

Penobscot Regional Communications Center

Request for Quotation

April 30, 2018

Regional Public Safety Communications Systems Upgrade

The purpose of this document is to provide interested parties with information to enable them to prepare and submit a proposal for a region wide Public Safety transmitter simulcast and microwave communications system.

Schedule of Events		
RFQ Release	April 30, 2018	
RFQ Conference	May 14, 2018	10:00 AM
Questions Due by Email	May 21, 2018	COB
Answers to Questions by Email	June 4, 2018	
Due Date & Time	June 22, 2018	4:00 PM

Deliver Proposal to:

Mr. Chad LaBree, Executive Director
Penobscot Regional Communications Center
97 Hammond St
Bangor, ME 04401

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1	1	INVITATION TO SUBMIT REQUEST FOR QUOTATION	4
2	1.1	Current State	4
3	1.2	Project Overview	5
4	1.3	RFQ Issuing Office, Inquiries, and Point of Contact.....	7
5	1.4	RFQ Schedule and Key Date	7
6	1.5	Pre-RFQ Conference and Site Tour	7
7	1.6	Pre-RFQ Conference Process	8
8	2	RFQ INSTRUCTIONS.....	8
9	2.1	RFQ Information & Work Conditions.....	8
10	2.2	Termination for Unavailability of Funds.....	9
11	2.3	Rights of PRCC.....	9
12	2.4	Confidentiality	9
13	2.5	Insurance Requirements.....	9
14	2.6	Contractor Project Manager.....	10
15	2.7	Standards & Codes.....	10
16	2.8	Exceptions and Clarifications	11
17	2.9	Delivery, Storage and Risk of Loss.....	11
18	2.10	Detailed Equipment List by Site.....	11
19	2.11	Software Licensing	11
20	2.12	Surety Performance Bond	12
21	2.13	Award and Contract.....	12
22		RFQ/	12
23	2.14	PROPOSAL FORMAT AND CONTENTS	12
24	2.15	Volume-1	12
25	2.16	Volume-2	14
26	3	RADIO INFRASTRUCTURE REQUIREMENTS.....	15
27	3.1	System Upgrade Overview.....	15
28	3.2	Proposed Transmitter Sites.....	16
29	3.3	Structural Analysis.....	16
30	3.4	RF Simulcast and Voting System.....	16
31	3.5	Communications Dispatch Console	16
32	3.6	IP Simulcast Repeater/Transmitter.....	17
33	3.7	Voting Receiver	17
34	3.8	Voter-Comparator System	17
35	3.9	VHF Duplexer, TX Combiner, and RX Multicoupler.....	17
36	3.10	Antenna and Feeder System	18
37	3.11	Transmitter Simulcast	18
38	3.12	DC Power System	19
39	3.13	Site Camera Surveillance System [OPTION]	20
40	3.14	FCC License Information	21
41	3.15	Physical and Functional Interface Requirements	21
42	3.16	Electromagnetic Interference	21
43	3.17	System Coverage Performance Requirements	21
44	4	IP MICROWAVE NETWORK.....	23
45	4.1	General Requirements.....	23
46	4.2	Microwave System Performance Requirements.....	23
47	4.3	Path Survey Requirements.....	24
48	4.4	Technical Requirements	24

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

49	4.5 Network Management.....	25
50	4.6 IP/Ethernet Switches and Routers	25
51	4.7 Microwave Licensing.....	25
52	5 IP PERFORMANCE CONSIDERATIONS	25
53	6 EQUIPMENT STATUS MONITORING SYSTEM.....	26
54	7 COMMUNICATIONS DISPATCH CONSOLE REQUIREMENTS.....	26
55	7.1 Receiver Voting	26
56	8 SITE FACILITIES.....	26
57	8.1 Grounding System	27
58	8.2 Electrical Systems.....	27
59	8.3 Outdoor Cabinet [OPTION].....	27
60	9 INSTALLATION REQUIREMENTS.....	28
61	9.1 General Requirements.....	28
62	9.2 Personnel Safety	29
63	9.3 RF Base/Repeater Stations.....	29
64	9.4 Simulcast Alignment.....	29
65	9.5 IP Microwave Radio	30
66	9.6 Microwave Parabolic Antenna	30
67	9.7 Transmission Line Grounding and Lightning Protection	30
68	9.8 GPS Receivers.....	31
69	9.9 Installation Documentation.....	31
70	9.10 Equipment and System Acceptance Testing.....	31
71	9.11 Coverage Testing and Verification.....	33
72	9.12 System Cutover.....	34
73	10 WARRANTY, MAINTENANCE AND TRAINING	34
74	10.1 Warranty and Maintenance	34
75	10.2 Response Times	34
76	10.3 General Maintenance Requirements	35
77	11 Appendix-A - Pricing Sheet	37
78		
79		
80		
81		

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1 INVITATION TO SUBMIT REQUEST FOR QUOTATION

You are invited to submit a proposal as described by this Request for Quotation [RFQ], and in accordance with the Penobscot Regional Communications Center [PRCC] General Terms and Conditions for the purchase of the proposed land mobile radio infrastructure equipment, microwave radio, as well as installation and maintenance services.

The intent of this RFQ is to provide PRCC an understanding of vendor equipment offerings and associated system cost. There will be no award based on this solicitation. This RFQ represents an effort undertaken by PRCC and its user groups to provide a comprehensive specification with the goal of implementing a reliable communications infrastructure throughout the region.

This specification is anticipated to provide the basis for the design, fabrication and delivery of a VHF-Highband Analog/DMR Tier-II transmitter simulcast/receiver voting system utilizing IP/Ethernet connectivity [via microwave, fiber, or VLAN transport]. Equipment will be from a single vendor who shall furnish all equipment and services related to the installation and optimization of the system.

The successful proposer will assume complete responsibility for equipment and system acceptance tests of systems equipment provided under this specification. All RFQ responses shall address the entire system, to ensure a complete system, and that nothing remains to be purchased by PRCC.

The Vendor must provide a detailed response to all items listed in these documents. The vendor must understand that all documents submitted will become part of the contract between PRCC and the Vendor.

The Vendor is required to meet all applicable State Prevailing Wage requirements, where required.

This procurement is for a turnkey system except for items specifically identified as being provided by others in this document. Moreover, the Vendor is responsible to provide all necessary components and services to integrate the existing PRCC Communications Dispatch Console [purchased in 2016] with the proposed system equipment.

The successful Proposer must work with the current PRCC maintenance provider on this project, as well as provide technician training for the various sub-system/equipment to be provided under this contract.

1.1 Current State

The existing VHF radio and microwave infrastructure equipment is beyond the manufacturer life-cycle. PRCC system is comprised of three [3] separate VHF systems. A system drawing found on page-6 shows the current PRCC radio system configuration, in summary:

1. PRCC TAC/TAC-1
 - This is a regional radio system used for Law Enforcement dispatching
 - Currently comprised of repeaters at 7 sites
2. PRCC Comm-2
 - This is a regional radio system for the northern part of the county used for Fire and EMS Services dispatching
 - Currently comprised of repeaters at 10 sites
3. PRCC Comm-3
 - This is a regional radio system for the central and southern part of the county used for Fire and EMS Services
 - Currently comprised of repeaters at 3 sites

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

- 132 4. Communications Dispatch Console
- 133 ▪ The console is a Motorola 8-positions MCC-7100 purchased in 2016
- 134
- 135 5. Site Connectivity
- 136 ▪ Currently non-redundant 960 MHz microwave with TDM multiplexers
- 137 ▪ 960 microwave system is comprised in a north and south configuration
- 138 ▪ The upper northern radio sites are controlled utilizing UHF control links

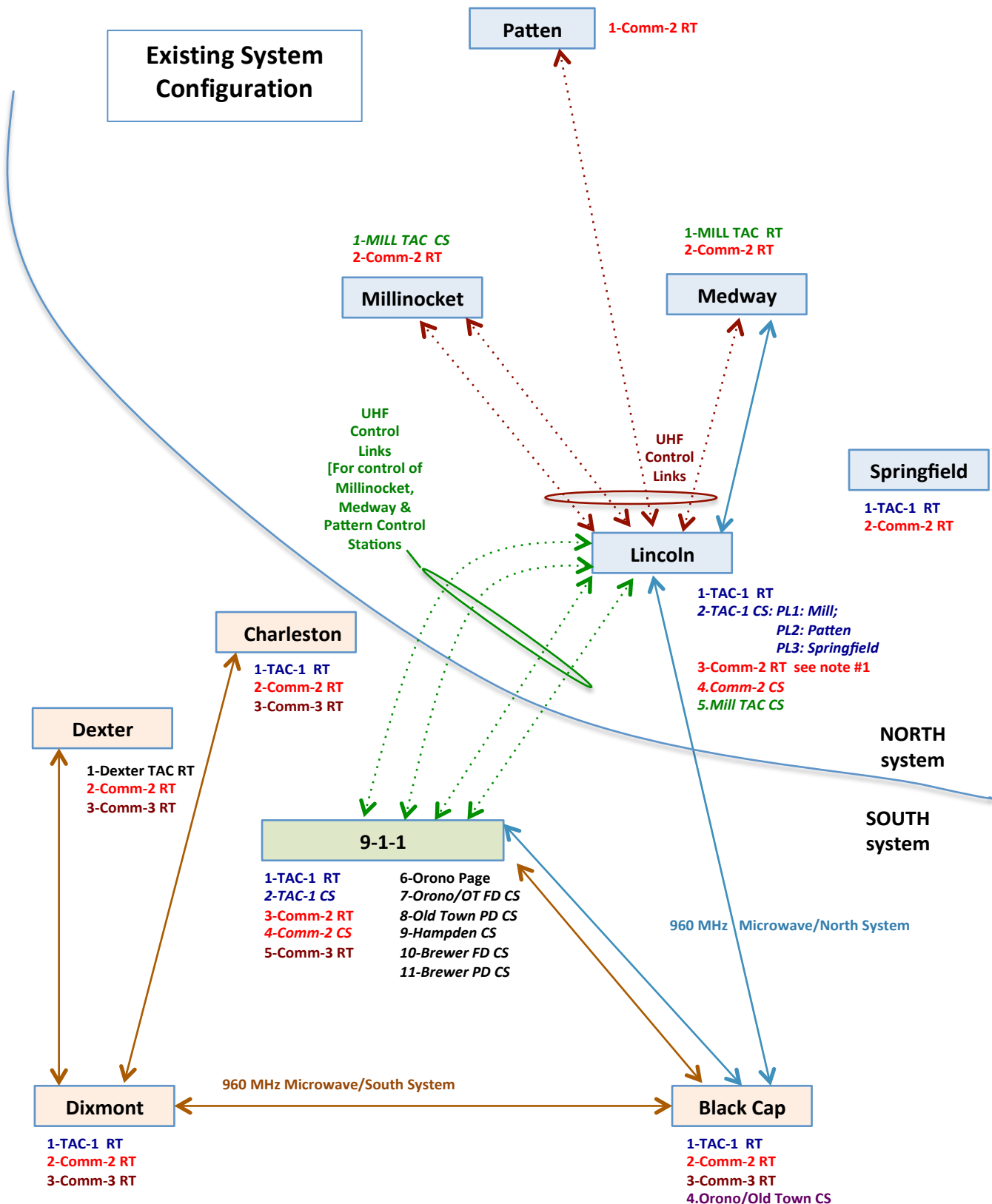
139 **1.2 Project Overview**

140

141 The equipment and services to be supplied under this procurement include:

- 142 ▪ Complete System Design
- 143 ▪ VHF Transmitter Simulcast Repeaters
- 144 ▪ Receiver Voting System
- 145 ▪ Antennas and feeder systems [transmission lines, duplexers, lightning protection, etc.]
- 146 ▪ IP Gateways
- 147 ▪ GPS Synchronization Equipment
- 148 ▪ IP Microwave Network
- 149 ▪ Microwave Antenna and Feeder Systems
- 150 ▪ Connectivity to Existing Communications Dispatch Console
- 151 ▪ Alarms / System Monitoring
- 152 ▪ Project Management
- 153 ▪ Installation and System Provisioning
- 154 ▪ Optimization of Simulcast Timing
- 155 ▪ System Testing and Acceptance
- 156 ▪ Site Facilities Grounding Upgrades
- 157 ▪ Documentation Including As-Built Drawings

Penobscot Regional Communications Center Regional Public Safety Communications System Upgrade



Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1.3 RFQ Issuing Office, Inquiries, and Point of Contact

Questions regarding this bid shall be made in writing only and be sent to the Executive Director, being received no later than five working days prior to the bid opening. They may be hand delivered, mailed, or emailed to clabree@penobscot-county.net.

