**SYSTEM AND SERVICES AGREEMENT BETWEEN
BROWARD COUNTY AND KEYLITE POWER & LIGHTING CORP.**

This System Services Agreement (the "Agreement") is made and entered into by and between Broward County, a political subdivision of the State of Florida ("County"), and Keylite Power & Lighting Corp., a Florida corporation ("Provider").

A. Pursuant to competitive procurement, RFP R1426611P1 Fire Station Alerting System, County solicited a fire station alerting ("FSA") system to support current and future fire department alerting needs for Broward County and local public safety personnel. The purpose of the FSA system is to provide end user departments with enhanced fire station functions and interface with the computer-aided dispatch ("CAD") and public safety microwave systems as well as the Project 25 ("P25") trunked radio system communications infrastructure.

B. On September 27, 2016, the Board of County Commissioners approved Provider as the first-ranked vendor responding to the solicitation.

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereto agree as follows:

ARTICLE 1. DEFINITIONS

1.1 Board. The Board of County Commissioners of Broward County, Florida.

1.2 Business hours or business day. 7 a.m. to 7 p.m. Eastern Time during weekdays that are not County holidays and on which County has not otherwise declared its offices closed.

1.3 Contract Administrator. E911 Communications Administrator of the Office of Regional Communications and Technology or such person's designee as stipulated by County in writing.

1.4 Documentation. All manuals, user documentation, specifications, and other related materials pertaining to the System and other hardware and software that Provider customarily furnishes to purchasers of the System.

1.5 Equipment. The hardware and other property identified in Exhibit A-1 being provided to County pursuant to this Agreement, including any embedded software and firmware incorporated therein or customarily provided by Provider to users of the Equipment.

1.6 Purchasing Director. The Broward County Purchasing Director as appointed by the Broward County Administrator.

1.7 Services. All required installation, integration, programming, configuration, customization, and enhancements of the System, together with necessary and appropriate consulting, training, and project management services, to meet County's ongoing needs in connection with the System, as further specified in Exhibit A.

1.8 Software. All proprietary or third-party software or other intellectual property rights, including the Documentation for same, provided or licensed to County or third party users

pursuant to this Agreement, including the computer programs (in machine readable object code form) listed in Exhibit A and any subsequent updates, upgrades, releases, or enhancements thereto developed by Provider during the term of this Agreement.

1.9 Support and Maintenance Services. The maintenance and support required to maintain optimal performance of the System as described in the Documentation and Exhibit C, as well as the support and maintenance services required for County to achieve and maintain optimal performance of the System.

1.10 System. The Software, Equipment, and other property identified in Exhibits A and A-1 being provided to County pursuant to this Agreement.

ARTICLE 2. EXHIBITS

The following exhibits are attached hereto and incorporated into this Agreement:

Exhibit A	**Statement of Work**	
	Exhibit A-1	**Equipment Schedule**
	Exhibit A-2	**Failure Mode Analysis**
	Exhibit A-3	**Functional Acceptance Test Plan**
	Exhibit A-4	**Coverage Maps and Path Calculations**
	Exhibit A-5	**Microwave Acceptance Test Plan**
	Exhibit A-6	**Preliminary Path Studies**
	Exhibit A-7	**Interface Control Document**
Exhibit B	**Payment Schedule**	
Exhibit C	**Support and Maintenance Services**	
Exhibit D	**Insurance Coverages**	
Exhibit E	**Work Authorization Form**	

If there is a conflict or inconsistency between any provision contained in Articles 1 - 14 and any provision contained in any of the Exhibits, the provision of Articles 1 - 14 shall prevail and be given effect unless expressly stated to the contrary.

ARTICLE 3. SCOPE OF SERVICES & SOFTWARE LICENSE

3.1 Scope of Services. Provider shall complete all Services required in this Agreement inclusive of the Exhibits. Unless stated otherwise in this Agreement, the work required of Provider includes all labor, materials and tasks, whether or not enumerated in the Agreement, that are such an inseparable part of the work expressly stated in the Agreement that exclusion thereof would render Provider's performance impractical, illogical, or unconscionable.

3.2 Support and Maintenance Services. For so long as requested by County, Provider shall provide Support and Maintenance Services to ensure the proper functioning and optimal performance of the System as set forth in the Documentation pursuant to the terms of Exhibit C.

3.2.1 Updates, Upgrades and Releases. For the duration of this Agreement, Provider shall promptly provide to County, with advance notice and at no additional cost, any and all updates (including error corrections, bug fixes, security updates, and patches), upgrades, or new releases to the Software (as well as any firmware included with the Equipment), including all that Provider has made available to other licensees of all or part of the Software licensed pursuant hereto. All such updates, upgrades, and new releases shall remain the sole property of Provider and shall be deemed to be included within the scope of the license granted under this Agreement.

3.2.2 Compatibility. For the full term of this Agreement, Provider will ensure the continued compatibility of the Software and System with all major releases, updates, or upgrades of any third party software used by County for access or operation of the System. In the event Provider is not be able to support any third party software update, upgrade or new release that is not backwards compatible with the Software or System, Provider shall use all reasonable efforts to resolve such issues and to provide optimal functionality of the Software and System in accordance with this Agreement. If Provider is unable to provide continued optimal functionality of the Software and System in accordance with this Agreement due to any applicable third party software release, update or upgrade, County shall be entitled to terminate the Agreement upon written notice with no further obligation to Provider.

3.2.3 Software Enhancements or Modifications. If requested by County, Provider shall incorporate certain features and enhancements into the licensed Software, and the source code for those features and enhancements shall be provided to and be the property of County. Any such request shall be formalized into a Statement of Work that shall define in detail the services to be performed, the financial terms, and the proposed project staffing and schedule. Any such Statement of Work shall be incorporated into a Work Authorization, to the extent permitted by Section 3.4 below, or otherwise into a proposed amendment to this Agreement.

3.3 License. Unless otherwise set forth in Exhibit A, Provider grants to County a perpetual, royalty-free, nonexclusive license, with no geographical limitations, for an unlimited number of users, to the Software, including to any software embedded in or provided with the Equipment, for use solely for County governmental and business purposes, including on- and off-site access and use of the System by Authorized Third Party Users (as defined in Exhibit A), including those persons or entities with which County may contract to operate the System or components thereof, and for the benefit of and use by all governmental entities within County, including the offices of the County constitutional officers.

3.3.1 Authorized Users and Additional Licenses. Unless otherwise stated in Exhibit A (Statement of Work), County and any of its employees, agents, suppliers of services, or other Authorized Third Party Users shall have the right to concurrently operate and use the System for County governmental or business purpose. If anything less than unlimited, concurrent use is expressly provided under this Agreement and additional licenses are required, County's Purchasing Director is authorized to execute a Work Authorization (Exhibit E) to purchase additional licenses for the fee specified in Exhibit B.

3.3.2 Additional Uses. County may, if required by reason of an emergency, disaster or operational need, or for testing of recovery resources, temporarily use the Software on recovery resources at no additional cost, including recovery resources that may not be owned by County. County may, at no additional cost, copy the Software for backup and archiving purposes for the purposes of support or maintenance by County or others hired by County to provide such support or maintenance. County may, at no additional cost, utilize a hosted environment, including without limitation through a third-party hosting provider, for all otherwise permitted uses of the Software.

3.3.3 Prohibited Uses. Except as otherwise provided for in this Agreement or required under Florida law, County shall not reproduce, publish, or license the Software to others. County shall not modify, reverse engineer, disassemble, or decompile the Software or any portion thereof, except (a) to the extent expressly authorized in Exhibit A, in which event such authorized actions shall be deemed within the license grant of Section 3.3, or (b) to the extent permitted under any applicable open source license.

3.4 Change of Scope Procedures. Provider acknowledges that Contract Administrator has no authority to make changes that would increase, decrease, or otherwise modify the scope of services to be provided under this Agreement except as expressly provided herein. To the extent any goods or services under this Agreement, or the quantity thereof, are optional ("Optional Services"), County may select the type, amount, and timing of such goods or services pursuant to a Work Authorization (Exhibit E hereto) executed by Provider and County pursuant to this Section, and provided that no such selection, when combined with those goods or services required under the Agreement, would result in a payment obligation exceeding the applicable maximum amount stated in Section 5.1. Notwithstanding anything to the contrary in the Agreement, Work Authorizations for Optional Services pursuant to this Section shall be executed on behalf of the County as follows: the Contract Administrator may execute Work Authorizations for which the total cost to County in the aggregate is less than $30,000.00; the Purchasing Director may execute Work Authorizations for which the total cost to the County in the aggregate is within the Purchasing Director's delegated authority; any Work Authorizations above the County's Purchasing Director delegated authority shall require Board approval. Subsequent to the full execution of any Work Authorization, the Contract Administrator will issue a Notice to Proceed for those authorized Optional Services. Provider shall not commence work on any Work Authorization until after receipt of the applicable Notice to Proceed.

3.5 Contract Administrator Authority. Unless otherwise expressly stated herein or in the applicable Procurement Code, Code of County Ordinances, or County Code of Administrative Procedure, the Contract Administrator may act on behalf of County to exercise the authority and powers of County under this Agreement.

ARTICLE 4. TERM AND TIME OF PERFORMANCE

4.1 Term. The Agreement shall become effective on the date it is fully executed by the Parties (the "Effective Date"). The initial term of the Agreement shall be for a period of five (5) years from the date of Final Acceptance (the “Initial Term”).

4.2 Extensions. County shall have the option to renew this Agreement for two (2) additional five (5) year terms by sending notice thereof to Provider at least thirty (30) days prior to the expiration of the then-current term. The Purchasing Director is authorized to exercise this renewal option. In the event that unusual or exceptional circumstances, as determined in the sole discretion of the Purchasing Director, render the exercise of an extension not practicable or if no extension is available, and expiration of this Agreement would result in a gap in the provision of services necessary for the ongoing operations of the County, then this Agreement may be extended on the same terms and conditions by the Purchasing Director for period(s) not to exceed six (6) months in the aggregate.

4.3 Fiscal Year. The continuation of this Agreement beyond the end of any County fiscal year shall be subject to both the appropriation and the availability of funds, in accordance with Chapter 129, Florida Statutes.

4.4 Delivery. Provider shall deliver the Equipment and Documentation via inside delivery to County in accordance with the Project Schedule set forth in Exhibit A and at the address(es) provided by County. Transportation cost and risk, and the cost of delivery, assembly and installation, including any applicable taxes and all actions necessary to integrate the Equipment into County’s existing system, shall be the responsibility of Provider, except to the extent (if any) expressly provided in Exhibit A.

4.5 Timetable. If the System fails to achieve Final Acceptance within twelve (12) months from the Effective Date, County shall have the option to terminate the Agreement by written notice from its Contract Administrator, in which event Provider shall, within fifteen (15) days, pick up the System at Provider's expense and reimburse all sums paid by County under this Agreement, if any. For purposes of this paragraph, any delays caused by County prior to Final Acceptance shall extend the Final Acceptance deadline by the same number of days as the delay caused by County.

4.6 Time is of the essence for all performance required under this Agreement.

ARTICLE 5. COMPENSATION

5.1 For the duration of the Agreement, County will pay Provider in accordance with Exhibit B up to the following maximum amount(s):

Services/Goods	Term	Not-To-Exceed Amount
Core System Equipment, Software, System and Services per Exhibit A	Initial Term (5 years)	$1,500,000
Contingency Equipment and Additional Spares	Duration of Agreement	$225,000
Subcontractor Pass-Thru Fees (per Exhibit B)	Duration of Agreement	$260,000
Support and Maintenance Services per Exhibit C	Initial Term (5 years)	$1,250,000
Optional renewal terms	Each 5-year renewal term Total all renewal terms (10 years)	$1,500,000 $3,000,000 (total 10 years)
Optional Services	Duration of the Agreement (inclusive of any renewals)	$500,000
TOTAL NOT TO EXCEED		**$6,735,000**

Payment shall be made only for work actually performed and completed pursuant to this Agreement or as otherwise set forth in Exhibit B (Payment Schedule), which amount shall be accepted by Provider as full compensation for all such work. Provider acknowledges that the amounts set forth herein are the maximum amounts payable for the respective terms and constitute a limitation upon County's obligation to compensate Provider for its work under this Agreement. These maximum amounts, however, do not constitute a limitation of any sort upon Provider's obligation to perform all items of work required under this Agreement. Unless otherwise expressly stated in this Agreement, Provider shall not be reimbursed for any expenses it incurs under this Agreement.

5.2 Method of Billing and Payment

5.2.1 Invoices. Provider may submit invoices only for goods provided and services completed in accordance with the Payment Schedule set forth in Exhibit B. Unless otherwise indicated in Exhibit B, an original plus one copy of each invoice must be submitted within fifteen (15) days after the end of the month for which payment is sought, except that the final invoice must be submitted no later than sixty (60) days after all services are completed. Provider shall submit with each invoice a Certification of Payments to Subcontractors and Suppliers on the form provided by County, as may be modified in County's reasonable discretion. If applicable, the certification shall be accompanied by a copy of the notification sent to each subcontractor and supplier listed in item 2 of the certification form, explaining the good cause why payment has not been made. Unless otherwise stated in Exhibit B or the applicable Work Authorization, any Optional Services shall be invoiced in accordance with the existing invoicing schedule for any like goods or services provided under this Agreement, including (if applicable) invoiced pro rata for the initial invoice period.

5.2.2 Payments. County shall pay Provider within thirty (30) days of receipt of Provider's proper invoice, as required by the "Broward County Prompt Payment Ordinance" (Broward County Ordinance No. 89-49). Payment shall be made to Provider at the most recent address designated under the "Notices" provision of this Agreement. To be deemed proper, an invoice must comply with all requirements set forth in this Agreement and must be submitted pursuant to any instructions prescribed by the Contract Administrator. County shall have the right to withhold payment of the invoice based on Provider's failure to comply with any term, condition, or requirement of this Agreement. The Parties hereto agree that any amounts so withheld shall not be subject to payment of any interest by County.

5.2.3 Unless a shorter period is required under applicable law or under the applicable contract, Provider shall pay its CBE subcontractors and suppliers within fifteen (15) days following receipt of payment from County and shall pay all other subcontractors and suppliers within thirty (30) days following receipt of payment from County.

5.3 Travel. With respect to travel costs and travel-related expenses, Provider agrees to adhere to Section 112.061, Florida Statutes, except to the extent, if any, that Exhibit B expressly provides to the contrary. County shall not be liable for any such expenses that have not been approved in advance, in writing, by County.

5.4 Fixed Pricing. Unless otherwise expressly permitted in this Agreement, prices set forth in this Agreement shall remain firm and fixed for the term of the Agreement, including any option terms. However, Provider may offer incentive or volume discounts to County at any time. County and, for any third party purchase, any Eligible Purchaser, shall provide an appropriate tax exemption certificate; in the event County or the applicable Eligible Purchaser is not exempt from sales tax or fails to provide an appropriate certificate, County or the applicable Eligible Purchaser shall be responsible for any properly-charged sales tax.

ARTICLE 6. WARRANTIES

6.1 Ownership and License Rights. Provider represents and warrants that it is the owner of all right, title, and interest in and to the Equipment and other property being sold to County under this Agreement, that it has the right to sell such Equipment and other property to County, and that such sale is free and clear of any lien or interest of any other person or entity. Provider further represents and warrants that it has the right to grant to County the rights and the licenses granted under this Agreement as to the Software and System. Provider warrants that it has not knowingly granted rights or licenses to any other person or entity that would restrict rights and licenses granted hereunder, except as may be expressly stated herein.

6.2 System Warranty. For the full term of this Agreement, Provider represents and warrants to County that the Software and System will perform substantially as described in the Documentation and in the Statement of Work (Exhibit A). This warranty does not cover any failure of the Software or System resulting from (a) use of the System in other than the manner for which it was intended; (b) any modification of the Software or System by County that is not

intended or authorized by Provider; or (c) County providing improperly formatted data to be processed through the System.

