$12.91	$14.82	$0.00	$63.75
	06/01/2021	$36.82	$12.91	$14.82	$0.00	$64.55
	08/01/2021	$36.82	$13.41	$14.82	$0.00	$65.05
	12/01/2021	$36.82	$13.41	$16.01	$0.00	$66.24
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2019	$51.38	$7.85	$16.45	$0.00	$75.68
	12/01/2019	$51.38	$8.10	$17.20	$0.00	$76.68
	06/01/2020	$52.37	$8.10	$17.20	$0.00	$77.67
	12/01/2020	$53.35	$8.10	$17.20	$0.00	$78.65
	06/01/2021	$54.37	$8.10	$17.20	$0.00	$79.67
	12/01/2021	$55.38	$8.10	$17.20	$0.00	$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2019	$53.38	$7.85	$16.45	$0.00	$77.68
	12/01/2019	$53.38	$8.10	$17.20	$0.00	$78.68
	06/01/2020	$54.37	$8.10	$17.20	$0.00	$79.67
	12/01/2020	$55.35	$8.10	$17.20	$0.00	$80.65
	06/01/2021	$56.37	$8.10	$17.20	$0.00	$81.67
	12/01/2021	$57.38	$8.10	$17.20	$0.00	$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2019	$43.45	$7.85	$16.45	$0.00	$67.75
	12/01/2019	$43.45	$8.10	$17.20	$0.00	$68.75
	06/01/2020	$44.44	$8.10	$17.20	$0.00	$69.74
	12/01/2020	$45.42	$8.10	$17.20	$0.00	$70.72
	06/01/2021	$46.44	$8.10	$17.20	$0.00	$71.74
	12/01/2021	$47.45	$8.10	$17.20	$0.00	$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2019	$45.45	$7.85	$16.45	$0.00	$69.75
	12/01/2019	$45.45	$8.10	$17.20	$0.00	$70.75
	06/01/2020	$46.44	$8.10	$17.20	$0.00	$71.74
	12/01/2020	$47.42	$8.10	$17.20	$0.00	$72.72
	06/01/2021	$48.44	$8.10	$17.20	$0.00	$73.74
	12/01/2021	$49.45	$8.10	$17.20	$0.00	$74.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2019	$34.54	$12.41	$12.70	$0.00	$59.65
	12/01/2019	$34.54	$12.41	$13.72	$0.00	$60.67
	06/01/2020	$35.44	$12.41	$13.72	$0.00	$61.57
	08/01/2020	$35.44	$12.91	$13.72	$0.00	$62.07
	12/01/2020	$35.44	$12.91	$14.82	$0.00	$63.17
	06/01/2021	$36.24	$12.91	$14.82	$0.00	$63.97
	08/01/2021	$36.24	$13.41	$14.82	$0.00	$64.47
	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
WAGON DRILL OPERATOR *LABORERS - ZONE 3 (BUILDING & SITE)*	06/03/2019	$31.75	$7.85	$14.22	$0.00	$53.82
	12/02/2019	$31.75	$8.10	$14.78	$0.00	$54.63
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 3 (HEAVY & HIGHWAY)*	06/01/2019	$31.75	$7.85	$12.18	$0.00	$51.78
	12/01/2019	$31.75	$8.10	$12.72	$0.00	$52.57
	06/01/2020	$32.56	$8.10	$12.72	$0.00	$53.38
	12/01/2020	$33.37	$8.10	$12.72	$0.00	$54.19
	06/01/2021	$34.21	$8.10	$12.72	$0.00	$55.03
	12/01/2021	$35.04	$8.10	$12.72	$0.00	$55.86
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 104*	09/17/2019	$41.21	$8.75	$16.35	$0.00	$66.31
	03/17/2020	$42.21	$8.75	$16.35	$0.00	$67.31
	09/17/2020	$43.21	$8.75	$16.35	$0.00	$68.31
	03/17/2021	$44.21	$8.75	$16.35	$0.00	$69.31
	09/17/2021	$45.21	$8.75	$16.35	$0.00	$70.31
	03/17/2022	$46.46	$8.75	$16.35	$0.00	$71.56
	09/17/2022	$47.46	$8.75	$16.35	$0.00	$72.56
	03/17/2023	$48.71	$8.75	$16.35	$0.00	$73.81
	09/17/2023	$49.71	$8.75	$16.35	$0.00	$74.81
	03/17/2024	$50.96	$8.75	$16.35	$0.00	$76.06
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - West						
EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$30.58	$8.00	$5.48	$0.00	$44.06
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN / TRUCK DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$39.97	$8.00	$10.96	$0.00	$58.93
For apprentice rates see "Apprentice- LINEMAN"						
HEAVY EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$47.01	$8.00	$13.22	$0.00	$68.23
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$51.71	$8.00	$15.55	$0.00	$75.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - West Local 42*

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$31.03	$8.00	$3.43	$0.00	$42.46
2	65	$33.61	$8.00	$3.51	$0.00	$45.12
3	70	$36.20	$8.00	$3.59	$0.00	$47.79
4	75	$38.78	$8.00	$5.16	$0.00	$51.94
5	80	$41.37	$8.00	$5.24	$0.00	$54.61
6	85	$43.95	$8.00	$5.32	$0.00	$57.27
7	90	$46.54	$8.00	$7.40	$0.00	$61.94

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TRACTOR-TRAILER DRIVER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	09/01/2019	$44.67	$8.00	$12.55	$0.00	$65.22
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	01/31/2016	$18.51	$3.55	$0.00	$0.00	$22.06

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*	01/31/2016	$16.32	$3.55	$0.00	$0.00	$19.87

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM: 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM: 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

2.8 Appendix C – Certified Payroll Report Form

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:	Payroll No.:

Employer's Signature:	Title:	Contract No:	Tax Payer ID Number	Work Week Ending:

Awarding Authority's Name:	Public Works Project Name:	Public Works Project Location:	Min. Wage Rate Sheet Number

General / Prime Contractor's Name:	Subcontractor's Name:		"Employer" Hourly Fringe Benefit Contributions						
							(B+C+D+E)	(A x F)	

Employee Name & Complete Address	Work Classification:	Employee is OSHA 10 certified (?)	Appr. Rate (%)	Hours Worked							Project Hours (A)	Hourly Base Wage (B)	Health & Welfare Insurance (C)	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (F)	Project Gross Wages	Check No. (H)
				Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	All Other Hours						Total Gross Wages	

Are all apprentice employees identified above currently registered with the MA DLS's Division of Apprentice Standards? YES ☐ NO ☐

For all apprentices performing work during the reporting period, attach a copy of the apprentice identification card issued by the Massachusetts Department of Labor Standards / Division of Apprentice Standards. No apprentices are identified above ☐

NOTE: Pursuant to MGL c. 149, s. 27B, every contractor and subcontractor is required to submit a **true and accurate** copy of their certified weekly payroll records to the awarding authority by first-class mail or e-mail. In addition, each weekly payroll must be accompanied by a statement of compliance signed by the employer. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Page _____of_____

Date Received by Awarding Authority
/ /

2.9 Appendix D – Required Forms

The following forms are required for submitting a bid, fully completed and excepting Form E, signed.

- ❑ Form A: General Bid Form
- ❑ Form B: Statement of Competency/Certification of Good Faith -- with list of references
- ❑ Form C: Bid Price Sheets
- ❑ Form D: Labor Harmony and OSHA Certifications
- ❑ Form E: Sample Contract
- ❑ Bid Deposit; Performance Surety Bond; Payment Bond
- ☐ Debarment Certification - (In lieu of the Certification form, the vendor must provide a statement under its letterhead attesting that they have never been debarred in the Commonwealth of Massachusetts and/or in any United States Federal Government programs and activities).

2.9.1 Form A - General Bid Form

The accompanying Statement of Competency and Bid Price Sheets are hereby submitted in response to the IFB cited above. All information, statements and prices are true, accurate and binding representations of its intentions and commitments in responding to this IFB.

Vendor Name: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Phone: _____ **e-mail:** _____

Web Address: _____

Non-Collusion Statement

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Taxes Paid Certification

Pursuant to M.G.L. c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am/my company is in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and VENDORs, and withholding and remitting child support.

For the Bidder:

X_____

Name: _____

Title: _____ Date: _____

If signing on behalf of a joint venture, partnership, corporation or other business or legal entity, please provide a certificate of authority that you are entitled to sign on behalf of said company.

2.9.2 Form B - Statement of Competency/Certification of Good Faith

I hereby certify under the penalties of perjury that the Bidder meets or exceeds the competency criteria set out in this IFB and that the project information contained in the bid is accurate and complete.

I further attest to the following assertions:

1. The Bidder has been in business for a minimum of 3 years.

2. Provision of the items specified in this IFB is consistent with the Bidder's normal lines of business.

3. The Bidder is incorporated, and if required licensed, to do business in Massachusetts.

4. The Bidder will receive favorable ratings from the following references.

5. The Bidder has sold to the customers listed above within the past 3 years and to the "checked' customers within the past 12 months.

   - ❑ _____ of _____, MA
   - ❑ _____ of _____, MA
   - ❑ _____ of _____, MA
   - ❑ _____ of _____, ___
   - ❑ _____ of _____, ___

For the Bidder:

X_____

Name: _____

Title: _____

Date: _____

2.9.3 Form C - Bid Price Sheets

See **Section 13** below for the Bid Price Sheets which must be included.

2.9.4 Form D - Labor Harmony and OSHA Training Certifications

I hereby certify under the penalties of perjury that the Bidder meets or exceeds the following requirements:

(1) The bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed at the work;

(2) All employees to be employed at the worksite by the Bidder will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successfully completion of said course with the first certified payroll report for each employee; and

(3) All employees to be employed in the work subject to this bid by the Bidder have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

For the Bidder:

X_____

Name: _____

Title: _____

Date: _____

2.9.5 Form E - Sample Contract

CONTRACTUAL AGREEMENT TO PURCHASE

ARTICLE 1

CONTRACTING PARTIES

1.1 THIS AGREEMENT made effective by dated signature of the Parties hereto, by and between the

THE TOWN OF LUDLOW, and_____* **[Vendor]**,
whose principal office address and state of incorporation are set forth in Section 10.2.

ARTICLE 2

SUBJECT OF AGREEMENT

2.1 WHEREAS, THE TOWN OF LUDLOW desires to retain the Vendor to provide goods and/or services to THE TOWN OF LUDLOW, and the Vendor is willing to accept such engagement, pursuant to the terms and conditions of this Agreement, including any Additional and Special Terms and Conditions listed in Exhibit B, and the following Invitation For Bids: **IFB#: 612R2019 THE TOWN OF LUDLOW RADIO COMMUNICATIONS P25 SYSTEM UPGRADE (the "IFB")** as it relates to provision of the items specified in "Appendix A – Product description and Specifications" of the IFB and as hereinafter set forth.

2.2 NOW, THEREFORE, in consideration of the mutual covenants hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

ARTICLE 3

ENGAGEMENT OF THE VENDOR

3.1 THE TOWN OF LUDLOW hereby engages the Vendor, and the Vendor hereby accepts the engagement, to provide goods to and/or perform certain services for THE TOWN OF LUDLOW, as described in Article 2.

3.2 In the performance of service under this Agreement, the Vendor acts at all times as an independent vendor. There is no relationship of employment or agency between THE TOWN OF LUDLOW, on the one hand, and the Vendor on the other, and neither party shall have nor exercise any control or direction over the method by which the other performs its work or functions aside from such control or directions as provided in this Agreement which the parties view as consistent with their independent vendor relationship.

ARTICLE 4

SERVICES OF THE VENDOR

4.1 The Vendor will provide the goods and/or services as described in the IFB and cited in Article 2 above **(the "GOOD")**.

4.2 The Vendor shall report, and be responsible, to THE TOWN OF LUDLOW or its designee as set forth in **Article 10**.

4.3 There shall be no modification to the list of goods, including substitutions of specific products offered in the Vendor's bid, or amendment of the scope of services provided for in this Agreement, without the prior written approval of THE TOWN OF LUDLOW. THE TOWN OF LUDLOW shall be under no obligation to pay for any goods or services not so authorized.

4.4 The Vendor represents and warrants to THE TOWN OF LUDLOW as follows:

4.4.1 That it and all its personnel (whether employees, agents or independent vendors) are qualified and duly licensed as required by law and/or local municipal code to provide the goods and/or services required by this Agreement.

4.4.2 That it further agrees to perform services, including manufacturing, in a professional manner adhering to a reasonable standard of care and in accordance with all applicable State or Federal laws, rules and regulations.

4.4.3 That it will obtain any and all permits, bonds, insurances and other items required for the proper and legal performance of the work.

4.4.4 That it is not a party to any agreement, contract or understanding, which would in any way restrict or prohibit it from undertaking or performing its obligations hereunder in accordance with the terms and conditions of this Agreement.

4.4.5 That it does not now, and will not during the term of this Agreement, conduct business with parties located in or supported by countries identified by the U.S. government as funding, harboring, supporting, promoting or otherwise facilitating terrorist organizations or activities, nor will it provide goods or services produced under such circumstances.

ARTICLE 5

TERM

5.1 The term of this Agreement shall commence on the date of its execution by both parties and continue for up to two years or until its purpose is accomplished and acknowledged by formal acceptance and acknowledgment of the Vendor's performance by THE TOWN OF LUDLOW, or until otherwise terminated as provided by this Agreement or the IFB, and may be extended for two additional one-year terms at the sole discretion of THE TOWN OF LUDLOW.
5.2 The Vendor agrees to proceed with the Work promptly upon execution of this Agreement and to diligently and faithfully prosecute the Work to completion in accordance with the provisions hereof. The Vendor acknowledges that time is of the essence as it relates to performance under this Agreement.

ARTICLE 6

PAYMENTS TO THE VENDOR

6.1 Compensation due the Vendor shall be paid as specified in Sections 2.5.9 and 9.4 of the IFB.

ARTICLE 7

TERMINATION

7.1 Either THE TOWN OF LUDLOW or the Vendor may terminate this Agreement for cause upon written notice given by the non-defaulting party. For the purposes of this provision, "cause" shall include the failure of a party to fulfill its material duties hereunder in a timely and proper manner.

DEFAULT BY A PARTY. If either Party fails to perform a material obligation under this Agreement, the other Party may consider the non-performing Party to be in default (unless a Force Majeure causes the failure) and may assert a default claim by giving the nonperforming Party a written and detailed notice of default. The defaulting Party will have thirty (30) days after receipt of the notice of default to either cure the default or, if the default is not curable within thirty (30) days, provide a written cure plan within said thirty (30) day period. The defaulting Party will begin implementing the cure plan immediately after receipt of notice by the other Party that it approves the plan. If the Town is the defaulting Party, the Vendor may stop work on the Project until it approves the Town's cure plan. If the provisions of this section are in conflict with another provision or provisions of this Agreement, such other provision or provisions shall supersede this section.

FAILURE TO CURE. If a defaulting Party fails to cure the default as provided above, unless otherwise agreed in writing, the non-defaulting Party may terminate any unfulfilled portion of this Agreement. In the event of termination for default, the defaulting Party will promptly return to the non-defaulting Party any of its Confidential Information. If the Town, as the non-defaulting Party, terminates this Agreement as permitted by this section, and completes the System through a third Party, the Town may as its exclusive remedy recover from the Vendor all reasonable costs incurred to complete the System to a capability not exceeding that specified in this Agreement less the unpaid portion of the Contract Price. The Town will mitigate damages and provide the Vendor with detailed invoices substantiating the charges.

7.2 THE TOWN OF LUDLOW shall have the right to terminate this Agreement for its convenience upon ten (10) days written notice.

7.3 Following termination of this Agreement, the parties shall be relieved of all further obligations hereunder except that:

7.3.1 THE TOWN OF LUDLOW shall remain liable for payments for the services and/or expenses of Vendor accrued prior to the effective date of the notice of termination in compliance with this Agreement (less all costs reasonably incurred by THE TOWN OF LUDLOW as a result of the Vendor's default, if any), as determined by THE TOWN OF LUDLOW, but for no other amounts including, without limitation, claims for lost profits on work not performed.

7.3.2 The Vendor shall remain liable for any damages, expenses or liabilities arising under this Agreement (including its indemnity obligations) with respect to work performed pursuant to the Agreement.

ARTICLE 8

INSURANCE AND INDEMNIFICATION

8.1 The Vendor agrees to indemnify and save THE TOWN OF LUDLOW harmless from any and all manner of suits, claims, or demands arising out of any errors, omissions or negligence by the Vendor (including all its employees or agents) in providing the **GOOD**, or any breach of the terms of this Agreement, which constitute an obligation of the Vendor. The Vendor shall reimburse THE TOWN OF LUDLOW for any and all costs, damages and expenses, including reasonable attorney's fees, which THE TOWN OF LUDLOW pays or becomes obligated to pay, by reason of such activities or breach. The provisions of this Section shall be in addition to and shall not be construed as a limitation on any other legal rights of THE TOWN OF LUDLOW expressed or not expressed in the **IFB** and with respect to this Agreement.

8.2 Before providing the **GOOD**, the Vendor shall obtain, and shall maintain throughout the term of this Agreement, insurance at limits specified in the **IFB** and provide written documentation of such in the form specified in the **IFB.**

8.3 The Vendor shall give THE TOWN OF LUDLOW 20 days (twenty) written notice and copies of documentation in the event of any change or cancellation of coverage.

ARTICLE 9

GENERAL PROVISIONS

9.1 Upon the expiration or termination of this Agreement for any reason, any data, drawings, specifications, reports, estimates, summaries and other work product which have been accumulated, developed or prepared by the Vendor (whether completed or in process) shall become the property of THE TOWN OF LUDLOW. The Vendor shall immediately deliver or otherwise make available all such material to THE TOWN OF LUDLOW.

9.2 Neither party may assign, transfer or otherwise dispose of this Agreement or any of its rights hereunder or otherwise delegate any of its duties hereunder without the prior written consent of the other party. Any such attempted assignment or other disposition without such consent shall be null and void and of no force and effect.

9.3 Except as otherwise expressly provided in this Agreement, any decision or action by THE TOWN OF LUDLOW relating to this Agreement, its operation, or termination, shall be made only by THE TOWN OF LUDLOW or its designated representative identified in **Article 10.**

9.4 This Agreement, together with its **Exhibits**, the **IFB** referenced above and its **Addenda**, the required supplemental documents and any additional exhibits, constitute the entire agreement between THE TOWN OF LUDLOW and the Vendor with respect to the matters set forth therein and may not be changed (amended, modified or terms waived) except by a writing signed by both parties. Any notices required or allowed shall be sent by receipt-verified mail, e-mail, fax or courier to the persons designated in **Article 10.**

9.5 In the event any terms and conditions of this Agreement conflict with those contained in the **IFB** and its **Addenda**, the **IFB** and its **Addenda** shall prevail.

9.6 This Agreement is governed by the laws of Massachusetts and shall be construed in accordance therewith.

ARTICLE 10

SIGNATURES

10.1 For TOWN OF LUDLOW:

x _____

Signature

_____

Name

_____

Title

_____

Date

_____

Phone

_____

Fax

_____

e-mail

10.2 For the Vendor:

x _____

* Signature

_____

* Title

_____

* Name

_____

* Date

_____

* Company Name

_____

* Street/P.O. Box

_____

* City, State, ZIP

_____

* Phone

_____

* Fax

_____

* e-mail

* Affix Corporate Seal ⇨

(or mark *"n/a"*)

EXHIBIT A

NOTICE ADDRESSEES

A.1 For THE TOWN OF LUDLOW:

_____
Name

_____
Title

_____
Street Address

_____
City, State, ZIP

_____
Phone

_____
Fax

_____
e-mail

A.2 For the Vendor:

_____
* Name

_____
* Title

_____
* Street Address

_____
* City, State, ZIP

_____
* Phone

_____
* Fax

_____
* e-mail

EXHIBIT B

ADDITIONAL AND SPECIAL TERMS AND CONDITIONS

THE TOWN OF LUDLOW and the Vendor agree that the following additional and special conditions apply to and shall be held in full force and effect during the term of this contract:

1. None

Initialed For:

THE TOWN OF LUDLOW: _____

* Vendor: _____

EXHIBIT C

The IFB and all of its attachments will be part of the contract.

2.9.6 Debarment Certification

If you do not already have a debarment certificate, you may use this information provided here; however, the certificate must be printed on your organization's letterhead and signed by an authorized agent.

DEBARMENT CERTIFICATE

In accordance with 24 CFR 24.100 through 24.714, (name of authorized agent) hereby certifies that neither the (name of organization) nor its principal employees has been debarred, suspended or voluntarily excluded by any Governmental agency from receiving Federal financial assistance and non-financial benefits.

By signing this Certificate, the organization expressly understands and acknowledges that any person or entity that has been debarred or suspended is not eligible to receive Federal financial and non-federal financial assistance and benefits under Federal programs and activities.

And Certifies that the organization has never been debarred in the Commonwealth of Massachusetts.

Dated:_____ _____
Signature of authorized agent

_____
Printed name of agent

3 Present Communications System

3.1 Voice and Paging Infrastructure

The Town uses several disparate radio systems in both VHF High Band and UHF channels.
The police department is currently operating on a leased three site UHF simulcast system. This system was implemented in early 2018 as a temporary improvement to the single transmitter site with multiple satellite receiver sites that was previously in operation. Site equipment for the leased simulcast is located at the police department headquarters, the Minechoag fire tower site, and the Nash Hill reservoir site.

The fire department units currently operate on a two site VHF simulcast system located at the Minechoag fire tower and the Nash Hill reservoir site. In addition to regular voice traffic, this VHF channel is utilized for fire & EMS paging.

The Ludlow department of public works (LPW) currently operates on a single VHF high band repeater located at the Minechoag fire tower site.

The Ludlow Public schools (LPS) currently operate on a single UHF high band repeater located at the Ludlow police headquarters.

None of the present infrastructure will support upgrade or migration to P25 and must be replaced in its entirety. As such, further detail on the existing systems is not necessary.