Questions and the resulting answers to the specifications will be in the form of a written addendum and sent to all bid holders registered in the County Commissioners.

All inquiries concerning any commercial or technical aspect of the project should be directed to:

Chad LaBree, Executive Director
Penobscot Regional Communications Center
97 Hammond St
Bangor, Maine 04401
Office: 207-945-4753
Email: clabree@penobscot-county.net

1.4 RFQ Schedule and Key Date

EVENT	DATE
RFQ Issued to Proposers	April 30, 2018
Pre-RFQ Conference and Site Visits	10:00 AM - May 14, 2018
Deadline for Submission of Pre-Bid Questions	COB May 21, 2018
Answers to questions by email	June 4, 2018
Proposal Due Date Chad LaBree Executive Director Penobscot Regional Communications Center 97 Hammond St Bangor, Maine 04401	4:00 PM - June 22, 2018

1.5 Pre-RFQ Conference and Site Tour

A Pre-RFQ conference will be held on the date shown above to discuss items of this RFQ. The Pre-Bid Conference will be held at:

Penobscot Regional Communications Center
97 Hammond St
Bangor, Maine 04401

Attendance of this pre-bid conference is mandatory if you wish to submit a bid for this project.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

208 **1.6 Pre-RFQ Conference Process**

209 **Step-1:**

210 Questions, request for interpretation or clarification, petition for changes, additions or deletions to technical or
211 commercial items in this RFQ, shall be submitted in writing [via email] prior to the Pre-Bid Conference. Questions are due
212 by the date listed in the RFP Schedule.

213

214 **Step-2:**

215 All Proposers will convene jointly on the date and time specified to receive answers to the vendor questions submitted in
216 advance; to submit additional questions or requests; and, to receive any updated information regarding the project.

217

218

219 Responses to questions or changes in an official, written set of responses and/or clarifications will be provided to all
220 bidders in the form of an Addenda and will be sent via email within 5-business days after the Pre-Bid Conference.

221

222 **Site Tour**

223 At the completion of the Pre-Bid conference, Bidders will have the opportunity to tour the communications center [PRCC]
224 and equipment room, both located at 97 Hammond Street.

225

226 In lieu of a site tour, and to assist bidders in the preparation of their proposal, PRCC will provide each bidder with a Site
227 Information Book with details of each site. The Site Information Book should provide vendors sufficient information on
228 conditions that will assist in the preparation of costs for installation labor and services, equipment, materials and site
229 improvements.

230

231 Upon contract execution, the successful Proposer will be required to conduct detailed site review and inspections, which
232 will include grounding conditions, lightning protection devices, and other site facilities to determine if suitable for the
233 proposed equipment.

234

235 Evaluation of electrical service at each site to supply ac power to the proposed equipment, or any electrical modifications
236 required, would also be considered. This would include environmental controls [HVAC] to determine their ability to
237 maintain the proposed equipment within its specified operating parameters as needed by the vendors proposed
238 equipment.

239

240 DURING THE SITE TOUR, THE COMMITTEE WILL NOT ENTERTAIN QUESTIONS FROM THE BIDDERS. BIDDERS ARE
241 EXPECTED TO SUBMIT THEIR ADDITIONAL QUESTIONS BY EMAIL BEFORE THE DEADLINE DATE.

242 **2 RFQ INSTRUCTIONS**

243 The Executive Director will accept sealed proposals identified in the bid schedule where they will be publicly opened.

244

245 Proposals may be hand-delivered or mailed to the Executive Director at the above address but must be in a sealed
246 envelope clearly marked "PRCC REGIONAL COMMUNICATIONS UPGRADE." Late, unsigned proposals or proposals
247 submitted electronically shall not be accepted. Bids shall remain open to acceptance for thirty days from their opening.

248

249 Please submit one [1] original and six [6] copies of the proposal. Each proposal shall also be provided with a USB drive,
250 note that the file must mirror the paper versions exactly and shall be a single PDF file.

251 **2.1 RFQ Information & Work Conditions**

252 This RFQ establishes the requirements for this Project and it is believed that all information necessary to complete a
253 response is included in this RFQ.

254

255 All Vendors are expected to carefully examine the RFQ documents. Any ambiguities or inconsistencies should be brought
256 to the attention of the individuals identified in the 'INQUIRIES' subsection of this RFQ, as appropriate.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

257
258 It is the responsibility of the Vendor to clarify any information, which is contained in this RFQ and not fully understood.

259
260 The Vendor, by and through the submission of a response, agrees to be held responsible for:

- 261 • having become familiar with the existing site facilities
- 262 • having become familiar with the existing radio system
- 263 • having completely understood the nature and scope of the work and
- 264 • any local conditions that may affect the materials, parts, labor and work to be done.

265
266 Nothing in this RFQ shall relieve the Vendor from supplying a totally turn-key system package, including, but not limited to
267 all materials, hardware, cabling and labor FOB Destination to be furnished under this contract. The Vendor shall, in all
268 cases, be solely responsible for the delivered system, and for furnishing complete system documentation for each and
269 every part of the furnished system.

270 **2.2 Termination for Unavailability of Funds**

271 In the event that PRCC grants or funds for the contract become unavailable, PRCC shall have the right to terminate the
272 contract without penalty. Availability of funds will be determined at the sole discretion of PRCC.

273 **2.3 Rights of PRCC**

274 This request for quotation does not commit PRCC to award a contract or contracts or to pay any costs incurred in the
275 preparation of a proposal in response to this request.

276
277 PRCC reserves the right to accept or reject any or all proposals received as a result of this request; to negotiate with
278 qualified Vendors, or to cancel in part or in its entirety this request for proposal, if it is determined to be in the best
279 interest of PRCC to do so.

280
281 PRCC reserves the right to waive any informalities in bids, to accept any bid or portions thereof (bidders are advised to
282 note this and quote accordingly) and to reject any or all bids should it be deemed for the best interest of PRCC to do so.
283 PRCC reserves the right to substantiate the bidder's qualifications, capability to perform, availability, including past
284 performance record.

285 **2.4 Confidentiality**

286 PRCC is subject to the Freedom of Access law. Under this law, it must make public information that it receives in the
287 solicitation of proposals. The Freedom of Access law does, however, have an exception applicable to "proprietary
288 information." In the event that the proposal you submit contains any proprietary information, PRCC agrees that it will not
289 disclose such information to any third party, and that such disclosure shall occur only if PRCC is compelled to disclose such
290 information by a final judgment, after giving you the opportunity to litigate the issue. Proprietary information must be
291 submitted in a separate sealed envelope to PRCC along with your sealed quotation I. The outside of the envelope must
292 clearly be marked "Proprietary information/confidential." PRCC agrees that proprietary information will only be viewed
293 by PRCC officials and will be reviewed only on a "need to know" basis. The information will not be shared with any third
294 party without your express consent or a court order.

295 **2.5 Insurance Requirements**

296 a.) Contractor shall maintain, at his own expense, insurance in the amount set below. Certificates of insurance,
297 evidencing this coverage is required at bid. Certificates naming the County as additional insured' shall be furnished to the
298 County Finance Director within ten days of notification of the receipt of this award.

299
300 b.) Workers Compensation in accordance with the laws of the State of Maine.

301
302 c.) Liability Insurance: Comprehensive General Liability Insurance including contractual insurance in the amount
303 of \$1,000,000 each occurrence and Automobile liability insurance in the amount of \$ 1,000,000 each occurrence and
304 property damage insurance of \$1,000,000.00 each occurrence.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

305 **2.6 Contractor Project Manager**

306 The proposer shall identify an individual who will serve as the contractor's Project Manager [PM] if awarded a contract.
307 This individual shall serve as the single point of contact between the successful contractor and PRCC PM.

308
309 The identified PM shall be an employee of the proposer at the time of the response submission. The PM shall have a
310 proven record of experience in projects of similar scope. PRCC reserves the right to accept or reject the identified PM. If,
311 during the term of the contract, it is necessary to replace the PM, PRCC reserves the right to accept or reject the newly
312 identified PM.

313
314 The response shall include the following information on the identified PM:

- 315 - Name
- 316 - Employment history with proposer
- 317 - Home base of operations
- 318 - Relevant experience for each listed project, provide name, title and telephone number of a reference contact
- 319 possessing a technical background
- 320 - Education & training

321 **2.7 Standards & Codes**

322 In all instances, offered and delivered goods shall be new, unused, in current production and meeting or exceeding all
323 applicable standards and codes of:

324
325 All facilities constructions, labor, equipment and cabling installations shall comply with the following applicable codes:
326

327 **General**

- 328 ADA - American with Disabilities Act
- 329 OSHA - Occupational Safety and Health Administration
- 330 EIA - Electronic Industry Association
- 331 FCC - Federal Communications Commission
- 332 IEEE - Institute of Electronic and Electrical Engineers

333 **Electrical**

334 Installation of all electrical equipment, power distribution, lighting and outlet assemblies, alarm and grounding systems,
335 including associated wire ways, and wiring, shall comply with the most recent edition of:

- 336 NEC - National Electrical Code
- 337 NFPA - National Fire Protection Association
- 338 UL - Certified by Underwriters Laboratories
- 339 NEMA - National Electrical Manufacturers Association

340 **Radio**

- 341 TSB-88 - Performance in Noise and Interference-Limited Situations - Recommended Methods for Technology-
342 Independent Modeling, Simulation, and Verification
- 343 NFPA 1221 – Standards for the Installation/Maintenance and Use of Emergency Services Communications Systems
- 344 EIA/TIA 603 - Land Mobile FM Communications Equipment Measurement and Performance Standards
- 345 EIA/TIA 329B - Minimum Standards for Communications Antennas

346 **Towers/Shelters**

- 347 R-56 - Standards and Guidelines for Communications Sites
- 348 TIA/EIA 222-H – Structural Standards for Steel Antenna Towers and Antenna Supporting Structures
- 349 ANSI - American National Standards Institute
- 350 ASME - American Society of Mechanical Engineers
- 351 ASTM - American Society for Testing & Materials
- 352 EIA-310 – Racks, Panels, and Associated Equipment

353

354

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

355 **Microwave Radio**

- 356 RS-252-A – Standard Microwave Transmissions Systems
- 357 TSB-10-F – Interference Criteria for Microwave systems
- 358 EIA-195 (latest revision) – Electrical and Mechanical Characteristics for Terrestrial Microwave Relay System
- 359 Antennas and Passive Reflectors
- 360 EIA- 210 – Terminating and Signaling Equipment for Microwave Communications Systems

361 **2.8 Exceptions and Clarifications**

362 Vendors taking exception to or clarifying the requirements, or offering substitutions, shall state so in their response. All
363 exceptions and clarifications shall be submitted in a separate section of the response. PRCC is the final judge that
364 determines what is a clarification or exception.

365
366 The absence of exceptions, clarifications and/or substitutions shall indicate that the Vendor has accepted all the
367 requirements of the RFQ in the manner described and shall hold the Vendor responsible to perform in strict accordance
368 with the requirements of the RFQ. PRCC reserves the right to accept or reject any or all of the exceptions, clarifications
369 and/or substitutions, in whole or in part, if it is deemed to be in the best interest of PRCC.

370 **2.9 Delivery, Storage and Risk of Loss**

371 The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material deliveries.
372 PRCC personnel shall be excluded from performing any of these activities.