6.3 Equipment Warranty. Provider represents and warrants to County that for a period of one (1) year from the date of Final Acceptance (or such longer period for applicable equipment to the extent an extended warranty from the original manufacturer is stated in Exhibit A-1), the Equipment will perform substantially as described in the Documentation and the Statement of Work (Exhibit A), will be free from defects in workmanship and material, and will have all of the qualities and features and be capable of performing all of the functions described in the Documentation and Statement of Work. This warranty shall not cover any failure of the Equipment resulting from (a) use of the Equipment in other than the manner for which it was intended; or (b) modification of the Equipment by County not authorized by Provider. In addition to the foregoing, Provider will extend to County the full factory or manufacturer's warranty for the Equipment (including the benefits of services plans, including without limitation support and maintenance services or extended warranty, purchased by Provider on County's behalf or referenced in Exhibit A), which shall provide for warranty coverage of at least one year. Provider further represents and warrants that none of the Equipment includes systems or components within five (5) years of their end of manufacture.

6.4 Warranty Regarding Viruses and PCI Compliance. Provider further represents, warrants, and agrees that the System and any software or firmware provided under this Agreement are free from currently-known viruses or malicious software (at the time the System and any subsequent version thereof is provided to County), and that Provider has and will continue, for the full term of this Agreement, to use commercially reasonable security measures to ensure the integrity of such software and firmware from data leaks, hackers, denial of service attacks, and other unauthorized intrusions. If the System will accept, transmit or store any credit cardholder data, Provider represents and warrants that the System complies with the most recent of the Security Standards Council's Payment Card Industry ("PCI") Payment Application Data Security Standard.

6.5 Intellectual Property Warranty. Provider represents and warrants that at the time of entering into this Agreement, no claims have been asserted against Provider (whether or not any action or proceeding has been brought) that allege that any part of the System or other property provided to County under this Agreement infringes or misappropriates any patent, copyright, mask copyright, or any trade secret or other intellectual or proprietary right of a third party, and that Provider is unaware of any such potential claim. Provider also agrees, represents and warrants that the System (or any portion thereof) and services to be provided pursuant to this Agreement will not infringe or misappropriate any patent, copyright, mask copyright or any trade secret or other intellectual or proprietary right of a third party.

6.6 Quality of Performance and Materials. Provider represents and warrants that all services provided under this Agreement will be performed by a person duly qualified and sufficiently experienced to perform such services and, where required, licensed by all appropriate governmental authorities in the applicable area(s). Provider agrees that all services under this

Agreement shall be performed in a skillful and respectful manner, and that the quality of all such services shall meet or exceed prevailing industry and professional standards for such services. Provider represents and warrants that all materials, Equipment, and products furnished pursuant to this Agreement shall be of good quality and free from defective or inferior workmanship; any items found not to be in conformance with the foregoing and with the Documentation or applicable specifications (if any) in Exhibit A shall be replaced by Provider at no additional cost to County. If requested by County's Contract Administrator, Provider shall develop and utilize a quality assurance plan approved by County to ensure the appropriate quality of the work and materials provided under this Agreement.

6.7 Remedy for Breach of Warranty. In the event of written notice from County of a breach of warranty, Provider shall, at no charge to County, promptly correct the warranty breach including, when required, by (a) correcting or updating the Software, (b) correcting or replacing the affected Equipment, or (c) providing to County other measures that correct the breach. In addition, upon notice from County of any warranty breach or other error or defect in the System, Provider will immediately provide to County any known reasonable methods of operating the System in a manner that eliminates the adverse effects of the error or defect. If Provider is unable to correct a material breach of this Article within a reasonable period of time not to exceed ten (10) business days, County shall be entitled to cancel the Agreement and receive a full refund of all amounts paid to Provider, Provider shall arrange for the return of the Equipment at Provider's expense, and neither party shall have any further obligation under the Agreement except as to any provision that expressly survives the Agreement's termination or expiration. In the event of replacement of any of the Software or Equipment, the Software or Equipment as replaced will be warranted as provided above from the date of installation. The remedies in this Section are in addition to any other rights and remedies County may have under this Agreement or applicable law.

ARTICLE 7. DELIVERY, TESTING AND ACCEPTANCE

7.1 Software. Unless otherwise stated in Exhibit A, Provider shall, within seven (7) days after the Effective Date, make the Software available to County and deliver to County a master copy of the Software licensed hereunder in object code form, suitable for reproduction in accordance with this Agreement, in electronic files unless otherwise requested by County. All County license keys, usernames, and passwords shall be authenticated by Provider and perform according to Exhibit A (Statement of Work).

7.2 Documentation. Provider shall deliver copies of the Documentation to County concurrently with delivery of the applicable Equipment and Software, and thereafter shall promptly provide any updated Documentation as it becomes available during the term of this Agreement. Provider represents and warrants that the Documentation is sufficiently comprehensive and of sufficient quality to enable a competent user to operate the applicable portions of the System efficiently and in accordance with Exhibit A. County has the right to copy and modify the Documentation as it deems necessary for its own internal use.

7.3 Final Acceptance Testing. Broward County Administrative Code Section 22.148 requires that all applicable software purchases be inspected and tested by the County, including verification by its Enterprise Technology Services ("ETS"), prior to final written acceptance of the software and software-related services. Within thirty (30) days following completion of installation and integration of the System, County shall test the System to determine whether the System: (i) properly functions with any applicable operating software; (ii) provides the capabilities stated in this Agreement and the Documentation; and (iii) if applicable, meets the acceptance criteria stated in the Statement of Work (the criteria referenced in (i), (ii), and (iii) are collectively referred to as the "Final Acceptance Criteria"). In the event of a conflict between the Documentation and the acceptance criteria stated in the Statement of Work, the Statement of Work shall prevail. Final payment shall not be made to Provider prior to the written confirmation by the County Chief Information Officer or his or her designee that the System has successfully passed the Final Acceptance Criteria, and such written confirmation shall constitute "Final Acceptance."

7.3.1 The testing period shall commence on the first business day after Provider informs County in writing that it has completed the Services required to be performed prior to testing and that the System is ready for testing, and shall continue for a period of up to thirty (30) days.

7.3.2 During the testing period, County may notify Provider in writing of any error or defect in the System so that Provider may make any needed modifications or repairs. If Provider so elects in writing, testing will cease until Provider resubmits for Final Acceptance testing, at which time the testing period shall be reset to that of a first submission for testing.

7.3.3 County shall notify Provider in writing of its Final Acceptance or rejection of the System, or any part thereof, within fifteen (15) days after the end of the testing period, as same may be extended or reset. If County rejects the System, or any part thereof, County shall provide notice identifying the criteria for Final Acceptance that the System failed to meet. Following such notice, Provider shall have thirty (30) days to (a) modify, repair, or replace the System or any portion thereof, or (b) otherwise respond to County's notice. If Provider modifies, repairs, or replaces the System or portion thereof, the testing period shall re-commence consistent with the procedures set forth above in this Section 7.3.

7.3.4 In the event Provider fails to remedy the reason(s) for County's rejection of the System, or any part thereof, within ninety (90) days after County's initial notice of rejection, County may elect, in writing, to either accept the System as it then exists or to reject the System and terminate the Agreement or applicable Work Authorization. If County elects to reject the System and terminate the Agreement or applicable Work Authorization, all sums paid by County under the Agreement or applicable Work Authorization shall be reimbursed to County by Provider within 15 days after such election is made. If County elects to accept the System as it then exists (partial acceptance), Provider shall continue to use its best efforts to remedy the items identified in the applicable notice of rejection. If, despite such continuing best efforts, Provider fails to remedy the issue(s) identified by County within a reasonable time as determined by County, then County shall be entitled to deduct from future sums due under the Agreement the

value of the rejected portion of the System as mutually determined by the Parties. If the Parties cannot agree upon such value, County shall have the right to reject the System and terminate the Agreement or applicable Work Authorization on the terms stated above in this paragraph.

ARTICLE 8. PROTECTION OF SOFTWARE AND PROPRIETARY RIGHTS

8.1 County Proprietary Rights. Provider acknowledges and agrees that County retains all rights, title and interest in and to all materials, data, documentation and copies thereof furnished by County to Provider hereunder, including all copyright and other proprietary rights therein, which Provider as well as its employees, agents, subconsultants, and suppliers may use only in connection with the performance of Services or Support and Maintenance Services under this Agreement. All rights, title and interest in and to certain ideas, designs and methods, specifications, and other documentation related thereto developed by Provider and its subconsultants specifically for County (collectively, "Developed Works") shall be and remain the property of County. Accordingly, neither Provider nor its employees, agents, subconsultants or suppliers shall have any proprietary interest in such Developed Works. The Developed Works may not be utilized, reproduced or distributed by or on behalf of Provider, or any employee, agent, subconsultants or supplier thereof, without the prior written consent of County, except as required for Provider's performance hereunder.

8.2 Ownership. Except for custom work products, if any, County acknowledges that all copies of the Software (in any form) provided by Provider are the sole property of Provider. County shall not have any right, title, or interest to any such Software or copies thereof except as expressly provided in this Agreement, and shall take all reasonable steps to secure and protect all Software consistent with maintenance of Provider's proprietary rights therein.

ARTICLE 9. CONFIDENTIAL INFORMATION, SECURITY AND ACCESS

9.1 Public Records Law. As a political subdivision of the State of Florida, County is subject to Florida's Public Records Law, Chapter 119 of the Florida Statutes. Notwithstanding anything else in this Agreement, any action taken by County in compliance with, or in a good faith attempt to comply with, the requirements of Chapter 119 shall not constitute a breach of this Agreement.

9.2 Provider Confidential Information. Provider represents that the Software contains proprietary products and trade secrets of Provider. Accordingly, to the full extent permissible under applicable law, County agrees to treat the Software as confidential in accordance with this article. Any other material submitted to County that Provider contends constitutes or contains trade secrets or is otherwise exempt from production under Florida public records laws (including Florida Statutes Chapter 119) (“Trade Secret Materials”) must be separately submitted and conspicuously labeled “EXEMPT FROM PUBLIC RECORD PRODUCT – TRADE SECRET.” In addition, Provider must, simultaneous with the submission of any Trade Secret Materials, provide a sworn affidavit from a person with personal knowledge attesting that the Trade Secret Materials constitute trade secrets under Florida Statutes Section 812.081 and stating the factual basis for

same. In the event that a third party submits a request to County for records designated by Provider as Trade Secret Materials, County shall refrain from disclosing the Trade Secret Materials, unless otherwise ordered by a court of competent jurisdiction or authorized in writing by Provider. Provider shall indemnify and defend County and its employees and agents from any and all claims, causes of action, losses, fines, penalties, damages, judgments and liabilities of any kind, including attorneys' fees, litigation expenses, and court costs, relating to the non-disclosure of the Software or any Trade Secret Materials in response to a records request by a third party.

9.3 County Confidential Information.

9.3.1 All Developed Works, materials, data, transactions of all forms, financial information, documentation, inventions, designs, and methods that Provider obtains from County in connection with this Agreement, that are made or developed by Provider in the course of the performance of the Agreement, or in which County holds proprietary rights, constitute "County Confidential Information."

9.3.2 All County-provided employee information, financial information, and personally identifiable information for individuals or entities interacting with County (including, without limitation, social security numbers, birth dates, banking and financial information, and other information deemed exempt or confidential under state or federal law) also constitute County Confidential Information.

9.3.3 County Confidential Information may not, without the prior written consent of County, or as otherwise required by law, be used by Provider or its employees, agents, subconsultants or suppliers for any purpose other than for the benefit of County pursuant to this Agreement. Neither Provider nor its employees, agents, subconsultants or suppliers may sell, transfer, publish, disclose, display, license or otherwise make available to any other person or entity any County Confidential Information without the prior written consent of County.

9.3.4 Provider expressly agrees to be bound by and to defend, indemnify and hold harmless County and its officers and employees from the breach of any federal, state or local law by Provider or its employees, agents, subconsultants or suppliers regarding the unlawful use or disclosure of County Confidential Information.

9.3.5 Upon expiration or termination of this Agreement, or as otherwise demanded by County, Provider shall immediately turn over to County all County Confidential Information, in any form, tangible or intangible, possessed by Provider or its employees, agents, subconsultants, or suppliers.

9.4 Maintenance of Confidential Information. Each party shall advise its employees, agents, subconsultants, and suppliers who receive or otherwise have access to the other party's Confidential Information of their obligation to keep such information confidential, and shall promptly advise the other party in writing if it learns of any unauthorized use or disclosure of the other party's Confidential Information. In addition, the Parties agree to cooperate fully and

provide reasonable assistance to ensure the confidentiality of the other party's Confidential Information.

9.5 Security and Access. Any access by Provider to any aspect of the County's network must comply at all times with all applicable County access and security standards, as well as any other or additional restrictions or standards for which County provides written notice to Provider. Provider will provide any and all information that County may reasonably request in order to determine appropriate security and network access restrictions and verify Provider's compliance with County security standards. If at any point in time County, in the sole discretion of its Chief Information Officer, determines that Provider's access to any aspect of the County's network presents an unacceptable security risk, County may immediately suspend or terminate Provider's access and, if the risk is not promptly resolved to the reasonable satisfaction of the County's Chief Information Officer, may terminate this Agreement or any applicable Work Authorization upon ten (10) business days' notice (including, without limitation, without restoring any access to the County network to Provider).

9.6 Data and Privacy. Provider shall comply with all applicable data and privacy laws and regulations, including without limitation the Florida Information Protection Act of 2014, Florida Statutes Section 501.171, and shall ensure that County data transmitted or stored in the System is not transmitted or stored outside the continental United States. Provider may not sell, market, publicize, distribute, or otherwise make available to any third party any personal identification information (as defined by Florida Statutes Section 817.568 or Section 817.5685) that Provider may receive or otherwise have access to in connection with this Agreement, unless expressly authorized in advance by County. If and to the extent requested by County, Provider shall ensure that all hard drives or other storage devices and media that contained County data have been wiped in accordance with the then-current best industry practices, including without limitation DOD 5220.22-M, and that an appropriate data wipe certification is provided to the satisfaction of the Contract Administrator.

9.7 Injunctive Relief. The Parties represent and agree that neither damages nor any other legal remedy is adequate to remedy any breach of this Article, and that the injured party shall therefore be entitled to injunctive relief to restrain or remedy any breach or threatened breach.

9.8 Survival. The obligations under this Article 9 shall survive the termination of this Agreement or of any license granted under this Agreement.

ARTICLE 10. INDEMNIFICATION AND LIMITATION OF LIABILITY

10.1 Indemnification. Provider shall be fully liable for the actions of its current and former officers, employees, subcontractors and other agents under this Agreement. Provider shall at all times hereafter indemnify, hold harmless and defend County and all of County's current and former officers, employees and other agents (collectively, “Indemnified Party”) from and against any and all lawsuits, causes of action, demands, claims, losses, fines, penalties, damages, judgments, liabilities and expenditures of any kind, including attorneys' fees, litigation expenses,

and court costs (collectively, “Claim”), raised or asserted by any person or entity that is not a party to this Agreement, which Claim is caused or alleged to be caused, in whole or in part, by any intentional, reckless, or negligent act or omission of Provider or any current or former officer, employee, subcontractor or other agent of Provider, arising from, relating to, or in connection with any obligation or performance under this Agreement. In the event any Claim is brought against an Indemnified Party, Provider shall, upon written notice from County, defend each Indemnified Party against each such Claim through counsel satisfactory to County or, at County's option, pay for an attorney selected by the County Attorney to defend the Indemnified Party. The provisions and obligations of this Section shall survive the expiration or earlier termination of this Agreement. To the extent considered necessary by the County Attorney, in his or her reasonable discretion, any sums due Provider under this Agreement may be retained by County until all Claims subject to this indemnification obligation have been resolved. Any sums so withheld shall not be subject to the payment of interest by County.