3.2 Dispatch Console System

The Town of Ludlow's Central Dispatch operations is located at the police department headquarters at 612 Chapin Street, Ludlow, MA 01056. The current dispatch console system consists of three (3) Motorola MCC5500 consoles. In addition to the consoles there are additional control station radios in the fire department operations area to support fire dispatch operations during escalating incidents.

With the deployment of the new P25 radio system and its new consoles, the Town intends to move all dispatch operations for both police and fire to the Central Dispatch Center inside of the Police Department. Two fixed control station radios are to be located inside the Fire Department operations area to serve to supplement communications during large scale incidents.

3.3 Backhaul System

The current systems site equipment is backhauled with a mix of 900 MHz licensed microwave equipment and copper leased lines. The present backhaul connectivity is inadequate to provide the Town's required 99.9995% reliability.

3.4 Portable and Mobile Equipment

Ludlow agencies currently have a mix of Motorola, Kenwood, and Vertex subscriber radios. With the new unified P25 system the Town is seeking to standardize the fleet of subscriber radios deployed across the multiple agencies. A common subscriber radio platform is desired to simplify programming and maintenance needs across all Ludlow agencies.

3.5 Present Coverage Area

The current system(s) coverage is deficient to support the responders needs. Recent simulcast upgrades to both the Police and Fire channels have improved coverage but responders regularly experience problems with both portable On-Street and In-Building coverage. This deficiency is most apparent in the northwest area of the Town with On-Street operation and in the southern area during In-Building operation.

3.6 FCC Licenses

The Town of Ludlow has several FCC Registration Numbers (FRN). This resulted from the multiple Town departments dealing with their communications needs independently of each other. The Town holds licenses for VHF High Band, UHF, as well as 900 MHz microwave FCC licenses. There are licenses for the PW, IG, and MW radio service classes. The complete list of Town licenses pertinent to this project are in Appendix E.

All towers to be used in the new radio system must have their ASR and FCC licensed tower coordinates in compliance with FCC Docket 10-88. This requirement falls under the Contractor's responsibility.

3.7 Communications Sites

The addresses, physical locations, and pertinent technical data for the existing radio tower sites are included in the appendices of this document. For details on the current sites, please see Appendix F, Site Locations. Also provided in this appendix are brief descriptions of potential greenfield site locations where the Town of Ludlow owns the property.

The Town of Ludlow is aware of deficiencies and shortcomings at its current tower site locations that will need to be addressed and remedied as part of the P25 radio system procurement.
Contractors should be prepared to take photographs and detailed notes of all aspects of the sites and their current conditions during the mandatory site visits.

3.7.1 Ludlow Police Headquarters

The tower structure at the Police Headquarters is a 100' light duty Pirod tower. Tower model is a U 4.5x100, serial number A 1109299. The tower does not have sufficient structural capacity to support additional LMR antennas and microwave dishes. Either a structural modification or a tower replacement will be required to support the current equipment and the Contractor's new proposed equipment.

Grounding at the site is inconsistent and does not meet the current public safety guidelines. This will need to be improved to properly protect new P25 and MW equipment to be deployed at this site.

3.7.2 Minechoag Fire Tower

This structure was constructed in the late 1930s as a fire observation tower. It was not originally intended to be an antenna support structure. In 1967 the original 7'x7' observation cabin was replaced with a larger 10'x10' aluminum observation cabin. Over the years the many modifications to the tower, observation cabin, and mounted antennas have led to the structure being at its maximum structural capacity. The Massachusetts Department of Conservation and Recreation (MA-DCR) who owns the tower would like to reduce the quantity of antennas mounted to the structure to reduce the structural load.

The site has adequate compound space to construct a new antenna support structure and equipment shelter. Discussions with MA-DCR will need to take place to determine what arrangements can be made to facilitate a proper antenna support structure at this site.

Site grounding is inadequate at this location and will need to be improved to properly protect new P25 and MW equipment to be deployed at this site.

3.7.3 Nash Hill Reservoir

The antenna support structure at this site is the bottom section of a larger guyed tower structure. The installation of the tower section was not done in a manner that easily supports adding additional sections to the tower. The Massachusetts Water Resources Authority (MWRA) who owns the site and operates communications equipment here indicated that they are interested in having Ludlow extend the structure to improve coverage. Site development work to achieve any extension of the tower will require detailed investigation and planning.

4 New Communications System Requirements

The new unified Town of Ludlow system will need to contain both trunking and conventional elements for system redundancy and interoperability. The Town requires an Internet Protocol (IP) network function throughout all Town sites that allows controlled and managed interconnection of the Town system to other systems and other equipment. The replacement system shall include the replacement of the existing 900MHz microwave radios with new Ethernet MPLS microwave equipment.

Per FCC Part 90.631, 100 users are allocated per RF channel. Ludlow presently has approximately 300 portable radios, 80 mobile radios, and 35 pagers operating on their mixed radio systems. For the new communication system, The Town desires to operate a single, town wide simulcast system operating in the UHF band. The Proposer is to analyze the channel capacity needs and propose a system design that meets projections for a minimum of ten (10) years growth. In addition, all proposed frequencies shall be analyzed for intermodulation products and interference to determine if the UHF channels proposed can be deployed in the simulcast system.

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 Town'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 at a later time. The system must also be easily expandable to accommodate growth and expansion.

4.1 P25 Compliance

The replacement architecture shall conform to the objectives and user requirements outlined in the current P25 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 2 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. The Town may agree to inclusion of a non-standard feature or function so long as that feature, or function is formally offered by the Proposer for standardization in the P25 standards process.

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 Conformance

The Town's top priority is to ensure reliable interoperability and compatible equipment to the extent possible through conformance with applicable P25 TIA-102 protocol service documents and requirements. To this end, the Proposer shall specifically address how the proposed equipment complies with the following:

- Project 25 Statement of Requirements (SOR) http://project25.org/images/stories/ptig/docs/Technical_Documents/12131211_Approved_P25_SoR_12-11-13.pdf
- Common Air Interface – (CAI) (TIA-102.BAAA)
- Inter-RF Subsystem Interface and Console Subsystem (ISSI/CSSI) Interface Suite of Wireline Standards (TIA-102.BACA-A)
- Conventional Fixed Station Interface (FSI) (TIA-102.BAHA)

The Proposer shall address the following for each document above:

- Conformance (Yes or No) and ship date
- Indicate specific TIA-102 Document and Addenda (w/revision dates)
- Describe exceptions

Ludlow's preference is to reach this assurance by use of the Compliance Assessment Program. If that is not possible, the Proposer must propose testing of a multiple manufacturer environment during staging tests or provide a list of the compliance assessment tests they have conducted, including interoperability tests along with the actual Supplier's Declaration of Compliance (SDOC). It is mandatory that the proposed trunked system must be compliant with both P25 Phase 1 and Phase 2 standards.

4.1.2 Phase 2 Half-rate Vocoder

The Town requires all transmitting and receiving Land Mobile Radio equipment adhering to P25 standards must be capable of implementing the DVSI Enhanced Half Rate or DVSI Dual Rate vocoder.

4.2 Simulcast Operation

To most effectively provide the required coverage and to most efficiently utilize the limited available spectrum, the Town prefers to use a simulcast configuration. The Town desires to utilize a single simulcast zone. However, the Proposer has the option to present an alternative multi-zone design in addition to the requested simulcast design. The Proposer shall provide the Town with their assumptions, criteria, and other factors used during the design of the system.

It is assumed that the new P25 system will follow this same design, with all frequencies operating at all sites unless otherwise dictated by FCC license limitations. This means, ideally, that all existing and new frequencies will need to be licensed at all existing and new sites. Knowing that this may be difficult to accomplish, the Proposer should have other options to offer in place of simulcasting all frequencies from all sites.

The simulcast design shall be GPS synchronized and shall have the capability to connect audio and data between the prime 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 antennas shall be conical shaped and spaced at least six (6) feet apart from each other when mounted. 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 IFB. The proposed standard must meet the simulcast frequency stability requirements when GPS timing clocks are lost.

The proposed trunked system design shall be capable of automatically adjusting the path delay time 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 total microwave path distance traveled. 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. The proposed system shall include centralized automated simulcast test equipment. This equipment shall be installed at the Ludlow Police 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:

- 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.
- 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.
- Addition of Sites – The procedure and equipment required for the proposed addition of any necessary trunking or receiver sites shall be specified.
- Addition of Channels – The procedures and equipment required for the addition of base stations or receiver channels shall be specified.
- 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.
- 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.

4.2.1 Voting Comparator and Audio/Data Distribution Equipment

Because of the use of simulcast, receiver voting is a requirement. The Proposer shall provide a means of selecting the best quality received signal from each of the proposed trunking sites. The voting comparator shall serve as the system-wide collector, voter and distributer of voice signals for its associated RF channels. The comparator shall produce the best quality audio signal from the multiple signal sources and provide the means to deliver it to the dispatch center and to all of the simulcast transmitter sites. The comparator shall incorporate frame diversity to utilize the best data frames of all of the inputs to construct a better output signal.

The Proposer shall include a detailed description of the methodology used in the voting process including the method of programming or otherwise configuring a comparator. Alarm reporting and diagnostic capabilities of the device, if any, shall be described along with the need of modems or other such devices to allow the remote accessing and monitoring of the comparator(s). The Proposer shall describe how the comparator equipment will work with the P25 Phase 2 mode of operation. Any additional equipment that may be required for the processing and/or routing of audio signals from the comparators and trunked consoles and/or for the processing and routing of trunked signaling originating from the trunked controller(s) shall be identified and described.

4.3 Responder Device Features

The Town requires small, lightweight radios that are user friendly, easily programmed, easy to read and easy to operate, especially while wearing protective gear. The responder equipment must meet the FBI CJIS Security Policy.

Mandatory Features:

- Emergency alert declaration capabilities
- Direct radio unit to radio unit calls (not through a base station) / ground channel
- Direct radio unit to radio unit private calls (through a base station)
- Radio ID
- Radio ID to display at console upon keying
- AES Encryption
- Over the Air Programming
- Meet CJIS security guidelines

Optional Features:

- Status and text messaging for mobile and portable radios
- GPS location in portable
- Touch-screen console monitors
- Bluetooth capability
- Wi-Fi and LTE capability in subscriber radios
- Vehicle repeaters if needed for limited users

4.3.1 Mandatory Responder Device Features

The Town 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
- 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 UHF band.
- AES encryption is required in police department radios only
- Emergency activation button
- Automatic unit ID on transmit, with programmable alias
- Remote unit ‘kill’ feature for dispatchers – This feature may be achieved through the Network Control and Management System
- Over the Air Reprogramming (OTAP)
- Scanning capability for any analog, digital, trunked, conventional, encrypted, or clear channels or talkgroups 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 talkgroups per scan list, as well as the latency associated with scanning multiple lists.
- Long lasting, light weight batteries with minimum 12-hour run time based on a 5/5/90 duty 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

4.3.2 Optional Responder Device Features

The Town 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
- Selectable receive signal strength indicator on displays.
- Short status messaging capability

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

4.4 Fleet Mapping

The Town of Ludlow's present radio systems provide service to Law Enforcement, Fire, EMS Public works and Public Schools agencies throughout the town. The new unified P25 simulcast radio system will need a fleetmap with sufficient talk groups provisioned to meet the operational needs of all Ludlow agencies. In addition to the talk groups for routine daily operations, talk groups for interoperability will need to be created. Due to expected growth and possible rearrangement of agencies within the Town, the new system must be designed with a capacity of up to 512 talkgroups without hardware upgrade. The Proposer shall discuss the additional capacity in the new system in terms of typical increased number of emergency responders and increased number of talkgroups in a typical and comparable public safety system. Proposers must describe the talkgroup capacity of the new system, and the means by which these groups are added or modified. Actual names for the active talkgroups will be developed during the final system design process, but those names must be able to be changed by system administrators as needed.

4.5 Site Upgrades and Additions

The Town of Ludlow requires that the new P25 system be installed and integrated seamlessly while the existing systems continues to provide uninterrupted service to emergency responders. This will require the installation of new digital equipment alongside the current equipment. Proposers will need to survey all existing sites and submit a plan of action to accomplish the transition. In addition to migration of two-way voice communications, Proposers shall provide a plan for retaining functionality of the Fire Department's legacy VHF paging equipment during implementation and cutover to the new UHF P25 infrastructure and pagers being provided.

The Town is aware of limitations and shortcomings present at each of the current sites and it shall be the proposer's responsibility to develop a plan to resolve any deficiencies during the deployment. As stated earlier the Town is seeking a Turnkey Solution.

4.5.1 Current Site Upgrades

The current sites at the Police Headquarters, Minechoag fire tower, and Nash Hill will all require improvements to bring them in line with the current standards for public safety critical infrastructure.

All towers, shelters, and equipment areas shall be inspected by the Contractor during the mandatory site inspection visits. Proposals shall address all aspects of bringing the sites up to the latest applicable standards. Site grounding is known to be deficient at several locations. Grounding that is not single-point or up to the latest grounding standards shall be corrected by the Contractor. To maximize lightning dissipation, all ground leads shall follow the shortest, most direct path to ground. Mechanical or split-bolt grounds are not to be used. Racks are to have home-run leads to the MGB (Master Ground Bus) or be H-tapped to a #2AWG rack lineup ground run. Site improvements and new sites must meet R56 or equivalent grounding standards.

4.5.2 Additional Sites

With the existing coverage deficiencies noted by the emergency responders of The Town of Ludlow, it may be necessary to add an additional site or sites to address these coverage deficiencies. It is the Proposer's responsibility to analyze and determine if and where new candidate sites are needed to accomplish the desired on-street coverage levels. The Town does not desire to lease space on commercial towers or structures. Colocation with other government entities or construction of new towers owned by the Town is the preferred approach.

Coverage maps must be provided for each potential new site, showing individual site coverage and composite coverage with the rest of the system as outlined in Section 6. As part of the design of any new site, the Proposer must include an analysis of space requirements for new equipment and antennas.

If additional site(s) is/are being proposed, Proposers must include pricing for all aspects of the development of the site. Proposers must include all zoning, permitting, and construction costs associated with installation of new towers, shelters and generators when required. In the case of a complete greenfield site location, 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 fees as needed.

4.6 Antenna Systems

The Town defines the antenna system as antennas, antenna mounting accessories and appurtenances, feed lines and associated cable connectors and components, transmit combiners,

and receiver multicouplers. The new P25 system shall be provided with new antenna systems independent of any existing systems.

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.

Transmission lines for the radio system shall be Andrew Heliax® or approved equivalent 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 radio system applications, with the possible exception of some mobile and control station installations. The RF connectors shall remain in the original packaging until installation in order to prevent oxidation and corrosion of the mating surfaces.

RF transmission mediums (waveguide, coaxial cables, etc.) must be labeled at the source equipment, inside and outside of each shelter RF entry port, and where terminated at the antenna jumper. All RF transmission mediums must be grounded per R56 standards or equivalent. To maximize lightning dissipation, all ground leads shall follow the shortest, most direct path to ground. Mechanical or split-bolt grounds are not to be used.

4.7 Microwave Network Improvement

The Town of Ludlow is seeking the Proposer to design, develop, and deploy a new IP MPLS microwave network to support the P25 system deployment. The microwave network shall be designed in such a way as to provide the highest level of redundancy and resiliency possible. The Microwave backhaul network shall achieve an annual availability of 99.9995% or greater. Any potential new site(s) must also be evaluated on the basis of microwave connectivity to the next two closest sites. Where possible MW hops shall incorporate both ring topology and Hot Standby (HSS) radios. It will be necessary for the Contractor to maintain a relationship with the microwave vendor throughout the design, implementation and cutover phases.

The elliptical waveguide should be terminated just before the microwave radio rack to ensure a smooth flow of the twist-flex when connecting the top of radio rack to the terminated elliptical waveguide. There should be no sharp turns of 90 degrees or greater or bend back in the microwave radio twist-flex. Nor should there be undue horizontal stress on the twist-flex due to being pushed against the shelter cable ladder or top-support. Using the correct length of rigid waveguide up the back of the radio rack(s) will help prevent such stresses on the twist-flex and the rigid waveguide.

Outside of the shelter, the elliptical waveguide is to be supported by waveguide snap-ins for support up the tower cable ladder. All new elliptical waveguide should also be properly labeled at a minimum on the inside and outside of the RF entry port.

Proposers must create a detailed design for integration of all proposed tower sites into the microwave system. Proposers must itemize the cost of these new microwave hops separately. The Contractor will be responsible for the licensing of any new microwave frequencies.

4.8 System Redundancy

The Proposer shall evaluate existing UPS loading and expected growth to size and determine the appropriate UPS system for each of the RF sites. The Contractor shall replace the current UPS system at all RF sites with a new UPS capable of supporting all the existing LMR equipment as well as the new LMR equipment during cutover.

Ludlow Police headquarters houses the existing voter and control point equipment which has backup power through the building generator and UPS. The Proposer shall evaluate this existing emergency power system for capability and capacity to provide adequate backup power to the existing equipment and any new equipment to be installed there. This analysis shall take into account that the existing equipment and its replacement will both be in operation till the cutover process is complete.

The Proposer shall provide generator/UPS backup and redundant AC power inputs to all equipment at all site 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.

Regarding microwave equipment redundancy, optional pricing for equipment protection (hot-standby modules) is to be provided for the new microwave digital radios.

4.9 Dispatch Console Replacement

The current Dispatch Consoles (Motorola MCC5500) in the Ludlow Police headquarters will require replacement. The Contractor's proposal shall include three new full featured P25 consoles to be located in the existing dispatch center. A plan for colocation of both the old and new consoles during cutover shall be developed and provided. The plan at a minimum, needs to address physical space and power requirements for both sets of equipment to be in operation at the same time.

4.9.1 Logging Recorder System

Currently voice recording is performed through Ludlow's existing Motorola MCC5500 consoles. The Town requires the Contractor to replace the current recorder capability with a new standalone recording platform located at the Town of Ludlow Central Dispatch Location. The

new logging recorder must interface to the Contractors proposed system, proposed new dispatch consoles, analog interoperability channels, and the Town's existing phone systems.
The recorder must be able to record the following:

Select audio from each console position, regardless of what talk group, channel, or resource is selected.

Phone audio from each console operator on either 911 or administrative phone lines.
A quantity of twenty (20) trunked talk groups from the P25 system. The specific defined list of talkgroups to be recorded will be identified during the fleetmap development process. Most of these talk groups will not be operating as a select group in a dispatch console.

All existing conventional analog channels that are or will be interfacing to the consoles
The proposed recorder solution must have sufficient storage to retain all recordings for a minimum of one year. The recorder system should reside on the Contractor's Network but will need to interface to the Town's enterprise network for recording retrieval and compilation purposes. The system software must include software suite to allow for compilation of recordings and must include redaction capabilities. Network outages shall not affect the console system from being able to provide radio audio to the logging recorder system.

4.10 Network Control and Management System

The Proposer shall provide a detailed description of the standard and optional capabilities of their Network Control and Management System (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 proposer is to provide options and recommendations for network security.

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 four (4) multiple users.

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, System interoperability gateways, the digital microwave system status & alarms, any 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 receive and display all alarms created by a site connectivity or microwave path failure.
The NCMS shall allow operators to create, change, and delete items such as adding sites, talkgroups, aliases, channels, and updating mobile and/or portable programming which may include encryption keys if needed to meet FBI CJIS Security Policy requirements.

When a field unit (portable, mobile, and RF control station) is powered on, the unit's discrete address (radio identification) 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.

4.10.1 NCMS Terminal

The NCMS terminal shall be provided at the Ludlow Police Headquarters. The terminal shall consist of a keyboard, processor, software, 21-inch LCD color display, all necessary interconnect cabling, and 120Vac operation. A color network printer shall also be provided.

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 (unit ID) of calling and called parties using the system

The 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.

4.10.2 NCMS Remote Access

The Town may have the need to access the NCMS from remote locations. Access shall be provided using a Windows based computer running the latest Windows operating system software. This remote NCMS access will be for a minimum of three (3) remote users.

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.

4.10.3 NCMS Security

The Proposer shall describe in detail their proposed security measures to protect physical network components (routers/switches, servers, 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.

4.10.4 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, talkgroup, fleet map and agency, etc. The complete system database must be backed up after implementation of the radio system.

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.

Additionally, whenever a field unit is turned on and the unit is within RF coverage range of the system, the unit's discrete ID 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 24 hours, the database shall be automatically backed up and stored on devices external to the trunked control system, such as a, hard drive, or "burned" to DVD R/W media.

4.10.5 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 NCMS 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 the Town.

4.10.6 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

4.11 Interoperable Communications

The Town understands that not all agencies in surrounding jurisdictions will operate on compatible UHF P25 digital systems and as a result will not be able to directly communicate on the Town's new P25 system. Disparities in technology and the frequency band being utilized by neighboring agencies will require interoperability solutions be implemented in order to provide the required communications with neighboring agencies and their responders.

All new radios on the Town's new P25 system will have multi-mode capability to offer the greatest flexibility for communications with legacy analog conventional systems. To further enhance this capability, the new P25 system will have the ability to interface with other RF systems through conventional gateways and Inter-RF Subsystem Interface (ISSI) gateway devices which tie into the new console system. Through the combined capabilities of; flexibility of the new portable and mobile radios, the use of conventional gateways, or the use of ISSI gateways, the Town requires the Contractor to accomplish interoperability with their neighboring organizations as outlined below. Some of the agencies are considered mandatory, while others are optional but still desired. Proposers must detail the equipment and configuration in the Contractor's proposed system to accomplish the required levels of interoperability. Itemized pricing should be provided for interfacing with any optional organizations. Any hardware and software required for interfacing to mandatory organizations are to be included in the base bid. The Town desires maximum flexibility to implement various levels of interoperability quickly from the field units or from the dispatch consoles.

It shall be the Contractor's responsibility to address all licensing requirements for the interoperability equipment and systems that they propose. This shall include licensing and letters of concurrence. The Town will assist the Contractor with providing points of contact and information for the neighboring jurisdictions and agencies defined in the interoperability requirements.

For clarity, it shall be the Contractor's responsibility to provide, configure, connect, and test a functioning interoperability solution to each of the agencies defined below as mandatory.