373
374 All claims necessary as a result of damage or loss during shipment shall be the responsibility of the contractor. The
375 contractor shall assume all risk of loss or damage to the equipment while it is at the vendor's storage or service facilities;
376 while it is shipped to the installation locations; and, until the completed system is accepted by PRCC.

377
378 All stored materials shall remain the responsibility of the successful contractor until accepted by PRCC. The PM or
379 contractor's designate shall be the only individuals authorized to accept materials delivered to PRCC. The contractor shall
380 present to PRCC's PM a receipt of items being delivered. PRCC's PM signature on the receipt shall constitute acceptance
381 of the materials.

382
383 Proposers shall list in their response the facilities where they plan to deliver the major system items prior to installation.

384
385 The contractor assumes full responsibility for the acts and omissions of all its employees and all sub-contractors, their
386 agents and employees, and all other persons performing any of the work under the contract.

387 **2.10 Detailed Equipment List by Site**

388 Proposals must contain detailed equipment list [model numbers, description, etc.] as required by the RFQ. The detailed
389 equipment list must be cross-referenced to the vendor's itemized pricing sheets required in the submittal.

390
391 Where applicable, detailed equipment lists must be provided by location and includes details of requirements needed for
392 the installation and operation of their equipment as deemed necessary.

393
394 Furthermore, upon completion of installation and a condition for acceptance, the vendor shall provide PRCC an updated
395 "as-built" equipment list by site showing location, quantities, model number and description, and serial numbers.

396 **2.11 Software Licensing**

397 Vendors responding to this RFQ shall provide detailed information on all software licensing, use or access to computer
398 programs that will be part of the vendor's offering. All costs, terms and conditions of use and access must be defined and
399 clearly indicated as part of the vendor's offering.

400

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

401 Vendors proposing software to support the network, either by leasing, renting, or selling, shall clearly define the
402 ownership or associated costs. Vendors are to provide definitions of software upgrades, enhancements and the costs,
403 terms, leasing arrangements, use, etc. must be clearly defined as part of the vendor's proposal.
404

405 **2.12 Surety Performance Bond**

406 The successful bidder shall supply PRCC with a Performance Bond and Labor and Material Payment Bond, each in the
407 amount of the contract price, guaranteeing one hundred percent (100%) performance of the contract, including the
408 guarantee period and free and clear of any and all liens, attachments and encumbrances. All bonds shall comply with the
409 requirements of Maine state law.
410

411 The surety bonds shall be security for the faithful performance of the contract and for the payment of all persons
412 performing labor and furnishing materials in connection with the contract.

413 No surety company will be acceptable as bondsman, unless said Surety Company has a permanent agent or
414 representative in the State of Maine with authority to countersign bonds for non-resident bonding companies.
415

416 Should the surety company acting as bondsman remove its permanent agent or representative from the State of Maine,
417 the contractor shall be required to furnish PRCC with a new surety bond conforming to the above described
418 requirements.

419 **2.13 Award and Contract**

420 There will be no award and contract resulting from this solicitation.
421

422 **2.14 RFQ/PROPOSAL FORMAT AND CONTENTS**

423 Proposals shall contain the following information in the format and order set forth below; and in two [2] volumes.
424

425 Volume-1 RFQ contents as outlined below
426

427 Volume-2 Equipment information, specification sheets and brochures
428

429 **Volume-1**

430 **COVER LETTER**

431 Respondents must include a cover letter transmitting the proposal to PRCC, signed by an official authorized to contract for
432 the firm. The letter must contain the name, title, address, telephone number and email of the firm's contact person for
433 the Proposal. The letter shall contain a statement that the respondent understands and agrees with the scope of work
434 and accepts all other requirements and terms and conditions of the RFQ.
435

436 Immediately following the cover letter shall include any forms required by PRCC.
437

438 Note that the original signature of the above listed documents is required in the response copy marked as 'ORIGINAL'.
439

440 **TABLE OF CONTENTS**

441 **SECTION 1 – SYSTEM OVERVIEW, REFERENCES, AND WARRANTY**

- 442
- 443 ▪ **System Overview** - Submit an executive summary of your proposed system and/or equipment provided, covering the main
444 features and benefits that distinguish it, in non-technical terms. Do not exceed three pages [3] or include any price
445 information.
446
 - 447 ▪ **Prime Proposer** - Introduction of the prime Proposers company including history, qualifications, experience, main line of
448 business, how business is organized (corporation, partnership, public, private, etc.). Do not exceed three pages [3].

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

- 449 ▪ **Sub-contractors** - Introduction of the Sub-contractors including history, qualifications, experience, main line of business, how
450 business is organized (corporation, partnership, public, private, etc.). Identify all Sub-contractors by listing name, address,
451 phone and contact person. State whether the prime Proposer has worked with the Sub-contractors in the past. If so, provide
452 brief descriptions on: the projects - no more than 3; the system elements; the Scope of each Sub-contractors responsibility;
453 the approximate start date and duration of the project. No greater than three pages [3].
- 454 ▪ **List of References** - For both Prime and Sub-contractors. Provide a list of three (3) references with radio systems having
455 similar requirements of this solicitation. The systems identified shall have been accepted no less than six (6) months and no
456 greater than two (2) years from the due date of this response. Include a brief description of the system, approximate date of
457 acceptance, contact name and telephone number.
- 458 ▪ **Warranty** - This sub-section shall also contain all the information requested in the 'WARRANTY' & 'PREVENTIVE
459 MAINTENANCE' sections of the procurement specification.

460 **SECTION 2 – COMPLIANCE SECTION**

- 461
- 462 ▪ If there are any exceptions, clarification, or other notes of concern, please *list in detail all exceptions* and related discussion to
463 the specification. In addition, discussion regarding any clarification points shall also be provided in this section. Use as many
464 pages as necessary to describe each exception or clarification. Please provide clear references to the Specification document
465 where needed.
- 466 ▪ Note that PRCC will have final interpretation of what is a clarification or an exception. In no instance shall the Proposer
467 deemed an exception as a clarification.
- 468 ▪ Please identify the anticipated responsibilities of PRCC in this section.
- 469 ▪ Any item of clarification or exception that is not included in this section will be deemed to have been accepted and agreed to
470 by the Proposer.
- 471 ▪ For clarifications or substitutions, provide an explanation of the difference between what the specification requested and
472 what the Proposer will supply. Proposer shall explain why they believe their method of accomplishing the requested
473 functionality will be equal or better.
- 474 ▪ It is the Proposer's choice to submit a point X point response to the specifications.

475 **SECTION 3 – STATEMENT OF WORK**

- 476
- 477 ▪ Describe the work to be performed in detail by the prime Proposer by identifying all major project tasks and milestones.
- 478 ▪ Describe the work to be performed by each Sub-contractor by identifying all major project tasks and milestones. Group all
479 project tasks by their associated sub-contractors.
- 480 ▪ Provide a proposed project organizational chart.
- 481 ▪ Provide a Project Schedule

482 **SECTION 4 - TECHNICAL SYSTEM INFORMATION**

- 483
- 484 ▪ Description of the system or equipment being offered.
- 485 ▪ Description of specification items requesting a detailed response
- 486 ▪ Include block system diagrams, network configuration, equipment interfaces, plan views and diagrams that clearly depict the
487 proposed system, its equipment, and components. These diagrams shall be provided on a per site basis.
- 488 ▪ Other diagrams as required.
- 489 ▪ Include a detailed itemized list and quantities, in matrix form, of all equipment supplied and their intended installed location.
490 Matrix should have equipment items on the vertical scale [rows], and site locations on the horizontal scale [columns]. Do not
491 include costs.

492 **SECTION 5 – COVERAGE RESPONSE**

- 493 ▪ This section shall contain all detailed discussion regarding signal propagation and shall include coverage maps required, and
494 other items as specified in this document.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

495 **SECTION 6 - PRICING**

496
497

- Cost shall be submitted on the Summary Pricing Sheet found in the Attachment.

498
499

- Detailed cost sheets shall be in matrix form to the greatest extent possible. Intended locations of items shall appear as columns on the matrix.

500
501

- The costs shall cover all the items to be supplied by the successful contractor. Costs shall be shown on a per unit and extended basis.

502
503

- Identify all cost sheet items as line items, at a minimum and in the following order: item number, manufacturer, model number, descriptor, quantity and intended location, total quantity, unit cost and extended cost.

504
505

- Cost for major services such as installation, licensing, systems engineering, program management, coverage testing, training, etc., shall be clearly identified as separate line items. Costs for these services shall not be lumped.

506

- List all sub-items associated with each major item.

507

- Any costs for optional items or offerings shall be presented on a separate cost sheet.

508 **Volume-2**

509

510 **SECTION 1 – Specification Sheets**

511

- Include equipment catalog, cut sheets, brochures or specification sheets in this section.

512 **SECTION 2 – Appendices**

513
514

- Appendices are optional. This section is for Proposers who wish to submit additional material that they believe will clarify or enhance their Proposal. Cross-references in the main RFP to the appendices are required.

515 Respondents may provide alternative proposals as long as they are in addition to the RFQ requirements and clearly
516 indicate that it is an alternative.

517

518 Vendors shall submit their cost proposals based upon their best offer price at the time of the initial RFQ submission,
519 including any special discounts. The equipment proposed by the Vendors shall be a complete turnkey system, with firm
520 pricing for all equipment and services described by the specifications. PRCC shall not pay for any additions, omissions, or
521 errors in the cost proposals.

522

523 Final pricing submitted must be valid for twelve [12] months from the date of system final acceptance. A fixed price for all
524 individual equipment and installation provided under this specification shall be held for an additional twelve [12] months
525 to allow for procurement and installation of additional equipment as required.

526

527 Prices are not subject to increase during the term of the contract. PRCC is not liable for escalation resulting from project
528 delays caused by the Vendor. All pricing shall be FOB destination.

529

530 A detailed cost spreadsheet itemizing pricing of all equipment, sub-assemblies, and labor services per site shall be
531 provided to allow deletion or addition of items following budgetary constraints or changes in plans concerning the
532 distribution of equipment. All material and installation costs shall be itemized.

533

534 Upon execution of the contract, the Vendor shall submit a Schedule of Values identifying labor and material costs.

535

536 PRCC is exempt from payment of excise, transportation and sales taxes imposed by the Federal Government and the State
537 of Maine. Such taxes must not be included in proposal prices. Exemption certificates will be provided upon request.

538

539 Respondents should know that PRCC will not make any advance payments under this Agreement. PRCC will only make
540 payments upon completion of the tasks receipt of deliverables.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

541 **3 RADIO INFRASTRUCTURE REQUIREMENTS**

542 This section addresses the technical requirements of the radio portion of the project. The Proposer shall provide the most
543 cost-effective solution to PRCC for the upgrade of the VHF RF network.

544
545 Proposed equipment specifications should comply with the stated requirements. However, if there is any disparity, the
546 Proposer shall explain how the equipment satisfies the intent of the particular requirement and how the end objective
547 will be met. In all cases, PRCC reserves the right to enforce the stated requirements. In addition, the Proposer may be
548 required to demonstrate compliance with any requirement.

549
550 Proposers are required to provide in their proposal system diagrams based on equipment provided as well as their
551 interconnections.

552 **3.1 System Upgrade Overview**

553 PRCC seeks to implement new radio systems for regional Law Enforcement, EMS, Fire Services, and Emergency Services
554 communications.

555
556 A key requirement of the proposed system Infrastructure radio equipment is the infrastructure shall be capable of mixed
557 mode Analog and DMR Tier-II digital standard operation, particularly with respect to the capability of supporting user
558 equipment from a variety of vendors/manufacturers. DMR operation shall include simulcast and voting operations.
559 It is the intent that the system be deployed in both the analog mode with DMR transition in the future, as the current
560 subscriber base is exclusively analog.

561
562 PRCC has no current channel plan at this time regarding DMR migration.

563
564 The Proposer shall identify and discuss additional requirements, equipment, or software that may be required when
565 migrating to DMR operation in the future.

566
567 The Proposer shall list all items that are considered to be proprietary or confidential in nature.