10.2 Limitation of Liability. Neither Provider nor County shall be liable to the other party for any damages under this Agreement that exceed the largest of the following amounts: (a) $100,000; (b) twice the maximum compensation amount specified in Section 5.1; or (c) the amount of insurance Provider is required to provide under Article 11. Neither party shall be liable for the other party's special, indirect, punitive, or consequential damages (including damages resulting from lost data or records other than costs incurred in the recovery thereof), even if the party has been advised that such damages are possible, or for the other party's lost profits, lost revenue, or lost institutional operating savings. These limitations of liability shall not apply to (i) any Claim resulting from Provider's actual or alleged disclosure of County Confidential Information or resulting from an actual or alleged data breach in violation of applicable law, (ii) any Claim resulting from an actual or alleged infringement of any interest in any intellectual property, or (iii) any indemnification obligation under this Agreement.

10.3 Infringement Remedy. If any Equipment, Software, or portion of the System is finally adjudged to infringe, or in Provider's opinion is likely to become the subject of such a Claim, Provider shall, at County's option, either: (i) procure for County the right to continue using the applicable portion of the System; (ii) modify or replace the System (in part or in whole) to make it noninfringing; or (iii) refund to County all fees paid under this Agreement. Provider shall have no liability regarding any infringement claim caused by any County modification of the System not authorized by Provider.

10.4 Third Party Pass Thru Rights. Provider shall extend to County all rights and benefits Provider has from any third party as to the Equipment or Software relating to warranty or third party claims, including any and all indemnification and hold harmless rights, to the extent permitted under any applicable agreement with the third party equipment or software supplier or otherwise available to Provider. Provider shall at all times use all reasonable efforts to cooperate with County in the event of an infringement claim involving System.

ARTICLE 11. INSURANCE

11.1 Provider shall maintain at its sole expense, on a primary basis, at all times during the term of this Agreement (unless a different time period is stated herein), at least the minimum insurance coverage designated in Exhibit D in accordance with the terms and conditions stated in this Article.

11.2 Such policies shall be issued by U.S. Treasury approved companies authorized and licensed to transact business in the State of Florida, with a minimum AM Best financial rating of A-, unless otherwise approved in writing by County. If any deductible amounts are permitted in Exhibit D, Provider shall be responsible for the payment of all such deductible amounts.

11.3 Provider agrees to list County as an additional insured under Provider's commercial liability insurance policy and any excess liability insurance policy. The listed certificate holder on all required policies shall be "Broward County."

11.4 Coverage shall be provided on forms no more restrictive than the latest edition of the applicable forms filed by the Insurance Services Office.

11.5 Provider shall notify County in writing within thirty (30) days after Provider learns of any claim against Provider's professional liability insurance policy in which damages claimed plus defense costs incurred to date exceed $250,000.

11.6 Within fifteen (15) days of execution of this Agreement, Provider shall provide County with proof of insurance in the form of Certificate(s) of Insurance and applicable endorsements. Failure to timely provide acceptable proof of insurance, as determined by County, shall entitle County to terminate this Agreement without any liability to Provider.

11.7 All insurance policies required under this Article must expressly provide County with at least thirty (30) days' written notice of expiration, cancellation, or restriction of coverage. Provider shall provide certified copies of any policy to County upon County's request.

11.8 If Provider subcontracts any work under this Agreement, Provider shall require that each subcontractor names County as an additional insured under the subcontractor's general liability insurance policy and any excess liability insurance policy.

ARTICLE 12. EEO and CBE COMPLIANCE

12.1 Nondiscrimination. Provider may not discriminate on the basis of race, color, sex, religion, national origin, disability, age, marital status, political affiliation, sexual orientation, pregnancy, or gender identity and expression in the performance of this Agreement, except that any project assisted by U.S. Department of Transportation funds shall comply with the nondiscrimination requirements in 49 C.F.R. Parts 23 and 26. Provider shall include substantially similar language

in its contracts with any and all permitted subcontractors providing goods or services under this Agreement.

12.2 Failure by Provider to carry out any of the requirements of this Article shall constitute a material breach of this Agreement, which shall permit County to terminate this Agreement or to exercise any other remedy provided under this Agreement, Broward County Code of Ordinances, Broward County Administrative Code, or under other applicable law, all such remedies being cumulative.

ARTICLE 13. TERMINATION

13.1 This Agreement may be terminated for cause based on any breach that is not cured within ten (10) days after written notice from the aggrieved party identifying the breach. This Agreement may also be terminated for convenience by the Board upon providing written notice to Provider of the termination date, which shall be not less than thirty (30) days after the date such written notice is provided. If County erroneously, improperly, or unjustifiably terminates for cause, such termination shall, to the full extent permissible under applicable law, be deemed a termination for convenience, which shall be effective thirty (30) days after such notice of termination for cause is provided.

13.2 County may terminate this Agreement if Provider is found to have submitted a false certification pursuant to Section 287.135, Florida Statutes, if Provider has been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or if Provider has failed to promptly implement corrective action for audit deficiencies upon reasonable notice by County. Notwithstanding anything contained in this Agreement to the contrary, the rights and obligations of the Parties under this paragraph shall be governed by Section 287.135, Florida Statutes, to the full extent applicable.

13.3 Provider represents that neither it nor any of its affiliates has been placed on the discriminatory vendor list, as defined by Section 287.134, Florida Statutes. County may terminate this Agreement effective immediately, without any further obligation to Provider, upon learning that such representation is false or if Provider or any of its affiliates is placed on the discriminatory vendor list.

13.4 Additionally, and notwithstanding anything to the contrary in this Agreement, County may terminate this Agreement without any further liability to Provider upon the decertification of Provider as a Certified Business Entity ("CBE") by County's Office of Economic and Small Business Development ("OESBD"), if Provider's status as a CBE was a factor in the award of the Agreement and such status was misrepresented by Provider. However, such termination shall not be effective until expiration of any timely-filed review or appeal of the decertification decision.

13.5 Notice of termination shall be provided in accordance with the "Notices" section of this Agreement.

13.6 In the event this Agreement is terminated for convenience, Provider shall be paid for any goods and services properly provided through the termination date specified in the written notice of termination. Provider acknowledges that it has received good, valuable and sufficient consideration from County, the receipt and adequacy of which are hereby acknowledged by Provider, for County's right to terminate this Agreement for convenience, and Provider hereby waives, to the full extent permissible under applicable law, any and all rights to challenge the adequacy of such consideration or the validity of County's right to terminate for convenience.

ARTICLE 14. MISCELLANEOUS

14.1 Rights in Documents and Work. Any and all reports, photographs, surveys, and other data and documents provided or created in connection with this Agreement shall be and remain the property of County and, if a copyright is claimed, Provider hereby grants to County a nonexclusive perpetual license to use the copyrighted item(s), to prepare derivative works, and to make and distribute copies to the public. In the event of termination or expiration of this Agreement, any reports, photographs, surveys, and other data and documents prepared by Provider, whether finished or unfinished, shall become the property of County and shall be delivered by Provider to the Contract Administrator within seven (7) days of termination or expiration of this Agreement by either party.

14.2 Audit Right and Retention of Records. County shall have the right to audit the books, records, and accounts of Provider and its subcontractors that are related to this Agreement. Provider and its subcontractors shall keep such books, records, and accounts as may be necessary in order to record complete and correct entries related to the Agreement and performance thereunder. All books, records, and accounts of Provider and its subcontractors shall be kept in written form, or in a form capable of conversion into written form within a reasonable time, and upon request to do so, Provider or its subcontractor, as applicable, shall make same available at no cost to County in written form.

Provider and its subcontractors shall preserve and make available, at reasonable times within Broward County for examination and audit by County, all financial records, supporting documents, statistical records, and any other documents pertinent to this Agreement for a minimum period of three (3) years after expiration or termination of this Agreement or until resolution of any audit findings, whichever is longer. County audits and inspections pursuant to this Section may be performed by any County representative (including any outside representative engaged by County). County reserves the right to conduct such audit or review at Provider's place of business, if deemed appropriate by County, with seventy-two (72) hours' advance notice.

Any incomplete or incorrect entry in such books, records, and accounts shall be a basis for County's disallowance and recovery of any payment upon such entry. If an audit or inspection in

accordance with this Section discloses overpricing or overcharges to County of any nature by Provider in excess of five percent (5%) of the total contract billings reviewed by County, the reasonable actual cost of the County's audit shall be reimbursed to the County by Provider in addition to making adjustments for the overcharges. Any adjustments and/or payments due as a result of such audit or inspection shall be made within thirty (30) days from presentation of County's findings to Provider.

Provider shall ensure that the requirements of this Section are included in all agreements with its subcontractor(s).

14.3 Public Records. To the extent Provider is acting on behalf of County as stated in Section 119.0701, Florida Statutes, Provider shall:

a. Keep and maintain public records required by County to perform the services under this Agreement;

b. Upon request from County, provide County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time and at a cost that does not exceed that provided in Chapter 119, Florida Statutes, or as otherwise provided by law;

c. Ensure that public records that are exempt or confidential and exempt from public record requirements are not disclosed except as authorized by law for the duration of this Agreement and following completion of this Agreement if the records are not transferred to County; and

d. Upon completion or termination of this Agreement, transfer to County, at no cost, all public records in possession of Provider or keep and maintain public records required by County to perform the services. If Provider transfers the records to County, Provider shall destroy any duplicate public records that are exempt or confidential and exempt. If Provider keeps and maintains public records, Provider shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to County upon request in a format that is compatible with the information technology systems of County.

The failure of Provider to comply with the provisions of this Section shall constitute a material breach of this Agreement entitling County to exercise any remedy provided in this Agreement or under applicable law.

A request for public records regarding this Agreement must be made directly to County, who will be responsible for responding to any such public records requests. Provider will provide any requested records to County to enable County to respond to the public records request.

IF PROVIDER HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO PROVIDER'S DUTY TO PROVIDE PUBLIC RECORDS

RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT (954) 357-8012, JDEZAYAS@BROWARD.ORG, 115 S. ANDREWS AVE., SUITE 325, FORT LAUDERDALE, FLORIDA 33301.

14.4 Truth-In-Negotiation Representation. Provider's compensation under this Agreement is based upon representations supplied to County by Provider, and Provider certifies that the wage rates, factual unit costs, and other factual information supplied to substantiate Provider's compensation is accurate, complete, and current at the time of contracting. County shall be entitled to recover any damages it incurs to the extent such representation is untrue.

14.5 Public Entity Crime Act. Provider represents that it is familiar with the requirements and prohibitions under the Public Entity Crime Act, Section 287.133, Florida Statutes, and represents that its entry into this Agreement will not violate that Act. In addition to the foregoing, Provider further represents that there has been no determination that it committed a "public entity crime" as defined by Section 287.133, Florida Statutes, and that it has not been formally charged with committing an act defined as a "public entity crime" regardless of the amount of money involved or whether Provider has been placed on the convicted vendor list. Notwithstanding any provision in this Agreement to the contrary, if any representation stated in this paragraph is false, County shall have the right to immediately terminate this Agreement and recover all sums paid to Provider under this Agreement.

14.6 Independent Contractor. Provider is an independent contractor under this Agreement. Provider shall not have the right to bind County to any obligation not expressly undertaken by County under this Agreement.

14.7 Third Party Beneficiaries. The Parties acknowledge that there are no third party beneficiaries under this Agreement.

14.8 Notices. In order for a notice to a party to be effective under this Agreement, notice must be sent via U.S. first-class mail with a contemporaneous copy via e-mail to the addresses listed below and shall be effective upon mailing. The addresses for notice shall remain as set forth herein unless and until changed by providing notice of such change.

NOTICE TO COUNTY:
Broward County Office of Regional Communications and Technology
Attn: Jose DeZayas
115 S. Andrews Ave., Suite 325
Ft. Lauderdale, Florida 33301
Email address: jdezayas@broward.org

NOTICE TO PROVIDER:
Keylite Power & Lighting Corp.
12312 SW 117th Court

Miami, Florida 33186
Email address: dan.deveson@gmail.com

14.9 Assignment. Except for subcontracting approved by County at the time of its execution of this Agreement or any written amendment hereto, neither this Agreement nor any right or interest herein may be assigned, transferred, subcontracted, or encumbered by Provider without the prior written consent of County. If Provider violates this provision, County shall have the right to immediately terminate this Agreement.

14.10 Conflicts. Provider agrees that neither it nor its employees will have or hold any continuing or frequently recurring employment or contractual relationship that is substantially antagonistic or incompatible with Provider's loyal and conscientious exercise of the judgment and care required to perform under this Agreement. Provider further agrees that none of its officers or employees shall, during the term of this Agreement, serve as an expert witness against County in any legal or administrative proceeding in which he, she, or Provider is not a party, unless compelled by court process. Further, such persons shall not give sworn testimony or issue a report or writing, as an expression of his or her expert opinion, which is adverse or prejudicial to the interests of County in connection with any such pending or threatened legal or administrative proceeding unless compelled by court process. The limitations of this Section shall not preclude Provider or any person from in any way representing themselves, including giving expert testimony in support thereof, in any administrative or legal proceeding. Provider agrees that each of its contracts with subcontractors performing under this Agreement shall contain substantively identical language to ensure that each subcontractor and its officers and employees meet the obligations contained in this paragraph.

14.11 Waiver of Breach. The failure of either party to enforce any provision of this Agreement shall not be deemed a waiver of such provision or modification of this Agreement. A waiver of any breach under this Agreement shall not be deemed a waiver of any subsequent breach.

14.12 Compliance with Laws. Provider shall comply with all applicable federal, state, and local laws, codes, ordinances, rules, and regulations in performing under this Agreement.

14.13 Severability. In the event any part of this Agreement is found to be unenforceable by any court of competent jurisdiction, that part shall be deemed severed from this Agreement and the balance of this Agreement shall remain in full force and effect.

14.14 Joint Preparation. This Agreement has been jointly prepared by the Parties hereto, and shall not be construed more strictly against either party.

14.15 Headings and Interpretation. The headings contained in this Agreement are for reference purposes only and shall not in any way affect the meaning or interpretation of this Agreement. All personal pronouns used in this Agreement shall include the other gender, and the singular shall include the plural, and vice versa, unless the context otherwise requires. Terms such as "herein," "hereof," "hereunder," and "hereinafter," refer to this Agreement as a whole and not

to any particular sentence, paragraph, or section where they appear, unless the context otherwise requires.

14.16 Governing Law, Venue and Waiver of Jury Trial. This Agreement shall be interpreted and construed in accordance with, and governed by, the laws of the state of Florida. The Parties agree that the exclusive venue for any lawsuit arising from, related to, or in connection with this Agreement shall be in the state courts of the Seventeenth Judicial Circuit in and for Broward County, Florida. If any claim arising from, related to, or in connection with this Agreement must be litigated in federal court, the Parties agree that the exclusive venue for any such lawsuit shall be in the United States District Court or United States Bankruptcy Court for the Southern District of Florida. **BY ENTERING INTO THIS AGREEMENT, PROVIDER AND COUNTY HEREBY EXPRESSLY WAIVE ANY AND ALL RIGHTS EITHER PARTY MAY HAVE TO A TRIAL BY JURY OF ANY CAUSE OF ACTION OR CLAIM ARISING FROM, RELATED TO, OR IN CONNECTION WITH THIS AGREEMENT.**

14.17 Amendments. No modification or amendment to this Agreement shall be effective unless it is in writing and executed by authorized representatives of each party. Without limiting the foregoing, the terms of this Agreement shall prevail over and against any additional or contrary terms and conditions in any format or medium whatsoever including, without limitation, shrinkwrap, click-through, or terms and conditions associated with any upgrade, update, release, patch, or other modification of the System or Software, unless expressly agreed to in writing by an amendment hereto executed by authorized representatives of each party.

14.18 Prior Agreements. This Agreement represents the final and complete understanding of the Parties regarding the subject matter hereof and supersedes all prior and contemporaneous negotiations and discussions regarding that subject matter. There is no commitment, agreement, or understanding concerning the subject matter of this Agreement that is not contained in this written document.