Additional technical details on the systems and channels required for interoperability is provided in Appendix G.

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

4.11.1 Mandatory

- Springfield Fire Department, Dispatch 1
- Springfield CMED MED 1
- Springfield CMED MED 2
- Springfield CMED MED 3
- Springfield CMED MED 4
- Springfield CMED MED 5
- Springfield CMED MED 6
- Springfield CMED MED 7
- Springfield CMED MED 8
- Springfield CMED MED 12
- Springfield CMED MED 22
- Springfield CMED MED 32
- Springfield CMED MED 42
- Springfield CMED MED 52
- Springfield CMED MED 62
- Springfield CMED MED 72
- Springfield CMED MED 82
- Wilbraham Fire Department Dispatch
- Wilbraham Police Department Dispatch
- Granby MA Police Department
- Granby MA Fire
- Granby MA Fire Backup/Fire Tac
- Belchertown MA Police
- Belchertown Fire
- Belchertown Fire Ground
- East Longmeadow Fire Primary Dispatch
- East Longmeadow Fire Tac
- Chicopee Fire Department Dispatch
- Chicopee Police Department Dispatch
- Palmer (Bondsville) Fire Dispatch
- Palmer (Bondsville) Fire Ground
- Holyoke Fire Department Dispatch
- Palmer Police Department Operations

- Hampden Fire Dispatch/Operations
- Hampden County Correctional Center (Jail1)
- Monson Fire Dispatch
- Three Rivers Fire Ground
- Ware Fire
- Westover Fire (Digitally Encrypted. Use WMLEC Sim2)
- Monson Fire Ground
- WMLEC UHF Police Mutual Aid
- WMLEC UHF Fire Mutual Aid
- Commonwealth of Massachusetts Interoperable Radio System (CoMIRS)
  - MSP Troop B
  - MSP Troop C
  - Hampden County Sheriff's Department
  - MA Environmental Police West Dispatch
  - MassDOT
  - MA Department of Conservation and Recreation (DCR)
  - Local Public Safety Special Events

4.11.2 Optional

- Hampden Town Fire Department Operations
- Hampden Town Police Department Operations
- Hampshire County Police, CoMIRS
- Springfield Police Department Dispatch

4.12 Life Cycle

The Proposer shall provide realistic life cycle data on the proposed radio system, sub-systems, components and third-party equipment. The Town expects the proposed radio system as a whole to remain in service no less than 20 years. Understanding that some components may have a shorter life, the Town has elected to utilize P25 technology to allow upgradability and scalability of the radio system over the years. The Proposer shall provide the Town with the anticipated last date of manufacture and sale of the proposed radio system. In the event that the Proposer cannot provide a specific date, the Proposer shall guarantee manufacture beyond 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 Town 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.

5 Technical and Functional Specifications of New Communications System

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 Telecommunications Industry Association (TIA), and the rules and regulations of the Federal Communications Commission (FCC). All equipment shall be type accepted by the FCC.

5.2 Communications Equipment Sites

The Proposer shall make every effort to utilize existing Town's communications sites in the implementation of their radio system. For current sites, new P25 infrastructure and microwave network equipment shall be integrated along with the existing infrastructure equipment.
In an effort to secure the coverage and audio quality detailed in this IFB, the Contractor may propose adding a new site or sites. The Contractor shall be responsible for the complete design and development of all sites in the proposed system.

5.2.1 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.

5.2.2 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 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 Town will allow the use of certain circuits to power multiple components on a temporary basis only to facilitate implementation of the replacement system.

5.2.3 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.

5.2.4 Antenna Systems

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

5.2.5 Transmission Lines

All coaxial cables and waveguide transmission lines must be new. This eliminates uncertainties such as the age and condition of existing lines and connections. This also allows for starting the warranty on the same day for all equipment.

5.2.6 Transmitter Combiners

The new combiners must be capable of at least 6 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.

5.2.7 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 receivers plus four (4) spare ports.

5.2.8 RF Interconnect Cables

For the new radio system, the Town 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 UHF band with Teflon® insulation and gold- or silver-plated mating surfaces shall be used throughout the RF system.

5.2.9 Transmission Line Surge Suppressors

All new surge suppressors shall support the full UHF band. Wherever possible, the surge protectors shall be installed at the port where cables enter the shelter.

5.2.10 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 450 to 470 MHz, covering all public safety UHF channels
- 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	450 to 470 MHz Public Safety
Power Output	Determined by coverage study, adjustable +/-4dB
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	450 to 470 MHz Public Safety
Frequency Stability	+/- 0.0001% at -30°C to +60°C
RF Input Impedance	50 Ohms nominal
Sensitivity	-119dBm for <5% BER
Spurious and Image Rejection	-100dB minimum
Modulation Acceptance	P25/EIA
Channel Spacing	12.5kHz offset from FCC and NPSPAC plan
Selectivity	TIA-102.CAAB Class A - 70dB minimum at 12.5kHz EIA, -80dB minimum at 25kHz
Audio Response	+1 to -3 of 6dB per octave de-emphasis from 300Hz to 3000Hz for analog

Audio Distortion	<3% at 1000Hz for analog
Audio Output (Local Speaker)	5 Watt output audio power into 4 Ohms.
(Line Output)	Continuously adjustable from –20dBm to +10 dBm (0dBm nominal) at 600 Ohms transformer balanced

The trunked repeaters shall be managed by the Master Network and/or Primary Site Trunked Controller, which will 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 talkgroup 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.

5.2.11 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. The Town of Ludlow 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 most recent version of the P25 SOR. Proposers must fully disclose any of features that they do not support and any features that cannot presently be complied with because of lack of acceptance as a standard.

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.

5.2.12 Over-the-Air-Programming (OTAP)

The Town requires the Proposers to include OTAP functionality in the new P25 system. As a result, the replacement system shall provide 'Over-the-Air-Programming' (OTAP) capability for mobile and/or portable units so equipped. The Town considers OTAP functions as data transactions, and therefore they shall not interfere with voice traffic priority. The Proposer shall describe, in detail, the full capabilities of their OTAP technology including the limitations as

outlined in the P25 Statement of Requirements (SOR), and any and all manufacturer proprietary features and functionality.

5.2.13 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 workstation 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 the Town is to have this control capability for the entire 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 Town's system manager total access to the system. The Town will have a single, centralized system manager terminal.

5.2.14 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.

5.2.15 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 system includes multi-site operation (as opposed to a 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.

5.2.16 Private Conversation

Though not widely used in Ludlow, the trunked radio systems shall permit authorized radios to initiate individual private conversations. The specific requirements for this function shall be identified by the Town during the detailed design process. These calls, as well as group calls, are to be recorded on the logging recorder.

5.2.17 Selective Alerting

Dispatch console positions and any optional control stations shall be capable of selectively alerting any individual 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.

5.2.18 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.

5.2.19 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.

5.3 Reliability and Redundancy

The Town 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 in the event that 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 discussing 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 first failure mode shall be single-site trunking. The second failure mode shall be conventional fallback.

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.
- Provisions shall be made for bypassing the system controller in the event of its failure. This will permit designated dispatch locations to have direct access to predetermined RF channels for operation in the site trunked mode.
- 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.

5.3.1 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 the Town 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 Town.

5.3.2 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 Town public safety system will be located at a location to be determined by the Town prior to the mandatory pre-proposal conference.
- The prime site for the Town 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.

5.3.3 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.

5.3.4 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 in 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 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 Town’s availability objective. The system shall be configured as one self-healing ring which interconnects to centrally located fixed-end equipment at all trunked repeater sites.

5.3.5 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.

For operational purposes this single-site may need to be the master site, but the Proposer can recommend a different site for better coverage if necessary. During this mode of operation, the system shall not be off-the-air for longer than 15 seconds during the transition to and from the site trunking mode.

5.3.6 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 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.

5.3.7 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.

5.4 Mobile and Portable Equipment

All mobile and / or portable equipment intended for public safety use that is supplied under this procurement shall have been independently tested for compliance to the published MILSTD 810 C, D, E, F, and G standards (including change notices) 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.

The Town intends to purchase 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. The Town desires that mobile and portable accessories are standardized to the greatest extent possible to simplify maintenance and reduce spare parts inventories. Whatever radio is recommended by the Proposer, it must be able to be upgraded to include the optional features listed in this IFB. 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 recommended by the Proposer shall be capable of performing all functions and features of the system.
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	Public Service	Public Safety Mid-Tier	Public Safety High Tier
UHF Capable	X	X	X
Group/Channel Selector, 16 Position	X	X	X
Rotary top-mounted Volume Control	X	X	X
System Selector	X	X	X
Minimum Number of Modes	256	512	512
Speaker Mic w/Antenna		X	X
Public Safety Speaker Mic w/Antenna		X	X
GPS Speaker Mics		X	X
Scan Control with Priority Scan		X	X
Alphanumeric Display Backlit	X	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	X
Single-Key Encryption		X	X
Over-the-air Rekeying		X	X
Analog Voice	X	X	X
Ruggedized Construction Option		X	X

5.4.1 Mobile Radios

All mobile radios offered shall meet technical standards recommended by the latest P25 suite of standards. 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 UHF band capable of operation in the following modes:

- P25 12.5kHz FDMA trunked mode
- P25 12.5kHz TDMA Phase 2 trunked mode
- P25 12.5kHz FDMA conventional mode
- 12.5kHz analog FM mode in the UHF public safety band

All installations, cabling, brackets, etc. shall be part of this procurement. 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 and terminate accidental PTT activations.

Due to the diversity of the Town's fleet of vehicles and their operational needs, multiple radio configurations are required. A detailed list of mobile radio types and configurations has been provided. All mobile units shall include external speaker, microphone, and all accessories required for installation.

	Quantity per Agency					
Town of Ludlow P25 Radios	**Ludlow PD**	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Mobile radios						
Public Safety, dash mount mobile radio, AES encryption	16					16
Public Safety Multiband, dash mount mobile radio, no encryption		5				5
Public Safety Multiband, remote mount radio w/single control head, no encryption		9				9
Public Safety Multiband, remote mount radio w/DUAL control heads, no encryption		2				2
Public Safety Multiband, remote mount radio w/DUAL control head, AES encryption *(Unit must be IP67 or greater for installation on a UTV)*	1					1
Public Safety, remote mount radio w/single control head, no encryption		8				8
Public Safety, remote mount radio w/single control head, AES encryption	3					3
Public Safety, remote mount radio w/dual control heads, no encryption		2				2
Public Service, dash mount radio			29		2	29
Public Service, dash mount radio, AES Encryption				1		1
Totals	**20**	**26**	**29**	**1**		**76**

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 particular department being supplied. Antennas, DC power, control, and audio cabling shall be supplied as part of this procurement, replacing any existing cabling and antennas.

Fire, EMS, and special purpose vehicles 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. It shall be the responsibility of the Proposer to inspect and audit the Town's fleet of vehicles to determine specific installation requirements.

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 talkgroup 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
- Meet CJIS security guidelines
- 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.
- *Optional Feature*
    - Over The Air Programming

<u>Status Tones</u> - 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

<u>Control Head</u>

- 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 talkgroup selector switch or switches, if applicable
- *Control Head - Option*
    - The ability to send and display short status messages such as Available, En-route, On Scene, etc.

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 The Town. The Contractor shall exercise care to ensure compliance with the manufacturer's installation instructions as previously noted.
3 dB gain (may be larger or smaller gain depending on final system design) operational across the entire UHF 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

5.4.2 Portable Radios

All proposed portable radios shall be provided 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. All proposed portable radios shall be equipped standard with a whip style antenna operational across the entire UHF 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 5 watts. Portable radios supplied under this procurement shall be frequency synthesized and furnished to operate on all channels in the UHF land mobile bands capable of operation in the following modes:

- P25 12.5 kHz FDMA trunked mode
- P25 12.5 kHz TDMA Phase 2 trunked mode,
- P25 12.5 kHz FDMA conventional mode, and
- 12.5 kHz analog FM mode in the UHF 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.

Quantity per Agency						
Town of Ludlow P25 Radios	**Ludlow PD**	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Portable radios						
Public Safety portable radio, no encryption, no GPS		60				60
Public Safety Multiband **portable radio, no encryption, no GPS**		4				4
Public Safety Multiband **portable radio, AES encryption, no GPS**	3					3
Public Safety portable radio, AES Encryption, GPS	85					85
Public Service portable radio			9		5	
Public Service portable radio, AES Encryption				135		135
Totals	**88**	**64**	**9**	**135**		**296**
Portable Radio Accessories						
Standard remote speaker microphone	88					88
Severe duty remote mount speaker microphone		64				64
***Belt mounted swivel carry case**	*					0
Carry case with shoulder strap		42				42
Portable belt clip		22	9	135		166
DC powered vehicular charger		24				24
Multi position bank charger	3	4				7
Totals	**91**	**156**	**9**	**135**		**391**

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 for the Public Safety agencies. A more cost-effective public service grade portable radio may be proposed for the Public works and Public Schools agencies.

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 talkgroups as desired, simultaneously selecting the correct transmitter and receiver digital code. Other controls shall

include a volume control and on-off switch. Controls need to be user friendly and able to be operated with gloved hands.

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, at 250 milliwatts of audio output, shall be at least 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, programming cables, 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 severe duty 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 talkgroup 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
- Meet CJIS security guidelines
- Batch cloning capability
- 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 known location.

- *System Compatibility Option*
    - Over the Air Programming

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 1 systems.

5.4.3 Battery Chargers

Battery charging units operating from 120Vac / 60Hz 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 DC 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."

5.4.4 Control Stations

Several fixed location control station radios are required. These units are to be provided with additional Tone Remote Control (TRC) desksets as documented in the Appendix H Subscriber Radio Quantities. The proposer shall include all materials and labor required to install the Control station and its associated TRC desksets. In addition to the new TRC desksets being purchased, the Fire Department currently has in place several TRC desksets throughout their facility. It shall be the successful contractor's responsibility to reconnect these existing units to the new P25 control stations at the fire department.

Control stations shall operate on 120Vac / 60Hz 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.

Quantity per Agency						
Town of Ludlow P25 Radios	**Ludlow PD**	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Control station radios						
Control station radio for fixed location	2	2	3	2	1	10
Tone Remote Control (TRC) DeskSet	9	0				
Control station radio for fixed location, w/ AES Encryption						0
Totals	**11**	**2**	**3**	**2**		**18**

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 talkgroup 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
- Meet CJIS security guidelines
- Software driven tuning and alignment capabilities
- Batch cloning capability
- *System Features Option*
    - Over the Air Programming

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

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.

5.5 Fire and EMS Pagers

As part of the P25 system deployment the Ludlow Fire Department requires new pagers capable of operating and being alerted through the new P25 system. The alert paging receivers require the following features:

General specifications:

- P25 Phase I and P25 Phase II operation
- Supports analog two tone conventional operation
- UL Certified as intrinsically safe for use in hazardous classified locations.
- Meet MIL standard 810E Procedures-I for rain
- Durable, rugged housing with large sturdy buttons and/or knobs suitable for use with gloves
- Synthesized receiver
- Field-programmable frequencies and codes
- Operation on NiMH, AA, or AAA Alkaline batteries
- Battery charger
- Charger amplifier unit (optional)
- Operator manual

Operational specifications:

- Two frequency, minimum
- Vibrating alert
- Voice storage
- Scan function
- Speaker and earphone jack
- Eight [8] individual addresses (Cap codes) or alerting group assignments
- Supplied with standard belt clip and batteries

Technical specifications guideline:

- Frequency: 450-512 MHz
- Modulation: C4FM (Phase I), H-DQPSK (Downlink-Phase II),
- H-CPM (Uplink-Phase II).
- Paging Protocol: TGID, Call Alert, QC-II
- Channel bandwidth: 12.5kHz, 6.25 kHz
- Sensitivity: -116 dBm
- Adjacent Channel Performance: 60dB
- Image Frequency Rejection: 70dB
- Spurious Performance: 70dB

- Intermodulation Rejection: 70dB
- Alert Response: 96dB @ 30cm
- Working Temperature: -30°C to +50°C

5.6 Microwave System Requirements

The Proposer shall design new microwave hops for network connectivity to all sites in the Town's P25. 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 provide for a loop (also referred to as "ring") network configuration. 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 of the microwave loop

The Contractor must plan space and structural loading for the microwave dishes on each tower, and space for microwave equipment in each shelter as needed to create the new network connections.

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 if reusing existing antennas on new paths. Contractor will also be responsible for ensuring that all Ludlow towers meet FCC Docket 10-88. Any ASR and FCC licensed tower coordinates for all existing tower sites should be modified to be within compliance of FCC requirements of ±1 second (“), which is approximately 100 feet, for the actual location of the tower.

All new microwave antennas shall be FCC-Part 101-Category "A" compliant, parabolic dishes. Dish model and sizing shall be chosen to provide at least 99.9995% reliability of each new hop. All microwave antennas shall be provided with protective radomes, standard four-inch pipe mounts, dual side struts/stiff arm supports, and ice shields, if needed. 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 TIA standards. Transmission line grounds shall take the shortest, most direct path to ground to maximize lightning dissipation.

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. Elliptical waveguide snap-in connectors shall be used when securing the waveguide up the tower cable ladder. 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 23dB, as measured at the antenna port of the radio. Flex waveguide shall not be used outdoors. The elliptical waveguide shall be terminated at a sufficient length before the radio rack location in the shelter to prevent any undue

stress or sharp bends in the twist flex when connecting between the elliptical waveguide and the top of rack of the microwave radio.

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. These alarms shall be provisioned into the systems NMS for reporting to the Town's supervisory staff.

The Proposer shall provide an inventory of manufacturer recommended spares for all critical digital microwave system network components as necessary to meet the Town's 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 Proposer shall recommend an MPLS-capable radio with throughput capacity that will meet all of Town's current needs and for the lifetime of the radio system.

The Town prefers to have a microwave loop design in order to have path protection to all the sites, but it does not mandate it. If the Proposer includes a spur link(s) in their design, it must include optional pricing for hot-standby/equipment protection.

Below are the minimum specifications for the new Microwave Network:

- 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
- 10/100/1000 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

6 New P25 Trunked System Coverage Performance and Requirements

Coverage and reliability are the cornerstones of public safety communications. The Town of Ludlow has experienced unreliability communications with a lack of talk-back and areas of poor paging reception in their current existing systems. The current radio systems support Police, Fire, EMS, Public Works and Public Schools throughout the Town. The intention of this section of the IFB is to provide the Proposers with a clear understanding of the Town'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 Town's expectations and requirements.

Information included in this section of the IFB includes:

- A description of the Town's jurisdiction and required coverage areas therein.
- Delivered audio quality performance (Telecommunications Industry Association (TIA) 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.

A major aspect of system design will involve site selection including the possibility of adding additional sites, if necessary, to what the Town is currently utilizing.

The Town requires that the system proposed for this project be capable of meeting the radio coverage requirements. The Town does not intend to add additional repeater sites after the initial purchase. To aid Proposers in system design and development, the appendices of the IFB include a detailed listing of the existing radio tower locations used by the Town, potential new locations that have been identified, and a list of the call signs for the current radio systems.

6.1 Definition of Coverage

For the purposes of this project, coverage is defined as successful and understandable transmission meeting or exceeding the Delivered Audio Quality (DAQ) requirement, both outbound (dispatch to emergency responder) and inbound (emergency responder to dispatch) achieved through the system infrastructure.

In the case of fire paging coverage is defined as a successful device alert with understandable transmission meeting or exceeding the Delivered Audio Quality (DAQ) requirement received at the pager worn on the hip.

6.2 Audio Quality

Audio quality will be determined based on the level of delivered audio quality (DAQ). **Per the TSB-88.1-E recommendation for public safety, The Town of Ludlow will require a minimum DAQ value of 3.4 as the coverage requirement for the new system.**

6.3 Coverage Reliability

The coverage reliability requirement outlined in this IFB will refer to area coverage reliability. The Town requires the system meet the DAQ 3.4 performance requirement for on-street portable radios worn at hip level in a case and for fire pagers worn on the hip, over 97% of the area bounded by the Town of Ludlow's jurisdiction.

6.4 Mobile Radio Coverage

The Town is requiring the system be designed for on-street portable radio and pager 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 town of Ludlow's jurisdiction. The proposals, system design and coverage acceptance testing configuration shall be conducted with the radio and antenna at hip level using a remote speaker microphone without a microphone mounted antenna. Refer to section 7.1 for detailed coverage acceptance testing requirements. The Town of Ludlow's coverage requirements are divided into three separate requirements.