568
569 Equipment locations are listed in the matrix in section 5.2. The upgraded system will provide improved radio coverage
570 throughout the region. It is the desire of PRCC to incorporate, at a minimum, into the new radio system the functionality
571 of the existing systems. It is not PRCC's intent, by accepting a new technology, to find itself in a position where any
572 existing functionality is lost.

573
574 Further, PRCC does not find it desirable to have to maintain multiple systems and infrastructures. The Vendor will be
575 expected to provide cost-effective solutions to this problem without sacrificing any existing system and console
576 functionality. The new system will be installed while the current systems are still in place and operating. This provides the
577 ability for both the current and the new systems to work together during the implementation phase.

578
579 The existing system infrastructure shall continue to interface and be operational from the dispatch center. A training
580 period will follow the installation period, where the dispatchers and radio users are to become familiar with the new
581 systems operations prior to system cut-over.

582
583 The system is intended to support PRCC's radio communications needs for at least the next 15 years. If other alternatives
584 exist, Vendors are encouraged to present them as proposed solutions.

585
586
587
588

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

589 **3.2 Proposed Transmitter Sites**

590 This section describes the sites selected for the simulcast systems.

591 **Site Information Matrix**

592

SITE	TOWER HEIGHT [ft]	TYPE	LATITUDE	LONGITUDE
9-1-1 / PRCC	120	Guyed	44 48 07.3	68 46 20.1
Blackcat	140	Guyed	44 45 29.3	68 33 56.1
Charleston	110	Guyed	45 05 37.2	69 05 07.1
Dexter	140	Guyed	45 02 40.0	69 15 01.0
Dixmont	180	Self-Support	44 42 13.3	69 04 45.2
Lincoln	50	Guyed	45 20 42.2	68 30 30.1
Medway	120	Guyed	45 34 26.1	68 31 11.5
Millinocket	160	Guyed	45 38 52	68 45 06.0
Patten	60	Guyed	45 58 55.2	68 28 13.1
Springfield	160	Guyed	45 20 37.0	68 05 42.0

593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613

614 **3.3 Structural Analysis**

615 Eight of the nine towers comprising PRCC radio system are owned by third party entities. It is anticipated that most of
616 these towers may be overloaded. PRCC will work with the site owners with regard to structural analysis and who is
617 responsible to perform structural analysis, as well as who upgrades the tower should the analysis fail.

618
619 The Proposer, as an option, shall provide a cost estimate in their proposal pricing sheet to perform a tower inventory and
620 structural analysis.

621
622 The contractor shall take no actions on tower installations without prior approval from PRCC.

623 **3.4 RF Simulcast and Voting System**

624 The VHF repeaters, simulcast, and voting equipment shall be public safety grade equipment to support mission critical
625 applications.

626
627 To provide the required radio coverage, the communications system shall be configured with the appropriate transmitter
628 sites that shall operate as transmitter IP simulcast. The proposer shall provide highly specialized equipment to control
629 transmitter frequency and audio synchronization throughout the system.

630
631 **3.5 Communications Dispatch Console**

632 PRCC currently utilizes a Motorola MCC7100 communications dispatch console. All equipment to be provided under this
633 specification shall interface with this equipment. This includes voting system status to indicate voted and failed receivers;
634 and a receiver disable and/or select function.

635

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

636 **3.6 IP Simulcast Repeater/Transmitter**

637 Each repeater station shall be of modular construction, and designed and constructed as a compact, highly reliable unit.

638
639 All repeater station equipment necessary for remote control operation shall be in a 19-inch rack-mounted unit.

640
641 All repeaters shall be dual [mix] mode analog and DMR Tier II digital.

642
643 The simulcast transmitter shall be capable of interfacing with an external high-stability frequency reference source. When
644 simulcasting, the frequency difference between multiple co-channel transmitters shall not exceed 1-Hz.

645 All necessary interfaces with repeaters, peripheral computer hardware or the radio interconnect system shall be provided
646 by the Vendor. Interfaces shall include cabling and modems, all of which shall be identified by the Vendor's functional
647 diagrams of the system.

648
649 The equipment shall capable of remote monitoring of its status and shall provide alarms for key operational parameters,
650 and shall provide for remote inquiry, display, disablement and diagnostic functions via LAN connections. Alarms shall be
651 displayed at the PSAP.

652
653 Each station shall be equipped with a RF sensor to remotely monitor forward and reflected power of each transmitter.
654 This sensor shall be installed in series with the station transmit output.

655
656 Service personnel shall have access to the radio for metering, alignment, programming and diagnostics by remote access
657 through a network connection via the proposed network management and alarm systems or microwave network.

658 Proposers shall describe their capability to monitor and control a repeater through an access port via a laptop PC. This
659 function is not mandatory but desirable.

660 **3.7 Voting Receiver**

661 The repeater receiver shall generate the appropriate voting signaling protocol typically a 2175/1950 Hz status tone.

662 **3.8 Voter-Comparator System**

663 The receiver voting equipment is to be configured as part of the radio communications systems. Interconnection
664 requirements shall be made via links identified elsewhere. The VHF simulcast radio channels shall be supplied with a
665 complete and independently functioning receiver voting system. It shall serve as the terminating and comparison point of
666 the multiple audio circuits connecting the receivers used in the system.

667
668 The voting equipment shall be located at PRCC.

669
670 The receiver voting system shall be designed and interconnected so that the highest quality audio signal being received is
671 constantly being selected, and the weak and noisy signals by comparison are automatically rejected. The process shall be
672 continuous and selective and provide for automatic switchover without interruption of speech to the best quality audio
673 signals during a transmission, as changes of condition or location occur.

674
675 The voting comparator shall monitor the integrity of the incoming receive audio circuits and disable any circuit upon
676 failure. Circuit failures shall be reported via the network monitoring system to be provided.

677 **3.9 VHF Duplexer, TX Combiner, and RX Multicoupler**

678 The Proposer shall provide duplexers for sites with up to two repeaters. Sites greater than two repeaters shall employ a
679 transmitter combiner and receiver multicoupler.

680 **Duplexer**

681 Where applicable, repeater stations shall be furnished with a duplexer to permit simultaneous transmission and reception
682 from a common antenna system. Duplex operation shall cause no worse than a 1-dB degradation in the receiver 12 dB
683 SINAD threshold sensitivity exclusive of duplexer insertion loss.
684

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

685 The transmitter output shall be followed, at a minimum, by a single stage isolator. The isolator load shall be rated for the
686 full output power of the transmitter. The duplexer shall be rack mounted in the EIA 19-inch rack specified for the repeater
687 station meeting the following minimum requirements:

688
689 To the extent that the repeater station requires less per channel duplexer isolation for the required duplex performance
690 at the actual operating frequencies, the Proposer may propose an alternative duplexer design. However, any alternative
691 design must be of the same or similar quality of construction and the electrical performance of the system must be
692 justified.

693 **Combiners**

694 Combiners shall be compatible with the frequencies in use and provide for filtering and isolation so as not to impact the
695 system operation. The Vendor shall state the manufacturer and model number of the transmitter combiner at each site.
696 This equipment shall be installed in an open rack.

697
698
699 The Vendor shall propose for all main radio sites a receiver multi-coupler. The multi-coupler shall be compatible with the
700 frequencies in use and provide filtering and isolation so as not to impact system operation. The Vendor shall state the
701 manufacturer and model number of the receiver multi-coupler system being proposed at each site. This equipment shall
702 be installed in an open rack.

703 **3.10 Antenna and Feeder System**

704 **Antennas**

705 The antenna system shall include compatible antenna, circulator, isolator and filter to reduce the potential for
706 intermodulation or receiver desensitization, and to provide the required coverage within the restraints of the FCC ERP
707 authorizations.

708
709 The antenna systems shall be furnished and installed with all necessary lightning and power surge protection devices to
710 be compatible with the R-56 Standards and Guidelines for Communications Sites as appropriate for use with existing
711 towers and equipment shelters.

712
713 Proposers shall state in their response to this RFQ, the manufacturer, model number, mounting height/azimuth, electrical
714 and mechanical characteristics of the antenna systems being proposed at each site, including sidearm brackets.

715 **Transmission Line & Accessories**

716 The Vendor shall furnish and install coaxial antenna transmission lines from the LDF series of transmission cable. Vendors
717 shall state the size and type of transmission line being proposed at each site. RF sensors to indicate VSWR and power level
718 shall be furnished and installed for each transmission line provided and monitored by the alarm system.

719
720 All connectors used shall be "DIN" type, as appropriate, and must be fully compatible with directly associated equipment
721 or jumpers in the system. Connectors must be of non-ferrous construction. No splices or adapters shall be used under any
722 circumstance. However, it is permissible to utilize different connectors on opposite ends of a cable to avoid the use of
723 adapters. When transforming from one diameter cable to another, it is acceptable to use flange reducers, so long as the
724 cable VSWR is not affected.

725 **3.11 Transmitter Simulcast**

726 The following specification element describes the simulcast sub-system.

727 **3.11.1 Precision Frequency Source**

728 A precision frequency source shall be provided at each simulcast site to stabilize frequency synthesizers in the
729 transmitter stations and to provide critical synchronization of simulcast transmission equipment.

730
731 The primary precision frequency source shall be an "off-the-air" GPS frequency locked stable source. Automated
732 timing system shall allow for initial simulcast launch settings for each transmitter site. The system shall

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

734 automatically readjust timing to maintain proper simulcast timing in the event a transport path reroutes and
735 changes the transport delay.

736
737 OPTION: A secondary high stability oscillator frequency stable source shall be quoted. The redundant frequency
738 source shall be capable of maintaining the proper frequency stability and synchronization of the system upon
739 failure/loss of the primary GPS reference signal.

740
741 The Proposer shall describe in detail the operation of the proposed frequency source and its redundancy
742 capabilities and justify the technical suitability of the source to meet simulcast system requirements during
743 normal, abnormal, or loss of GPS reference signal.

744 ***3.11.2 Amplitude and Phase Delay Equalization Equipment***

745 Analog audio amplitudes of each transmitter shall be within 0.25 dB of each other. Digital audio shall be less
746 than 0.1 kHz deviation.

747
748 Amplitude and phase delay equalization equipment shall be provided to minimize simulcast overlap distortion.
749 Equipment shall be provided for each transmit channel, and shall have sufficient adjustment range to provide
750 "over" and "under" adjustment of at least ten percent of the range. The equipment may be an integral part of IP
751 circuit equipment, or separate stand-alone equipment mounted in equipment racks. The equipment must be
752 installed in a way that affords ready access for servicing and adjustment. Amplitude and phase delay equalization
753 for all remote RF sites shall be capable of adjustment from one central location (prime site) without manual
754 intervention at the remote sites, or capable of automatic self-adjustment if feasible.

755 ***3.11.3 Audio Distribution Equipment***

756 Audio distribution equipment shall be provided as necessary to allow for proper distribution of audio signals to
757 and from the multiple simulcast sites. The equipment shall be rack mounted in a way that affords ready access
758 for servicing and adjustment.

759 ***3.12 DC Power System***

760 All equipment will operate at -48vdc for primary power.

761
762 Each electronic equipment shall have a dedicated circuit power/breaker distribution panel with surge protection.

763
764 The system shall include inverters, batteries, battery mounting or racking facilities, float-type battery chargers, low
765 voltage disconnect, and DC load center with:

- 766 ▪ Rectifier Modules (N+1)
- 767 ▪ Monitoring and Control Unit
- 768 ▪ Power Distribution Unit
- 769 ▪ Battery Modules
- 770 ▪ Equipment Racks

771 The DC power system shall be sized for the proposed equipment with a 10% reserve capacity for future equipment.

772 Modular stationary batteries shall be the sealed maintenance-free type with sufficient ampere-hour capacity to provide a
773 minimum four [4] hour operating period for the Vendor-furnished equipment following the loss of primary station power.
774 This shall be based on a 25% transmit duty cycle for the fire and police systems operating simultaneously.