14.19 HIPAA Compliance. It is understood by the Parties that County personnel or their agents have access to protected health information (hereinafter known as "PHI") that is subject to the requirements of 45 C.F.R. § 160, 162, and 164 and related statutory and regulatory provisions. In the event Provider is considered by County to be a covered entity or business associate or otherwise required to comply with the Health Insurance Portability and Accountability Act of 1996 ("HIPAA") or the Health Information Technology for Economic and Clinical Health Act ("HITECH"), Provider shall fully protect individually identifiable health information as required by HIPAA and HITECH. Where required, Provider shall handle and secure such PHI in compliance with HIPAA, HITECH and its related regulations and, if required by HIPAA, HITECH, or other laws, shall include in its "Notice of Privacy Practices" notice of Provider's and County's uses of a client's PHI. The requirement to comply with this provision, HIPAA and HITECH shall survive the expiration or termination of this Agreement. County hereby authorizes the County Administrator to sign Business Associate Agreements if required under this Agreement.

14.20 Payable Interest

14.20.1 Payment of Interest. County shall not be liable to pay any interest to Provider for any reason, whether as prejudgment interest or for any other purpose, and in furtherance thereof Provider waives, rejects, disclaims and surrenders any and all entitlement it has or may have to receive interest in connection with a dispute or claim arising from, related to, or in connection with this Agreement. This subsection shall not apply to any claim interest, including for post-judgment interest, if such application would be contrary to applicable law.

14.20.2 Rate of Interest. If the preceding subsection is inapplicable or is determined to be invalid or unenforceable by a court of competent jurisdiction, the annual rate of interest payable by County under this Agreement, whether as prejudgment interest or for any other purpose, shall be, to the full extent permissible under applicable law, 0.25% (one quarter of one percent) simple interest (uncompounded).

14.21 Incorporation by Reference. Any and all Recital clauses stated above are true and correct and are incorporated herein by reference.

14.22 Representation of Authority. Each individual executing this Agreement on behalf of a party hereto represents and warrants that he or she is, on the date of execution, duly authorized by all necessary and appropriate action to execute this Agreement on behalf of such party and does so with full legal authority. Provider represents that it is an entity authorized to transact business in the State of Florida.

14.23 Domestic Partnership Requirement. Unless this Agreement is exempt from the provisions of Section 16½-157 of the Broward County Code of Ordinances, which requires County contractors to provide benefits to domestic partners of their employees, Provider agrees to fully comply with Section 16½-157 during the entire term of the Agreement. If Provider fails to fully comply with that section, such failure shall constitute a material breach which shall allow County to exercise any remedy available under this Agreement, under applicable law, or under section 16½-157. For that purpose, the contract language referenced in Section 16½-157 is incorporated herein as though fully set forth in this paragraph.

14.24 Drug-Free Workplace. It is a requirement of County that it enter into contracts only with firms that certify the establishment of a drug-free workplace in accordance with Chapter 21.31(a)(2) of the Broward County Procurement Code. Execution of this Agreement by Provider shall serve as Provider's required certification that it has or will establish a drug-free workplace in accordance with Section 287.087, Florida Statutes, and Chapter 21.31(a)(2) of the Broward County Procurement Code, and that it will maintain such drug-free workplace for the full term of this Agreement.

14.25 Contingency Fee. Provider represents that it has not paid or agreed to pay any person or entity, other than a bona fide employee working solely for Provider, any fee, commission, percentage, gift, or other consideration contingent upon or resulting from the award or making

of this Agreement. If County learns that this representation is false, County shall have the right to terminate this Agreement without any further liability to Provider. Alternatively, if such representation is false, County, at its sole discretion, may deduct from the compensation due Provider under this Agreement the full amount of such fee, commission, percentage, gift, or consideration.

14.26 Living Wage Requirement. If Provider is a "covered employer" within the meaning of the Broward County Living Wage Ordinance, Broward County Code sections 26-100 – 26-105, Provider agrees to and shall pay to all of its employees providing "covered services," as defined therein, a living wage as required by such ordinance, and Provider shall fully comply with the requirements of such ordinance. Provider shall be responsible for and shall ensure that all of its subcontractors that qualify as “covered employers” fully comply with the requirements of such ordinance.

14.27 Force Majeure. If the performance of this Agreement, or any obligation hereunder, is prevented by reason of hurricane, earthquake, or other casualty caused by nature, or by labor strike, war, or by a law, order, proclamation, regulation, or ordinance of any governmental agency, the party so affected, upon giving prompt notice to the other party, shall be excused from such performance to the extent of such prevention, provided that the party so affected shall first have taken reasonable steps to avoid and remove such cause of nonperformance and shall continue to take reasonable steps to avoid and remove such cause, and shall promptly notify the other party in writing and resume performance hereunder whenever and to the full extent such causes are removed. However, if such nonperformance exceeds sixty (60) days, the party that is not prevented from performance by the force majeure event shall have the right to immediately terminate this Agreement upon written notice to the party so affected. This Section shall not supersede or prevent the exercise of any right the Parties may otherwise have to terminate this Agreement.

14.28 County Logo. Provider shall not use County's name, logo, or otherwise refer to this Agreement in any marketing or publicity materials without the prior written consent of County.

14.29 Counterparts. This Agreement may be executed in multiple originals, and may be executed in counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

14.30 Other Eligible Purchasers. Other municipalities, public safety organizations, local government entities, or Authorized Third Party Users (each an “Eligible Purchaser”) may, if they so elect, purchase goods or services from Provider under the terms and conditions of this Agreement and any other supplemental terms or conditions as may be agreed to between Provider and the Eligible Purchaser, provided that the Eligible Purchaser shall be solely responsible for all payment and performance with respect to any such purchased goods or services and shall separately execute purchase order or other purchasing document adopting the terms of this Agreement and stating any additional terms; any such purchase order or purchasing document shall not be binding in any way upon the County and shall have no effect upon the

performance, duration, or enforcement of this Agreement. In no event shall any term or condition in any such purchase be binding on the County unless County expressly agrees to such term or condition in an appropriate Work Authorization or amendment. In the event of a conflict between any term in a purchase order or purchasing document and anything stated in the Articles or Exhibits of this Agreement, the Articles and Exhibits of this Agreement shall prevail.

(The remainder of this page is intentionally left blank.)

IN WITNESS WHEREOF, the Parties hereto have made and executed this Agreement: BROWARD COUNTY through its BOARD OF COUNTY COMMISSIONERS, signing by and through its Mayor or Vice-Mayor, authorized to execute same by Board action on the _____ day of _____, 2017, and KEYLITE POWER & LIGHTING CORP., signing by and through its _____, duly authorized to execute same.

COUNTY

ATTEST:

_____
Broward County Administrator, as
Ex-officio Clerk of the Broward County
Board of County Commissioners

Insurance requirements approved by
Broward County Risk Management Division:

By: _____
Name: Tim Crowley
Title: Property Specialist

BROWARD COUNTY, by and through
its Board of County Commissioners

By: _____

_____ day of _____, 2017

Approved as to form by
Joni Armstrong Coffey
Broward County Attorney
Governmental Center, Suite 423
115 South Andrews Avenue
Fort Lauderdale, Florida 33301
Telephone: (954) 357-7600
Telecopier: (954) 357-7641

By: _____
René D. Harrod (Date)
Assistant County Attorney

RDH
2017-09-06 Keylite FSA Agreement
09/06/2017
#214193.12

PROVIDER

WITNESSES:

Signature

Jose Tovar
Print Name of Witness above

Signature

Raul M. Cota
Print Name of Witness above

KEYLITE POWER & LIGHTING CORP.

By: _____
Authorized Signor

Angel Muñoz President
Print Name and Title

19th day of Sept., 2017

ATTEST:

Michel Verdun
Corporate Secretary or other person
authorized to attest

(CORPORATE SEAL OR NOTARY)

PAOLA DE CASTRO
Notary Public – State of Florida
Commission # GG 114905
My Comm. Expires Jul 21, 2021
Bonded through National Notary Assn.

Exhibit A – Statement of Work

Provider and County agree that Provider shall provide the following work under this Agreement:

1. Project Request

The County provides fire department dispatching services to the Broward County Sheriff's Office (BSO) Department of Fire Rescue, and various municipal fire departments throughout the County. Broward County currently uses eleven (11) console positions located at three (3) public safety answering points (PSAP), and a computer aided dispatch (CAD) system located in each PSAP, to dispatch fire and emergency medical services (EMS) incidents. The radio console positions are used to dispatch field units and monitor situations using the County's trunked radio system. The CAD system provides unit status, unit assignment, unit responses, and call updates for each dispatch operator position, then automatically sends fire unit recommendations to the assigned dispatch operators. The County's current fire station alerting system will be replaced with a new FSA System ("System") to enhance fire station functions and improve public safety to citizens and first responders.

Keylite ("Provider") represents that the System, Software, and related Services provided under this Agreement will provide this functionality and solution.

2. Services Description

Provider's System shall provide a fully functioning Internet Protocol (IP) based fire station alerting (FSA) System which integrates and interfaces to the County's radio system and computer-aided dispatch (CAD) system.

Equipment and Software: Provider will provide all necessary Equipment (including all Software embedded or otherwise provided with the Equipment) for the System, which Provider represents will provide the functionality set forth herein. The Equipment listed on Attachment A-1 and the Software listed below may be modified upon prior written approval of the County Contract Administrator. All Equipment and Software shall be the latest versions as of the date of installation, unless otherwise approved by the Contract Administrator.

A. **Software.** Provider will provide the following Software under this Agreement:

Software Suite, Version & Module	**Quantity & Type of License** ***(e.g., Enterprise, User, Third-Party)***	**Describe Purpose, Functionality & Expected Operation of Software**
Phoenix G2 System	Enterprise license	CAD interface servers
Phoenix G2 ATX Station controller (most recent version unless otherwise approved by County)	Embedded software	The Phoenix G2 ATX Station controller is embedded in the Equipment and will be provided in conjunction with

Software Suite, Version & Module	**Quantity & Type of License** ***(e.g., Enterprise, User, Third-Party)***	**Describe Purpose, Functionality & Expected Operation of Software**
		delivery of the Equipment.
Station Status and Control Web Application module	Enterprise license	Software is embedded in the communications gateway and provides the user interface to control, manage, monitor the System, send manual alerts and configure the System, including station controllers
PulseNET Network Management Software	Enterprise license	Network Management software for General Electric MDS equipment

Provider shall ensure that the System and its components will meet the County's FSA needs. The System includes the Phoenix G2 System as a special-purpose appliance system, with the components specifically configured by Provider with hardware and software for station alerting.

Provider shall ensure that any new hardware or software components provided to the County over the life of the system are backward compatible with the system being provided to the County. Hardware peripherals devices deployed over the life of the system that may be operating with updated software shall be backward compatible as necessary to properly operate in the installed System.

Third Party Software provided by Provider	**Quantity & Type of License**	**Describe Purpose, Functionality & Expected Operation of Software**
Solarwinds 082A7E01D	Network Performance Monitor SL250 (up to 250 elements)	Network monitoring software that enables detection, diagnostics of network performance problems and outages.
Solarwinds 072A7E01D	NetFlow Traffic Analyzer Module for SolarWinds Network Performance Monitor SL250	Capture data from continuous streams of network traffic, quantify how the network is being used, by whom, and for what purpose.
Solarwinds 401BIE01D	SolarWinds User Device Tracker UT2500 (up to 2500 ports)	User and device tracking along with switch port management
Solarwinds 13250E01D	SolarWinds Network Configuration Manager DL50 (up to 50 nodes)	Manage configurations, changes, and compliance for routers, switches, and other network devices
Solarwinds 79101E01D	SolarWinds High Availability for SolarWinds Orion - License with 1st-Year Maintenance	Supports redundant network management servers
Microsoft KL-WS2016	Windows server 2016, 5	Solarwinds server

Third Party Software provided by Provider	Quantity & Type of License	Describe Purpose, Functionality & Expected Operation of Software
	users	
Microsoft KL-WSQLE	Windows SQL Express	Solarwinds Server
Cambium KL-CNM1	Single license	Cambium network manager
General Electric FL-GENM	GE MDS network management, single license	PulseNet Enterprise

Provider shall integrate the System with station-level third-party systems, including phone systems, paging systems, gate opening devices, traffic control devices, gas shut off valves, etc. Provision of these third-party systems will be the responsibility of the individual fire agency.

B. **Equipment**

Provider will provide to the County the Equipment listed on Attachment A-1 (subject to any substitutions approved in writing by County Contract Administrator) ("Core System Equipment"). In addition, Provider shall make available to each fire station to purchase such equipment as that fire station may order ("Fire Station Equipment"); each fire station shall have the ability to choose a basic equipment package, which contains the most commonly requested equipment for fire stations, or other equipment options are available for purchase to allow each fire station to fully customize their fire station alerting needs. The term "Equipment" includes both Core System Equipment and all Fire Station Equipment purchased by any fire station during the term of this Agreement.

Core System Equipment

Provider will provide and install a fire station alerting infrastructure System, inclusive of the network management terminals, transmitters, and antenna systems.

Provider shall ensure the System is flexible and modular which allows for System expansion and Broward County's future needs through expansions of hardware and upgrades to software without having to replace the FSA System or its components, and allows for the addition of communication gateways, station controllers and station peripherals, with only configuration changes necessary on the existing System. The System equipment shall be modular to the extent practicable, allowing the replacement of components such as the power supply, processor board, input/output boards, audio interface, backup battery, and radios without replacing the entire unit.

Provider shall ensure all Core System Equipment is connected to County-provided backup power. Backup power will be provided by the County for all Core System Equipment. Backup power systems, including circuits supplied by both uninterruptible power supply (UPS) units and generators, will be made available by County to the Provider at each location. Provider shall ensure that the switchover to backup power for the Core System Equipment is be instantaneous and automatic in the event of power failure (only for cases where Provider is providing the

backup power system). If main power is lost, the System equipment shall switch automatically to Broward County provided backup battery power without loss of data or communications.

Provider shall ensure all System equipment, including all Equipment installed in PSAPs, at radio tower sites, and in each fire station, are UL-compliant or equivalent, and has undergone extensive safety testing, and has passed Federal Communications Commission ("FCC") for safety standards, TUV Rheinland ("TUV") internal electrical safety standards, or alternative safety standards.

Provider shall provide all Equipment in new condition covered by a full factory and/or manufacturer's warranty of not less than one (1) year in accordance with Section 6.3 of the Agreement. Provider shall ensure that none of the Equipment provided include subsystems or equipment with published cancellation dates as of the date of Final Acceptance. Provider will ensure all Equipment shall be supported for a minimum of five (5) years following any cancellation date published during the term of this Agreement.

Fire Station Equipment

Provider shall provide fire stations a variety of equipment options that may be purchased by the respective fire departments. The packages offered shall consist of an ATX Station Controller unit, interfaced to a UHF MDS radio and a Cambium radio for redundant station alerting connectivity to the core equipment, and an 800 megahertz (MHz) trunked radio for voice messages. A basic system option is included in Exhibit A-1. Fire station equipment packages shall be provided by Provider which shall consist of the station transponder and control unit (ATX Controller), voice and data radios, antenna systems, and interface capabilities to station lighting, PA system, speakers, message board, and zoning systems. Each individual fire stations will have the ability to choose public address (PA) systems, station zoning, and other custom features installed in each station, based upon individual department and station requirements. Provider shall ensure that dispatch and individual fire agencies have the ability to add to its core equipment at any time as budgets allow, with only simple configuration required to add new equipment to the System. Additional fire station equipment shall be made available to each fire station by Provider for purchase, but shall be the responsibility of the individual jurisdictions and departments to purchase.

Provider shall ensure that the System supports station-level equipment, peripherals and devices to convey alerts, including but not limited to: LED message signs, LED Speaker Lights, digital display panels, sign remotes, room remotes, HDTV remotes, IO remotes, speaker, amplifiers, strobe lights, standard architectural grade speakers, and weatherized speakers. Each station will determine which equipment features they will use.