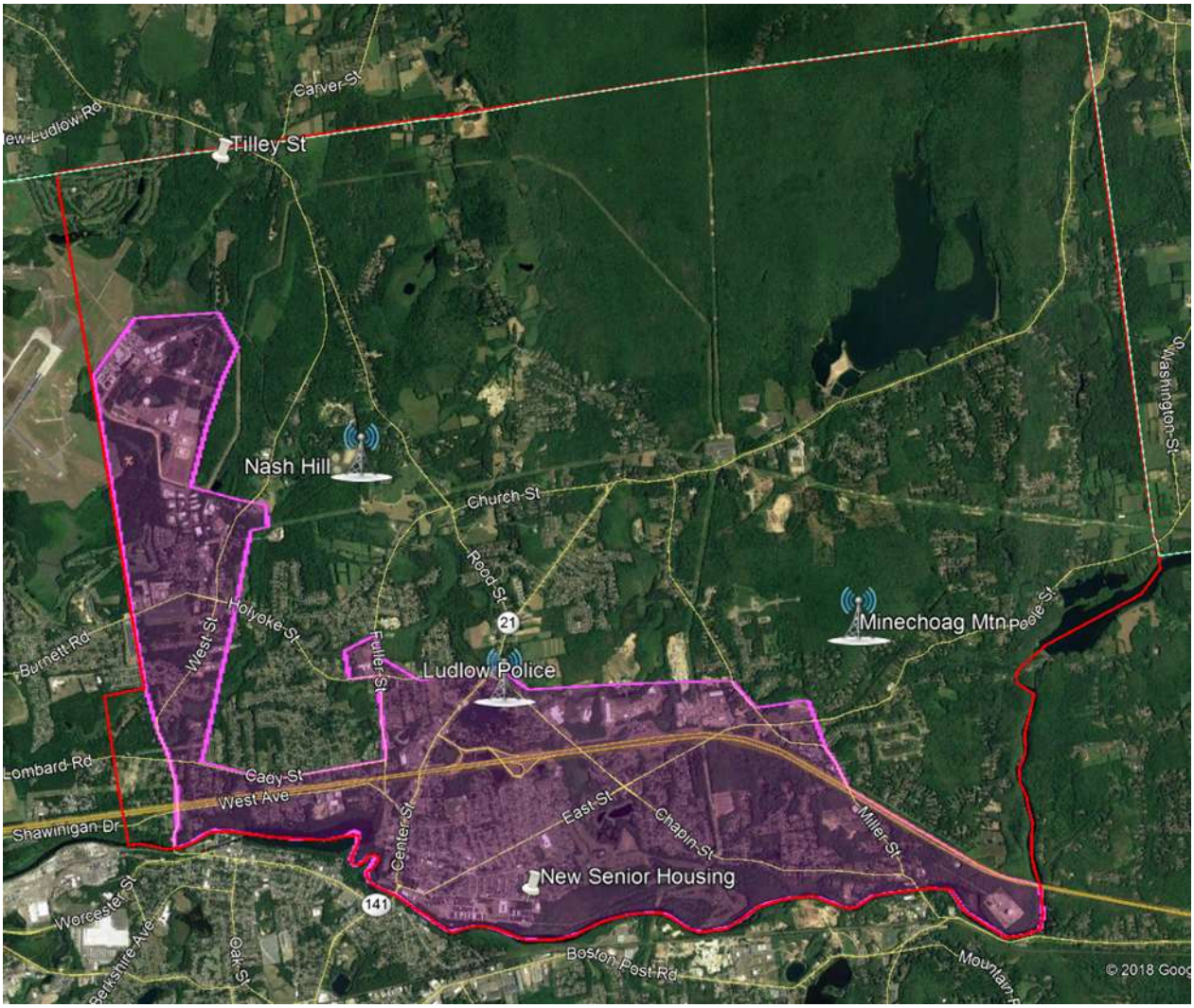
1. Town wide throughout the entire jurisdiction, 97% portable on-street at 3.4DAQ
2. Town wide throughout the entire jurisdiction, 97% pager on-street at 3.4DAQ
3. Within the defined Urban-Industrial area, 97% portable on-street at 3.4DAQ, with an additional 20dB of signal provided to overcome building attenuation.

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 Town 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.

6.6 Urban-Industrial Area

The town of Ludlow has defined a polygon of approximately seven (7) square miles that contains the majority of buildings where signal attenuation exceeds normal light construction. Within this defined area, the Town requires the proposer to provide an additional 20dB of signal strength above the portable on-street requirement. Testing to validate the Proposer has achieved this will require the use of special attenuated portable radios during the CATP process. The polygon shown below can be provided as a .kml file if requested.



1- Ludlow Urban-Industrial Area

6.7 Radio Coverage Prediction

The Town of Ludlow 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.

In the coverage maps, the Proposer shall show signal power that is anticipated to achieve a DAQ of 3.4. All maps MUST have a legend clearly delineating input data used to generate the analysis. The required signal power is based on the reference sensitivity adjusted for the following:

- Static C/N for reference sensitivity
- C/(I+N) for DAQ 3.4,
- Loss of the portable carrying method
- Building attenuation.

The calculation below is based on TSB-88.1-E. The on-street level signal for a hip mounted portable to reliably produce 3.4DAQ shall be a minimum of -99.1dBm. The on-street signal level in the defined Urban Industrial area requiring an additional 20dB for building losses shall be -79.1dBm. This value was calculated from the TSB-88.1-E formulas for acceptance test plan signal level.

		Running Total (dBm)	
Reference Sensitivity*	-119 dBm	-119	
Static C/N	-7.6 dB	-126.6	
Faded C/N for DAQ 3.4	16.4 dB	-110.2	
Swivel Clip Carrying Case	11.1 dB	-99.1	Portable On-Street
Building Attenuation	20 dB	-79.1	Portable in-Building
**Typically, -119 dBm reference sensitivity, however, if the proposer's receiver has different reference sensitivity for 5% BER static then the table must be updated accordingly*			

		Running Total (dBm)	
Reference Sensitivity*	-119 dBm	-119	
Static C/N	-7.6 dB	-126.6	
Faded C/N for DAQ 3.4	16.4 dB	-110.2	
Regular Mobile Whip Antenna	- 1db	-111.2	
RG58A Feed Line (10.6 dB/100 ft)	1.5 dB	-109.7	Mobile Radio
**Typically, -119 dBm reference sensitivity, however, if the proposer's receiver has different reference sensitivity for 5% BER static then the table must be updated accordingly*			

If the body loss value used in a vendor's signal power threshold calculation is less than 11.1dB as shown in Table D-5 of TIA TSB-88.1-E for a ¼ whip UHF antenna with a swivel case, the vendor is required to justify the value used. The Proposer must provide a datasheet proving that the receiver sensitivity at 5% BER for their proposed base station is -119dBm or better.
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.

The Proposer must also submit a separate map showing the land use / land clutter data used for the coverage maps using the USGS National Land Cover Dataset NLCD-11. In addition to this map, a legend describing each land use / land clutter category, its associated losses, and technical parameters used to generate the map must be included by the Proposer. The Proposer will be required to submit coverage maps for individual site analyses as well as a composite Town wide map showing the predicted coverage for entire simulcast system throughout the jurisdiction. Each coverage map should include a legend outlining the following information:

- Coverage type: mobile, portable on-street, or portable in-building at -20dBm loss, pager on street
- Receiver and transmitter location i.e. portable radio at hip level (1m)
- 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 shall be portable belt swivel
- Site-by-site and overall 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.

The Town also requests 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 – 1meter AGL
- **Received power shown in the same colors and ranges as shown on the maps in Appendix I.**

These conventions are depicted in the sample coverage maps supplied in Appendix I of this IFB. Please note, the maps in the Appendix I are NOT intended to be used as the design for the system. The maps are intended to serve as a guideline for the Contractor’s formatting of their coverage prediction maps. Portable coverage maps should be presented for both talkout (dispatch to emergency responder) and talkback (emergency responder to dispatch) scenarios as well as for mobile talkout coverage.

These maps shall be performed employing P25 Phase 2 technology as proposed in the initial bid. A critical aspect of any simulcast system is the timing and whether or not the simulcast delay spread will cause harmful intra-system interference. Therefore, Proposers should submit a table indicating the per site delays used for the simulcast map. The Proposer must indicate the delay spread threshold in microseconds on which the proposed system is designed.

7 Acceptance Testing

It is essential to the Town that the new trunked radio system operates properly, both initially and long term. The Town 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 Functional Acceptance Test Plan (FATP), and the Coverage Acceptance Test Plan (CATP). 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 IFB. 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 required coverage performance is being provided by the new system. Representatives from the Town and its project manager will participate in and supervise every aspect of the coverage testing program.

For the purposes of the testing, the Town will be divided into uniform square tiles. Per TSB-88.3-E, the recommended test tile size is greater than 100λ by 100λ, but less than 2 km by 2 km. For the purposes of this CATP, the Town will be divided evenly into .25 mile tiles. Two separate test sequences will be performed.

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 both Portable On-Street and fire pager On-Street performance.

The second test shall be for the remaining tiles that are part of the defined Urban Industrial Area. 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 Town 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 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

CATP Delivered Audio Quality Test sequences and pass/fail criteria

1	97% Portable on-street outside the Urban Industrial area	97% pass with no more than 3 adjacent tiles failing
2	97% Fire pager on-street outside the Urban Industrial area	97% pass with no more than 3 adjacent tiles failing
3	97% Portable on-street with 20dB attenuation in the Urban Industrial area	97% pass with no more than 3 adjacent tiles failing

As part of the CATP, the Contractor shall submit a proposed map showing the test tiles planned for the CATP process. All tiles that include any part of the Ludlow service area shall be tested, regardless if the center point of the tile is outside of the defined Ludlow service boundary. For tiles along the border it may be necessary to drive outside of the boundary 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 Town during the testing process. 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 Prerequisites for Coverage Testing

Coverage testing will not begin until the field acceptance testing has been completed. This means that every component of the system infrastructure has been properly installed, fully optimized, and tested to validate its proper performance and functionality. The Town 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.

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. On-Street testing will be conducted using subjective DAQ testing. This testing shall be performed using a list of standard sentences supplied by the Town. Tests will be performed for talk-in (portable to dispatch), talk-out (dispatch to portable), and fire pager talk-in. For a test point to score as successful passed, a delivered audio quality of at least DAQ 3.4 must be achieved in all test sequences.

Foliage has a significant impact on signal propagation. The Town of Ludlow service area must be under full foliage for the test to be conducted. No exceptions will be made to this requirement. Should the Contractor complete the system deployment and be otherwise ready for coverage testing at a time when foliage is lacking, the test will be postponed until such time as the Town determines the foliage has returned. The Contractor shall not be eligible for additional costs or fees for mobilization of resources as a result of a foliage delay.

The following conditions need to be met prior to starting the coverage acceptance test procedures:

- Signed and approved Factory and Field Acceptance Testing (excluding the 60-Day Burn-In Test)
- Coverage area is under full foliage
- 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
- Verification of coverage test equipment setup and readings. This is to include daily post and pre calibration of the attenuated portable radio set ups
- Documentation from the System Acceptance Testing
- Each RF site has been audited to verify proper radio system performance

Documentation from the System Acceptance Testing required for coverage testing to be recorded. These parameters include:

- 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
- Time domain reflectometry (TDR), VSWR and return loss sweeps for each repeater 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 gains as configured

7.1.2 Portable Voice Quality Test

Coverage testing shall be in conformance with the Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin TSB-88-E, titled “Wireless Communications Systems - Performance in Noise and Interference-Limited Situations - Recommended Methods

for Technology-Independent Modeling, Simulation, and Verification". TSB-88-E has defined Channel Performance Criterion (CPC) as the specified minimum design performance level in a faded channel and provides a set of Delivered Audio Quality (DAQ) CPCs that define subjective voice quality performance applicable to both analog voice and digital voice systems. These DAQ definitions are provided in Table 1.

Delivered Audio Quality	Subjective Performance Description
DAQ 5.0	Speech easily understood.
DAQ 4.5	Speech easily understood. Infrequent Noise/Distortion.
DAQ 4.0	Speech easily understood. Occasional Noise/Distortion.
DAQ 3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion.
DAQ 3.0	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
DAQ 2.0	Understandable with considerable effort. Frequent repetition due to Noise/Distortion.
DAQ 1.0	Unusable, speech present but unreadable.

Table 1 - Delivered Audio Quality Scale Definitions

TSB-88-E also defines a service area as a boundary of the geographic area of concern for a user, and states that Validated CPC Service Area Reliability shall be determined by the percentage of test locations in the bounded service area that meet or exceed the specified CPC. The bounded service area is enclosed by the Town of Ludlow border.

RF coverage is verified by evaluating the voice quality of digital voice test calls to/from a portable radio mounted at hip level (1m) connected to a shoulder level speaker/microphone. Tests will be performed at specific test locations throughout the Town's defined bounded service area. At each test location, a test call is placed from the portable user to the dispatcher (an inbound call), as well as from the dispatcher to the portable user (an outbound call). The inbound and outbound test call at each location is graded using the DAQ definitions in Table 1. Scores that equal or exceed the specified CPC of DAQ 3.4 are considered acceptable (PASS), and those lower than DAQ 3.4 are not acceptable (FAIL).

7.1.3 Test Planning

The Contractor will use a 0.25-mile by 0.25-mile grid pattern to obtain an even or uniform distribution throughout Ludlow's entire service area. The grid pattern is overlaid onto street maps and a drive test route determined that will pass through the center point of all accessible grids within the Town boundary.

All accessible tiles, including tiles that only partially include an area within the town boundary will be tested. Regardless of the tiles center point being inside or outside of the town boundary, all tiles touching the service area shall be included in the test. The voice quality test is conducted as close to the center of the tile as possible. All test calls will be made with the operator at street level outside any vehicle or other enclosure such as buildings, tunnels, underpasses, underground garages, or other man-made obstructive areas that could negatively impact the signal propagation.

Inaccessible grids must be thoroughly documented by the filed test team as to why they are inaccessible. Inaccessible grids will be discarded from the reliability calculations by treating the inaccessible grids as exclusion zones.

7.1.4 Test Teams

The test teams shall consist of two Town representatives and a representative from the Contractor. This will be comprised of one representative from the Contractor, one from the Town and one from the Town's consultant. There shall be one test team located in the dispatch center and one test team in the field. The Contractor shall provide the driver for the on-street testing. The driver shall only be responsible for the proper and safe operation of the vehicle and shall not participate in the audio quality testing. The driver shall get as close as possible to the center of each full grid for coverage testing. All navigation directions shall be the responsibility of the Contractor's representative and is expected to be provided via an automatic computerized system. During the drive testing, the exact location to stop and test will be verified on the map with grid overlays by the Town's representatives to ensure that the test location is at or as near as possible to the center of each tile.

For the subjective DAQ audio tests, 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. For a retry, 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 police and fire emergency transmissions. Tests may be repeated at any or all grids as determined by Ludlow 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:

- Test Monitor – Dispatcher or other Town first responder (speaker)
- Test Monitor – Town's consultant
- Test Monitor – Provided by the Contractor
- Observer – Optional participant provided by the Town
- Record keeper (can be a separate person or define which team member would perform that function)

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

- Driver – Provided by the Contractor
- Test Monitor – Town first responder (speaker)
- Test Monitor – Town's consultant
- Test Monitor – Provided by the Contractor
- Observer – Optional participant provided by the Town
- Record Keeper – (can be a separate person or define which team member would perform that function

The field team shall be responsible to document the specific details of any tiles that fail the DAQ test. In addition, the field team shall document the reason why any tiles were deemed to be inaccessible. The central dispatch team shall be responsible for keeping the overall test record including results for each tile and the overall results of the CATP. To reduce the time required for the coverage test, a single Dispatch team can support multiple Field teams.

7.1.5 Test Vehicles and Equipment

The Contractor will provide all vehicles required for the coverage testing as well as the driver for the field team(s). It is anticipated that the 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 Town.

7.1.6 Grading of Test Locations

At each agreed upon test location as near as possible to the center of the full grid, testing will be performed. The Field Team representatives will test outside of the vehicle. Both portable to dispatch (inbound) and the dispatch to portable (outbound) test calls are performed. Per TSB-88-E, if the message is not understood on the first attempt the portable user is allowed to move 3-feet in any direction and the test can be repeated one time. If during the repeat test, either the Field Team member or the Base Team member scores the audio as less than DAQ3.4 the tile is

marked as a fail. A failure in either the talk-in or talk-out direction will constitute a failed test call. All retries will be logged and counted. No more than 5% of the total tiles may be subject to retry attempts. If greater than 5% of the tiles require a retry the portable coverage testing shall be determined to fail.

All portable radio coverage tests will be performed using a portable radio with the proposed antenna, worn at hip level (1 meter above ground level) and equipped with a remote speaker microphone. The Contractor shall also supply the test radio with the belt swivel as is clearly outlined in the portable coverage description offered by the Contractor.

The digital voice test calls consist of a short message representative of typical public safety call duration and includes the identification of the tile being tested. The suggested test sequence is as follows:

Field team: "Dispatch, team one testing tile alpha delta 25. Leaves of three, let it be."
Dispatch team: "Copy tile alpha delta 25. Leaves of three, let it be."
Field team: "Pass tile alpha delta 25"

Each of the three (3) voting representatives on the team grades the test call using the definitions in Table 1 DAQ definitions and records the test score for each test location. A pass/fail determination is made separately for the inbound and outbound calls at each location. Each test is deemed to pass if it meets or exceeds the requirement for DAQ 3.4 voice quality from two out of three graders. If two (2) out of three (3) graders agree that the voice quality does not meet the defined DAQ 3.4 criteria, then that test fails.

An individual test tile is determined to PASS if both the inbound and outbound calls in that tile have been scored as a PASS. The Portable Voice Quality Test is deemed to meet the coverage requirements if all of the following conditions are met:

- Non-Urban/Non-Industrial Service Area – 97% or more of all 0.25 x 0.25 mile tiles are scored as a PASS
- Urban/Industrial Service Area – 97% or more of all 0.25 x 0.25 mile tiles are scored as a PASS
- No more than three adjacent grids can be scored as failed. As defined above, these adjacent grids can be arranged as either a linear series or an "L" shape

7.1.7 Coverage Report Presentation

At the conclusion of the CATP, the Contractor shall be required to provide a Radio Coverage Test Report that includes:

- A Table of Contents
- Who prepared the report and the date it was prepared
- The total number of test tiles in the service area

- The total number of accessible tiles that were tested during the CATP DAQ test
- Map(s) with the test grids overlaid and identification of each tiles pass/fail or inaccessible result
- For any failed tiles, the location within each grid where the DAQ test took place
- A table with the Pass/Fail scores for each test tile
- The % PASS calculation for the Town of Ludlow boundary area
- The % PASS calculation for the Town of Ludlow Urban Industrial Area
- Table of summarized CATP results
- A statement of overall test acceptance or failure of coverage
- The test setups used for all test sequences
- An analysis as to if the designed system is balanced, talk-back limited, or talk-out limited

7.1.8 Automated RSSI and BER Testing

As previously discussed, subjective audio quality tests to evaluate the DAQ will be used throughout the Town to determine the pass/fail percentage for coverage validation. In addition to the subjective DAQ testing, Automated Bit Error Rate (BER) and signal strength (RSSI) measurements will also be required to be gathered. The RSSI and BER data shall be for informational purposes only. This additional information on the System's coverage performance will not impact the P25 system's pass/fail acceptance. The desired BER is 2% for phase 2. Every effort should be made to traverse all roads in the town's service area so as to gather the highest resolution data set possible.

7.2 Functional Acceptance Testing

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

7.2.1 Staging and Factory Acceptance Testing

Because the new system will be large and complex, the Town is requiring that system "staging" takes place at a Contractor provided facility where any system problems can be identified and addressed. This will allow any issues to be corrected prior to shipping the system infrastructure to Ludlow. 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 up to ten (10) Ludlow personnel and/or their representatives. The proposers must itemize the cost per Town's representative to attend the staging. 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 layout and 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 town desires to have one single staging test that encompasses both the microwave backhaul network and the P25 system staged as a fully functional system.
The following are components and tasks that shall be included in the staging area test:

- Physical review of the system to familiarize the Town's 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
- Primary Master Network Controllers
- All trunking controllers
- All repeater sites
- All simulcast equipment
- All voting comparators
- All dispatch consoles
- Testing of all P25 features (including OTAP)
- Compliance with CJIS guidelines
- 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

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 Contract Design Review (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 Town-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.

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 Town for approval prior to equipment being released and shipped to Ludlow. The Town of Ludlow reserves the right to approve or disapprove system infrastructure shipment after staging based on the results of the factory test. Upon the Town'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 that details all of the above listed tests with any variances and includes any additional tests to 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 Ludlow; installation, performance and operational tests shall be performed. These tests shall be performed by the Contractor and observed by Town 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. A final FATP shall be submitted by the awarded Contractor during contract negotiation.

7.2.2.1 Functional Acceptance Tests

The functional acceptance tests submitted by the Proposer should, 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 IFB 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.

7.2.2.2 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 primary Master site 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
- Primary Master 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.

7.2.2.3 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 non-encrypted calls
- System access time for encrypted calls if required to meet CJIS guidelines
- Emergency alarm function, with and without all voice channels busy
- Talkgroup 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 talkgroup database
- Over-the-air-programming (OTAP)
- Interface as appropriate to other radio systems for interoperability
- Encryption operations, if required to meet CJIS guidelines

7.2.2.4 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

7.2.2.5 New Microwave Hop Testing and Acceptance

After the completion of installation and optimization of all new microwave hops and subsystem components in Ludlow, performance and operational tests shall be performed. These tests shall be performed by the Contractor and observed by Town 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

7.2.2.6 Communications Console Functions

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

- Proper operation of all talkgroup 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
- Meet CJIS guidelines
- Over-the-air-programming (OTAP)

7.2.2.7 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 talkgroup 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 with the tests listed above.

7.2.2.8 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

7.2.2.9 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

7.2.2.10 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
    - Commands-in-Progress (regroups, inhibits)
    - Responder device configuration and attributes (by individual, talkgroup and multi-group)
- Channel usage
    - Identification of calling units by talkgroup 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 talkgroup 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

7.2.2.11 Site Grounding and Bonding Verification

High quality grounding and proper installation of the grounding system are important to the Town. 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 IFB. All grounding facilities that are to be installed below ground and buried will be inspected by a Town representative prior to burial, but after installation. As part of the ATP, the Proposer shall include their plan for grounding and bonding testing.

7.3 Acceptance Testing Documentation

Within 30 days of successful completion of the Acceptance Test Plan, the Contractor shall provide the Town with a complete set of test documentation. The documentation package is to 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.

Included with the test results, the Contractor shall include a complete inventory database of all equipment sold and installed for the Town for this project. The inventory shall include information such as 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 user names.

8 Installation and Documentation

8.1 Installation Standards

All equipment provided to meet any section of this IFB 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 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 IFB, 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 IFB, 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 fees as needed. Bid proposals shall include an all-inclusive base price proposal for a turnkey solution as described in the IFB.

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 including As-built drawings. The Contractor shall incorporate any and all comments received from the Town into this final document. An initial and final walk-through will be conducted to determine operational conditions.

8.1.1 Installation Plans, Procedures and Approvals

The Proposer shall prepare, in response to this IFB, 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. The Contractor shall provide detailed installation plans and procedures showing the proposed installations at each site and facility at least 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.

8.1.2 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 Town. The Contractor shall install the equipment within the designated space as proposed in the installation plan; all changes require prior written approval from the Town. Access to all existing Town facilities shall require prior coordination with the Town.