775
776 The ampere-hour rating of the batteries shall be based on an eight-hour discharge rate. Battery life expectancy shall be at
777 least 10 years in normal float-type service. No venting facilities or special battery rooms shall be required for normal
778 operating conditions. Secure mounting facilities shall be incorporated in the design of the battery bank including
779 protection from ruptured battery cells. The battery connections shall be protected from falling metal objects. Battery
780 chargers shall provide sufficient current output to supply station load requirements and simultaneous charging of a
781 discharged battery bank to full capacity in 48 hours.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

782 Battery chargers shall be capable of battery eliminator operation. The chargers' rectifier modules shall be provided on a
783 redundant N+1 basis. The charger shall operate in ambient temperatures of 0 C to +50 C without degradation in
784 performance. The battery chargers shall be rack-mounted in an EIA 19-inch rack. The battery chargers shall be provided
785 with an AC circuit breaker, DC circuit breaker, minimum two-percent accuracy DC voltmeter and DC amp meter, current
786 limiting and high voltage shutdown circuitry, continuous float and equalizing voltage adjustment, and 24-hour equalizing
787 timer. These features may be integral to the chargers or provided in separate rack mount assemblies.

788 The charger shall have the following minimum alarm points:

- 789 ▪ Battery charger low voltage
- 790 ▪ Battery charger high voltage
- 791 ▪ Battery charger no charge

792 A rack-mounted DC load center with breakers shall be provided with the battery power system to provide a protected DC
793 distribution to all -48 volt DC-powered equipment. Additionally, the Vendor shall furnish and install a minimum of two (2)
794 spare DC circuit breakers of the same type supplied on the panel for future use. To protect the battery supply, an
795 automatic low-voltage disconnect shall be provided to remove the load from the battery bank at the point when the
796 battery voltage reaches a preset dropout voltage level. All DC power equipment shall be included in one rack.

797 **3.13 Site Camera Surveillance System [OPTION]**

798 This feature shall be priced as an option on the pricing sheet.

799

800 PRCC requires the provision and installation of a transmitter site surveillance system. It is intended that this system be a
801 stand-alone that includes IP video cameras, video encoder/decoder, monitors, intrusion detection, as well as digital video
802 recording. The system shall be capable of up to 24 cameras.

803

804 The Proposer shall have a clear and concise understanding of PRCC video monitoring requirements that includes remote
805 site connectivity, recording and storage.

806

807 The site surveillance system shall accommodate control of the camera network and recording. The system shall have
808 motion-sensing capability to detect motion in preset viewing zones. When a programmed area motion is detected, an
809 alarm [e.g., soft tone] is sent to the Supervisor position at PRCC, with an image of the detected area displayed on a high-
810 resolution monitor. Video recording shall commence at this time. The operator shall be able to view live or recorded video
811 on appropriate storage unit. Storage capability for each camera shall be for seven [7] days.

812

813 If a camera lens is zoomed by the control operator, the camera shall revert back to a preset condition automatically after
814 a programmed length of time.

815

816 Transport to PRCC will be via IP/Ethernet utilizing the proposed microwave radio system provided under this specification.
817 Camera data rates shall not exceed 650 kbps at 30-fps.

818

819 The system shall be capable of minimizing false positive alarms [detection of birds, leaves, wind debris, etc.].

820

821 Cameras shall be installed at each location at approximately the 50-ft level of the tower. Outdoor equipment shall consist
822 of a weatherproof, domed pan/tilt/zoom [PTZ]. The dome must have a rugged and protected bubble with appropriate
823 mounting hardware. Positioning of cameras on the tower shall consider potential ground obstructions, and capture
824 critical areas of the communications compound perimeter. Sunlight or night glair shall be minimized.

825

826 PTZ shall be 360° pan and -5, -90 tilt, and capable of preset positions.

827

828 A second camera shall be installed inside the shelter.

829

830 Tower mounting equipment shall include hardware to install the camera on a tower leg. Each camera shall also have a
831 hood or ice shield to protect it from falling ice.

832

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

833 The system shall also have a tower mounted instant-on flood lamp placed to maximize camera-viewing area.

834

835 All outside conductors shall be routed in watertight secured conduit and be appropriately grounded per R56.

836

837 It is desired that the camera equipment be powered via the site -48 volt system.

838 **3.14 FCC License Information**

839 There is no licensing requirement the VHF radio system. Licenses applicable to this project include:

840

CHANNEL	CALL SIGN	TX MHz	RX MHz
TAC	WNHI300 / WQQQ531	155.4900	158.7300
COMM-2	WQGR400 / WQQQ531 / WQGG953	153.4000	158.7500
COMM-3	WPPH420	151.4075	156.2325

841

842

843

844

845

846

847

848 The contractor is responsible to ensure that license technical requirements are met in their system design.

849 **3.15 Physical and Functional Interface Requirements**

850 The contractor is responsible for the physical interface [connectors, terminal strips, punchblocks, etc.] for network, audio
851 and control between the new equipment, proposed simulcast repeaters, and the communications console.

852

853 The successful contractor shall be responsible for the functional interface between the equipment and the proposed
854 simulcast repeaters. It is the contractor's responsibility to confirm interface compatibility between equipment types.

855

856 The functional interface is expected to include, at a minimum, the following:

857

- 857 ■ Provisioning of Radio and Microwave radio equipment
- 858 ■ Provisioning of IP/Ethernet/LAN equipment
- 859 ■ Adjustments of the input signal level to/from the voting/audio distribution network
- 860 ■ Adjustments of the output signal level from the repeater/base stations
- 861 ■ Precise modulation level adjustment for simulcast
- 862 ■ Adjustments of the input/output levels and to /from the console
- 863 ■ Adjustment of simulcast audio launch delays/timing

864 **3.16 Electromagnetic Interference**

865 Shielding and filtering shall be provided to prevent interference from, or to, other radio frequency equipment installed
866 near or in the vicinity of the proposed equipment. The equipment shall meet or exceed spurious frequency emissions,
867 conducted or radiated, as outlined in Part 15 of the FCC Rules and Regulations, Subpart J, Class B Computing Devices.
868 Equipment shall be operationally compatible with the following types of equipment located at the site:

869

870

871

872

- 869 ■ IP/Ethernet equipment
- 870 ■ Ethernet switches & routers
- 871 ■ VHF Base Transmitters & Receivers
- 872 ■ DC Power System

873 **3.17 System Coverage Performance Requirements**

874 Coverage is defined as providing the minimum design signal level while delivering the specified audio quality.

875

876 The hand-held portable radio configuration for coverage design is a portable worn at the hip, with a swivel case and the
877 use of a standard lapel speaker/microphone.

878

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

879 The coverage design and performance testing shall comply, at a minimum, with the current version of TIA/EIA-TSB-88.

880

881 Minimum Received Signal Level (MRSL) is defined as the minimum signal level required at the receiver input port to meet
882 the coverage requirements (DAQ 3.0) within the service area.

883

884 The defined service area is the Penobscot County political boundaries.

885

886 The coverage requirements for the system are:

887 ▪ 95% reliability for mobile talkout/talkback throughout the defined service area

888

889 ▪ 95% reliability for portable in-street talkout/talkback coverage throughout the defined service area

890

891 ▪ 95% reliability for portable in residential buildings talkout/talkback coverage throughout defined service area

892

3.17.1 RF Coverage Method

893

The Proposer shall provide radio system coverage predictions in its response to this specification with a radio wave propagation model that has been developed from theoretical and empirical data, and shall consider terrain irregularity, foliage, urban clutter, building penetration losses, noise, and long and short-term signal variations.

894

895 The Proposer is required to design the antenna system to provide the required coverage and maintain the FCC filing parameters. The Proposer shall describe their approach to meeting this requirement as defined in TSB-88A.

896

897 The Proposer shall provide the parameters used such as, but not limited to, propagation model used, simulcast parameters, effective radiated power, antenna model, antenna gain, antenna height, directional/downtilt, system gains, system losses, portable antenna losses at belt and receive level assumptions. Proposers are required to provide a detailed explanation of their calculations relative to TSB-88.

898

899 PRCC reserves the right to have the Proposer revise coverage predictions as required. Measurement and verification methodology shall be provided by the Proposer to ensure compliance.

900

3.17.2 RF Coverage Prediction Submittals

901

902 **Parameters Table:** Proposer shall provide a complete listing in its response to this specification of all site, component, and system parameters used to calculate and generate the predicted RF coverage. Proposer shall also state the RF coverage prediction model(s) utilized. If multiple models are used to generate a composite prediction, then a detailed explanation shall also be included. Proposer shall utilize 30-meter resolution digitized terrain database used for the predictions. The Proposer shall supply the parameters used to predict coverage in the format of the FCC Form 601 for each site/frequency.

903

904 **Prediction Maps:** Proposer shall provide in its response to this specification prediction maps indicating a signal reliability of 95% coverage. Prediction maps shall indicate RF site locations, and areas of non-coverage.

905

906 Coverage maps shall be provided for:

907

908 Map-1 Mobile coverage for fire and police using a 40 W ERP mobile with a unity gain antenna

909

910 Map-2 Portable coverage in-street for fire and police

911

912 Map-3 Portable coverage inside residential buildings for fire and police

913

914 Map-4 Alert and voice paging coverage in-street for fire

915

916 Map-5 Alert and voice paging coverage inside residential buildings for fire

917

918 The Proposer shall include interstate, state, local roads as well as lakes and rivers. In addition, the RF coverage prediction maps shall be developed using a topographic base map scale for optimum information on an 8.5" x 11" page.

919

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

926 **4 IP MICROWAVE NETWORK**

927 This section defines the requirements for IP backhaul microwave links and connections between designated antenna sites
928 and the communications center.

929
930 The microwave network routing design and frequency band selection is to be determined by the Proposer. Nevertheless,
931 PRCC desires a ring configuration. If the ring configuration requires excessive relay sites, PRCC will accept the inclusion of
932 hot-standby spurs or cascaded hops.

933
934 The Proposer shall select the appropriate frequency band [960 MHz; 6/11/23 GHz] to provide reliable microwave service
935 outlined in this specification.

936
937 Proposed bandwidth is 100 Mbps minimum.

938
939 The microwave system design, routing, and frequency band selected for the replacement of the existing northern and
940 southern microwave routes must be a cost effective solution for PRCC. Furthermore, the microwave antenna design
941 should be taken into consideration to minimize tower-loading conditions, where applicable.

942
943 Moreover, PRCC desires to replace the existing UHF control links used to control the northern county radio sites with
944 microwave radio. The Proposer shall identify routing and equipment to accomplish this goal. If intermediate relay sites
945 are needed, the Proposer shall identify these locations and obtain site owner's written documentation and willingness to
946 sign an agreement with PRCC. The letter shall provide a cost range for site lease.

947
948 Compatibility with Simulcast. Microwave radios, gateways, multiplexers, switches and routers provided shall reliably
949 maintain the relative simulcast delays at each site under normal conditions.

950 **4.1 General Requirements**

951 The equipment shall be designed and manufactured for continuous duty operation in a fixed station application, be of all
952 solid state design, and have an expected operational service life of at least 15 years with proper maintenance and service.

953
954 The microwave radios shall utilize modulation schemes necessary to maintain overall system performance and reliability.
955 The equipment shall be an all-outdoor configuration. The antenna and radio shall one unit and connected to the network
956 by a CAT-6 outdoor cable.

957
958 The contractor shall furnish and install all pipe mountings, as required, for support of the microwave antenna/radiohead.

959
960 Microwave antennas shall be selected by the Proposer to meet the system reliability requirements defined within this
961 specification. All antennas shall be single polarized, low VSWR, standard type antennas, unless path designs dictate
962 otherwise.

963
964 All microwave antennas, including standard, high performance, and maximum or ultra-high performance types, shall be
965 provided with protective radomes. Radomes shall be colored to minimize visual impact of the antenna system installation.

966 **4.2 Microwave System Performance Requirements**

967 The contractor shall provide PRCC with link verifications based on line of sight projections taking into consideration the
968 terrain and obstructions detailing their effect on Fresnel interference as part of the proposal submission.