Provider shall provide and install the following mandatory equipment at each fire station (actual purchase shall be initiated and paid by the individual fire station or representative agency for that station):

a. UHF MDS data radio, interfaced into the station controller and the Communications Gateway (as defined below)

b. 4.9 GHz Cambium access point, interfaced into the station controller and the Communications Gateway
c. 700/800 MHz P25 Phase II-capable voice radio interfaced to the station controller and station PA system
d. ATX station controller, with two tested communications paths to the Communications Gateway
e. Uninterruptible Power Supplies (UPS)
f. Available, optional peripheral equipment for fire stations, including lights, signs and display boards, are listed in the Optional Services section of this SOW.

System Functionality

General System Functionality

Provider shall ensure all System functions are configurable by software changes only, and shall not require changes to hardware systems. The System shall be web accessible, subject to security and access rights.

Provider shall ensure that the System performs as a mission critical System which only allows authorized personnel to control speaker volume in specific audio zones using a control process which is done electronically through control interfaces, rather than manually. The System will maintain logs to keep track of individual volume changes and provide dependable coverage through a station, while reducing potential liability and risk from calls being missed due to staff lowering individual speaker volumes and will provide the ability to select and set automatic speaker timer controls, and shall be accessible from a remote personal computer (PC). Provider shall ensure the Fire Station Equipment includes configurable digital inputs and outputs for system expansion into additional auxiliary station functions.

The System does not support ad-hoc reporting on the internal operation of the communications gateways. However, all performance information is presented using the log viewer applications provided by the System. The information is in chronological order for viewing by personnel. The alert log presents each alert as received from the CAD system, and shows all activity on the station alerting system as viewed from the communications gateway's perspective.

Provider shall provide all necessary networking switches and routers, configured to act as a host "hub" and point of presence for future LAN/WAN connectivity to each fire station, if the individual jurisdiction or Authorized Third Party User opts for landline connectivity in addition to radio connectivity. If a jurisdiction or Authorized Third Party User opts for landline connectivity, it will be responsible for all connectivity costs and interfaces necessary to connect with the County hub.

The basic equipment package includes WAN router/firewalls and associated pricing, which must be purchased as part of the basic equipment package if the County Contract Administrator

determines it is necessary for the applicable fire station, and if County Contract Administrator determines it is not appropriate, then it shall not be included and shall be removed from the package and pricing; Provider shall work with County and the applicable fire station, municipality, or Authorized Third Party User to determine the best configuration(s). The system "hub" shall support connections for up to 125 fire stations.

The System shall alert the fire stations using both the General Electrics MDS system and the FireNet point-to-multipoint system links, with each link capable of initiating all required FSA system auxiliary functions and capabilities. The "hub" described above shall provide a third optional alerting path if an agency elects to have this connectivity or if connectivity from one of the two primary delivery methods is unavailable.

The System shall utilize FireNet microwave IP network and the UHF MDS radios to alert fire stations over both IP and radio links sequentially. All transmissions generated by the System shall automatically receive a positive acknowledgment per each transmission. If an acknowledgment is not received, the System shall automatically send the data again for a predetermined number of attempts. If no acknowledgment is received, the System will send an alarm to the CAD system.

Alerting and Dispatching

Dispatch operations are conducted from the County's designated PSAPS (currently 3 PSAPs, geographically located in the north, central, and south areas of the County), with specific station alerting and dispatching responsibilities assigned to each PSAP. The System shall be able to alert the fire station(s) designated by the responding PSAP.

Provider shall ensure the FSA System shall be configurable, expandable, and flexible, allowing customization to meet the specific needs of each station or company. The FSA System shall accommodate all PSAPs and fire dispatch positions supported by the County's CAD system. The System shall be capable of supporting as many dispatcher positions as can be accommodated by the County's CAD system. The System shall perform alerting for up to 255 stations or companies, and allow for additional expansion in the future.

Provider shall ensure the System automatically resets the Fire Station Equipment after each alert in preparation for the next alert. The System will automatically reset to its pre-alert status after completion of an alert. The default time to reset after an alert is 2 minutes, but can be configured by the user to reset at a shorter or longer time period. Any alert sent prior to the reset timer expiring will take the place of the previous message.

Provider shall ensure the System displays and identifies the following alarms on the dispatch operator screens identified by the County:

- Failure to alert a station(s)
- Failure of the FSA Equipment at any fire station
- Failure of any communications link (radio and/or IP) and identification of the

failed link
- Failure to communicate with the CAD system

In addition to the two alerting communications links, a separate, independent radio link utilizing a control station radio shall be used for voice announcements from the fire dispatch operator or automated text-to-speech initiated by the CAD system. The communications gateway and gateway radio interface (GaRI) together provide a link to the radio system for automated dispatch announcements.

Provider shall provide radio interface via a Motorola APX1500 radio as the interface device at each of the two server locations. This link shall be a dispatch talkgroup on the P25 trunked system designated by the County and dedicated to this purpose. The Communications Gateway shall indicate when the dispatch data from the CAD system has been sent and provide a "clear to talk" message to the fire dispatcher to begin the voice message.

Provider shall ensure the Communications Gateway will provide indication to the dispatcher via CAD interface when all alerted stations are available for a voice announcement. Stations shall be alerted with a tone followed by a dispatch voice announcement or text-to-speech announcement (as elected by the dispatcher) to those stations alerted. All dispatches (manual or text-to-speech) shall be preceded by the alert tone.

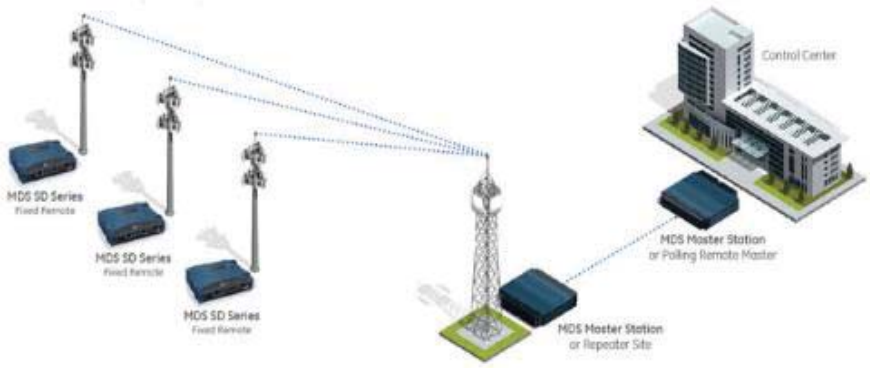
Provider shall configure the Network Management System (as described below) to send emails and short message service (SMS) messages to personnel designated by the County upon discovery of an alarm event described above. Provider will link to Broward County provided account and access to SMS outbound service. Upon receipt of an alert from the CAD or manual alerting client, the communications gateway will generate an alert and can send an email to server via SMTP or ESMTP which can be directed to a paging or cell phone system to deliver pages or SMS messages. Authorized users may configure how the messages can be sent. Event messages shall be delivered when the event occurs.

RF Network

Provider shall supply two (2) independent methods of alerting each fire station. The first method shall utilize MDS radios on a conventional channel, while the second shall utilize a point to multi-point microwave system.

The FSA system shall utilize a UHF channel in the 450 – 470 MHz band to meet and exceed the County's needs as the first method of FSA connectivity.

The following figure illustrates the basic network configuration which shall be used:



The base station configuration shall be a geographically diverse, hot-standby configuration. Provider shall provide double-redundancy, exceeding the reliability requirements. The configuration will include transmitters at the EMS, Coconut Creek, Channel 2, and Markham Park radio sites. The sites may be changed at the approval of the Contract Administrator.

The radio sites have been selected based on providing reliable coverage to the County's fire stations. Coverage maps and path calculations for the GE MDS system are included in Exhibit A-4.

The MDS Base Stations shall provide hot-standby radios and power supplies. Provider shall install the system with a geographically diverse head-end at the identified transmitter locations approved for use by the County. Provider shall provide the MDS network management software suite, and shall work with County staff to implement redundant IP routing using your existing network facilities. Support shall include troubleshooting any network problems in combination with the County's network maintenance provider should any communications problems occur on the County's network.

Provider shall ensure that the MDS radios can share a single channel amongst physically disparate sites, re-using the frequency to serve a wider area more effectively to optimize the design and locate base station radios at various sites as necessary and appropriate, and allow the polling system to steer outbound calls accordingly.

Provider will provide the following antenna system components for each of the four MDS radio locations identified in the equipment list in Exhibit A-1:

- ⅞" Heliax cable
- Single antenna for full duplex base stations
- Tower structural load analysis
- Operation on a narrow band UHF channel

The current radio base station used by the Zetron system operates on the UHF T-Band frequency of 470.0375 MHz, which must be returned to the FCC by 2022. Provider shall provide a

replacement full duplex base station and antenna system capable of operation in the UHF spectrum (450–470 MHz).

Provider shall provide MDS licensed base stations, and offer subscriber radios for purchase by user agencies at each fire station. There is a variety of terminal options available that can be elected for purchase by the applicable fire stations or other eligible purchasers.

Microwave Network (FireNet)

Provider shall supply a point to multipoint microwave system, providing end to end IP access to Broward County fire stations for a secondary path to the Core System Equipment. The System shall be comprised of both point to point microwave links and point to multipoint access points, and shall use utilize Cambium equipment.

Provider shall offer each fire department Cambium subscriber modules that will provide connectivity to Provider-provided access points (APs) located at radio towers throughout the county. These AP's shall be connected with a standalone loop-switched fault tolerant microwave ring provided by the Provider. Provider shall guarantee two methods of connectivity to each fire station in Broward County.

Provider shall guarantee coverage to each fire station in the County by direct RF path. If a direct RF path is not available, Provider shall provide and install up to ten (10) link radio pairs to cover stations shadowed from NLOS coverage margins if elected by County as part of Optional Services. Station 106 shall be connected by alternate means.

The System shall provide a high speed wireless network installed, tested and integrated, to provide Layer 2 IP connectivity, with aggregate capacity of 694 Mbps. Provider shall ensure this network is designed to support fire station alerting, but can be leveraged for any other public safety communications needs, such as connectivity for CAD, site monitoring, wireless video, and even act as a backup to pending communications procurements.

Provider will ensure that individual fire stations and other fixed-point subscribers can connect with small, cost-effective Access Points that support up to 136 Mbps.

The Provider has completed preliminary path studies for the point to point microwave system. These studies are included in Exhibit A-6.

In support of the microwave solution, Provider shall be responsible for the following:

- Complete path studies to validate microwave paths are feasible prior to conducting path surveys
- Complete path surveys to validate obstructions along each proposed microwave path

- Conduct site walks to identify where equipment will be located, identify shelter entry port, confirm availability of power, and ascertain any other site conditions that may impact the equipment installation
- Obtain all necessary licensure, including filing FCC applications and any necessary documents to secure frequencies required to support the proposed 11 GHz point to point microwave and point to multipoint access points. Provider shall be responsible for the frequency coordination services, which may be subcontracted to ComSearch (or equivalent subcontractor approved in advance by County Contract Administrator). (The County is responsible for 4.9 GHz FCC licensing.)
- Conduct a system design review to validate the system design and equipment lists prior to ordering equipment
- Perform a structural analysis at each tower site to confirm the sites will support the loading of the proposed equipment (in addition to all other pre-existing or pre-approved equipment on the towers). Any subcontractor charges for tower structural analysis shall be Subcontractor Pass-Thru Services and must be pre-approved in advance by County and shall be invoiced in accordance with Exhibit B on a pass-thru basis with no additional markup by Provider.
- Stage equipment in a factory-controlled setting and validate system performance
- Secure applicable construction permits prior to equipment mounting
- Install equipment at each radio site and dispatch center at County-designated locations
- Install associated antennas and applicable feedline/data cables
- Ground all installed equipment per Motorola R56 requirements
- Interface the County's Public Safety Internet (PSI) to the microwave network and ensure end to end connectivity between the Provider communications gateways and remote access points connected through the Cambium system
- Provide IP routers and switches at each radio site and dispatch location (including new sites developed in conjunction with ongoing P25 project) to support future Broward County applications
- Provide legacy interfaces at each FireNet-equipped radio site and dispatch location, including a minimum of 4 x DS1 ports
- Optimize equipment and validate proper link performance
- Validate proper system functionality through the completion of functional, operational, and final accepting testing as set forth below in Section 14.
- Validate access points provide guaranteed coverage to each fire station in Broward County
- Ensure seamless integration with the Provider communications gateways and the MDS radio system and validate proper FSA alerting via both systems in a hot standby configuration
- Provide applicable technician and system manager training

Overall System Interfacing

Provider shall be responsible for providing all interfaces specified on Exhibit A-7, including without limitation the following two-way interfaces, as applicable (including any and all necessary software and hardware):

1. Interface Communications gateways to County PSI
2. Interface Communications gateways to primary and backup Motorola PremierOne CAD servers, and work with Motorola to validate proper operation of the interface
3. Interface Communications gateways to console positions to allow access to fire station alerting functionality without use of CAD via web browsers on the CAD terminals
4. Interface Communications gateways to pass automated speech over radio channel
5. Interface FireNet microwave system to County PSI to provide IP connectivity to radio sites
6. Interface leased circuits to County PSI to provide network management access at the County Government Center and Radio Shop

The FSA system is interfaced with the County's Motorola PremierOne CAD system and the County's Project 25 (P25) trunked radio system communications infrastructure, and will provide end users the option of enhanced fire station functions. Provider shall ensure the FSA system is fully compatible and integrated with the County's currently-implemented version of the Motorola PremierOne CAD system. Provider shall be responsible for the all aspects of the interface other than the Motorola CAD side of the interface, as further detailed below:

- Provider will ensure CAD integration between USDD and MSI interfaces so that the integrated System operates correctly and is capable of accepting and processing the requested messages in a way acceptable to the County. Provider is does not assume any responsibility regarding the performance of the Premier One CAD system, and is only responsible for provision of the two-way interface between the fire station alerting System and the CAD system.

- Provider shall design and build interfaces between the System and Software with the County's CAD system with servers located at the north and central regional dispatch centers, unless otherwise directed by the Contract Administrator. Each geographically redundant G2 Communications gateway will interface seamlessly with each geographically redundant CAD server. The County shall be responsible for providing the connectivity between facilities for the G2 communications gateways and CAD servers. Provider shall coordinate with the County's PremierOne software provider to ensure the System is configured to accurately transmit all data from the PremierOne system through the fire station alerting system to the fire stations located throughout the County.

- To the extent approved in writing by County Contract Administrator, Provider is authorized to subcontract with Motorola Solutions, Inc. to provide any necessary services,

and will pass through costs as-quoted at no additional markup to County. Any subcontractor charges for the CAD interface shall be Subcontractor Pass-Thru Services that require prior written authorization and approval by County Contract Administrator and shall be invoiced in accordance with Exhibit B on a pass-thru basis with no additional markup by Contractor.

- Provider shall provide USDD's standard XML interface to interface to the CAD system. The communications between the CAD system and the communications gateway for initiating alerts and receiving status messages is via TCP/IP. The System's API is an XML-based messaging API that allows the CAD system integrator full access to the alerting functions of the System. Alerts are generated by sending an XML Alert message to the communications gateway with the details of the alert including the groups, stations, or units to alert. The communications gateway will then generate the alerts based on this information and return a destination status message XML response after all configured retries have occurred in the System. The API also includes a periodic handshake message that is sent between the CAD system and the communications gateways to allow each end to detect the connection status.

Provider shall also provide all necessary interfaces to integrate seamlessly with the County's IP network to ensure backhaul connectivity between all components. The County shall leverage FireNet for backhaul for the MDS radios, but may elect to secure leased circuits to provide connectivity from the dispatch centers to the remote radio sites in order to expedite System activation. The Provider shall be responsible for interfacing those circuits to the Provider's equipment and the County's public safety internet (PSI) that connects the two dispatch centers and associated CAD servers. This effort will include troubleshooting network connectivity between the Provider's equipment and the PSI network, including working with Motorola who shall be responsible for managing and supporting the PSI network, if any issues are found. Provider shall be responsible for running cables from their equipment to the PSI demark, which may not be located in the same equipment room. Provider shall participate in the County's change management review (CMR) process, which entails submitting paperwork and attending conferences calls whenever changes will be made to the County's equipment.