8.1.3 Equipment Installation Requirements

The Proposer shall provide a copy of their latest installation and quality standards with the response to this IFB. The Contractor shall be responsible for the installation of all equipment furnished for the 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 Town's requests. The most stringent of these requirements and guidelines shall govern if a conflict arises during the installation. The Town 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 shall include a written report delineating any deficiencies and identifying the required corrective action. Any mandatory corrective actions identified by the Contractor shall be included in the proposal and pricing under the Turn Key aspect.

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 for equipment rack grounds to the master ground bus bar. Grounding down leads from the master ground bus bar to the shelter ring shall be Number 2 AWG 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. Surge suppressor grounds shall take the shortest most direct path to ground.

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 Town prior to site acceptance. A single point ground system shall be used, whenever possible and approved by the Town, 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.

8.1.4 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 (master ground buss bar)
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. Ground leads shall be short and take the most direct path to ground.
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 36 inches. Cables shall be supported for all runs in excess of 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 Town. In the event that the Town 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.

8.2 General Requirements

These specifications define the minimum requirements and standards for a town wide public safety P25 voice and paging radio system, including related components, accessories and required facility upgrades/construction for the Town of Ludlow Massachusetts. The Town is seeking a multi-channel, town wide, trunked, simulcast digital, P-25 voice radio solution operating in the UHF public safety spectrum. The system is expected to support between 150 and 175 emergency responders utilizing portable and mobile radios in a public safety environment. In addition, there is expected to be another 150 public works and public school users operating on the unified system.

8.2.1 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.

8.2.2 Conflict Resolution

The Contractor and the Town agree to resolve any and all conflicts that arise during the procurement, delivery, installation, construction, post-construction, removal and acceptance phases of the radio project in the following manner:

1. Town and Contractor will seek direct communications to work in good faith to resolve discrepancy

2. Town shall provide a written complaint to the Contractor and seek a written response within ten (10) business days
3. Town and Contractor may enter into non-binding mediation
4. Civil litigation

8.3 Quality Assurance

The Town or their assigns shall, at their discretion, provide oversight of any and all installation and construction work. The Town 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 Town to address such situations in a timely manner. The Contractor shall work directly with the Town 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 Town 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 Town or their 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 Town.

Overall radio system acceptance is addressed in Section 7 of this IFB. 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 Town agree to resolve disagreements in quality by guidelines expressed in the general requirements section of this IFB.

8.4 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 project. 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 Town 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 standpoint. 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 disposition instructions see Section 8.10 of this IFB. 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 Town approval, uses existing resources as part of the new system, such components shall be in a condition that both the Contractor and Town agree will provide reliable service and not negatively impact service or warranty.

8.5 Software, Manuals, Handbooks and Documentation

The Contractor shall provide Ludlow with a complete system documentation package. Each major component of the system shall include, at a minimum, three (3) printed and one (1) electronic 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 Ludlow. 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 Town 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 radio project.

8.5.1 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, Ludlow technical staff, post or extended warranty service shop, as identified in IFB, if different than the warranty shop. The Contractor shall provide Ludlow with

sufficient copies and or licenses to utilize the radio system to its fullest ability. The Contractor shall also authorize Ludlow to share such software with a third party radio maintenance vendor of the Town's choice if the Town chooses to switch repair facilities after the warranty and extended warranty periods.

8.5.2 End User Equipment Support

As many modern radio systems require unit specific programming of portable and mobile radios, the Contractor shall provide Ludlow with the necessary resources to complete such programming. The Contractor is responsible for the initial programming of the radios purchased as part of this project. For ongoing programming, the Contractor shall provide the Town with all software, templates (soft and hard copies), and programming cables along with anything else required to complete ongoing field unit programming.

8.5.3 Interface cables

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

8.6 Codes

The Contractor shall provide the Town 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 Town 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 the Town of Ludlow and the Contractor agrees not to release these items to unauthorized parties without written consent from the Town.

8.7 As-Built Documentation

The Contractor shall provide as-built documentation to the Town upon completion of the radio project. As-built drawings shall be provided for each location where work occurs regardless of the extent of improvement or equipment installation. 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 and/or Visio but must be presented to the Town as a PDF and three (3) hard copies. The Contractor shall review these drawings with the Town or their representatives prior to final acceptance of the drawings by the Town.

8.8 Shelters, Generators, Antennas

8.8.1 Shelters

For new site locations, 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.

8.8.2 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 NFPA 110-1996
- 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.

8.8.2.1 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 600Vac 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

8.8.2.2 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 40Hz, 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.

8.8.3 Antennas

The antennas shall be mounted to the towers 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 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. The Town may want to witness the sweep test, and the Town 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. Bottom labeling includes both inside and outside of the shelter RF entry port. 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.

8.9 Vehicle Installation

The Contractor will install all mobile vehicle radio equipment in compliance with all safety standards with a primary focus on the emergency responders' safety during the placement and installation of hardware. Industry standards shall be adhered to and consistent installation techniques must be followed. The following standards shall apply to mobile equipment installations:

- All mobile equipment installations shall take place at one or several locations within the Town of Ludlow.
- Proposed installations shall be discussed with and approved by end user agency prior to Contractor installation of mobile equipment. All mobile radio installations shall include an optional power-down timer switch that turns the radio off after a selectable time limit. Time shall be variable between 30 minutes to three hours. The timer shall be reset when the vehicle ignition switch is activated. (Alternatively, this function may be built into the mobile radio models proposed.)
- The Contractor shall coordinate with the Town to establish work areas or other necessary facilities for mobile equipment installations, vehicle availability, and detailed schedule.
- Both positive and negative high-current power cables shall be entirely new and home run directly to the vehicle battery or OEM power distribution point to ensure a noise-free installation.
- Installation of mobile equipment shall minimize the exposure to and possibility of damage due to abuse, vandalism, and theft. Theft-resistant fasteners and mountings shall be used when necessary. Cables shall be run in hidden and protected spaces to the degree possible. New microphone holders in vehicles shall be located in a position convenient to the driver; exact locations shall be coordinated with each end user agency.
- Remove all existing radios, wiring harnesses, speakers, and other mounting accessories and replace them with new components. As part of the mobile installation, the Contractor shall reconnect all existing subordinate systems in the vehicles, such as communication systems for headsets.

8.10 Removal of Decommissioned Equipment

8.10.1 Ownership

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

8.10.2 Removal of Active Equipment

The Contractor, the Town, or current maintenance representatives of the Town 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 Town as to illustrate how resource sharing and active equipment removal will be executed in a manner that protects emergency responders.

Ludlow, via the Town's 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.

8.10.3 Decommissioned Equipment with Resale Value

The Town of Ludlow shall clearly identify any and all decommissioned equipment they wish to sell prior to removal from site. The Town 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 resale in such a manner as not to lessen the resale value. The Town shall be the sole recipient of proceeds from sale of used assets.

8.10.4 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 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 Town 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 Town 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 any hazardous materials are properly handled and disposed of; this includes, but is not limited to, beryllium tubes often used in radio final amps. The Contractor may elect to keep abandoned items but must report this to the Town so that Ludlow has a complete record of disposal.

8.10.5 Money Recovered from Recycled Goods

Any monies recovered from the recycling or salvage process under section 8.10.4 shall become the property of the Contractor.

9 Implementation and Payment Schedule

9.1 Project Schedule and Timetable

Due to the age of the current radio system, the Town wants to develop and implement the new system as soon as possible. The Proposer needs to 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 Town
- Initial portable and mobile fleet of non-public safety user training and portable and mobile installation completed
- 60-day operational test successfully completed
- System infrastructure accepted, Warranty begins
- Completion of transitioning the remaining Town agencies to the system
- 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 Town and the Contractor. The project timeline shall include important milestones and logical breakpoints during which the Town and Contractor shall assess the progress to date and prepare for the remaining project tasks.

9.2 Change Procedure

Either party may request changes within the general scope of this agreement. If the requested change causes an increase or decrease in the cost of or time required for the performance of this agreement, the Contractor and the Town will agree to an equitable adjustment in the agreement price, performance schedule or both.

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 Town and all affected emergency responders.

The Proposer shall submit with their proposal 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 IFB and must be fully described. The Contractor and the Town will finalize a mutually agreed upon cutover plan based on discussions held during the contract negotiations.

The Town will not accept downtime at a given site for more than 15 minutes. The Proposer shall specify in their plan how long sites will be down during cutover and migration. The Town 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 what channels will be down at a given site at a given time and how this is being minimized. Moreover, any site downtime shall be scheduled with Town 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 Town 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 Proposed Payment Milestones

A payment milestone schedule shall also be provided as part of the Contractor’s IFB response. This will illustrate those milestones and related deliverables that include a measurable progress payment. The requested percentage of project payment due at each stage shall be clearly identified, along with the actual dollar amount. Payment milestones that are proposed 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

Payment Milestone #	***Description***	***Percentage of Contract Value***
#1	Design Review Document Complete	10%
#2	System Factory Staging Testing Complete	10%
#3	Infrastructure Delivered, Installed & Field Tested for Acceptance - Due upon successful completion and Town's written approval of the results of the Field Acceptance Test Plan (FATP)	20%
#4	Coverage Acceptance Testing Complete - Due upon successful completion and the Town's written approval of the results of the Coverage Acceptance Test Plan (CATP)	20%
#5	Mobiles and Portables Delivered and Programmed/Installed - Due upon delivery of the Mobiles and Portables to the Town on a date mutually agreed upon by the Town and the Contractor. The Town shall have the right to inspect and confirm that the Mobiles and Portables included in the Contractor's invoice have been delivered to the Town before payment	20%
	60-Day Burn-In Testing Completed - Due upon successful completion and Town's written approval of the results of the 60-Day Burn-In period	0%
#6	Final System Acceptance - Due upon successful resolution of all punch list items and execution of Final System Acceptance (FSA) between the Town and the Contractor	20%
Total		**100%**

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 (the "Warranty Period"). Warranty shall include all parts, labor and travel necessary to return the equipment to its original working condition. The Contractor (or their 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 and repair 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 Town with the proposal.

In their response, the Proposer shall provide the Town with the name, location and capabilities of service facilities that will provide any or all of the installation, service and maintenance, both initial and continuing. Proposers shall also include a description of the service facilities, the size and qualifications of their staff, the number of years in business and a list of customers (with names and telephone numbers) who operate systems of similar size and complexity for whom installation and maintenance services are performed.

Proposers shall further demonstrate their ability to maintain equipment substantially similar to that furnished under this specification. This information is required to demonstrate to the Town that the local service facilities are capable of installing, optimizing and maintaining the system provided by this procurement. As part of optimizing and maintaining the radio system, a log of all maintenance and replacement equipment must be maintained for each site.

Proposers shall describe the ongoing level of factory engineering and service support that will be available to the local service facility during the 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 (Town 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 Town 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 Town. The Proposer shall include a list of recommended spare parts in their proposal for this system, to be acquired and stored by the Town to expedite future system repairs. The Contractor will then be responsible to repair or replace any spare parts used from Town stock within 30 days during the Warranty Period.

Mobile and portable radio units must be replaced by spares, and then the failed units must be repaired and returned to the Town within ten (10) business days. The Proposer 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, the Proposer shall certify that all replacement parts shall remain available to the Town for a period of ten (10) years following system acceptance.

During the Warranty Period and subsequent maintenance, the Proposer 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. The Proposer 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 by the Contractor 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, Town asset number, and to whom the unit is assigned. The maintenance log shall be stored electronically and be updateable utilizing commercially available software.

10.2 Optional Extended Warranty

It is the intent of the Town to contract for extended maintenance to continue service after the expiration of the Warranty Period. The scope of repair and maintenance services provided, and the terms and conditions for the extended maintenance offerings shall be the same as those provided during the Warranty Period. The Proposer shall include options to provide the Town with extended system maintenance and repair for a period of both three (3) years and eight (8)

years following expiration of the Warranty Period. The optional extended maintenance proposal shall be broken down by year, and divided into the following three major categories:

- Infrastructure response and repair services
- Subscriber radio equipment repair and Depot Services
- 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.

The Town may be interested in extending the warranty beyond ten (10) years. The Proposer is to provide cost escalators to indicate what the capped warranty pricing will be for each additional year beyond ten (10) years.

10.3 Manufacturers Service Facilities

Proposer shall identify at least two (2) factory authorized service providers that have the full capability to support the proposed radio system and components while in and out of warranty. Said providers shall be ranked by distance to The Town. Providers listed shall have the ability to meet emergency response times as described in Section 10.4.2 of this IFB. 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. The Town and their representative(s) shall have the opportunity to interview service facilities listed by the Proposer. The Town 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 Town radio system completely and in a professional and timely manner as described in Section 10.4 of this IFB.

10.4 Repair/Service Response

10.4.1 Definitions

With respect to classifying repair response events the following definitions shall be used.

- Emergency Event (traffic effecting) – When a component of the voice radio 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 radio system (excludes portable and mobile radios) fails in such a way that produces no immediate harm or degradation of service but still requires timely attention, such as a fan failure.

- Scheduled Event – A preplanned period 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 both the warranty and extended maintenance periods, the Contractor shall provide Emergency Event response time of two (2) hours to respond and four (4) hours to restore from time of first alarm or notification of an issue. The Contractor agrees to pay the Town 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 Town 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 Town and the service provider.

In the warranty and extended maintenance periods, the Contractor shall provide Non-Emergency Event response time of four (4) hours to arrive and 24 hours to repair.

10.4.3 Maintenance Windows

For Scheduled Events, the Contractor shall request a maintenance window two (2) business days in advance for scheduled maintenance activities that may or may not negatively impact the radio system. The Town shall reply within one (1) business day of request. Contractor can request an emergency maintenance window in the event an issue cannot wait two days. Recurring work, such as routine preventative maintenance, shall have a long-term schedule acceptable to both the Town and the service center.

10.4.4 System Availability Metrics

With regard to unscheduled downtime of any radio 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 Town in the form of a monthly report. The system availability metrics will serve as an operational goal to track the performance and reliability of the radio system, associated support systems, and repair response efforts. 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

It is essential for the Contractor's proposed repair technicians to have unrestricted access to the Town's communication sites to perform their duties and accomplish the repair response times required. The Contractors proposed repair facility staff shall be vetted by the Town for security clearance prior to being granted access.

10.4.6 Technical Support

The Contractor shall provide live technical support via phone and web for the entire warranty and extended maintenance periods in support of field equipment, radio system and components 24 hours per day 365 days per year.

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 Commencement

All warranties shall commence on the date that The Town and the Contractor execute and sign the Final System Acceptance (FSA) Certificate. Warranty coverage shall not commence prior to this date. The Contractor shall be responsible for timely response and repair of any failures prior to FSA. Once the cutover to live production use has taken place and Town responders are relying on the P25 system as their primary communications system, the Contractor shall meet the response times defined above in section 10.4.2.

10.7 Warranty Repair

10.7.1 Basic Warranty

The Proposer shall provide The Town with a minimum two (2) year warranty on all components of the radio project. This warranty shall cover the extension of 3rd party materials and contractor work. The Proposer shall ensure that all materials, equipment and workmanship are new and free of all defects. Warranty starts upon final acceptance of the entire radio 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 industry, local, state, and federal codes and standards.

10.7.4 Final Acceptance

The Contractor shall repair/replace any items or sub-standard installation practices found during the Field Acceptance testing and final site walks. The Town shall not be required to accept the systems and sign off on FSA while any outstanding deficient issues remain at the sites or with the equipment.

10.7.5 Post Warranty Extended Maintenance

The Proposer shall provide optional extended maintenance costs for extending the basic warranty for both an additional three (3) and eight (8) years. Maintenance levels and response times of the extended maintenance contract shall match the warranty requirements and shall include a preventative maintenance schedule. The Proposer shall include extended maintenance plans in their response as an option for the Town, and realize the Town has and reserves the right to choose another post warranty vendor or service facility.

10.8 Warranty Exceptions

The Proposer shall provide a written exclusion and exception report upon submittal of the response. 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

The Proposer 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 capable of meeting the required response times.

10.9.1 Portable and Mobile Radios

All field subscriber radio units are to be repaired and returned to the Town's spares inventory within ten (10) business days. Should the Contractor not be able to repair defective units around in ten (10) business days, the Contractor shall provide the Town with spare units so as to keep the emergency repair radio cache at normal levels. Normal repair cache levels shall be specified in Section 10.9.3.

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.

10.9.3 Spare Parts

The Proposer shall provide The Town with a comprehensive list of spare parts including recommendations on the quantity of spare units the Town should maintain given the Proposer's experience and the size of the Town's system. The spare parts list shall include part numbers, major component association and cost. The Proposer 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. System spare parts, 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 radio system. Damaged or defective part(s) shall be repaired and returned to the spare stock within 30 business days provided the vendor maintains enough spare inventory in the area to meet repair needs. While the Town is willing to purchase a reasonable number of spare parts for their system as to ensure rapid repair of the system, the Town 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

The Proposer 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 the Town's specific maintainability requirements. The Contractor shall electronically issue all product cancellation notices to the

Town throughout the entire implementation, warranty, 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 The Town, 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.

The Proposer shall state any concerns they may have regarding compliance with this support requirement. Along with establishing warranty and repair schedules with the manufacturer, the Town must request that the Proposer 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. The Proposer 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 Town will not have to completely overhaul the system in the immediate future.

11 Training

Radio equipment training is very important to The Town. The Proposer shall include the necessary training for The Town to become proficient in the operation and maintenance of 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 Town's staff.

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

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

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 IFB) 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 Town'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 four (4) 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.

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. The Town shall 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 The Town 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 twenty (20) members of The Town's staff. Training shall include system orientation and familiarization that includes discussion and equipment demonstration. The Proposer 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. Training shall also include programming and installation of the mobile and portable equipment.

The Contractor shall provide one (1) set of manuals per student plus an additional five (5) sets of printed manuals. All manuals shall also be provided in an electronic version such as *.PDF format. The Contractor's program shall include training in orientation, management, and operation of all equipment provided under the following items:

- Overview of the Radio System
    - Basic operation of system, system components and responder equipment
    - Basic use of the portable and mobile radios
- Use of Radio 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
    - Overview of Interoperability solutions
    - Implementing interoperability functionality on subscriber radios
    - 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 The Town.

11.3 Radio System Management Training

The Contractor shall provide on-site training for up to five (5) members of The Town'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 or CD-based self-paced programs developed by the Contractor are also encouraged by the Town. 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.

The Contractor shall conduct comprehensive classroom operator training for the communications management personnel operating and administering the new radio system. This training shall be conducted in a classroom 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. The Contractor shall provide 12 hard copies and 12 CD-ROM/DVD copies shall be supplied.

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 and tone remote desk sets
- 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 operation of the specific equipment. The Town responders desire for this training to include covering reasonable expectations on dispatch functions and radio system capabilities. For example, the student shall be qualified to train The Town 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 Town's satisfaction in conjunction with the specific programming and configuration parameters utilized by The Town.

The Contractor shall provide training for four (4) classes for up to fifteen (15) 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 The Town. 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.

12 Bid Requirements

12.1 Proposer's Background and Qualifications

As part of the response, the Proposer shall submit a description of the Proposer's background, qualifications, history and experience in large-scale Town and city projects of a similar nature and with the proposed system technology. The Town would like to see three (3) references of public safety projects of similar size and scope that have been completed in the State of Massachusetts 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 radio project. The Proposer must include resumes, certifications and licenses of all key personnel who will be responsible for the delivery, installation and services associated with the project. The Proposer shall also describe the experience of any sub-contractors and what their role will be in the project.

12.2 Exceptions and Clarifications

All official clarifications, exceptions or interpretations of the IFB document will be made available to the Proposers by written addenda issued by the Town. Questions submitted to The Town prior to the deadline of **02/20/2020**, may be addressed at the Pre-Proposal conference on **02/27/2020**, but will definitely be addressed in an addendum with answers which will be issued shortly thereafter. The Town will entertain additional questions during the pre-proposal conference. The Town 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 contact persons listed in Section 2.1.4 of this IFB.

12.3 Manufacturing and Staging

It is the intent of this IFB to purchase a comprehensive P25 radio system to replace the current Town systems in which the Proposer 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 IFB.

12.4 Criteria to Determine if the Proposal is Responsive and Responsible

A requirement for proposals is that the Proposer must be responsible and must submit a responsive offer. To be responsive, a proposal must conform to the criteria described in this IFB.

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 Board reserves the right to request additional information and/or presentations that may be necessary in assisting with the selection process.

The following criteria are outlined and to be used to determine if a proposal is responsive:

- Does the Proposer demonstrate an understanding of The Town'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 IFB (and resultant contract) and produce the required outcomes in a timely manner?
- 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, have they (and/or their team members) otherwise demonstrated their capability to perform the contract The Town seeks to establish through this IFB?
- Does the Proposer propose to perform the work at a fair and reasonable cost?
- Proposer and their subcontractors are authorized and certified to perform work in the State of Massachusetts.

12.5 Delivery Dates and Exclusions

Any delivery dates and/or exclusions shall be duly noted in the Proposer's IFB submission and clearly defined in the resulting contract with The Town.

12.6 Proposer Responsibilities

The Proposer's responsibilities are as follows:

- Provide an on-site project manager as needed 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 IFB
- Attend a mandatory pre-proposal conference and facilities tour

- Develop a migration plan from the existing systems 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 and FCC permits, approvals, letters of concurrence, and licenses
- Performing all MPE (Maximum Permissible Exposure) and RF radiation studies for new and existing sites where required
- Performing intermodulation studies of all proposed transmitter sites
- 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
- Replace the microwave system to provide redundant IP MPLS backhaul to all 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, and FAA and FCC regulations.
- Provide multilevel training to technical staff, dispatchers and responders
- Coordinate the activities of third-party contractors and vendors

12.7 Mandatory Pre-Bid Conference

All potential vendors must attend the Pre-Proposal conference scheduled for **02/27/2020 at 10:00 ET**. This meeting will be held at The Town of Ludlow's Town Hall, Selectman's Conference Room #303 – 488 Chapin Street, Ludlow, MA 01056. Proposers are responsible for any and all travel and meeting preparation expenses.