969
970 **Path Outage:** All paths in the system shall be designed for a minimum two-way path reliability of 99.999% EFS [error free
971 seconds].

972
973 **Path Quality:** All paths in the system, including spurs and rings, shall have a required unfaded RBER (residual bit error
974 rate) of <10⁻¹¹.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

975 **4.3 Path Survey Requirements**

976 Physical path surveys shall be performed upon contract execution. The contractor shall be responsible to provide all
977 personnel, maps, proper instrumentation and any other equipment or material necessary to perform the physical path
978 surveys.

979
980 The contractor shall be required to provide a report of the physical path surveys on every path. These submittals shall
981 provide, as a minimum, the following information and material:

- 982
- 983 ▪ Verified site geodetic coordinates
- 984 ▪ Verified site ground elevations
- 985 ▪ Microwave system schematic drawings
- 986 ▪ Sites plotted on maps
- 987 ▪ Obstruction heights along microwave paths
- 988 ▪ Path profile characteristics, path clearances at critical points along the path, potential reflection points
989 and natural/manmade shielding along the paths shall be identified /noted and discussed in detail

990 The Proposer shall provide in their proposal response the following microwave information and data:

- 991 ▪ Path design calculations showing path reliability and fade margins
- 992 ▪ Path profiles with trees/obstructions
- 993 ▪ Dish sizes, types, sizes, and tower loading requirements for each site
- 994 ▪ Equipment rack profiles and floor space requirements for each site

995 **4.4 Technical Requirements**

996 To the extent possible, the Proposer shall design the microwave system in a Ring configuration. If a ring cannot be
997 established, then all hops outside the ring shall be hot-standby operation.

998
999 The unit shall be suitable for mounting on antenna tower structures, water tanks or building rooftop.
1000 The unit shall be comprised of either a self-contained integral antenna or a separate antenna meeting the following
1001 specifications.

- 1002 – Path reliability specifications
- 1003 – Operating Temperatures: -35°C to 60°C / -31°F to 140°F Humidity 95% non-condensing.
- 1004 – Shock and Vibration Standard: EN 300 019-2-4 IEC 60068-2 Class 4M5

1005 Microwave Radio Technical Requirements

- 1006 – Frequency Band: 960 MHz / 6 / 11 / 23 GHz FCC Licensed bands
- 1007 – Radio transmission must comply with FCC-47CFR Part 101
- 1008 – Modulation: OFDM (BPSK)/QPSK/16QAM/64QAM/128QAM
- 1009 – Channel Bandwidth: As required for proposed radio load
- 1010 – Max Tx Power: to meet FCC rules and provide the required availability specification
- 1011 – Sensitivity: to meet FCC rules and provide the required availability specification
- 1012 – Capacity: 100 Mbps Ethernet - Minimum

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1013 **4.5 Network Management**

1014 Proposers shall provide capability to monitor and control a system access port of selected contiguously linked radios via a
1015 laptop PC. The user shall have access to the far end radio as well as each of the radios in the selected chain. This feature
1016 shall be totally independent of other network management and alarm systems.

1017 Proposers shall describe their offering and provide detailed information on remote monitoring functions, remote control
1018 functions software, laptop/desktop PC requirements, and method/medium of accessing this information.

1019 Proposers shall describe the local and remote programming parameters and options are performed. A description of this
1020 feature and the details associated with its operational use shall be included as part of the Proposer's response. The
1021 description shall contain a list of programmable items, software options, computer access requirements, and manner of
1022 access to the microwave radios.

1023 **4.6 IP/Ethernet Switches and Routers**

1024 The Proposer shall provide LAN switches and routers as deemed necessary. Units shall be capable of both AC and DC
1025 power. Equipment shall provide all end user feature set and end user licenses to support specified products.

1026 **4.7 Microwave Licensing**

1027 The contractor will be responsible for all FCC licensing and frequency coordination activities.

1028

1029 Frequency availability shall be determined by the contractor as part of any plan for new microwave links. The contractor
1030 shall be responsible for preparing any coordination and licensing documentation for PRCC signature.

1031 **5 IP PERFORMANCE CONSIDERATIONS**

1032 This Section provides information regarding IP connectivity to all sites including the dispatch center.

1033

1034 The proposed transmitter simulcast radio system design as specified elsewhere in this specification shall utilize IP
1035 gateways. The contractor is required to provide connectivity to these devices as well as LAN switches and routers to be
1036 interfaced with the microwave system.

1037

1038 **Latency:** The IP performance for round-trip delay of packets across paths between redundant sub-site link pairs shall be
1039 measured and recorded; [Latency or IP Packet Transfer Delay is defined pursuant to RFC 2681].

1040

1041 Latency link budgets for IP voting and IP transmitter simulcast shall be designed to be fully functional for less than 10-ms
1042 to the remote RF sites.

1043

1044 **Jitter:** In an IP network system, the jitter shall be based upon 99th percentile (Y.1541), end-to-end jitter specifications
1045 shall be measured and recorded during peak activity daytime periods for the five longest anticipated routes and shall be
1046 demonstrated to be below the contractor's maximum jitter guarantee.

1047

1048 Jitter for IP voting and IP transmitter simulcast shall be designed to be fully functional for less than 10-ms.

1049

1050 **Packet Loss:** Packet loss can result from exceeding jitter budgets or actual packet loss in the network as "Type-P-One-
1051 Way-Packet-Loss" as defined pursuant to RFC 2680. Any packet loss will have an immediately effect on audio; end-to-end
1052 packet loss shall be tested and documented.

1053

1054 Packet Loss for IP voting and IP transmitter simulcast shall be designed to be fully functional for less than .01% packet loss

1055

1056 **Packet Reordering.** Packet reordering manifests itself as lost packets. The contractor shall design and implement the IP
1057 communications network to ensure that access times and audio quality will be acceptable.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1058 **6 EQUIPMENT STATUS MONITORING SYSTEM**

1059 The system shall provide the capability of automatically monitoring in real-time the status of key infrastructure
1060 components, and provide an alarm and visual display of operational parameters and/or failures.

1061

1062 The monitoring system shall provide a complete alert call management system for all remote sites. When an alarm occurs,
1063 the monitoring system will send an alert message to a workstation monitor at the communications center with audible
1064 alarm conditions. Moreover, it is also desirable to send either a SMS text message or email the alarm conditions to
1065 selected individuals.

1066

1067 The Vendor shall identify and discuss in their proposal a cost effective solution of proposed equipment and software
1068 resources needed to accomplish this function, as well as functionality it can provide, or not provide.

1069

1070 The desirable features for the status monitoring system includes:

1071 Reports indicating the equipment that generated the alarm, time stamp, when it occurred and how long before the alarm
1072 was cleared.

1073 Real time status of all equipment by indicating either in the active or alarm state, including:

- 1074 ▪ Transmitter power output monitoring/VSWR
- 1075 ▪ Voting comparator/voter
- 1076 ▪ Microwave hop failure
- 1077 ▪ LAN switches, routers failures
- 1078 ▪ Site alarms, such as site environmental sensors, door open, temperature, etc.
- 1079 ▪ Primary power and generator status

1080 **7 COMMUNICATIONS DISPATCH CONSOLE REQUIREMENTS**

1081 PRCC currently utilizes a recently installed MCC-7100 Communications Dispatch Console as manufactured by Motorola.
1082 All equipment and components provided for this system shall be compatible with this equipment.

1083

1084 The interface to the existing equipment shall be implemented to support both old and new systems in parallel for dual
1085 operation during transition from the legacy system to the new system. Actual cut-over plan to be discussed at DDR.

1086 **7.1 Receiver Voting**

1087 The following voting functions shall be accessible from each console operator position:

- 1088 1. Force vote a receiver; momentary or timed period
- 1089 2. Enable and Disable a receiver
- 1090 3. Indicate a disabled receiver
- 1091 4. Voted display that shows the operator which receivers are receiving
- 1092 5. Indicate a failed receiver
- 1093 6. Indicate receive status of a receiver with signal quality display

1094 **8 SITE FACILITIES**

1095 PRCC plans to continue utilizing the existing antenna sites for the proposed system. These sites are leased from a third
1096 party with PRCC having no control over site management. The majority of these locations appear to not have satisfactory
1097 grounding, cable management, and in many cases adequate HVAC systems.

1098

1099 Further, for bid purposes, the Proposer shall submit on a per site basis a cost allotment of \$5,000 to correct these
1100 deficiencies.

1101

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1102 The contractor will be required to assess site conditions prior to installation of any equipment and make
1103 recommendations to PRCC on upgrading these facilities. The following provides guidance for improving site facilities.

1104 **8.1 Grounding System**

1105 The primary grounding system at each site is the responsibility of the existing site owner and is presumed to be in good
1106 order, although most sites appear to have deficiencies.

1107
1108 The contractor shall measure ground resistance per R56 to determine existing conditions. The goal is for a 5-ohm ground
1109 resistance

1110
1111 The contractor shall inspect the grounding system, which includes the master ground bar, internal ground ring, external
1112 ground rod system, cable entry port, and tower grounding. If deficiencies are noted, the contractor shall provide a written
1113 report delineating the deficiencies and recommendation for remedies on a site-by-site basis.

1114
1115 An assessment will be made by PRCC if it should continue to use existing grounding facilities or install an independent
1116 ground system for its equipment only.

1117
1118 The contractor shall furnish and install any additional required grounding and bonding conductors, connections, ground
1119 bars, etc. and make connections to the proposed communications equipment specified in this RFQ, including the
1120 communications centers. The conductors shall be No. 2 AWG solid copper wire or larger. Bonding conductors shall be
1121 used to bond the various pieces of equipment, conduit, trays, etc. together.

1122
1123 All connections to equipment room or shelter ground halos shall be made as straight as possible with a minimum number
1124 of bends. The minimum bending radius of any ground wire shall be one foot.

1125
1126 Grounding of Radio Equipment Cabinets, Racks, and associated Cable Trays shall conform to the latest version of the
1127 Lightning Protection Institute LPI-175 and LPI-176 codes.

1128 **8.2 Electrical Systems**

1129 The contractor is responsible to provide connection to the existing site power and emergency generators, where
1130 applicable.

1131
1132 PRCC's goal to reduce possible system damage and failure due to strikes or induced currents. The contractor shall adhere
1133 to current industry practices in providing protection to sensitive electronic equipment.

1134
1135 The contractor shall assess the current AC surge and lightning protection at the site. If inadequate, the contractor will
1136 provide recommendations for installing AC surge suppression devices used for telecommunications equipment.

1137
1138 The electrical panels at the transmitter sites should have capacity to add additional circuit breakers for the new
1139 equipment if required. Telecommunications Circuits

1140 If applicable, all telephone company circuits or other twisted pair cable which may enter an electronic equipment room or
1141 shelter shall be equipped for electrical transient protection utilizing a device which will protect up to 150V, with a
1142 clamping voltage of 200Vpk and a response time of less than 5 nanoseconds similar to the Northern Technologies TMC-
1143 50, or equivalent. These arrestors shall be intrinsic to the punch blocks being used, and shall be grounded to the
1144 equipment shelter/room ground ring.

1145 **8.3 Outdoor Cabinet [OPTION]**

1146 PRCC may, at some locations, be required to install an outdoor cabinet inside an existing shelter. The contractor shall
1147 determine the structural integrity of the existing shelter floor to determine the requirements to accommodate the
1148 proposed cabinet. If installed outside, the contractor shall ensure that the enclosure is installed on a concrete pad.

1149

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1150 The cabinet shall be sized to accommodate the electrical radio equipment provided under this specification [similar to
1151 American Products enclosures].