Communications Gateway

Provider shall ensure the communications gateway has a web-based configuration and management interface. This interface provides access to the configuration database as well as diagnostic reporting. Access to the system is password protected and role-based, allowing function restriction to the individual level when necessary.

System logging is provided on the Communications Gateways, and all communications with the CAD system is logged. In addition, statistical information on messages received and transmitted, along with counts of message retransmissions is kept in the database. Stations that do not respond to periodic polls are flagged as having trouble, and email / pager messages can be send to designated personnel advising of the failure.

The System also includes a manual alerting client for dispatcher use when the CAD system is unavailable. This client can also be used by technical staff to generate end-to-end alert tests for the fire station.

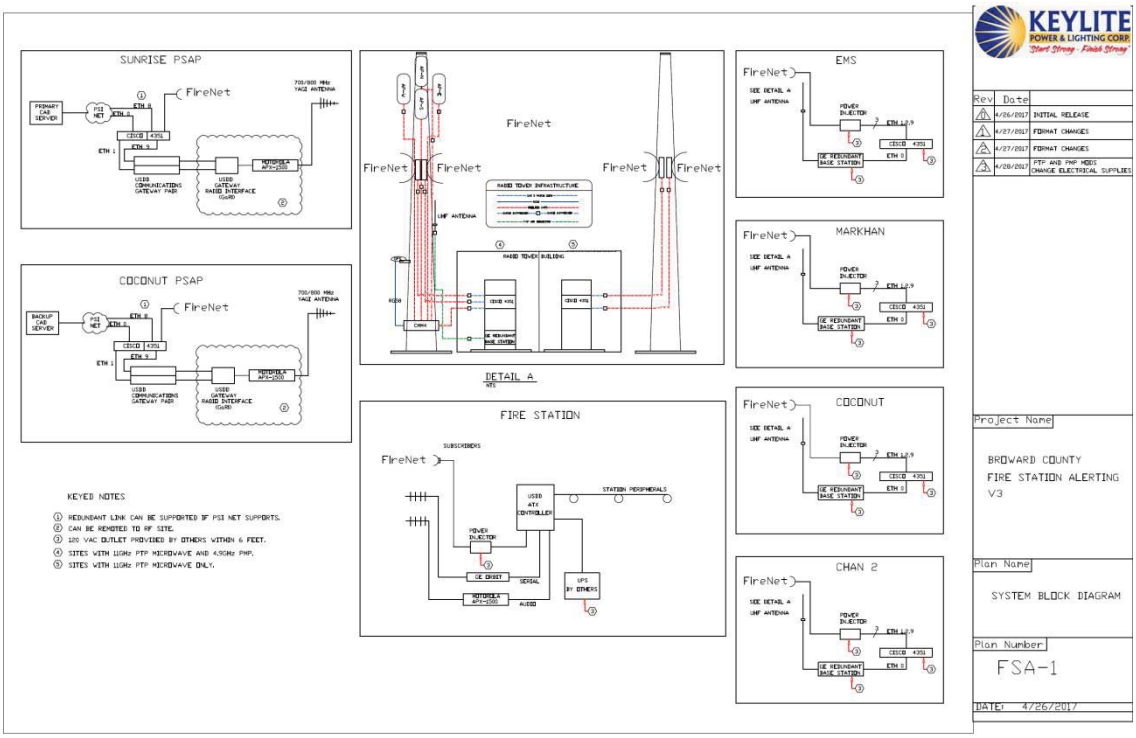
Provider shall ensure the communications gateways support multiple simultaneous CAD interfaces to a XML-based TCP-connected bidirectional API provided by Motorola. The CAD interface receives an alert message from the CAD system and returns a destination status message back to the CAD system indicating the success or failure of the alert to the involved station controllers. The CAD system shall have the ability to send event information to the CAD system based on configured activity events from the station controllers, such as pushbutton presses.

Provider shall ensure CAD systems shall send unit status information to the station alerting System and the System shall display the available/unavailable status on message displays connected to the station controllers when an alert is not active in the station to the extent the information is provided by the CAD system.

Software updates for the communications gateway shall be updated by Provider using remote access to its disk drives which have two separate partition groups and shall each have a complete operating System and application installed. Remote access shall provide the Provider with the ability to update the Software on the communications gateways and switch reboot the System into either of the installed Systems, as well as ensuring that database updates can be migrated directly from a running System to a new System.

Gateway Radio Interface

Provider will also provide Gateway Radio Interface (GaRI) units for each Communications Gateway to provide automated audio alerts over the County's radio system. Each communications gateway shall be configured with one or more gateway audio radio interfaces (GaRI) to allow the System to transmit paging tones, and alert tones over the County's radio channels or talkgroups, without dispatcher intervention. The GaRI is a network device that receives streaming audio and control instructions from the communications gateway and outputs analog audio and control signals to detect radio channel busy signals, generate radio push-to-talk signals, and play the audio over the radio system. Each GaRI shall control and output audio for two (2) channels. Multiple GaRI's shall be connected to the System providing control for multiple radio channels. The System shall be fully compatible and functional to support operations on analog, digital, and P25 radio systems.



IP Connectivity

There is no existing Internet protocol (IP) network connecting the County PSAPs and the 106+ fire stations that will need to be alerted. The Provider shall provide a solution that leverages an over-the-air interface through a conventional channel, and provide a point to multi-point microwave delivery system as a secondary option for station connectivity, thus providing two independent paths for station connectivity.

Provider's System shall provide alerts to stations with station toning and station functions over both microwave IP connectivity and data radio transmission, and provides for dispatch operator announcements over a designated fire voice radio talkgroup on the County's P25 public safety radio system.

County shall be responsible for meeting the following minimum requirements: on either County-provided or leased networks:

- Minimum requirements for leased circuit bandwidth, latency, and jitter (if required): 2 Mbps, 10 msec latency, no jitter requirement.
- Bandwidth requirements for all connections that will leverage the County's PSI: 10 Mbps
- Firewall policies appropriate to support connectivity on the Provider's equipment and all other interfaced equipment on the PSI. These policies include source IP address, destination IP address, and any ports utilized.

Network Management System

Provider shall provide the MDS PulseNet management software. MDS PulseNET Network Management Software was designed specifically for MDS Industrial communication systems and satisfies the real-time needs of customers who are responsible for managing them. MDS PulseNET software is unique, and requires no customization to get started. PulseNet is included in the System provided to County. If fire stations so elect, fire stations may purchase licenses on a per-radio basis for PulseNet management software; if so purchased, Provider will provide all necessary configuration for the subscriber data radios for PulseNet.

Provider shall provide the Cambium Wireless Manager which shall perform as a deployment and management application to deliver integrated network control. The solution shall automatically incorporate relationships between network layers, and make use of Google maps technology for the visualization of network devices and connectivity.

Provider shall provide the SolarWinds network management system to provide system alarming and reporting for all the subsystems included within the FSA System, including the Cambium microwave, and GE MDS systems. Provider shall provide all of the interfaces from the various subsystems to SolarWinds, and ensure that alarms are accurately reported by the SolarWinds network management system. The SolarWinds installation shall be provided with redundancies to ensure alarm logs are preserved in the event of a hard drive or other System failure, and with redundancies to allow the timely restoration of service compliant with mandated response and restoration times.

Provider shall ensure all transmissions and subsequent acknowledgments, shall be time-stamped, date-stamped, and stored in the FSA system database, and that all communications between all devices in the system are logged. All remote access and maintenance activities shall be logged in the maintenance log.

The communications gateway shall log CAD communications and station controller communications and the station controller logs communications with the communications gateways and the peripherals and internal components. The System provides detailed logging information on both the communications gateway and the station controllers. The communications gateway provides a detailed alert log and System log and each station controller provides a detailed diagnostic log. The System Administrator can designate personnel who are authorized to access the logging information when configuring the gateways on the settings page. Access to the diagnostic log on the station controller is restricted to a user with the proper password. Log information is accessed in the log viewer utility provided in the communications gateway user interface. The log viewer utility also provides a utility to download the log file to a local or remote file analysis.

All FSA alarms and events shall be time- and date-stamped, stored, and available for review and printing. System alarms and events include, but are not limited to, fire station alerting, transmission acknowledgments, CAD system failure, station alert failure, station equipment

failure, communications link failure, system configuration changes, and fire dispatch operator entries. Notification for AC power failures shall require UPS units provided by Provider.

Station Controller

Provider shall ensure the station alerting controller receives the alerting information from the communications gateway and informs the station alerting controller which units are to be alerted for the particular dispatch. The alerting controller then decides, based on its configuration, which areas of the station to alert and what information to display or speak for this alert. The station controller then activates all the peripherals necessary to complete the alert. This can involve any combination of amplifiers, message remotes, and/or room remotes or printers. The station controller can activate output relays attached to any of these peripherals in a momentary or latched mode, such as opening bay doors or turning on lighting.

Administration and configuration of the individual station controllers in the stations is accomplished two ways. Basic operations, configuration, and maintenance information is provided using the touch screen display on the front of the unit. This display normally shows basic Station controller status information such as CAD link status, current time, and last dispatch received. Other detailed diagnostic information can also be displayed when needed and basic troubleshooting can be conducted using the IP address and device name display functions. The display also provides the fire fighters control over the station radio monitor, and allows them to reprint dispatch information on previously received dispatches.

Provider shall ensure the primary configuration of the Station controller is accomplished using the web-based interface to the controller. A web browser can be used to configure the System from any PC that can access the station controllers. This allows staff to make configuration changes either locally in the station or remotely from an office or home with VPN access to the system. The interface allows the modification of all station controller settings, including time-of-day volume changes, audio input level and priority behavior, message device settings, unit configuration, and unit to station area assignments.

When the communications gateway receives an alert request from the CAD system or manual alerting application, the communications gateway analyzes the alert information received and creates two parallel alerting paths, one for the station alerts (using IP) and one for the radio alerts.

The alert created for the primary station alerting path (FireNet) will be transmitted to the affected stations in no more than two (2) seconds. In the event a station fails to acknowledge receipt of the initial alert, the gateway will send two (2) retries, one (1) per second. If an acknowledgment is not received after the retries, the gateway will move to the secondary communication path (GE) and attempt to alert the station via this path. The initial alert and retries are the same as the primary communication path. If the secondary path fails, an unsuccessful delivery status message will be returned to the CAD and dashboard, allowing the dispatcher to send the alert via alternate methods. Under normal circumstances, the alert via

the alternate radio path should take no more than ten (10) seconds Under normal circumstances with no retries and a normal (500 bytes) message payload, alerting ten (10) stations should take no longer than two (2) seconds, and one-hundred (100) stations no longer than four (4) seconds.

The station alerting system provides an automated alert acknowledgement as part of the System. The station controller will return an acknowledgement message back to the communications gateway after the successful receipt of an alert message. The communications gateway will then return a message to the CAD system listing all stations that successfully received the alert and separately listing those that did not successfully receive the alert. The communications gateway retries any unacknowledged alerts with the necessary station controllers. If an alert is still unacknowledged after exhausting all retries, the communications gateway will move to the next available communications path and attempt to alert the station controller using that path. The status of all alerts sent by the System is also displayed on the active alerts display on the communications gateway dashboard web application**.**

The System displays the operational state of all components, including the remote message display peripherals provided by Provider. The web interface also provides access to a basic test alert function to allow technical staff to generate local test alerts. A System log is kept by the System and is accessible to staff through the web interface. This log contains all interactions with the communications gateways as well as all received dispatches and the actions the System took for each of these alerts.

Provider shall ensure the System has an audio relay bypass switch or equivalent installed at each fire station allowing monitoring of “continuous radio traffic” or monitoring of “radio traffic only when alerted” through the station speakers.

Provider shall ensure the ATX Station controller has a Speakers ON / Speakers Auto function to allow radio monitoring during the day (or when desired) and alert only activation during nighttime. The ATX Station controller’s Speakers ON / Speakers Auto function can be controlled using the Day mode and Night mode configuration through the Station controller web interface. Authorized users can set the time each mode is to start and end, and control speaker volume for each mode for indoor and outdoor speakers. If necessary, this feature can be overridden when desired on a station by station basis using the Station Status and Control web application in the dispatch center to force monitoring during critical times. The On/Auto monitoring can also be automatically controlled by time of day or through other triggers using the station’s IO Rules configuration. A “night mode” shall be configurable for each station allowing outside speakers to be switched “on” or “off” based on a timer.

Provider shall provide an ATX station controller which has four (4) relay outputs that can be connected to low-voltage control for station bay doors, overhead lighting and other equipment. The ATX shall also have three (3) dry contact inputs that can be connected to doorbells, acknowledgment switches and other input devices. Additional inputs can be added in groups of

8 with the addition of an I/O remote peripheral. Any relay in any device can be configured to energize when any one or more specific units at that station are alerted. The activation time for the relays is configurable, and can be momentary or maintained. In addition, any input in the System can be configured to control the same relays. The relays can be used to control lighting, open apparatus bay doors, turn equipment on or off, etc.

Provider shall provide the minimum number of electronic relay "dry contact" outputs as may be requested for each fire station, which shall be provided through the ATX Station Controller and G2 peripherals. G2 peripherals may include the I/O remote, room remote, LED message sign, color indicator remote, message remote, or any combination thereof as may be approved by the fire department. The outputs provided in the System shall be low voltage. In the event higher voltages are required for a contact, an external interposing relay connected to the output will be required to provide the current requirements. These interposing relays must be provided by an electrical contractor.

Provider shall provide any required high or low voltage specific wiring or switching on-site on a time and materials basis, or via a quote fixed price, for any such projects. Charges for these services shall be performed at the hourly rates defined in the optional services section of this SOW, or via a quoted fixed price.

The Station controller firmware shall be updated by Provider as a single file upload to the station controller using the web interface. The station controllers shall have two different copies of operating firmware installed, and a restart of the System will boot into the primary image. When a new image is loaded, the previous version is moved to the secondary image and is used automatically if the System fails to boot with the primary image. County shall have the ability to decide if they want to update its station controllers to the current version firmware as part of support, or leave its station controllers as-is and not perform an update.

Station Controller Alerting Tones

Provider shall ensure the System provides the following features relating to tones:

- The System shall provide user-selectable alerting tones that rise from off to full volume over varying amounts of time and shall provide built-in alert tones which rise from off to full volume in more than two (2) seconds to minimize startle response.

- Alert tones shall be configured System-wide and shall be applied to all jurisdictions or stations.

- The ATX Station controller shall have numerous fixed and ramping alert tones which can be fixed or selected based on incident nature or other CAD data to meet operational requirements.

- Alert tones shall be saved in standard digital formats.

- The receipt of an alert triggers tones and the tone to play is contained in the alert message. Tones are commonly selected based on the incident nature, but can also be based on the units alerted or other CAD data.

Station PA

The fire station alerting equipment shall interface with existing station PA equipment (amplifiers and speaker system) and the ATX Station controller shall have three (3) customer audio inputs that can be used to connect customer audio sources. These inputs are 600 ohm balanced, DC isolated inputs.

The ATX Station controller shall have five (5) audio outputs and each individual output is zone controllable. These outputs can be connected to existing 8 ohm or 70 volt speakers or with an additional level-adjusting unit, to line-level speakers. Provider shall provide line-level adjusting units for each built-in zone if necessary.

Station Status and Control Web Application

Provider shall ensure that the station status and control web application are accessible by authorized personnel over secure sockets layer (SSL) from a web browser that can access the System network, either remotely or at the station location. Both station controller and communications gateway configuration and maintenance applications shall be web-based allowing authorized personnel to modify, update and configure the System. The communications gateway configuration web applications and the station controller web application (SC Remote) are both compatible with the current version of Internet Explorer, as well as Firefox and Safari. This feature shall be accessible from a commercially-available remote personal computer.