Anyone planning to attend the Pre-Proposal Conference must **register by 02/24/2020** to allow the Town to properly prepare for the conference. Failure to do so, shall result in disqualification of the vendor(s) participation in mandatory pre-proposal 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 to Ali Shahnami of ACD Telecom at ali.shahnami@acdtelecom.com. This information should be sent no later than **02/24/2020**.

Proposers have the opportunity to ask questions prior to the Pre-Proposal Conference. These questions should be emailed to Ali Shahnami no later than **02/20/2020 at 16:00 ET**. Questions regarding the radio system or facilities will be recorded and answered at the Pre-Proposal Conference. Answers to all questions involving the general requirements of the proposed radio system and any additional questions received after the Pre-Proposal Conference will be

addressed in Addenda posted on the website, http://www.ludlow.ma.us/html/business/rfp.htm. The deadline for Final Questions is **03/10/2020 at 16:00 ET**.

12.8 Mandatory Pre-Bid Site Inspection Visits

All potential vendors must attend the mandatory site visits that are scheduled for **02/27/2020**. 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 these site visits.

The Town 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 that the Town has elected to reuse facilities wherever possible and that there are known areas of improvement required at each facility. Of particular concern 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 one day to complete.

The Proposer is responsible for providing a Turnkey Solution to design, implement, and test a Town wide radio system that meets or exceeds the requirements established throughout this IFB. These site visits are intended to provide the Proposer with firsthand knowledge of the existing facilities and resources available and insight to possible problems and concerns that could influence system design.

12.9 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 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.

12.10 Authorized Service

The Contractor shall provide factory authorized service for the entire warranty period on the proposed radio system, sub-systems, components and third-party equipment. The Contractor shall also provide the Town with a post warranty service contract with a factory authorized service center. Proposers shall provide the Town with the name and location of the two closest authorized service centers and provide the Town 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 Events. The service shop shall also provide technical support to Town 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 10.4.2 of this IFB.

12.11 Test Equipment

The Contractor shall ensure that both the factory authorized service center and The Town'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.

The Town 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.

12.12 Project Manager

The Proposer shall designate a single point of contact as the Project Manager (PM) for the duration of the project. The Town reserves the right to accept or reject the proposed PM at their discretion.

12.12.1 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 Town representative/PM and the Contractor and is responsible for ensuring that work performed under the contract 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.

12.12.2 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 and must demonstrate a leadership role in at least five (5) successful projects that were delivered on time and within budget.

13 Price Sheets

13.1 Price Sheet – Master Site Equipment

Master Site Equipment			
Description	Qty	Unit Cost	Extended Cost
Master Site Trunking Controller		$	$
Master Site Audio Switch, LAN, WAN Equip		$	$
Master Site Server/Client Equip		$	$
Master Site Alarm Monitoring Equip		$	$
Master Site Other Equip		$	$
Master Site MW Equip (as necessary)		$	$
System Management & Alarm Terminals		$	$
Computer-Based Logging Recorder		$	$
Services: Upgrade to Master Site Equip Shelter		$	$
Services: Installation, Project Management, Engineering, Optimization, Programming and other Services Related to Master Site		$	$
Total Master Site Equipment and Services		$	$

13.2 Price Sheet – Simulcast Prime Site Equipment

Simulcast Prime Site Equipment			
Description	Qty	Unit Cost	Extended Cost
Simulcast Prime Trunking Controller		$	$
Simulcast Prime LAN, WAN Equip		$	$
Simulcast Prime Audio Distribution		$	$
Simulcast Prime Receiver Voting		$	$
Simulcast Prime Simulcast Sync Equip		$	$
Alarm Monitoring Equip		$	$
Simulcast Prime MW Equip (as necessary)		$	$
Simulcast Prime DC Power System		$	$
Simulcast Prime Site Tower (if necessary)		$	$
Simulcast Prime Site Equip Shelter (if necessary)		$	$
Simulcast Prime Site Work		$	$
Services: Installation, Project Management, Engineering, Optimization, Programming and other Services Related to the Simulcast Prime Site		$	$
Total Simulcast Primary Site Equipment and Services			$

13.3 Price Sheet – Simulcast Remote Site Equipment

Simulcast Remote Site Equipment			
Description	Qty	Unit Cost	Extended Cost
Simulcast Remote Site Trunking Controller		$	$
Simulcast Remote Site LAN, WAN Equip		$	$
Simulcast Remote Site Audio Distribution		$	$
Simulcast Remote Site Base Stations		$	$
Simulcast Remote Site Sync Equip		$	$
Simulcast Remote Site Antenna System		$	$
Simulcast Remote Site Alarm Monitoring Equip		$	$
Simulcast Remote Site MW Equip (as necessary)		$	$
Simulcast Remote Site DC Power System		$	$
Simulcast Remote Site Tower (if new)		$	$
Simulcast Remote Site Equip Shelter (if new)		$	$
Simulcast Remote Site – Site Work		$	$
Services: Installation, Project Management, Engineering, Optimization, Programming and other services related to simulcast remote site		$	$
Total Simulcast Remote Site Equipment and Services			$

13.4 Price Sheet – Recommended Spare Infrastructure Equipment

In the following price sheet, list Proposer-recommended spare equipment separately so that the Town understands the extent of spare equipment contained in the system. As stated in the IFB, the Town requests the Proposer to recommend appropriate spare equipment to be purchased as part of this procurement that will be required for proper warranty service and ongoing maintenance of the system.	
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
Total Recommended Spares for Infrastructure Equipment	$

13.5 Price Sheet – Emergency Responder Mobile Radios

Mobile Radios			
Description	Qty	Unit Cost	Extended Cost
Digital P25 Public Safety Mobile Radio		$	$
Dash Mount		$	$
Remote Mount		$	$
Dual Control Head		$	$
Digital P25 Public Safety **Multiband** Mobile Radio		$	$
Dash Mount		$	$
Remote Mount		$	$
Dual Control Head		$	$
Digital P25 Public Service Mobile Radio		$	$
Dash Mount		$	$
Remote Mount		$	$
Dual Control Head		$	$
256 Talkgroup Minimum		$	$
Alphanumeric Display		$	$
Partial Keypad		$	$
PTT-ID		$	$
Emergency Alert		$	$
Priority Scan		$	$
Individual Call and Call Alert		$	$
Signal Level Indicator		$	$

AES Single-Key Voice Encryption		$	$
AES Over-the-Air-Rekeying (OTAR) (Optional)		$	$
External Speaker		$	$
Over-the-Air-Programming (OTAP)		$	$
GPS Location (Optional)		$	$
Services: Installation, Programming and other services related to mobile radios		$	$
Total Mobile Radios and Related Services			$

13.6 Price Sheet – Emergency Responder Portable Radios

Portable Radios			
Description	Qty	Unit Cost	Extended Cost
Digital P25 Public Safety Portable Radio		$	$
Digital P25 Public Safety **Multiband** Portable Radio		$	$
Digital P25 Public Service Portable Radio		$	$
256 Talkgroup Minimum		$	$
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 (OTAR) (Optional)		$	$
Intrinsically Safe (Optional)		$	$
Single Unit Charger		$	$
Vehicular Charger		$	$
Multi-Unit Charger		$	$
Standard Speaker Microphone		$	$

Severe Duty Speaker Microphone (fire)		$	$
Spare Batteries		$	$
Carrying Case		$	$
Over-the-Air-Programming (OTAP)		$	$
GPS Location (Optional)		$	$
Services: Installation, Programming and other services related to portable radios		$	$
Total Portable Radios and Related Services			$

13.7 Price Sheet – Emergency Responder Control Station Radios

Control Station Radios			
Description	Qty	Unit Cost	Extended Cost
P25 Control Station Radio		$	$
Tone Remote Desk Set for CS Radios		$	$
256 Talkgroup Minimum		$	$
Alphanumeric Display		$	$
Partial Keypad		$	$
PTT-ID		$	$
Emergency Alert		$	$
Priority Scan		$	$
Individual Call and Call Alert		$	$
Signal Level Indicator		$	$
AES Single-key Voice Encryption		$	$
AES Over-the-Air-Rekeying (OTAR)		$	$
Over-the-Air-Programming (OTAP)		$	$
Battery Backup (UPS)		$	$
Antenna System, Lightning Protection, Grounding		$	$
Services: Installation, Programming and other services related to control station radios		$	$
Total Control Station Radios and Related Services			$

13.8 Price Sheet – Fire Pagers

Fire Pagers			
Description	Qty	Unit Cost	Extended Cost
P25 pagers		$	$
Standard charger		$	$
Amplified charger		$	$
Programming cradle		$	$
Spare Batteries		$	$
Carrying Case		$	$
Services: Programming and other services related to pagers		$	$
Total Fire Pagers & Related Services			$

13.9 Price Sheet - Training

In the following price sheet, list and price the Training plan referenced in Section 11 of this IFB.	
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
	$
Total Training	$

13.10 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. The Proposer is also encouraged to include any creative cost reduction options that may be available. For services see second table on this page.	
Total Master Site Equipment	$
Total Simulcast Prime Site and Services	$
Total Simulcast Remote Site and Services	$
Total Dispatch Equipment and Services	$
Total Recommended Spares for Infrastructure Equipment	$
Total Mobile Radios	$
Total Portable Radios	$
Total Control Station Radios	$
Total Training	$
Total Base Project Cost (before adjustments)	$
Trade-In Allowance	$
Cost Reduction Incentives	$
Total Base Project Cost (after adjustments)	$
Total Project Cost (after adjustments) with Options	$

13.11 Breakdown of Services

While it is understood that the costs of services have been included and distributed throughout the preceding price sheets, the Town 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	$

13.12 Pricing for Recommended Maintenance

The following price sheet is for additional years of maintenance following the proposed 2 year warranty period.			
	Corrective Maintenance	Preventative Maintenance	Total Maintenance
Year 3	$	$	$
Labor for Infrastructure Equipment	$	$	$
Labor for Microwave Equipment	$	$	$
Labor for Dispatch Equipment	$	$	$
Labor for Mobile, Portable 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 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 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 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 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 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 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 and Control Station Equipment	$	$	$
Cost of Parts	$	$	$
% Discount off of list Price for ongoing Service and Maintenance Equipment			%

14 Appendix E – FCC Licenses

14.1 Ludlow Current Operational Channels

Channel Assignment	Transmit Frequency	Receive Frequency
Police Primary Dispatch	453.2500	458.2500
PD - SRT	453.7625	458.7625
PD - Major Incident	453.4625	458.4625
PD - Detail	453.3125	458.3125
Fire Operation & Paging	154.2050	159.3150
Fire Ground Simplex	154.2500	
RIT Simplex	154.0475	
Public Works	151.1300	159.2625
Schools	463.7250	468.7250
Schools	463.9750	468.9750

14.2 FCC Call Signs

Call Sign	Name	FRN	Radio Service	Status	Exp Date
WPST361	Ludlow, Town of	5193594	IG	Active	7/30/2021
KNAK469	Ludlow, Town of Communications Officer	5193610	PW	Active	11/14/2021
WPMQ962	Ludlow, Town of Fire & EMS Services	5193610	PW	Active	11/13/2023
WPZR671	Ludlow, Town of Department of Public Works	5193610	PW	Active	2/27/2024
KNFU334	Ludlow, Town of Police Department	9034232	PW	Active	7/30/2023
WQDM670	Ludlow, Town of Police Department	9034232	MW	Active	10/3/2025
WQDS846	Ludlow, Town of Police Department	9034232	MW	Active	10/24/2025
WQDS847	Ludlow, Town of Police Department	9034232	MW	Active	10/24/2025
WQDS848	Ludlow, Town of Police Department	9034232	MW	Active	10/24/2025
WQEY264	Ludlow, Town of Police Department	9034232	PW	Active	5/16/2026
WPOY935	Ludlow, Town of Town Manager	11453156	PW	Active	9/8/2024
WQEW670	Ludlow, Town of Public Schools	12442851	IG	Active	5/4/2026

Federal Communications Commission
Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: MARC GAUVIN
LUDLOW, TOWN OF
488 CHAPIN ST.
LUDLOW, MA 01056-2523

Call Sign	File Number
WPST361	0004812564

Radio Service
IG - Industrial/Business Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005193594

Grant Date	Effective Date	Expiration Date	Print Date
07-23-2011	07-23-2011	07-30-2021	07-23-2011

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Area of operation**
Operating within a 5.0 km radius around 42-13-39.3 N, 072-31-46.3 W,
Ludlow, HAMPDEN county, MA

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meter	Construct Deadline Date
1	1	000451.76250000	MO	20		11K2F1D 11K2F3E	2.000	2.000		8	07-30-2002
1	1	000456.76250000	MO	20		11K2F1D 11K2F3E	2.000	2.000			07-30-2002

Control Points

Control Pt. No. 1

Address: 408 Chapin St.

City: Ludlow **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-8025

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license not the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WPST361 **File Number:** 0004812564 **Print Date:** 07-23-2011

Associated Call Signs

Waivers/Conditions:
NONE

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW TOWN OF

ATTN: COMMUNICATIONS OFFICER
LUDLOW TOWN OF
574 CENTER STREET
LUDLOW, MA 01056

Call Sign	File Number
KNAK469	0005550323
Radio Service: PW - Public Safety Pool, Conventional	
Regulatory Status: PMRS	
Frequency Coordination Number	

FCC Registration Number (FRN): 0005193610

Grant Date	Effective Date	Expiration Date	Print Date
10-26-2011	12-14-2012	11-14-2021	12-14-2012

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** MINECHOAG MOUNT TOWER RD
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-50.3 N **Long (NAD83):** 072-25-48.3 W **ASR No.:** N/A **Ground Elev:** 220.0

Loc. 2 **Address:** 574 CENTER ST
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-24.3 N **Long (NAD83):** 072-28-08.3 W **ASR No.:** N/A **Ground Elev:** 75.0

Loc. 3 **Address:** 627 RANDALL RD
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-12-15.3 N **Long (NAD83):** 072-30-34.3 W **ASR No.:** **Ground Elev:** 70.0

Loc. 4 **Area of operation**
Land Mobile Control Station meeting the 6.1 Meter Rule: MA

Loc. 5 **Area of operation**
Operating within a 25.0 km radius around fixed location 1

Loc. 6 **Area of operation**
Operating within a 8.0 km radius around fixed location 1

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW TOWN OF

Call Sign: KNAK469 **File Number:** 0005550323 **Print Date:** 12-14-2012

Antennas:

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000154.20500000	FB2	1	100	11K2F3E	50.000	30.000	12.0	117.0	
2	1	000033.46000000	FB	1	100	20K0F3E	50.000	75.000	24.0	-8.0	
2	1	000033.52000000	FB	1	100	20K0F3E	50.000	75.000	24.0	-8.0	
2	1	000154.20500000	FB	1	100	11K2F3E	50.000	75.000	24.0	-8.0	
3	1	000154.20500000	FB2	1	100	11K2F3E	25.000	25.000	18.0	-10.0	
4	1	000159.31500000	FX1	1		11K2F3E	30.000				
5	1	000033.46000000	MO	35		20K0F3E	60.000				
5	1	000033.52000000	MO	35		20K0F3E	60.000				
5	1	000154.20500000	MO	35		11K2F3E	30.000				
5	1	000154.25000000	MO	35		11K2F3E	30.000				
5	1	000159.31500000	MO	35		11K2F3E	30.000				
6	1	000154.04750000	MO	35		11K2F3E	5.000	5.000			04-22-2003

Control Points

Control Pt. No. 1

Address: 574 CENTER ST

City: LUDLOW **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-8332

Associated Call Signs

<NA>

Waivers/Conditions:

NONE

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: FIRE & EMS SERVICES
LUDLOW, TOWN OF
574 CENTER ST
PO BOX 382
LUDLOW, MA 01056

Call Sign	File Number
WPMQ962	0005980047

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0005193610

Grant Date	Effective Date	Expiration Date	Print Date
10-24-2013	10-24-2013	11-13-2023	10-25-2013

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Area of operation**
Operating within a 8.0 km radius around 42-10-24.3 N, 072-28-08.3 W,
HAMPDEN county, MA

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000458.08750000	MO	6		11K3F3E	2.000				
1	1	000458.08750000	MO3	3		11K3F3E	2.000				

Control Points

Control Pt. No. 1

Address: FIRE HEADQUARTERS 574 CENTER ST

City: LUDLOW **County:** **State:** MA **Telephone Number:** (413)583-8332

Associated Call Signs

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WPMQ962 **File Number:** 0005980047 **Print Date:** 10-25-2013

<NA>

Waivers/Conditions:
NONE

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: PAUL DZUBEK
LUDLOW, TOWN OF
198 SPORTSMENS RD
LUDLOW, MA 01056

Call Sign	File Number
WPZR671	0006209745
Radio Service: PW - Public Safety Pool, Conventional	
Regulatory Status: PMRS	
Frequency Coordination Number	

FCC Registration Number (FRN): 0005193610

Grant Date	Effective Date	Expiration Date	Print Date
03-25-2014	03-25-2014	02-27-2024	03-26-2014

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** MINECHOAG MOUNTAIN TOWER RD
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-50.3 N **Long (NAD83):** 072-25-48.3 W **ASR No.:** **Ground Elev:** 219.0

Loc. 2 **Area of operation**
Land Mobile Control Station meeting the 6.1 Meter Rule: MA

Loc. 3 **Area of operation**
Operating within a 25.0 km radius around fixed location 1

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000151.13000000	FB2	1		11K2F3E	25.000	25.000	10.0	71.0	02-27-2005
2	1	000159.26250000	FX1	2		11K2F3E	25.000	25.000			
3	1	000151.13000000	MO	50		11K2F3E	25.000	25.000			02-27-2005

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WPZR671 **File Number:** 0006209745 **Print Date:** 03-26-2014

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
3	1	000159.26250000	MO	50		11K2F3E	25.000	25.000			02-27-2005

Control Points

Control Pt. No. 1

Address: 198 SPORTSMENS RD

City: LUDLOW **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-5625

Associated Call Signs

<NA>

Waivers/Conditions:

Request for waiver of Section 1.949 granted on March 25, 2014. In future, licensee must comply with the Commission's procedures for license renewals. See Public Notice, DA 03-1974 (rel. June 16, 2003).

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: POLICE DEPT
LUDLOW, TOWN OF
612 CHAPIN ST
LUDLOW, CT 01056

Call Sign	File Number
KNFU334	

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
06-05-2013	08-21-2017	07-30-2023	

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** MINECHOAG MOUNTAIN TOWER RD
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-50.3 N **Long (NAD83):** 072-25-48.3 W **ASR No.:** N/A **Ground Elev:** 219.0

Loc. 2 **Address:** 612 CHAPIN ST POLICE HDQTRS
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-30.3 N **Long (NAD83):** 072-28-19.3 W **ASR No.:** N/A **Ground Elev:** 70.0

Loc. 3 **Area of operation**
Countywide: HAMPDEN, MA

Loc. 4 **Address:** NASH HILL RD
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-11-41.3 N **Long (NAD83):** 072-29-18.1 W **ASR No.:** **Ground Elev:** 119.0

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000453.25000000	FB2	1	30	11K2F3E	75.000	150.000	15.0		
2	1	000453.25000000	FB2	1	30	11K2F3E	75.000	150.000	37.0		

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: KNFU334 **File Number:** **Print Date:**

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
3	1	000453.25000000	MO	60		11K2F3E	50.000	100.000			
3	1	000458.25000000	MO	60		11K2F3E	50.000	100.000			
4	1	000453.25000000	FB2	1	30	11K2F3E	75.000	150.000	18.3	37.4	08-21-2018

Control Points

Control Pt. No. 1

Address: 612 CHAPIN ST

City: LUDLOW **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-8305

Associated Call Signs

<NA>

Waivers/Conditions:

NONE

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Ludlow, Town of

ATTN: CHIEF PABLO P. MADERA
LUDLOW, TOWN OF
612 CHAPIN STREET
LUDLOW, MA 01056

Call Sign	
WQDM670	
File Number	
0006909467	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
07-23-2015	07-23-2015	10-03-2025	08-11-2015

LOCATION

Fixed Location Address or Area of Operation:
NEAR INTERSECTION OF WINSOR AND CHESTNUT ST
City: LUDLOW **County:** HAMPDEN **State:** MA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	SENIOR HOUSI	42-09-31.0 N	072-28-54.9 W	73.1	
002	612 CHAPIN	42-10-30.6 N	072-28-17.8 W	80.8	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
941.925	0.00015	100KD1W	41.200	04-03-2007	001	1	001	16.0	18.2	12.0	V	24.8	002	

Waivers/Conditions:

NONE

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Ludlow, Town of

ATTN: CHIEF PABLO P. MADERA
LUDLOW, TOWN OF
612 CHAPIN STREET
LUDLOW, MA 01056

Call Sign	
WQDS846	
File Number	
0006908410	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
08-08-2015	08-08-2015	10-24-2025	08-08-2015

LOCATION

Fixed Location Address or Area of Operation:
612 CHAPIN STREET
City: LUDLOW **County:** HAMPDEN **State:** MA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	612 CHAPIN	42-10-30.6 N	072-28-17.8 W	80.8	
002	MINECHOAG MT	42-10-50.3 N	072-25-49.3 W	213.7	
003	SENIOR HOUSI	42-09-31.0 N	072-28-54.9 W	73.1	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
934.625	0.00015	100KD1W	41.200	04-24-2007	001	1	001	36.6	18.2	12.0	V	79.9	002	
932.925	0.00015	100KD1W	41.200	04-24-2007	002	1	001	36.6	18.2	12.0	V	204.9	003	

Waivers/Conditions:

NONE

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Ludlow, Town of

ATTN: CHIEF PABLO P. MADERA
LUDLOW, TOWN OF
612 CHAPIN STREET
LUDLOW, MA 01056

Call Sign	
WQDS847	
File Number	
0006908460	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
08-08-2015	08-08-2015	10-24-2025	08-08-2015