1152

1153 The cabinet shall be a dual bay cabinet complete with lifting brackets. The cabinet shall, at a minimum, be comprised of
1154 the following:

1155 Mechanical: NEMA 3R insulated cabinet; front/rear hinged doors with locks; adjustable 19-in rack rails; test
1156 equipment/laptop tray

1157

1158 Electrical: 100-amp 12 slot load center; sufficient 20-amp outlets, interior light(s); support for battery
1159 system; 30-amp generator plug; master ground bar and grounding; door alarm;

1160

1161 HVAC: Heating and cooling capacity to accommodate operating temperature range of -25F to +110F

1162 **9 INSTALLATION REQUIREMENTS**

1163 All existing radio communications systems shall remain fully operational during installation of the new equipment and
1164 until PRCC provides final acceptance. Because existing systems support public safety operations, interruptions in service
1165 due to contractor or contractor activities are not acceptable. If interruptions in service are deemed necessary by the
1166 contractor to be unavoidable, then written notification detailing the nature and duration of such interruptions shall be
1167 provided to PRCC for review and approval.

1168

1169 All installation work performed shall be in accordance with laws and regulations of the U.S. Dept. of Labor, and PRCC
1170 policies. Technicians shall have a valid Federal Communications Commission General Radiotelephone Operators License
1171 or its approved equivalent to work on RF equipment.

1172

1173 The Vendor shall provide all the necessary personnel, tools, equipment and transportation for the successful delivery and
1174 installation of all equipment provided.

1175 **9.1 General Requirements**

1176 The Vendor will be required to begin installation according to the approved schedule for material delivery to the installing
1177 Vendor location. The installation Vendor shall be prepared at this time. The Vendor shall ensure that all material and
1178 components are delivered to the proposed sites and according to the approved schedule.

1179

1180 The Vendor is responsible, and shall provide all the hardware and supplies necessary for the proper and complete
1181 installation of the radio and microwave equipment, this includes bolts, clamps, wire wraps and other hardware, as
1182 required.

1183

1184 Provisioning, optimization, troubleshooting, and adjustment of each subsystem shall be the Vendors Responsibility Any
1185 equipment or parts required to provide a complete and operational system, and not specifically mentioned herein, shall
1186 be provided by the Vendor without any claim for additional payment. It shall be understood that the proposed contract
1187 and agreement contemplates and requires a 'turnkey' construction and installation of a completely operational
1188 communications system that meets the standards of PRCC.

1189

1190 Notwithstanding the details presented in these specifications, it is the responsibility of the Vendor's Project Manager to
1191 verify the correctness of the material lists and suitability of devices proposed to meet the intent of the specifications. The
1192 Vendor shall be responsible for providing or arranging for all parts necessary for the equipment and its installation up to
1193 and including final system acceptance.

1194

1195 The Vendor shall disconnect legacy equipment after the network has been accepted and after PRCC has authorized the
1196 Vendor in writing to do so. The Vendor shall remove all legacy radio and control equipment to include antennas and
1197 transmission lines, and ensure that the area is clean. All equipment shall be transported to a location within the Bangor
1198 area for disposal by PRCC.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1199 **9.2 Personnel Safety**

1200 The contractor shall be required to provide a Certificate of Insurance indicating the coverage limits as outlined by PRCC.
1201 The contractor shall bear responsibility for the safety of its workers and all others during the installation phase.

1202
1203 All employees of the Vendor who work for PRCC shall be instructed in and be familiar with safety rules and regulations
1204 applicable to the nature of the work being performed under this contract. The Vendor shall have sole responsibility to see
1205 that its employees are so informed and that they follow requisite safety practices.

1206
1207 All applicable OSHA rules and requirements shall be rigorously complied with, as well as applicable FCC and FAA
1208 requirements including RF exposure guidelines. For antenna installations, under no circumstances shall an individual be
1209 allowed to work alone. It is crucial and imperative that all current OSHA fall protection rules are followed. This includes
1210 but is not limited to “full body harness” and 100% “TIE OFF”. contractor employees found not following all OSHA rules
1211 and directives will be ordered from the job site by PRCC.

1212 **9.3 RF Base/Repeater Stations**

1213 For RF equipment installed at fixed sites, upon completion of staging the equipment, the contractor shall deliver and,
1214 install the equipment at the sites.

1215
1216 Equipment and physical facilities shall be installed in a neat and professional manner, employing the highest standard of
1217 workmanship and in compliance with applicable standards.

1218
1219 All sites shall be left in a neat, presentable condition throughout the installation phase of the project. All rubbish,
1220 temporary structures, and equipment generated or used by the contractor shall be removed after completion of the
1221 work, and prior to acceptance.

1222
1223 Racks shall be designed and installed to provide easy access to equipment controls and connection points. Racks shall
1224 meet the requirements of EIA-310-D.

1225
1226 All equipment racks shall be securely mounted to the floor. If necessary, racks shall be bolted together or braced from the
1227 ceiling to prevent swaying or being dislodged. Racks shall be isolated from floors and ceilings using suitable insulators,
1228 insulating plates, washers and sleeves.

1229
1230 Equipment racks shall be placed to allow a minimum of 30 inches access front and back, unless all connection and
1231 maintenance points are in the front. Under no conditions shall an equipment rack need to be moved for maintenance
1232 after installation.

1233 **9.4 Simulcast Alignment**

1234 Parameters for simulcast alignment shall be determined by the contractor in order to meet coverage requirements.

1235
1236 Simulcast system alignment procedures shall be straightforward and logical. After the system is initially aligned and
1237 accepted, there shall be procedures and alignment test facilities in place to allow routine verification of system alignment
1238 and equalization. There shall further be procedures and alignment equipment and facilities in place to allow realignment
1239 and re equalization of the system under extraordinary situations such as replacement or repair of system components.

1240
1241 Routine verification of system alignment shall be possible using a single maintenance technician, preferably at a single
1242 location. Vendors shall describe equipment capabilities in their response.

1243
1244 A simulcast system shall be designed so that, once aligned, it shall remain aligned and shall not need routine realignment.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1245 **9.5 IP Microwave Radio**

1246 The installation of the microwave equipment will be provided by the vendor at the designated location within the
1247 equipment shelters at the sites. The contractor shall supply and install all required equipment, accessories, punchblocks,
1248 terminal strips or cables needed to interface to new or existing facilities.

1249
1250 Inspection of the completed microwave network equipment installation shall be performed to ensure compliance with
1251 standards set forth in final contract and the specifications.

1252 **9.6 Microwave Parabolic Antenna**

1253 Adjustments on horizontal and vertical azimuths shall be capable of a minimum extension of +/- 5-degrees. After
1254 completion of antenna panning, the side struts and stiff arms shall be cut to a suitable length past their mounting, not to
1255 exceed 3-feet.

1256
1257 Transmission line [t-line] shall not exceed its bending radius or twisted. At antenna level, the t-line shall be terminated to
1258 the antenna via short jumper that will allow the antenna to be panned through +/- 2-degrees without creating any stress
1259 on the waveguide or its connector. Appropriate seals shall be used at the cable entry port of the shelter.

1260
1261 The antenna shall be capable of being panned +/- 2-degrees, and panned by noting the 3dB and 15dB points on both sides
1262 of the antenna pattern in both the horizontal and vertical planes.

1263
1264 All microwave antennas, regardless of size and frequency band, shall be provided with stiff arms for mounting. Ice shields
1265 shall be provided, where required, with all mounting hardware for each size of microwave antenna. Stiff-arms and ice
1266 shield mounts shall be attached to the tower in accordance with the requirements of the tower and microwave antenna
1267 manufacturers.

1268 **9.7 Transmission Line Grounding and Lightning Protection**

1269 Where shelters use a single point ground system, RF and ancillary equipment supplied shall be grounded to the single
1270 point ground system. All grounding interconnections shall be made by using #2 AWG solid copper wires.

1271
1272 The ground points shall be made by using copper ground straps from the same manufacturer as that supplying the
1273 transmission line and in accordance with the manufacturer's installation practices.

1274
1275 No grounding to tower cross braces is allowed only direct conductor to ground. Braided ground straps are not
1276 acceptable.

1277
1278 Cuts made in the outer jacket of the transmission line to install the ground straps shall be thoroughly sealed with a water-
1279 resistant tape (no vinyl tape) or compound. Ground connections to galvanized tower legs shall be made with transition
1280 clamps thereby reducing the oxidation effect of dissimilar metals.

1281
1282 Each transmit or receive transmission line shall be protected by coaxial surge/lightning protectors, Polyphaser, or
1283 equivalent, between the transmitter combiner output and the antenna. Lightning arrestors shall be grounded to the
1284 bulkhead panel.

1285
1286 Control stations with outdoor antennas shall be equipped with a coaxial lightning arrestor, Polyphaser IS-50NX-C2, or
1287 equivalent. These lightning arrestors shall be grounded to a 5/8" X 8 foot driven ground rod by a #2 AWG tinned solid
1288 copper wire attached to the rod using exothermic welding. It is preferred that the grounding system used for the control
1289 station lightning arrestor shall be connected back to the building ground system at the power service entrance.

1290

1291

1292

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1293 Each coaxial transmission line shall be grounded at a point above the bend required to exit the tower mounted cable
1294 ladder to the ice bridge leading to the radio equipment shelter or room. These grounds shall be installed in accordance
1295 with the manufacturer's specifications, and shall be sealed against entry of moisture at any location where the outer
1296 sheath of the transmission line has been cut or removed.

1297 **9.8 GPS Receivers**

1298 GPS antennas shall be installed outside the shelter in an elevated an unobstructed location.

1299

1300 The proposed GPS receivers used in the simulcast system shall have the antenna line equipped with a gas tube surge
1301 arrester Polyphaser IS-MR50LNZ+6 or +15, or equivalent.

1302 **9.9 Installation Documentation**

1303 Documentation shall consist of equipment test data, software documentation (which describes system and equipment
1304 software and provisioning), "as-built" drawings and diagrams. Detailed equipment maintenance, setup and alignment
1305 manuals shall also be provided.

1306

1307 The contractor shall provide to PRCC complete system operating instruction manuals and maintenance manuals for each
1308 type of equipment supplied.

1309 At a minimum, this documentation shall include:

1310

1311

- **Equipment** - manuals published by the equipment manufacturers.

1312

- **System diagrams** - showing "as-built" configuration (to date) for all parts of the RF systems. The contractor shall
1313 develop detailed schematic drawings showing the various equipment components in the system, the
1314 interconnections, and the identifying circuit numbers, IP addresses, etc.

1315

- **Cabling, conduit and terminal plans.** All interconnecting cables shall have permanent identification markings to
1316 indicate cable function, origination and destination. Cable identification (tag, label, etc.) shall be accomplished in
1317 a manner that will allow visual cable identification after complete installation. The cable identification shall be
1318 uniform and consistent throughout the system. It is essential that this information be stored in a computer
1319 database for future reference and update, if required.

1320

- **Maintenance drawings** - Each item that is capable of replacement for maintenance purposes shall be shown in
1321 an appropriate drawing that clearly indicates its position and relationship to the communications system. Exact
1322 names, part, and identification numbers shall be shown with instructions and information for future
1323 procurement.

1324

- **Equipment List** - Upon completion of installation and a condition for acceptance, the vendor shall provide PRCC
1325 an updated "as-built" equipment list by site showing: location, quantity, model number, description, and serial
1326 number.

1327 Wherever possible, the above documentation shall also be provided on Flash/Thumb Drives.

1328 **9.10 Equipment and System Acceptance Testing**

1329 Prior to installation at the sites, the contractor shall stage the equipment in PRCC area to ensure all equipment is properly
1330 connected, provisioned, and operational prior to delivery at the sites.

1331

1332 The Acceptance Testing for all systems shall consist of a series of tests, inspections, and verifications that are defined in
1333 this section. The ATP shall cover all field testing procedures and which inspections shall be made in order to show Vendor
1334 compliance to the specifications as well as define each and every required sub-system interface. PRCC's representative
1335 and the Vendor's representative shall conduct these tests and inspections as defined.

1336

1337

1338

1339

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1340 Test Methods are defined as follows:

1341

1342 • **Test:** Verification based upon measurements (e.g. RSL and BER tests, transmitter output, sensitivity, signal
1343 levels, etc.)

1344

1345 • **Inspection:** Verification based upon visual review or physical measurement (e.g. equipment racks,
1346 grounding, antenna mounting, frequency selection, etc.)