Provider shall ensure the Station Status and Control web application module and Station controller web interface is accessible by any web browser enabled device provided the user has appropriate permissions to access the web application.

Audio Inputs

Provider shall ensure the System's ATX audio input function provides the interface and control of audio sources in the fire station and shall have three (3) audio connections for dispatch radios, dispatch audio phone lines and telephone intercoms which can be switched to the audio output depending on their priority and the status of any active alerts. The input level of the audio inputs shall also have different input levels depending on the alerted/not alerted state of the station controller which allows the level of monitored radio inputs to be reduced in volume when an alert is active and to be raised to a higher level for monitoring when an alert is not active.

Backup Alerting

Provider shall ensure a doorbell input is provided which shall play a selectable doorbell tone throughout the station when activated. The ATX audio input shall also have the ability to connect

a telephone with a ring detector, which shall allow the ATX audio input to detect ringing on the line and allow a ringing tone to be played through the System into the fire station, and display a message on any message device as a form of backup alerting. The ATX shall also function as a qualified backup controller in the event that the alerting controller or primary signaling circuit (T1 WAN) is unavailable due to failure. Provider shall ensure that if an ATX is operating in backup mode, it will alert the entire station by activating all peripherals (i.e. amplifiers, message remotes, high definition television (HDTV) remotes, sign remotes or room remotes) if ringing is detected on the telephone line which provides a redundant alerting circuit as required in the National Fire Protection Association's codes and standards #NFPA 1221 for Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.

3. Technical Approach

Provider will provide the following Services:

1. Conduct preliminary design review
2. Conduct final design review
3. Stage equipment in a factory-controlled setting
4. Successfully complete the staging acceptance test plan
5. Ship equipment to Provider facility in proximity to Broward County
6. Installation of communications gateways at the Primary and Secondary Dispatch Center.
7. Installation of radio interface and integration with the County's CAD system
8. Installation of MDS and FireNet wireless transport systems
9. Optimize equipment in preparation for testing
10. Integration of communications gateways with the data network
11. Comprehensive system testing of all subsystems
12. Administrative, dispatcher and technical training
13. Problem resolution
14. Support Cutover and decommissions activities
15. Change management

For any agency selecting Fire Station Equipment, Provider will provide the following:

- Installation of station controllers, peripherals and associated hardware in each station ordering equipment.
- Configuration and testing of the station controllers.
- Integration of communications gateways with the data network.

A. Project Schedule

Provider shall comply with the following project schedule adjusted based on the actual notice to proceed date, unless modification thereto is approved in writing by County Contract Administrator. To the extent Contract signature milestone is after October 2, 2017, the remainder of the Project Schedule shall be adjusted by the same number of days as the contract signature is beyond October 2, 2017.

Project Schedule:

ID	Name	Duration	Start	Finish	Predecessors
1	Contract signature milestone	0 days	10/2/17 8:00 AM	10/2/17 8:00 AM	
2	Notice to Proceed	5 days	10/2/17 8:00 AM	10/6/17 5:00 PM	1
3	Kickoff Meeting	3 days	10/2/17 8:00 AM	10/4/17 5:00 PM	1
4	Develop preliminary design	22 days	10/5/17 8:00 AM	11/3/17 5:00 PM	3
5	Acquire tower engineering documentation from County/consultant	5 days	10/5/17 8:00 AM	10/11/17 5:00 PM	4SS
6	Conduct 19 site surveys	20 days	10/5/17 8:00 AM	11/1/17 5:00 PM	4SS
7	Prepare site antenna design	3 days	11/2/17 8:00 AM	11/6/17 5:00 PM	6
8	Revise design based on sites	3 days	11/2/17 8:00 AM	11/6/17 5:00 PM	6
9	Create and submit FCC license applications	60 days	10/5/17 8:00 AM	1/11/18 5:00 PM	4SS
10	Design USDD CAD integration	60 days	10/9/17 8:00 AM	1/15/18 5:00 PM	2
11	Integrate with CAD	10 days	1/16/18 8:00 AM	1/29/18 5:00 PM	10
12	Develop IP networking design	10 days	10/9/17 8:00 AM	10/20/17 5:00 PM	2
13	Conduct Preliminary Design Review (PDR) milestone	2 days	11/7/17 8:00 AM	11/8/17 5:00 PM	4,6,7,8,12,2
14	Receive PDR comments from Broward	10 days	11/9/17 8:00 AM	11/22/17 5:00 PM	13
15	Revise design/equipment list from PDR	10 days	11/9/17 8:00 AM	11/22/17 5:00 PM	13
16	Revise schedule	1 day	11/9/17 8:00 AM	11/9/17 5:00 PM	13

ID	Name	Duration	Start	Finish	Predecessors
17	Develop preliminary uWave/4.9 network parameters	5 days	11/28/17 8:00 AM	12/4/17 5:00 PM	15
18	Develop preliminary network mgmt parameters	2 days	11/28/17 8:00 AM	11/29/17 5:00 PM	15
19	.Develop Router/switch parameters	5 days	11/28/17 8:00 AM	12/4/17 5:00 PM	15
20	Develop GE parameters	4 days	11/28/17 8:00 AM	12/1/17 5:00 PM	15
21	Develop Motorola radio parameters (note SZ vs P25?)	2 days	11/28/17 8:00 AM	11/29/17 5:00 PM	15
22	Develop USDD fixed peripheral parameters	1 day	11/28/17 8:00 AM	11/28/17 5:00 PM	15
23	Consolidate/revise parameters	2 days	12/5/17 8:00 AM	12/6/17 5:00 PM	17,18,19,20,21,22
24	Develop final drawing package	10 days	11/28/17 8:00 AM	12/11/17 5:00 PM	15
25	Milestone Final Design Review (FDR)	2 days	12/12/17 8:00 AM	12/13/17 5:00 PM	14,15,16,17,18,19,20,21,22,23,24
26	Receive FDR comments from Broward	10 days	12/14/17 8:00 AM	1/8/18 5:00 PM	25
27	Revise design/parameters per FDR	5 days	1/9/18 8:00 AM	1/15/18 5:00 PM	26
28	Milestone Final Design Complete	0 days	1/15/18 5:00 PM	1/15/18 5:00 PM	27
29	Place preliminary equipment orders	45 days	1/16/18 8:00 AM	3/19/18 5:00 PM	27
30	Staging, phase 1 (network, 3 links) Milestone	22 days	3/20/18 8:00 AM	4/18/18 5:00 PM	29
31	Install phase 1	10 days	4/19/18 8:00 AM	5/2/18 5:00 PM	30
32	Staging phase 2 (3 links)	5 days	4/19/18 8:00 AM	4/25/18 5:00 PM	30
33	Install phase 2	10 days	5/3/18 8:00 AM	5/16/18 5:00 PM	31
34	Staging phase 3 (3 links)	5 days	4/26/18 8:00 AM	5/2/18 5:00 PM	32
35	Install phase 3	10 days	5/17/18 8:00 AM	5/30/18 5:00 PM	33
36	Staging phase 4 (3 links)	5 days	5/3/18 8:00 AM	5/9/18 5:00 PM	34
37	Install phase 4	10 days	5/10/18 8:00 AM	5/23/18 5:00 PM	36
38	Stage phase 5 (4 links)	5 days	5/10/18 8:00 AM	5/16/18 5:00 PM	36

ID	Name	Duration	Start	Finish	Predecessors
39	Install stage 5	10 days	5/17/18 8:00 AM	5/30/18 5:00 PM	38
40	30 Day Operational Test Plan (OTP)	22 days	5/31/18 8:00 AM	6/29/18 5:00 PM	39
41	ATP Milestone	10 days	7/2/18 8:00 AM	7/13/18 5:00 PM	40
42	Conduct remedial actions	10 days	7/16/18 8:00 AM	7/27/18 5:00 PM	41
43	Prepare as-builts	10 days	5/31/18 8:00 AM	6/13/18 5:00 PM	39
44	Commence Cutover Milestone	0 days	7/27/18 5:00 PM	7/27/18 5:00 PM	42

Note: Schedule may be adjusted upon reasonable approval of Contract Administrator for weather, force majeure. Tower work must be delayed for inclement weather.

B. Implementation

Preliminary Design

Provider shall provide preliminary design package in their native editable format and Portable Document Format (PDF) within 45 calendar days after the applicable Notice to Proceed is issued. The Preliminary Design package shall include the following for County review and approval:

A. Updated QA/QC plan
B. Updated detailed project schedule (in Microsoft Project)
C. Updated System-level and block diagrams (in Visio format)
D. Patching schedules and termination details for all cabling necessary for a complete record of the installation
E. Radio channel plans
F. Equipment room overview drawings
G. Equipment rack/cabinet elevation drawings
H. Tower profile drawings indicating antenna-mounting locations
I. Detailed lists of materials for each site
J. Updated Acceptance Test Plan (inclusive of the Operational Test Plan (OTP))
K. Updated Interface Control Documents (ICDs) describing all applicable network parameters such data transmission type, latency, traffic flow, firewalls, gateways, switches, routers, and any and all technical performance requirements of said communication links. Preliminary ICDs are included in Exhibit A-7.

Final Design

Provider shall submit for County review, comment, and approval, the proposed Final Design package. The proposed Final Design shall include all comments and modifications requested by County in response to the Preliminary Design. The proposed Final Design package shall include the following:

1. Any updates to Preliminary Design, including modifications as requested by County
2. Cutover plan
3. Updated system-level and block diagrams (in Visio format)
4. Patching schedules and termination details for all cabling necessary for a complete record of the installation
5. Equipment room overview drawings
6. Equipment rack/cabinet elevation drawings
7. Tower profile drawings indicating antenna-mounting locations
8. Detailed lists of materials for each site
9. Radio channel plans
10. 30-day Operational Test Plan
11. System operation and maintenance manuals for all equipment
12. Site installation drawings
13. A Staging Acceptance Test Plan (Staging ATP) outlining a comprehensive series of tests that will demonstrate proof of performance nd readiness for shipment including modifications as requested by County

County will review and provide any comment to Provider within 14 calendar days. Provider shall update and revise to incorporate County's comments. Upon written approval by County Contract Administrator, the updated and revised package shall constitute the Final Design. Any deviation from the Final Design or the specifications shall require prior written approval by the County Contract Administrator.

Staging

Provider will ensure that each individual assembly or equipment unit shall undergo factory testing prior to shipment. Provider will ensure that each individual assembly and equipment unit is subjected to and successfully completes factory testing prior to shipment. Provider must provide the County with documentation available demonstrating the tests performed and the successful completion of testing to the County or provide other proof of same to the reasonable satisfaction of the County Contract Administrator.

The complete System shall be staged and tested in phases in Broward County, to the greatest extent practical. Provider shall provide all necessary technical personnel and test equipment to conduct staging tests. All deviations, anomalies, and test failures shall be resolved at the

Provider's expense. The Staging Acceptance Test Plan shall be provided by Provider as part of the Final Design (inclusive of County edits and requested changes).

Shipping/Inventory Requirements

Provider shall submit a bill of materials/packing list with two copies for each shipment of equipment. The packing list shall include the following information, at a minimum, for each component included in the packaging:

1. Manufacturer
2. Model
3. Serial number
4. Unique identification of the package containing the item

Provider shall provide a matrix which reflects the manufacturer, model number, serial number, and unit cost.

C. Installation

Installation shall take place at the following locations as set forth in this Statement of Work, unless otherwise approved in advance by the County Contract Administrator:

Dispatch Sites

- Sunrise (Central Dispatch Site) – 24 dispatcher positions located at 10440 W. Oakland Park Blvd., Sunrise, FL 33351
- Pembroke Pines (South Dispatch Site) – 23 dispatcher positions located at 6057 S.W. 198th Terrace, Fort Lauderdale, FL 33311
- Coconut Creek (North Dispatch Site) – 21 dispatcher positions located at 4800 W. Copans Rd., Coconut Creek, FL 33063

Radio Sites

- Channel 2
- Coconut Creek
- Coconut Creek PSAP
- Core
- Davie
- EOC
- Hollywood
- Markham Park
- Miramar
- Pembroke Pines Dispatch

- Playa
- EMS
- Points of America
- Pompano
- Sunrise Dispatch
- Tamarac

After the Core Equipment is installed, Provider shall conduct equipment measurements to ensure that all appropriate levels have been set, and that the Equipment is functioning according to the System Final Design and manufacturer's specifications.

Provider shall ensure that installation complies with the following:

1. Provider's installation shall include a complete, tested System including placement of associated cabling, appropriate system layout, and terminal connections. Provider shall provide associated power supplies and any other hardware, adapters and/or connections to deliver a complete operable System to the County at the time of Final Acceptance testing.

2. All installations shall be performed by Provider unless otherwise approved in advance by Contract Administrator. Installation by any personnel other than the Key Personnel (identified below) shall require Contract Administrator's prior written approval.

3. Prior to the start of the system installation, Provider and the Key Personnel shall participate in a mandatory project site survey with the Contract Administrator or his or her designee to confirm actual equipment location within each space. At that time, the exact equipment locations shall be mutually agreed by Provider and County.

4. Provider shall coordinate with County and others, as requested by Contract Administrator, to confirm that any preparation work that affects the installation of the base station equipment, such as tower work, coring, bracing, conduit, electrical, etc., is complete before final inspection.

5. Provider shall provide and pay for all materials necessary for the execution and completion of all work. Unless otherwise specified, all materials incorporated into the System shall be new and shall meet the requirements of the Specifications. All materials furnished and work completed shall be subject to inspection by County.

6. Equipment supplied as spare equipment shall not be used for installation of the System. All spare equipment shall be supplied in new and unused condition (and not grey-market equipment).

7. Provider shall ensure that all equipment and devices shall be cleaned internally and externally, and all damaged finishes shall be repaired prior to submittal for Final Acceptance testing.

8. Provider shall ensure that worksites shall be left neat and broom swept upon completion of work each day. All shelter floors will be thoroughly cleaned and all scuff marks and abrasions shall be removed prior to acceptance. All trash shall be removed weekly.

9. Inspection: The County shall conduct an inspection of the installations upon notice from Provider that installation is substantially complete. Any deficiencies shall be documented by Contract Administrator on a punch list and provided to the Provider for resolution. Provider must resolve all list items to the reasonable satisfaction of Contract Administrator prior to submitting the System for Final Acceptance testing.

10. Provider shall ensure that the existing fire station alerting system shall be kept in its present form, and the new alerting equipment shall be integrated in, allowing the existing system to function in parallel with the new equipment to ensure the new FSA System is implemented with minimal interruption or downtime to the current Zetron FSA (currently model 26/6) system, which utilizes the Zetron Model 26 station encoder at each PSAP. During this implementation period, Provider shall ensure that dispatch data continues to be routed via the County's microwave system to an ultra-high frequency (UHF) T-Band base station located at the County's Public Safety Building tower site and that dispatch voice audio routes to the county-wide trunked radio system to allow broadcast on designated dispatch talkgroups.

11. Provider shall be responsible for ensuring that the only time the existing equipment shall not be able to alert a station is during the actual integration of the new equipment, which is estimated at a total of two (2) hours, but no greater than three (3) hours time at each station. After this integration is complete and preliminarily tested, the station shall again be alertable by the existing System and, if the communications gateways are installed and CAD integration is complete, the station shall be alertable by the new System as well.

12. Work shall be planned, coordinated, and conducted by Provider to ensure minimal interruption of service to existing critical systems.

All equipment shall be installed at the locations identified in Exhibit A-1.

D. Optimization

Once all Core System Equipment is in place and fully installed, Provider will configure, optimize and program all System and Equipment as agreed upon during design review. Provider will

perform optimization on the Equipment to ensure that all of the radio equipment is properly tuned and functioning at optimal performance.

E. Cutover and Decommissioning

Provider shall be responsible for planning and coordinating the implementation of all Equipment, Software, and the overall System. Provider shall execute the cutover plan as approved by County Contract Administrator and shall ensure that new systems are brought online with minimum interruption to all existing systems and communications. Provider shall successfully complete all tests and training prior to the actual cutover of systems. Provider shall provide the necessary labor to cutover from existing systems to the new System.