LOCATION

Fixed Location Address or Area of Operation:
END OF TOWER ROAD
City: LUDLOW **County:** HAMPDEN **State:** MA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	MINECHOAG MT	42-10-50.3 N	072-25-49.3 W	213.7	
002	HILL TERRACE	42-09-43.7 N	072-26-42.4 W	92.4	
003	612 CHAPIN	42-10-30.6 N	072-28-17.8 W	80.8	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
941.825	0.00015	100KD1W	41.200	04-24-2007	001	1	001	18.0	18.2	12.0	V	210.7	002	
943.625	0.00015	100KD1W	41.200	04-24-2007	002	1	001	18.0	18.2	12.0	V	259.9	003	

Waivers/Conditions:

NONE

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Federal Communications Commission

Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: Ludlow, Town of

ATTN: CHIEF PABLO P. MADERA
LUDLOW, TOWN OF
612 CHAPIN STREET
LUDLOW, MA 01056

Call Sign	
WQDS848	
File Number	
0006908473	
Radio Service	
MW - Microwave Public Safety Pool	
SMSA	**Station Class**
	FXO

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
08-08-2015	08-08-2015	10-24-2025	08-08-2015

LOCATION

Fixed Location Address or Area of Operation:
END OF HILL TERRACE
City: LUDLOW **County:** HAMPDEN **State:** MA

Loc No.	Location Name	Latitude	Longitude	Elevation	Antenna Structure Registration No.
001	HILL TERRACE	42-09-43.7 N	072-26-42.4 W	92.4	
002	MINECHOAG MT	42-10-50.3 N	072-25-49.3 W	213.7	

FREQUENCY PATHS

Frequency (MHz)	Tol (%)	Emission Desig	EIRP (dBm)	Constr Date	Path No	Seg	Emit Loc No	Ant Hgt (m)	Gain (dBi)	Beam (deg) Reflector Ht(m)xWd(m)	POL	AZIM (deg)	Rec Loc No	Rec Call Sign
932.825	0.00015	100KD1W	41.200	04-24-2007	001	1	001	12.2	18.2	12.0	V	30.7	002	

Waivers/Conditions:

NONE

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: CHIEF OF POLICE
LUDLOW, TOWN OF
612 CHAPIN STREET
LUDLOW, MA 01056

Call Sign	File Number
WQEY264	0007268645

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0009034232

Grant Date	Effective Date	Expiration Date	Print Date
05-17-2016	05-17-2016	05-16-2026	05-17-2016

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** 612 CHAPIN STREET
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-30.6 N **Long (NAD83):** 072-28-17.8 W **ASR No.:** **Ground Elev:** 72.3

Loc. 2 **Area of operation**
Operating within a 13.0 km radius around fixed location 1

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000453.76250000	FB2	1		11K2F3E	75.000	40.000	36.6	4.7	05-16-2007
1	1	000453.31250000	FB2	1		11K2F3E	75.000	40.000	36.6	4.7	05-16-2007
1	1	000453.46250000	FB2	1		11K2F3E	75.000	40.000	36.6	4.7	05-16-2007
2	1	000453.76250000	MO	75		11K2F3E	40.000	40.000			05-16-2007
2	1	000458.76250000	MO	75		11K2F3E	40.000	40.000			05-16-2007

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license not the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WQEY264 **File Number:** 0007268645 **Print Date:** 05-17-2016

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
2	1	000453.31250000	MO	75		11K2F3E	40.000	40.000			05-16-2007
2	1	000458.31250000	MO	75		11K2F3E	40.000	40.000			05-16-2007
2	1	000453.46250000	MO	75		11K2F3E	40.000	40.000			05-16-2007
2	1	000458.46250000	MO	75		11K2F3E	40.000	40.000			05-16-2007

Control Points

Control Pt. No. 1

Address: 612 CHAPIN STREET

City: LUDLOW **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-8305

Associated Call Signs

<NA>

Waivers/Conditions:

NONE

Federal Communications Commission
Public Safety and Homeland Security Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: MUNICIPAL OFFICE TOWN MANAGER
LUDLOW, TOWN OF
POB B
LUDLOW, VT 05149

Call Sign	File Number
WPOY935	0006447536

Radio Service
PW - Public Safety Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0011453156

Grant Date	Effective Date	Expiration Date	Print Date
10-24-2014	10-24-2014	09-08-2024	10-25-2014

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** OKEMO MTN
City: LUDLOW **County:** WINDSOR **State:** VT
Lat (NAD83): 43-24-25.0 N **Long (NAD83):** 072-44-49.0 W **ASR No.:** **Ground Elev:** 977.0

Loc. 2 **Area of operation**
Land Mobile Control Station meeting the 6.1 Meter Rule: VT

Loc. 3 **Area of operation**
Operating within a 40.0 km radius around fixed location 1

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
1	1	000153.96500000	FB2	1	35	11K2F3E	25.000	29.000	6.0	452.6	
		Frequency 000153.96500000 Special Condition Authorization on a secondary basis.									
2	1	000158.88000000	FX1	1		11K2F3E	45.000	45.000			
3	1	000153.96500000	MO	6		11K2F3E	45.000	45.000			

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WPOY935 **File Number:** 0006447536 **Print Date:** 10-25-2014

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meters	Construct Deadline Date
3	1	000158.88000000	MO	6		11K2F3E	45.000	45.000			

Control Points

Control Pt. No. 1

Address: MUNICIPAL OFFICE

City: LUDLOW **County:** WINDSOR **State:** VT **Telephone Number:** (802)228-2841

Associated Call Signs

<NA>

Waivers/Conditions:

This authorization is granted in part to remove emission types which do not comply with Rule 90.209. Please review Public Notice DA 14-281 for further information.

Federal Communications Commission
Wireless Telecommunications Bureau

RADIO STATION AUTHORIZATION

LICENSEE: LUDLOW, TOWN OF

ATTN: ADMINISTRATIVE SECRETARY
LUDLOW, TOWN OF
63 CHESTNUT STREET
LUDLOW, MA 01056

Call Sign	File Number
WQEW670	0007248376

Radio Service
IG - Industrial/Business Pool, Conventional

Regulatory Status
PMRS

Frequency Coordination Number

FCC Registration Number (FRN): 0012442851

Grant Date	Effective Date	Expiration Date	Print Date
04-30-2016	04-30-2016	05-04-2026	04-30-2016

STATION TECHNICAL SPECIFICATIONS

Fixed Location Address or Mobile Area of Operation

Loc. 1 **Address:** 612 CHAPIN STREET
City: LUDLOW **County:** HAMPDEN **State:** MA
Lat (NAD83): 42-10-30.3 N **Long (NAD83):** 072-28-19.3 W **ASR No.:** **Ground Elev:** 70.0

Loc. 2 **Area of operation**
Operating within a 24.0 km radius around fixed location 1

Antennas

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meter	Construct Deadline Date
1	1	000463.97500000	FB2	1		11K2F3E	75.000	100.000	37.0	s13.6	05-04-2007
1	1	000463.72500000	FB2	1		11K2F3E	75.000	100.000	37.0	13.6	05-23-2007
2	1	000463.97500000	MO	70		11K2F3E	40.000	40.000			05-04-2007
2	1	000468.97500000	MO	70		11K2F3E	40.000	40.000			05-04-2007
2	1	000463.72500000	MO	70		11K2F3E	40.000	40.000			05-23-2007

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Licensee Name: LUDLOW, TOWN OF

Call Sign: WQEW670 **File Number:** 0007248376 **Print Date:** 04-30-2016

Antennas:

Loc No.	Ant No.	Frequencies (MHz)	Sta. Cls.	No. Units	No. Pagers	Emission Designator	Output Power (watts)	ERP (watts)	Ant. Ht./Tp meters	Ant. AAT meter	Construct Deadline Date
2	1	000468.72500000	MO	70		11K2F3E	40.000	40.000		s	05-23-2007

Control Points:

Control Pt. No. 1

Address: 63 CHESTNUT STREET

City: LUDLOW **County:** HAMPDEN **State:** MA **Telephone Number:** (413)583-5663

Associated Call Signs:

Waivers/Conditions:

NONE

15 Appendix F – Site Locations

15.1 Minechoag Mountain Fire Tower

SITE IDENTIFICATION	
SITE NAME	Minechoag Mountain Tower
ADDRESS	Tower Rd, Ludlow MA 01056
TOWER OWNER	MA DCR
SITE CONTACT INFO	Officer Daniel Soares
FCC/FAA INFORMATION	
LAT/LONG	42-10-50.3N 72-25-48.3W
SITE AMLS HEIGHT	721’
TOWER HEIGHT	60’ Steel fire tower with 10’x10’ lookout cab on top
FCC ASR#	NA
SERVICES SUPPORTED	
EQUIPMENT	Ludlow PD, Ludlow FD, Ludlow PW
OTHER EQUIPMENT (TENANTS) in shelter	Wilbraham Fire (UHF) & Wilbraham Police (800MHz), WMLEC-2
GENERAL SITE CONDITIONS	
Ownership	Property owned by MWRA and structure owned by MA-DCR
Perimeter security	Compound fence with barb wire and locked gates
Shelter security	Standard door lock, no cameras
Climate control	Redundant HVAC in front room only
System Connectivity	900MHz microwave
Grounding in shelter	Some present but incomplete and substandard
Grounding out of shelter	Missing and/or inadequate
NARRATIVE DETAIL	
SECURITY: Overall security is good. Locked access gate on driveway and locked compound CLIMATE CONTROL: Front equipment room where PD equipment is located has dual redundant HVAC units. FD and WMLEC equipment is located in the rear generator room. GENERATOR: Generac 10KW Propane with 1000 gallon above ground tank CONNECTIVITY: 900MHz microwave to Police HQ and Hill Terrace. GROUNDING: Equipment is VERY unprotected. Only one path to earth ground identified on a single tower leg. Remaining ground wiring all feeds back into electrical utility grounds. Missing buss on tower base, line grounds cut and hanging. Poor quality and corroded mechanical connector on ground buss at entry port. There is no path to earth ground for the shelter grounds. The propane tank is ungrounded. MISC. ITEMS: Large tree inside compound area with limbs directly over the shelter. No ice bridge (overhead protection) on propane tank and exposed line.	

15.2 Ludlow Police Headquarters

SITE IDENTIFICATION	
SITE NAME	Ludlow Police Department
ADDRESS	612 Chapin St., Ludlow MA 01056
TOWER OWNER	Town of Ludlow
SITE CONTACT INFO	Officer Daniel Soares
FCC/FAA INFORMATION	
LAT/LONG	42-10-30.3N 72-28-19.3W
SITE AMLS HEIGHT	243’
TOWER HEIGHT	100’
FCC ASR#	NA
SERVICES SUPPORTED	
EQUIPMENT	Consoles, Voter, MW radios, BU transmitter
OTHER EQUIPMENT (TENANTS) in shelter	School radio, Public Works, WMLEC-1
GENERAL SITE CONDITIONS	
Ownership	Town of Ludlow
Perimeter security	Building-Excellent, Tower-fenced & locked compound with no barb wire
Shelter security	NA – Internal building rooms
Climate control	Main building HVAC
System Connectivity	Microwave and copper line
Grounding in shelter	Non-existent
Grounding out of shelter	Limited
NARRATIVE DETAIL	
SECURITY: Excellent perimeter security. Unlocked cages in sally port CLIMATE CONTROL: All areas maintained in acceptable temperature. Humidity concern in sally port. Dust concerns in IT and voter areas CONNECTIVITY: 900MHz microwave to Minechoag Fire Tower and Senior Housing. Copper wire to Hampden Town Jail site GROUNDING: Almost zero grounding on site. Equipment is unprotected MISC. ITEMS: Diesel generator supplies the entire building	

15.3 Nash Hill Reservoir

SITE IDENTIFICATION	
SITE NAME	Nash Hill
ADDRESS	62 Nash Hill Rd., Ludlow MA 01056
TOWER OWNER	Massachusetts Water Resource Authority
SITE CONTACT INFO	Officer Daniel Soares
FCC/FAA INFORMATION	
LAT/LONG	42-11-41.3N 72-29-18.1W
SITE AMLS HEIGHT	422’
TOWER HEIGHT	40’
FCC ASR#	NA
SERVICES SUPPORTED	
EQUIPMENT	Town simulcast UHF radio
OTHER EQUIPMENT (TENANTS) in shelter	
GENERAL SITE CONDITIONS	
Occupancy	MWRA data equipment
Ownership	
Perimeter security	Gated driveway
Shelter security	Building locked and secure
Climate control	Only in inner equipment room, larger building has no AC
System Connectivity	900MHz Microwave
Grounding in shelter	Inadequate
Grounding out of shelter	Inadequate
NARRATIVE DETAIL	
SECURITY: Facility security is average CLIMATE CONTROL: Main building is hot with no climate control. Inner room for MWRA equipment with single HVAC unit. CONNECTIVITY: 900MHz Microwave link back to PD HQ GROUNDING: Interior buss bar present but only tied to building grounds. Needs underground system installed outside. MISC. ITEMS: Tower is the bottom section of a larger guyed tower. Does not appear to be properly installed to allow for additional height to be added.	

15.4 Potential – New Ludlow Senior Center

The Town of Ludlow is working to construct a new Senior Center on the corner of State Street and First Avenue (42-9-20.3N 72-28-10.3W). The property is owned by the Town and should have ample space to allow a new communications site to be constructed if needed.


Meadow St
Hampden St
Berkshire St
Hampshire St
Bristol St
Duke St
Essex St
Franklin St
Worcester St
Norwood St
New Senior Housing
River Rd
Stony Hill Rd

15.5 Potential – Center Street (New Cemetery)

The town owns a parcel in the northeast area of the town (42-11-52.8N 72-26-8.8W).


Westside Dr
New Cemetery
21
Center St

16 Appendix G – Interoperability Requirements

Mandatory	Technical Details	Call Sign
Springfield Fire Department, Dispatch 1	154.4000/158.8950, 413NAC (P25)	KDU448
Springfield CMED MED 1	462.9500, 100.0 PL	WQUY987
Springfield CMED MED 2	463.00000, 100.0 PL	WQUY987
Springfield CMED MED 3	463.02500, 100.0 PL	WQUY987
Springfield CMED MED 4	463.05000, 100 PL	WQUY987
Springfield CMED MED 5	463.07500, 100.0 PL	WQUY987
Springfield CMED MED 6	463.10000, 100.0 PL	WQUY987
Springfield CMED MED 7	463.12500, 100.0 PL	WQUY987
Springfield CMED MED 8	463.17500, 100.0 PL	WQUY987
Springfield CMED MED 12	463.01250, 100.0 PL	WQUY987
Springfield CMED MED 22	463.03750, 100.0 PL	WQUY987
Springfield CMED MED 32	463.06250, 100.0 PL	WQUY987
Springfield CMED MED 42	463.08750, 100.0 PL	WQUY987
Springfield CMED MED 52	463.11250, 100.0 PL	WQUY987
Springfield CMED MED 62	463.13750, 100.0 PL	WQUY987
Springfield CMED MED 72	463.16250, 100.0 PL	WQUY987
Springfield CMED MED 82	463.18750, 100.0 PL	WQUY987
Wilbraham Fire Department Dispatch	453.1250/458.1250, 343DPL	KCE264
Wilbraham Police Department Dispatch	854.5375/809.5375, 100.0PL	WNXR889
Granby MA Police Department	153.815	WQJ319
Granby MA Fire	155.0400, 205DPL	WRG826
Granby MA Fire Backup/Fire Tac	155.044, 114.8 PL	WRG826
Belchertown MA Police	155.370	KUG782
Belchertown Fire	158.8200, Tone PL 151.4	KCW396
Belchertown Fire Ground	155.92500, Tone PL 74.4	WNNG464
East Longmeadow Fire Primary Dispatch	155.7600, 132DPL	KCH462
East Longmeadow Fire Tac	153.8300, 114.8 PL	KUB896
Chicopee Fire Department Dispatch	154.1600/158.8650, 141.3PL	KDQ358
Chicopee Police Department Dispatch	851.5625/806.56250, 155DPL	WPUI308
Palmer (Bondsville) Fire Dispatch	159.3450/151.1600. 167.9PL	WPOQZ398
Palmer (Bondsville) Fire Ground	151.19000/159.36000, 74.4 PL	WPQZ398
Holyoke Fire Department Dispatch	159.6450, CC4 TG1001 SL1 (DMR)	KCG775

Palmer Police Department Operations	155.6700/153.9950, 118.8PL	KNDP584
Hampden Fire Dispatch/Operations	155.64000, 411DPL	KCE779
Hampden County Correctional Center (Jail1)	151.4600, 423DPL	KZF950
Monson Fire Dispatch	155.98500, 88.5 PL	KCB981
Three Rivers Fire Ground	154.38500, 723 DPL	WPWL611
Ware Fire	153.92000, 205 DPL	WPUF267
Westover Fire (Digitally Encrypted. Use WMLEC Sim2)	(Air Force Base)	
Monson Fire Ground	151.44500, 88.5 PL	KCB981
WMLEC UHF Police Mutual Aid	460.2250, 206.5PL	WQDK561
WMLEC UHF Fire Mutual Aid	460.4750, 206.5PL	WQRH261
Commonwealth of Massachusetts Interoperable Radio System (CoMIRS)	700/800MHz P25 Phase II TDMA	WQTN732
MSP Troop B	TGID 2099	
MSP Troop C	TGID 2113	
Hampden County Sheriff's Department	State M3	WQTN732
MA Environmental Police West Dispatch	TGID 2445	
MassDOT	TGIDs (2003, 2013, 2015, 2035, 2039, 2043)	
MA Department of Conservation and Recreation (DCR)	TGID 20 potential different talk groups	
Local Public Safety Special Events	Groups 2271, 2273, 2275, 2277, 2279, 2281, 2283, 2285, 2287, 2289	
Optional		
Hampden Town Fire Department Operations	155.6400/151.2200, 411DPL	KCE779
Hampden Town Police Department Operations	155.60250/153.91250, 91.5 PL	WPRI633
Hampshire County Police (CoMIRS)	Interop with CoMIRS 800 MHz system	
Springfield Police Department Dispatch	460.1000/465.1000, 698NAC (P25 encrypted)	KEM702

17 Appendix H – Subscriber Radio Quantity

Quantity per Agency						
Town of Ludlow P25 Radios	**Ludlow PD**	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Mobile Radios						
Public Safety, dash mount mobile radio, AES encryption	16					16
Public Safety Multiband, dash mount mobile radio, no encryption		5				5
Public Safety Multiband, remote mount radio w/single control head, no encryption		9				9
Public Safety Multiband, remote mount radio w/DUAL control heads, no encryption		2				2
Public Safety Multiband, remote mount radio w/DUAL control head, AES encryption	1					1
Public Safety, remote mount radio w/single control head, no encryption		8				8
Public Safety, remote mount radio w/single control head, AES encryption	3					3
Public Safety, remote mount radio w/dual control heads, no encryption		2				2
Public Service, dash mount radio			29		2	29
Public Service, dash mount radio, AES Encryption				1		1
Totals	**20**	**26**	**29**	**1**		**76**
	Ludlow PD	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Portable Radios						
Public Safety portable radio, no encryption, no GPS		60				60
Public Safety Multiband portable radio, no encryption, no GPS		4				4

Public Safety Multiband portable radio, AES encryption, no GPS	3					3
Public Safety portable radio, AES Encryption, GPS	85					85
Public Service portable radio			9		5	
Public Service portable radio, AES Encryption				135		135
Totals	**88**	**64**	**9**	**135**		**296**
	Ludlow PD	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Portable Radio Accessories						
Standard remote speaker microphone	88					88
Severe duty remote mount speaker microphone		64				64
***Belt mounted swivel carry case**	*					0
Carry case with shoulder strap		42				42
Portable belt clip		22	9	135		166
DC powered vehicular charger		24				24
Multi position bank charger	3	4				7
Totals	**91**	**156**	**9**	**135**		**391**
	Ludlow PD	**Ludlow FD**	**Ludlow DPW**	**Ludlow PS**	**Council on Aging**	
Control Station Radios						
Control station radio for fixed location	2	2	3	2	1	10
Tone Remote Control (TRC) DeskSet	9	0				
Control station radio for fixed location, w/ AES Encryption						0
	11	**2**	**3**	**2**		**18**

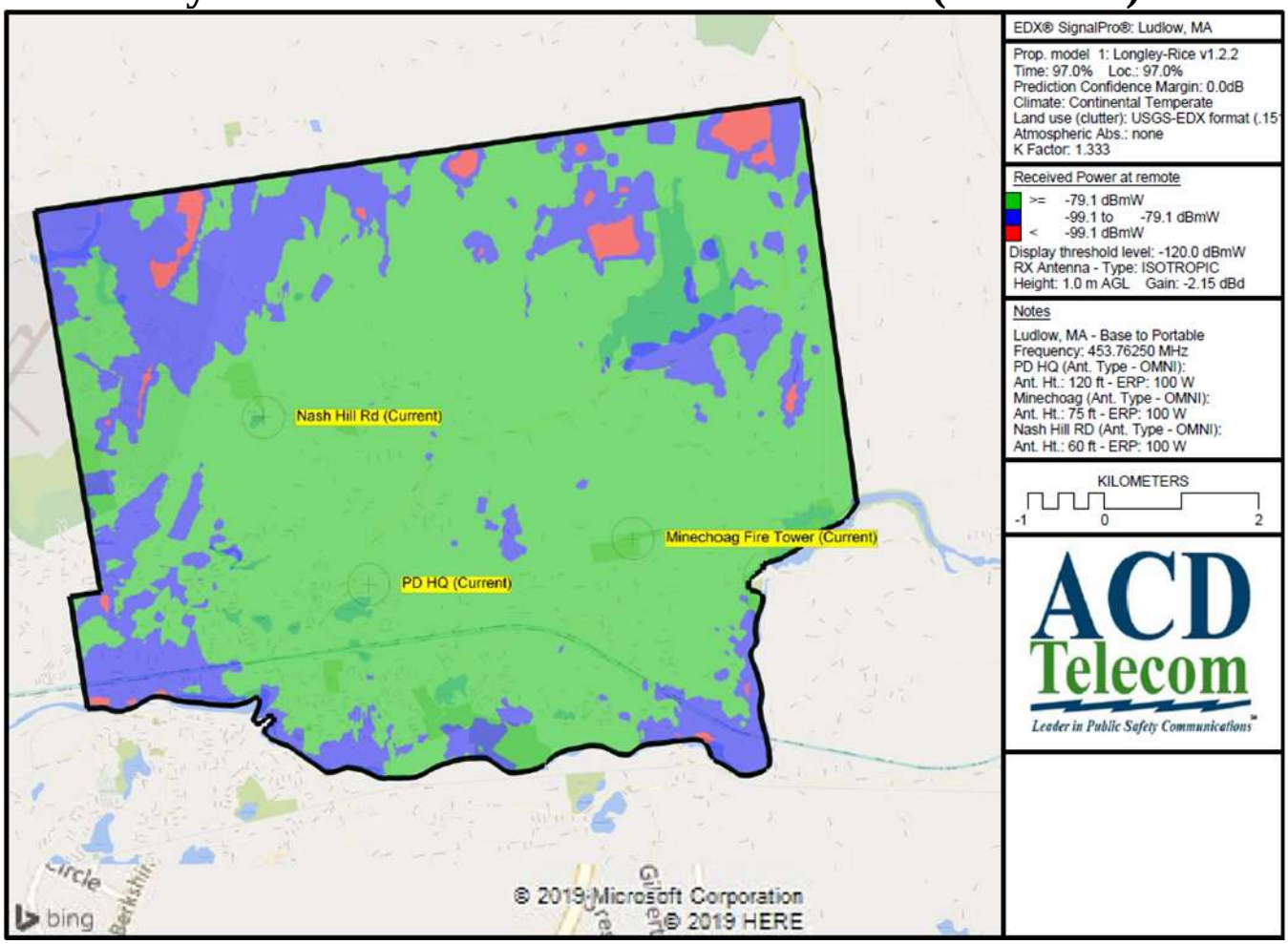
The town does not intend to directly purchase swivel cases for the police department portable radios. Each officer is responsible to procure their own case through the clothing allowances provided by the department. The Vendor should plan to have available an appropriate quantity of cases for the officers to buy directly.