1347

1348 • **Demonstration:** Non-instrumented verification of a response given a stimulus (e.g. a, battery chargers,
1349 proper receiver voting, etc.)

1350

1351 At minimum, the tests and inspections listed below shall be performed. Final Acceptance of each individual transmitter
1352 shall include, but not be limited to, the following list of tests and inspections. The results of the tests and the associated
1353 punch list of outstanding items to be compiled or re-tested shall be signed by both parties and forwarded to PRCC for
1354 review and acceptance.

1355

1356 Radio System

- 1357 • Transmit frequency and deviation
- 1358 • Transmit output and reflected power
- 1359 • Receiver threshold sensitivity
- 1360 • Receiver frequency
- 1361 • Alarm function
- 1362 • Adjustment of control line levels to proper levels
- 1363 • Simulcast optimization
- 1364 • Proper setting of audio phase delays
- 1365 • Proper setting of audio amplitude levels
- 1366 • Proper operation of frequency standard

1367

1368 Microwave, Multiplexers, Switches & Routers

1369 The following tests, in addition to other standard manufacturer's test procedures, shall be performed. Complete
1370 documentation of Field Acceptance Test results shall be provided to PRCC upon completion of testing.

1371

1372 **Perform/Verify Complete Terminal Provisioning.** Provision microwave terminal and IP devices in accordance with PRCC
1373 requirements.

1374

1375 Path Alignment

- 1376 ■ The Vendor shall be responsible to perform microwave dish alignments for all microwave paths
- 1377 ■ Dishes shall be aligned for maximum RSL/BER
- 1378 ■ The Vendor shall provide all material, equipment, and personnel required to perform path alignments

1379 Bit Error Rate

- 1380 ■ BER test shall be performed for 24 hours on each microwave hop
- 1381 ■ BER tests shall be performed at the maximum data rate of the hop under test
- 1382 ■ Unfaded RBER shall be <10⁻¹¹
- 1383 ■ Provide recorded results

1384 IP/Ethernet Testing

1385

1386 RFC-2544 tests for all hops

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1387 **Audio Quality**

- 1388 ▪ Audio quality measurements shall be performed following integration of microwave and RF radio systems
- 1389 per the RF radio manufacturer

- 1390 ▪ Mutually agreed upon procedure to be developed and implemented for microwave and RF radio system test

1391 **Ground Resistance Testing**

1392 A component of the system acceptance test plan to be completed by the Successful contractor will be the testing of all
1393 existing grounding systems and any grounding systems installed, or utilized, for equipment associated with this
1394 procurement. This includes grounding at all base stations, dispatch centers, control stations and microwave
1395 terminal/repeater sites associated with this RFQ.

1396
1397 All grounding systems shall be tested using an AEMC, or equivalent, clamp-on ground resistance tester or Biddle 500V Null
1398 Megger or equal (3-terminal fall-of-potential method). The resistance to ground shall measure 5 ohms or less.

1399
1400 Ground tests shall be conducted in the presence of a PRCC installation representative and results shall be recorded on a
1401 form approved by PRCC Project Manager. These forms shall be included as a part of the acceptance test documentation
1402 and are a component of final acceptance of the radio communications system.

1403 **9.11 Coverage Testing and Verification**

1404 It is important that the new system provide 100% of coverage currently provided by the existing system.

1405
1406 Based on the information provided in Section 4.2.11 regarding distortion zones, PRCC and the contractor shall initiate
1407 audio performance testing to ensure that the simulcast system is operating as specified. PRCC and the contractor will
1408 jointly develop a subjective test plan and method to evaluate simulcast audio.

1409 **9.11.1 Simulcast Proof of Performance**

1410 **Acceptance Testing** - The contractor shall demonstrate to PRCC's Project Representative that all requirements
1411 stated in this document have been provided and are operating in accordance with PRCC and manufacturer
1412 specifications.

1413
1414 Because the coverage performance requirement cannot be guaranteed without a proper testing methodology,
1415 acceptance testing shall include coverage performance testing to verify the proposed coverage design.

1416
1417 Since PRCC is specifying all of the fixed sites to be used, the contractor is not required to meet a bounded area
1418 coverage requirement [Penobscot political boundaries]. However, the contractor is required to provide minimum
1419 delivered audio quality (DAQ-3.0 / 95%) when a minimum mean signal level is present in the absence of external
1420 interference within the proposed coverage area shown on contractor coverage prediction maps.

1421
1422 The purpose of the coverage requirement and associated coverage testing is to ensure all other elements of the
1423 network, including but not limited to site transmitters and receivers, antennas, microwave backhaul, voting
1424 system and subscriber receiver are performing properly.

1425
1426 Of primary concern is audio quality and simulcast delay settings, and the associated delay spread from multipath
1427 and from simulcast interference in the simulcast overlap areas.

1428
1429 The system shall operate for 30 days without failure before the warranty period commences. Any failure occurring
1430 within the 30-day period shall reset the 30-day clock. The contractor must obtain written acceptance from PRCC's
1431 Project Representative to initiate the warranty period.

1432

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

I433 **9.12 System Cutover**

I434 The Vendor is to describe in their RFQ response a cutover plan. This plan shall include a chronological chart with the tasks
I435 to be accomplished and the time for achievement of each task shown. A smooth operational transition from the existing
I436 systems to the replacement system is the goal. Key elements will be how active dispatching and fire alerting will be
I437 supported throughout implementation.

I438
I439 The detailed cutover plan shall include a narrative description of the sequential cutover steps and a clear delineation of
I440 which tasks are the responsibility of the Vendor and which tasks is the responsibility of PRCC. Please describe any
I441 additional or temporary equipment that may be required to accomplish the transition.

I442 **10 WARRANTY, MAINTENANCE AND TRAINING**

I443 Vendors shall include in their response the cost for providing [1] one-year labor and parts warranty period maintenance
I444 plus an optional second [2] through fifth [5] year parts and labor contract maintenance separately for proposed
I445 equipment.

I446
I447 The additional 2 through 5 year contract maintenance period shall begin on the date that the warranty period
I448 maintenance expires. During this period, the maintenance requirements and conditions shall be identical to the warranty
I449 period maintenance described in this warranty maintenance section.

I450
I451 The Proposer shall include a list of recommended spare parts with the cost proposal. This list shall include quantity and
I452 unit prices.

I453 **10.1 Warranty and Maintenance**

I454 The Proposer shall warrant all equipment, software and installation work after system acceptance. Warranty shall include
I455 all parts, labor and travel necessary to return the equipment to its original working condition.

I456 **10.2 Response Times**

I457 **10.2.1 Catastrophic Failures**

I458 The Vendor shall have a qualified technician available to respond [24x7] as follows: respond within one [1]-hour
I459 on site of notification of a problem at any time (24x7) and be on site within 4-hours to complete repairs. The
I460 Proposer is responsible to replace any spare parts used during the warranty period.

I461 **10.2.2 Non-catastrophic Failures**

I462 All other failures are considered non-catastrophic and require the following responses:

- I463 1) 0000-1200 same working day—overtime if needed.
I464 2) 1201-2400 next working day—start job in AM.
I465 3. Response times shall be the same as above during the acceptance test period.

I466 **10.2.3 Simulcast Re-Alignment**

I467 After the system has been aligned, optimized and accepted, the vendor shall, during the warranty period, assist
I468 PRCC in corrective actions and make recommendations of potential remedies of simulcast problems that may
I469 develop as users on the system identify potential simulcast distortion areas.

I470 The contractor shall be prepared to perform re-alignments during the first year, and once per year over for the
I471 remainder of the warranty period. If additional equipment is needed, or antenna work is required, the
I472 contractor and PRCC shall negotiate pricing to perform this additional work.

Penobscot Regional Communications Center

Regional Public Safety Communications System Upgrade

1473 **10.3 General Maintenance Requirements**

1474 The Vendor shall provide competent, experienced personnel to execute the required maintenance tasks during the
1475 warranty period. All maintenance personnel shall be trained and experienced in standard communications industry
1476 practices. Personnel who perform maintenance on the system shall have completed all required manufacturer-approved
1477 training for that equipment. Said training, or appropriate refresher courses, shall have been completed within the
1478 previous year and evidence thereof shall be provided to PRCC.

1479
1480 The Vendor shall provide PRCC in its response the name, location and capabilities of service facilities that will provide any
1481 or all of the installation, service and maintenance, both initial and continuing. Vendors shall also include a description of
1482 the service facilities, the size and qualifications of its staff, the number of years in business and a list of customers (with
1483 names and telephone numbers) who operate systems of similar size and complexity for whom installation and
1484 maintenance services are performed. Vendors shall further demonstrate their ability to maintain equipment substantially
1485 similar to that furnished under this specification.

1486
1487 The information is required to demonstrate to PRCC that the local service facilities are capable of installing, optimizing
1488 and maintaining the system provided by this procurement.

1489
1490 Malfunctions that cannot be immediately diagnosed and pinpointed to a certain item of equipment or service will require
1491 the participation of all service Proposers [PRCC included] until responsibility for the problem has been established. In no
1492 instance shall the failure to resolve the issue of responsibility relieve any Proposer of the mutual obligation to restore
1493 system operability with the least impact on the availability of the system to the end-user. PRCC reserves the right to
1494 adjudicate such matters after the fact and validate charges applicable to the provision of the Vendor. The Vendor shall be
1495 the sole point of responsibility to resolve all maintenance matters to the satisfaction of PRCC.

1496
1497 Vendors shall describe the ongoing level of factory engineering and service support that will be available to the local
1498 service facility during the installation and maintenance of the system. The factory organization that provides such
1499 support shall be described in the RFQ. Vendors shall also indicate the response time of factory support should it be
1500 required by the local service facility. The factory support referenced here will be provided directly to the local service
1501 facility for assistance in fulfilling the terms of the installation and maintenance agreements; it shall be provided at no
1502 additional cost to PRCC.

1503
1504 The Vendor shall also certify that a stock of replacement parts for each critical component to be supplied as part of the
1505 communications system shall be immediately available at all times during the initial warranty period. These parts shall be
1506 either in the Vendor's stock and available for timely transfer to the communications system site to meet maintenance
1507 criteria, or stored at the sites.

1508
1509 In addition, the Vendor shall certify that all replacement parts shall remain available to PRCC for a period of ten years
1510 following system acceptance.

1511
1512 During the warranty period and subsequent maintenance, the Vendor shall have the necessary common and specialized
1513 test and repair equipment for the components and all ancillary hardware provided in this specification. This includes
1514 equipment and software carried to the site for preventative maintenance, troubleshooting and failure repair. It is the
1515 intent of PRCC to contract for maintenance after expiration of warranty period. Vendor shall certify that the local service
1516 facility has the appropriate test and repair equipment, and technicians are factory trained and certified

1517
1518 There shall be a maintenance log with sufficient detail on each failure or maintenance action to enable the maintenance
1519 personnel to analyze the problems within the communications system and take the required corrective or preventative
1520 action. This log shall be initiated at the start of equipment delivered and shall be maintained throughout the warranty
1521 maintenance period. The log shall include all equipment purchased under this contract and shall include at a minimum the
1522 make, model, serial number, date put in service, unit cost, PRCC asset number, and to whom the unit is assigned. The
1523 maintenance log shall be stored in an electronic database and be updateable.

Penobscot Regional Communications Center Regional Public Safety Communications System Upgrade

1524 The Vendor shall provide a cost proposal that clearly describes the cost information (includes equipment and services,
1525 where applicable) using the Pricing Sheet. Estimated PRCC quantities of user equipment are also provided in the table;
1526 however, quantities may be updated through the course of the project.

1527
1528 PRCC is exempt from payment of excise, transportation and sales taxes imposed by the Federal Government and/or the
1529 State of Maine. Such taxes must not be included in proposal prices. Exemption certificates will be provided upon request.
1530

**Penobscot Regional Communications Center
Regional Public Safety Communications System Upgrade**

1531 **11 Appendix-A – Pricing Sheet**