18 Appendix I – Sample System Coverage Map

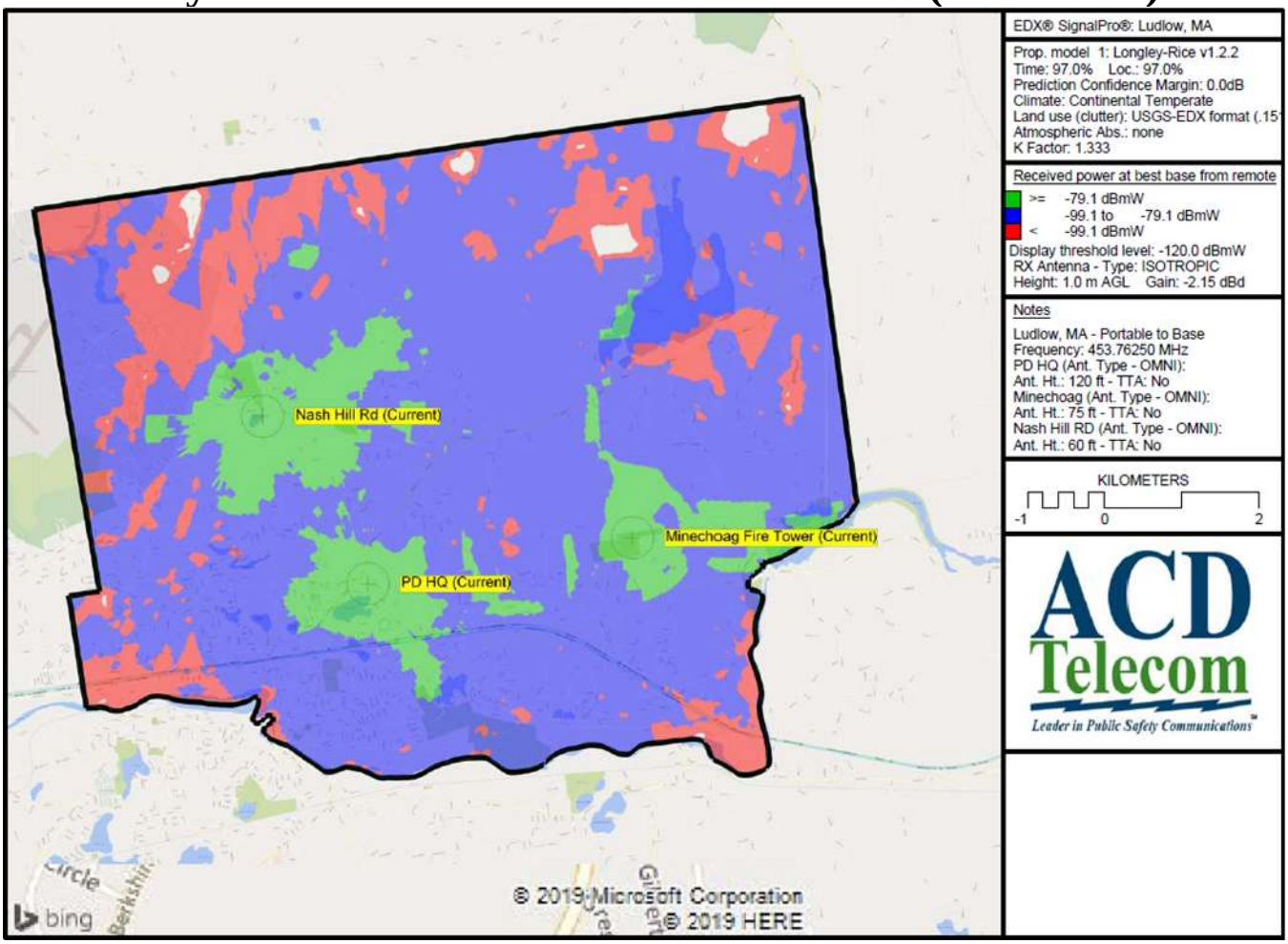
Computer Generated Propagation Maps:

As part of the Town of Ludlow's overall process, ACD Telecom performed computer generated modeling studies based on two scenarios. First was with the current operating parameters of the Police department's 453.2500MHz simulcast channel licensed under KNFU334. Second was utilizing these same site locations with improved antenna heights and ERP values.

18.1 Study 1A – Current Ludlow PD Simulcast (Talk Out)

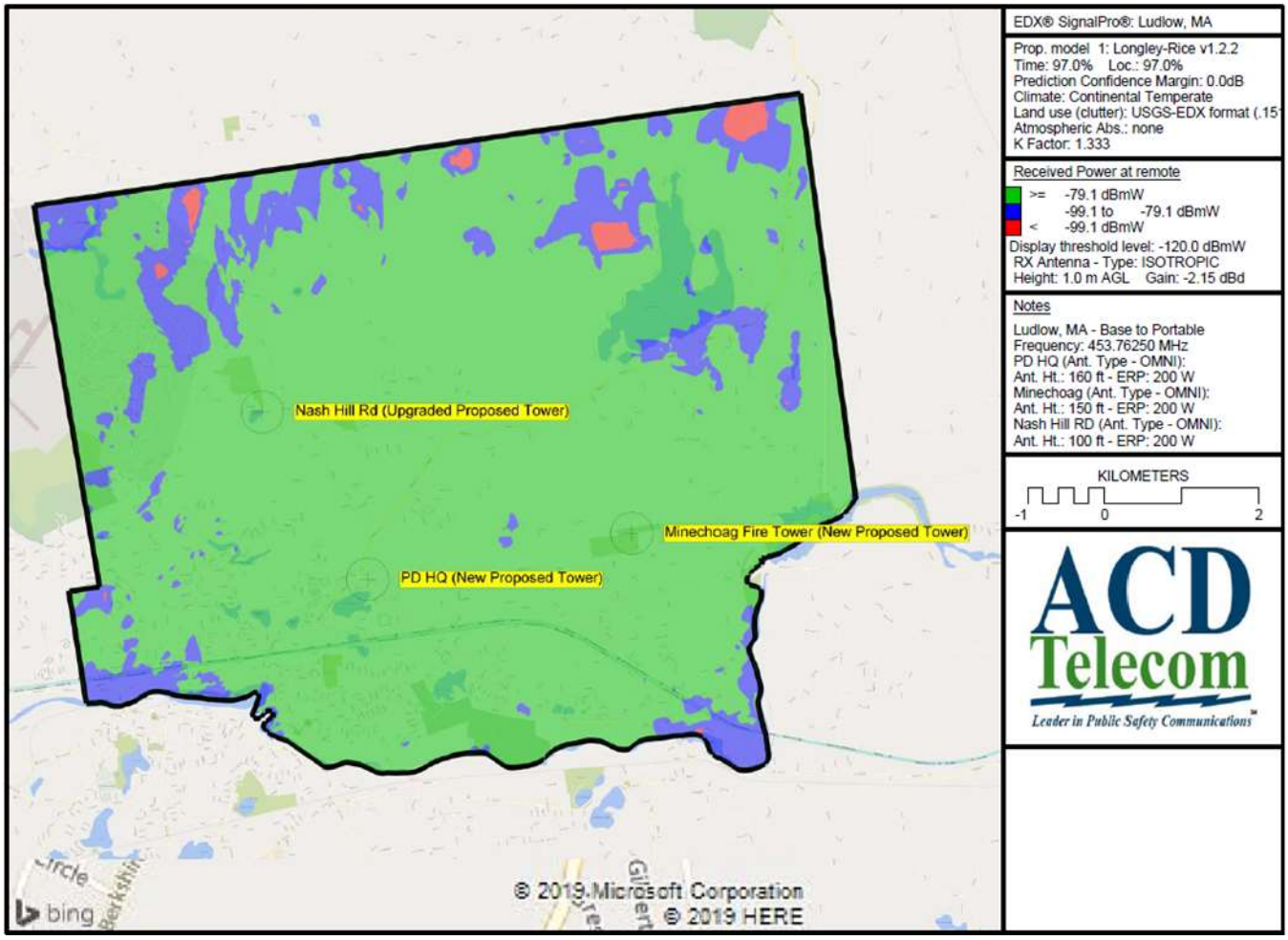


18.2 Study 1B – Current Ludlow PD Simulcast (Talk Back)



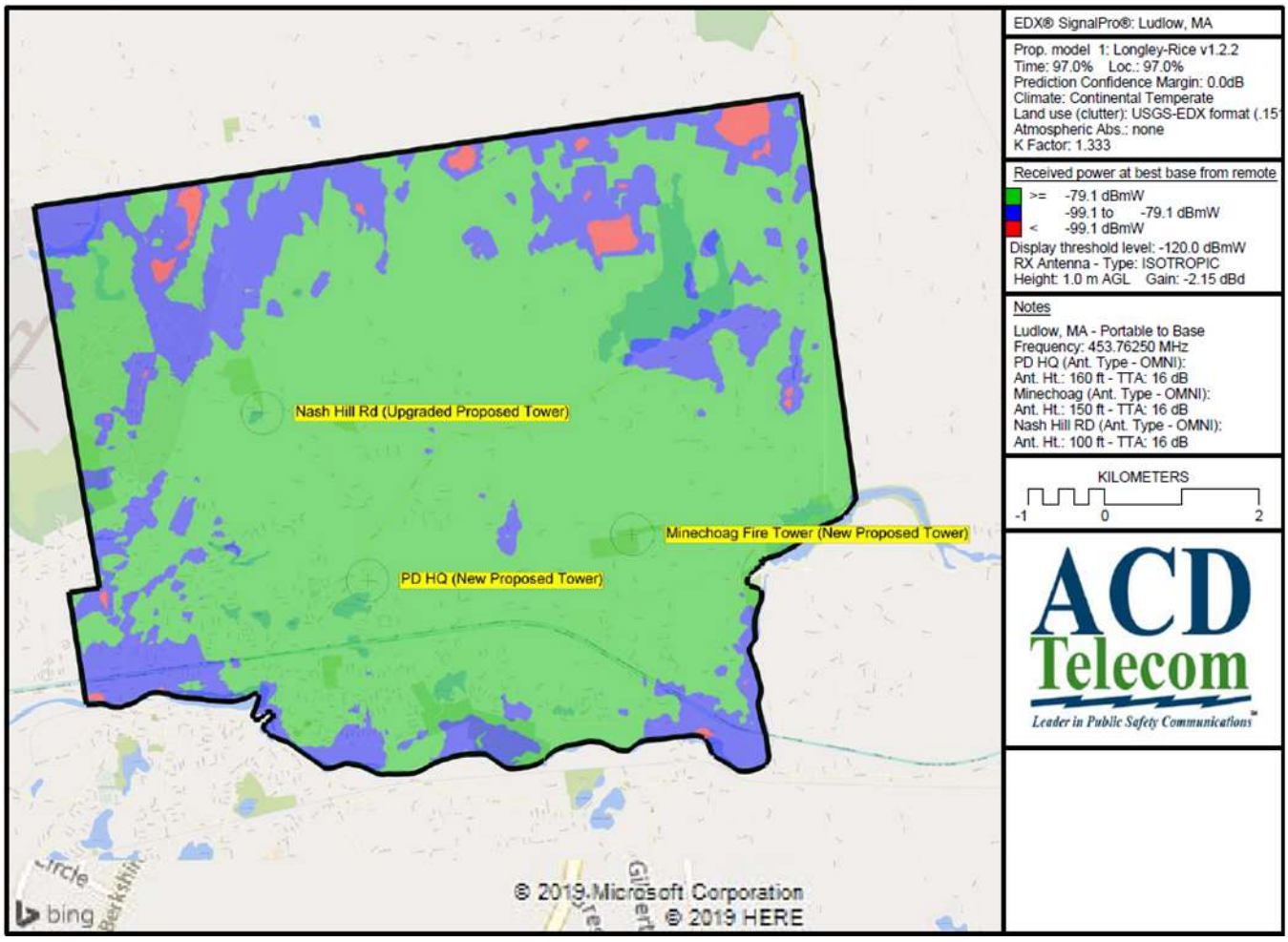
18.3 Study 2A – Ludlow Possible 3 Site UHF (Talk Out)

Increase antenna heights and ERPs at all three locations



18.4 Study 2B – Ludlow Possible 3 Site UHF (Talk Back)

Increased antenna heights and TTAs at all three locations



19 Appendix J – Proposed Table of Compliance

Determination of Compliance Please complete the following table as part of the proposal submission to this IFB.			
Description of Capability, Feature or Functional Requirement	**Complies (Y/N)**	**Vendor's Response**	**Notes**
Proposed system is in conformance with applicable APCO Project 25 TIA-102 standards			
Proposal meets all the mandatory requirements of the P25 SOR			
Proposed radio equipment meets the 'FBI CJIS Security Policy			
All mobile and portable radios recommended by the Proposer can perform all mandatory and optional functions and features of the system.			
Proposal includes a datasheet proving that the receiver sensitivity at 5% BER for their proposed base station is -119dBm or better.			
Proposal includes network connectivity to all new and existing sites			
Proposals including new sites include all additional costs for construction			
Proposal includes a cutover plan for uninterrupted service to the Town throughout system migration			
Proposed system includes replacement of all legacy consoles including all necessary system equipment at the primary dispatch center			
Proposal includes a method of direct interoperability to disparate systems within the Town			
Proposed system is easily expandable to accommodate Town growth			
Proposed system **is** software upgradeable from P25 Phase 1 to Phase 2			

Description of Capability, Feature or Functional Requirement	Complies (Y/N)	Vendor's Response	Notes
Proposal does NOT contain trunking messages and/or procedures that are proprietary			
Proposed system **is** compliant with P25 Phase 1 (FDMA) trunked infrastructure standards			
All proposed LMR equipment is capable of both half rate and full rate vocoding			
Proposed simulcast system frequency resource meets or exceeds the performance of a Stratum 2 ANSI clock standard which should not be greater than ±2Hz			
If GPS timing is used, proposed frequency standard meets the simulcast frequency stability requirements when GPS timing is lost			
Proposal addresses the compatibility of their responder equipment with readily available 3rd party accessories			
Scanning capability in radios has selectable priority levels			
Proposal includes description and pricing for all features available in portable and mobile radios			
Proposed system is designed with a capacity of up to 512 talkgroups			
Proposal includes analysis of space requirements for new equipment and antennas			
Proposal includes pricing for a pre- fabricated shelter where necessary			
Proposal includes all zoning, permitting and construction costs associated with installation of new shelters where required			
Proposal contains design and quote for backup dispatch console position at The Town Sheriff's Office that is compatible with existing The Town Dispatchers Consoles			

Description of Capability, Feature or Functional Requirement	Complies (Y/N)	Vendor's Response	Notes
Proposal provides pricing for the complete purchase and construction of new tower(s), shelter(s), generator(s) and antennas where needed			
Proposed antenna components are designed for full 700/800 MHz band coverage			
Proposed microwave equipment is compatible with existing equipment			
Proposal includes a detailed design for integration of all new (if any) tower sites into the Town microwave system			
Proposal includes microwave cutover plan for addition of new hops			
Proposal itemizes the cost of new microwave hops separately			
Proposal itemizes separately the cost for equipment protection (hot-standby modules) for the new microwave digital radios			
Proposed microwave digital radio system is an all-indoor, MPLS-capable radio solution with specified battery backup			
Proposal addresses the feasibility of 700 MHz and 800 MHz band consolidations			
Proposal details the options available for the desired level of interoperability and pricing for any equipment such as an ISSI device			
Proposal includes interoperability training including any functional processes			
Proposal includes combiners capable of 700/800 MHz combining with at least 12 transmitter inputs each			
Proposal includes replacement of existing generators and UPS at the RF sites			

Description of Capability, Feature or Functional Requirement	Complies (Y/N)	Vendor's Response	Notes
Proposal details the options available for the desired level of interoperability and pricing for any equipment such as an ISSI device			
Proposed system manager terminals have password protection			
Proposed system has the capability to offer an audible channel grant tone			
Proposal includes descriptions of all fallback and system failure scenarios			
Proposed consoles have a fallback mode with a description of this mode			
Proposed control stations are equipped for remote control from another room in the same building			
Proposed control station antennas have been chosen to be in conformance with any FCC and FAA requirements			
Proposal addresses that Contractor will be responsible for ensuring that all six (6) of the existing The Town towers meet FCC Docket 10-88.			
Any proposed microwave equipment matches the quality, capacity and specifications of the existing microwave system			
Proposed console allows for transferring of telephone calls from console to console with audible and visual notification			
Proposal specifies the portable antenna that will be used for the system design			
Proposal includes all required coverage prediction maps, including interference reduction maps, if required			

Description of Capability, Feature or Functional Requirement	Complies (Y/N)	Vendor's Response	Notes
Proposal identifies the basic propagation model , the shadow loss model, and the statistical model(s) used in determining the coverage prediction			
Proposed system meets Service Area Reliability target at specified CPC			
Error margin for proposed system is no less than 1.5%			
Co- and adjacent-channel interference analysis included, if required.			
If a simulcast system, CPC based on delay spread.			
Coverage maps account for both site noise and intermodulation and other types of environmental noise.			
Terrain database horizontal resolution is no greater than 200 meters for frequencies below 1 GHz, 10 meters for above.			
Land Cover dataset used is no older than 10 years old, preferably the latest available.			
If micro-diversity is used, the proposal includes documentation of the calculation of the gain.			
Proposed number of CATP test tiles is at least 100 and is based on estimate of proportions formula and 99% confidence.			
Size of test tiles in proposed CATP does not exceed ½ mile (800 meters).			
Proposed CATP does NOT permit treating inaccessible grids as a "PASS"			
Proposed CATP conforms to the applicable subclauses of §5.7 of TSB-88.3-E			
Proposal's simulcast coverage maps are based on the delay spread methodology (§5.8 of TSB-88.1-E)			

20 Appendix K – Responsibilities Matrix

Responsibilities Matrix defines the principal activities and responsibilities of all parties for the implementation of the System for The Town. Vendor is providing a Turnkey System based upon the proposed System design using the sites identified herein. Visual inspections were performed by Vendor on all available sites. This Responsibilities Matrix is also based upon Vendor's site surveys and Vendor'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 Vendor should have reasonably included herein based upon Vendor's visual inspections, site surveys and Vendor'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	Town	Comments
Participate in weekly Project Review Meetings, Submit weekly status reports	X	X	Contractor to provide weekly status reports, Town to review
Establish Project Communications protocol, maintain communications log	X		
Participate in Monthly Project Reviews	X	X	Contractor to provide monthly update material, Town to review
Provide report results to Town	X		Grounding Reports, (Staging) Factory Acceptance Test results, Acceptance Test Plan results
Update Project Schedule Monthly	X		
Submit Change Order forms to Town	X		
Review and Approve Change Order		X	
Designate individual to be Town'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**	**Town**	**Comments**
Prepare FCC 601 form(s) and ensure that all six (6) of existing The Town towers meet FCC Docket 10-88.	X		
Create the contour maps and propagation maps required for regional coordination, submit to the Town	X		
Provide technical data to Town to support regional frequency coordination	X		
Prepare microwave frequency searches and license applications	X		
Sign license applications for 700 & 800 MHz frequencies		X	
Sign microwave frequency application		X	
Obtain all required FCC licensed frequencies as per the system design	X		UHF & 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 Town 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 Town 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 Town 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	Town	Comments
Kickoff Meeting & Preliminary Design Review			
Assemble project team and travel to the Town location.	X		
Present preliminary information on sites and design	X		
Provide a team to go on scheduled site surveys	X		
Assemble Town 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			
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-Town owned sites	X	X	New Site leases and modifications of current leases
Customer Design			
System block diagrams	X		
List of deliverable equipment for each site	X		
Network connection/microwave plan	X		

Tasks	Contractor	Town	Comments
Tower antenna placement drawings	X		
Antenna system drawings	X		
Coverage prediction maps	X		
Frequency plans	X		
Present Intermodulation study results	X		
700/800 MHz Combiner plans	X		
Site plot drawings	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	