F. Network Cutover Preparation

The FSA system will be installed in parallel with existing systems. Provider shall test the System stand-alone with the USDD client.

The GE and FireNet systems will be commissioned in parallel on existing towers. Field unit hardware will be used to test wide-area coverage as part of the build out.

Landline networking will be provided by others for GE backhaul to be installed and burned in with loopback testing for minimum 30 days.

Network elements, including IP connections, terminal servers and related internetworking hardware will be installed stand-alone. The infrastructure will be tested in isolation.

G. Preliminary Implementation for Pilot Fire Stations

County shall work with Provider to determine the number of pilot fire stations which will be selected and used for preliminary implementation. A minimum of 1 pilot fire station will be required for System Final Acceptance testing and Final Acceptance.

Provider shall install Fire Station Equipment in these locations in parallel with any existing equipment at those location(s). Audio will not be routed to existing station PA's, but will be available locally for test purposes.

Provider shall conduct a 30 day test for these pilot fire stations. During this period, all dispatch operations must be conducted in parallel with the Zetron and Provider's Systems. During this period, all dispatch data shall be audited for validity by County and Provider. Any missing or errant data must be analyzed and problems identified to determine root cause, and shall be resolved, and re-tested to confirm success and stability. When the test period is over, and all relevant errors and omissions are resolved, the System infrastructure shall be cut over for production dispatching.

H. CAD Cutover Preparation

In parallel with the preliminary implementation for pilot fire stations, Provider shall perform the CAD integration. Provider shall work with Motorola Solutions, Inc. to perform testing of the CAD system utilizing the development environment to ensure there are no negative impacts to operational CAD traffic. The Provider shall not make any changes to the County's existing Zetron system until cutover is formally completed. Provider shall complete API development and unit testing, and ensure the CAD system is providing forward dispatch data to stations equipped with the relevant hardware.

I. Fire Station Equipment

Individual fire station equipment may be purchased by fire stations at any time, and therefore some fire station equipment may be installed after Final Acceptance of the System. Final Acceptance of the System assumes the installation of fire station equipment at ten (10) or more separate locations, but may be conducted with fewer if approved by the County Contract Administrator. The completion of the rollout of all fire stations is anticipated to occur within a 2-3 year roll out timeframe after the Effective Date.

The warranty period for all Fire Station Equipment purchased prior to the commencement of the 30 day operational test shall commence upon the date of the Final Acceptance. The warranty period for all Fire Station Equipment purchased after the commencement of the 30 days operational test (including after Final Acceptance) shall commence upon the earlier of (a) 10 days after first beneficial use in production, or (b) successful passage as documented by written acceptance by the applicable fire station of any acceptance criteria set forth in the purchasing document executed between Provider and the purchasing fire station. Operational usage during the testing period shall not be considered beneficial use.

J. Responsibilities

Provider shall be responsible for the following responsibilities:

- Attend a project kickoff meeting with Broward County personnel
- Attend weekly status conference calls to report project status
- Complete a design review with Broward County personnel
- Survey each radio and dispatch site
- Collect all information available from Broward County staff and contractors to conduct structural studies at all tower locations
- Conduct structural studies to validate that tower will accommodate the load of the additional antennas. (Any required upgrades to the tower structures, as determined by the structural analyses, are the responsibility of the County.)
- Provide radio programming parameters to County
- Provide Network diagrams for details on protocols necessary for the System Secure applicable FCC licenses for microwave

- Secure all necessary permits from all applicable authorities including municipalities in which each site is located (permit fees reimbursed by County on a pass-thru basis). Engineered/PE Stamped drawings and required supporting permit data will be contracted by Provider to third parties and costs will be passed through to Broward County without markup.
- Install antennas, feed lines, TTAs, and any other tower-mounted equipment consistent with the requirements in the Specifications
- Install all equipment on the equipment list in compliance with the RFP specifications
- Manufacture and assemble all parts and components at Provider's facility
- Install all Equipment per industry standards
- Stage and test equipment at Provider's facility
- Deliver pre-assembled equipment to the stated Broward County locations
- Provide County requirements for leased IP circuits and PSI and interface equipment to these networks
- Ensure reliable backhaul connectivity between radio and dispatch sites
- Ensure end to end connectivity between all radio, dispatch, and control equipment
- Provide all necessary interfaces to County's CAD system (including subcontracting with coordinating with CAD vendors, to the extent necessary, to complete all interfaces) and validate performance.
- Program base stations and associated transmit and receive antenna systems with the UHF frequencies provided by Broward County
- Perform functional acceptance testing to validate proper operation of the equipment
- Perform site inspections and resolve all punch list items to validate proper installation and confirm all equipment has been provided
- Provided identified training courses to Broward County personnel
- Correct any errors or failures during Final Acceptance testing until Final Acceptance is successful achieved

County is responsible for:

- Providing written responses to Preliminary and Final Design in a timely manner.
- Obtaining the UHF and 4.9 GHz frequencies necessary to support the System design.
- Providing approved FCC licensing (non-microwave) prior to the scheduled activation of equipment in order to meet the implementation schedule requirements.
- Providing environmentally controlled equipment areas.
- Any necessary environmental impact analysis
- Any necessary tower upgrades
- Secure leased circuits between the radio sites and the dispatch centers in a redundant configuration if County elects to expedite MDS radio deployment
- Secure PSI connectivity between facilities and provide network equipment necessary for the G2 communications gateways to communicate to each other
- Provide VPN or other means for remote access to the System for the installation, testing and remote access support

- For each Communication Gateway location:
    - Provide rack or cabinet space of 4 RU, or space for a new equipment rack or cabinet, for the installation of the Communications gateway server pairs. Each Gateway pair is composed of two servers, each 2 RU high.
    - Provide three (3) 100/1000baseT LAN ports for communications gateways and IP KVM (1 for each Gateway - 2 total, and 1 for IP KVM). These LAN ports must have connectivity to the County's CAD System interface server for the station alerting interfaces.
    - Prior to shipment of the communications gateways, assign four IP addresses on the network where the communications gateway will reside, and provide the addresses to Proposer, together with the subnet mask and default gateway address (two IP addresses are for physical communication gateways, one IP address is for the active communications gateway, and one IP address is for the Spider IP KVM).
    - If use of the G2 Mobile smartphone application is anticipated, allow all Communication Gateway IP addresses to access the URL https://fsa-mobile.com (note the use of https indicating use of TLS TCP port 443).
    - Provide IP address for internal NTP server for Communications gateway time synchronization to allow outbound access to time.nist.gov on NTP (UDP 123) and either allow access to DNS outside the County's network or provide an internal DNS server IP address.
    - Provide VPN access to the 4 IP addresses assigned to the Communications gateway (access will be required for all equipment on TCP Ports for SSH (22) HTTP (80) and HTTPS (443)).

Contract Administrator may perform or designate other County personnel or a third party to perform any of the rights or responsibilities of County under this Statement of Work.

K. **Security/Access**

Provider will cooperate with County and provide any and all information that County may request in order to determine appropriate security and network access restrictions and verify Provider compliance with County security standards.

Provider shall comply with the following security standards for the System:

1. Provider shall immediately notify the County of any terminations/separations of employees performing services under the Agreement or who had access to the County's network in order to disable such employees' access to County systems.
2. Provider shall ensure all Provider employees have signed County's Information Security Policy Acknowledgement form prior to accessing County network environment. (PCI 12.3.5)
3. Provider shall perform privacy and information security training to its employees with

access to the sensitive County environment upon hire and at least annually. (PCI 12.6.1)

4. Provider must provide a security plan or secure configuration guide for Software installed in the County environment by the Provider.
5. Provider shall advise of any third party software (e.g., Java, Adobe Reader/Flash, Silverlight) required to be installed and version supported. Provider shall support updates for critical vulnerabilities discovered in the versions of third party software installed.
6. Provider shall ensure that the Software is developed based on industry standards/and or best practices, including following secure programming techniques and incorporating security throughout the software-development life cycle.
7. Provider shall ensure the Software has a security patch issued for newly identified vulnerabilities within 30 days for all critical or high security vulnerabilities.
8. Provider shall ensure the Software provides for role-based access controls.
9. Provider shall support electronic delivery of digitally signed upgrades from Provider or supplier website.
10. Provider shall enable auditing by default in software for any privileged access or changes.
11. If the Software is a payment application which processes, stores, or transmits credit card data, the VISA Cardholder Information Security Program ("CISP") payment Application Best Practices and Audit Procedures will be followed and current validation maintained.
12. Provider shall regularly provide County with end-of-life-schedules for all applicable Software.
13. Provider shall ensure that physical security features are included in the Hardware acquired under this Agreement to prevent tampering.
14. Provider shall ensure security measures are followed during the manufacture of the Equipment acquired under this Agreement.
15. Any Equipment provided under this Agreement shall not contain any embedded remote control features unless approved in writing by County's Contract Administrator.
16. Provider shall disclose any default accounts or backdoors which exist for access to County's network.
17. If a new critical or high security vulnerability is identified, Provider shall supply a patch, firmware update or workaround approved in writing by County's Contract Administrator within 30 calendar days from identification of vulnerability.
18. Provider shall make available, upon County's request, any required certifications as may be applicable and required (e.g., Common Criteria ("CC"), Federal Information Processing Standard 140 ("FIPS 140)).
19. Provider shall regularly provide County with end-of-life-schedules for all applicable Equipment and Software.
20. Provider shall support electronic delivery of digitally signed upgrades from Provider or

supplier website.

21. Upon County's request, Provider shall make available to the County proof of Provider's compliance with all applicable federal, state, and local laws, codes, ordinances, rules, and regulations in performing under this Agreement, including but not limited to: HIPAA compliance; Provider's latest compliance reports (e.g., PCI Compliance report, SSAE 16 report, International Organization for Standardization 27001 (ISO 27001) certification); and any other proof of compliance as may be required from time to time.

Provider shall employ the following security measures for the System:

1. Servers (communications gateway) shall have all unnecessary services disabled to minimize direct attaches to Systems.
2. Fire station peripherals shall be isolated from the general network by being logically located behind the station controller.
3. Access to administrative functions shall be protected by passwords which are modifiable by the systems administrator.
4. Authentication and encryption algorithms shall be used to protect all access to and between the communications gateways and station controllers.
5. The System shall encrypt all information used for alerts, manual dispatches and System management.
6. Alerting messages shall be secured using the SSL v3 (TLS v1) protocol with RSA public-key encryption methods used to authenticate and encrypt both ends of the connection.
7. The System management and manual dispatch message shall be encrypted using the SSL v3 protocol using a certificate on the server.
8. System shall use solid state media in the Station Controllers for permanent storage and shall not have any need for floppy disks or USB connected drives.
9. The System shall be periodically audited for security issues by a PCI security auditing firm coordinated by one of the Provider's customers.
10. Any issues identified in the audit shall be corrected and a software update shall be generated and distributed for the System which is under warranty or support.

The primary dispatch links shall be monitored constantly to provide prompt warning of a malfunction.

The System shall automatically self-interrogate each communications link (IP and radio) to each station to verify connectivity and to notify all fire dispatch operator positions of

County and the Provider shall agree to the level of remote firewall as well as the access the Provider will be permitted for remote troubleshooting and maintenance of the system.

A. Said remote connection shall be a secure IP wired connection.
B. The remote connection shall allow access to all FSA system alerting features.
C. Agreed-to security measures shall be provided by the Provider.

D. The Provider shall provide a description of the remote system access design and the remote login security.
E. The FSA system remote access shall permit FSA system diagnostics, software configuration, application software uploading and downloading, programming, problem resolution, and system maintenance.
F. Access rights to specific FSA system features shall be assignable based on the login.

CJIS Security

Provider shall comply with all security requirements of the Criminal Justice Information Services (CJIS) Security Policy CJISD-ITS-COV-08140-5.2, Version 5/2 dated 08/09/2013 or later.

ID Badges

Provider and subcontractor personnel servicing and requiring unescorted access to General Facilities must have a County issued contractor ID badge (contractor ID badge). Depending upon the request, the badge may carry electronic access privileges. The badge must be visible and worn at all times together with the contractor's company/business contractor ID badge. Similar to employee security/ID badges, requests for contractor ID badges are initially approved by the requesting agency director or designee and then submitted to Facilities Management Division (FMD) Security for final approval.

Many Broward County government facilities will have areas designated as critical to security and public safety, pursuant to Broward County Ordinance 2003-08 Sections 26-121 and 26- 122, as may be amended. The issuance of an ID badge for unescorted access to facilities critical to security and public safety may entail a comprehensive statewide and national background check. Unescorted access to certain facilities occupied by the Broward Sheriff's Office (BSO) and the State Attorney's Office will require a national fingerprint-based records check per the Criminal Justice Information System (CJIS) policy. A Provider employee found to have a criminal record consisting of felony conviction(s) shall be disqualified from access to the State Attorney's Offices and certain BSO facilities. A Provider employee with a record of misdemeanor offense(s) may be granted access if the System Security Officer (CSO), Terminal Access Coordinator (TAC), and FDLE determines that the nature of the offense(s) do not warrant disqualification. Applicants shall also be disqualified on the basis of confirmations that arrest warrants are outstanding for such applicants.

The issuance of an ID badge for unescorted access to General Facilities requires a "Level 1" FDLE background check, which can be conducted by the Florida Department of Law Enforcement (FDLE). FDLE background checks can be done by Provider by phone at (850) 410-8109 or online at https://web.fdle.state.fl.us/search/app/default

Upon completion of the background check, Provider must attach a copy of the results to the Provider's application for an ID badge. The Project Manager or designee utilizing the service of the contractor will be the "Sponsor" and will either provide the contractor with a Provider ID Badge Request Form or assist the contractor in completing an on-line application for the County issued contractor ID badge.

Requests for an ID badge requiring an FDLE background check may require lengthy processing and review by the Broward Sheriff's Office (BSO). Provider and subcontractors must therefore submit the request to Broward County Security at least two (2) weeks prior to the start of service by the contractor. When identification badges are ready, Broward County Security will contact the contractor to arrange pick up. Upon pick up, the applicant must present a valid Florida identification and must be accompanied by his or her supervisor. Broward County Security will then supply contractor ID badge valid for the anticipated period within which the work will be performed. The validity period must be clearly stated on the Contractor ID Badge Request Form; however, the period of validity will not exceed one (1) year. Background checks will be required for renewal of contractor ID badge. At the termination of the contract and separation of employee services, Provider is responsible for the collection and return of all contractor ID badge to the Project Manager and/or to Broward County Security.

Compliance with the County's security requirements is part of the overall contract performance evaluation. Final payment will, in part, be contingent on the return of all Provider ID badges issued to Provider personnel.

4. Managerial Approach & Communication

Provider and County will adhere to the following communication and reporting schedule unless otherwise agreed in writing by the Parties:

Project Kickoff Meeting
A project kickoff meeting shall be scheduled prior to the beginning of the project.

Project Implementation Plan
Provider will work with the County's project staff to put together the exact implementation plan before any installation work is started, and will make adjustments with County staff as necessary.

Project Management Plan
Provider shall provide a project management plan that includes a detailed work breakdown structure, project scope, deliverables, schedule, quality assurance/quality control (QA/QC) processes, and risk management sections.

The project management plan shall describe how Provider intends to monitor and control the installation and deployment of the System, and mitigate risks in order to ensure that the System meets the performance specifications to ensure it is delivered on time.

Weekly Scheduled Status Meetings
Weekly scheduled status meetings shall be scheduled and conducted following project kickoff meeting between the County Project Team and Provider. Provider shall provide a schedule for these meetings subject to the approval of the County and shall be responsible conducting these

meetings as well as preparing meeting agendas and minutes. Meeting agenda items shall include, at a minimum, the following items:

1. Schedule review
2. Status of deliverables
3. Risk items
4. Changes
5. Plans for the next period
6. Action-item assignments
7. Punch-list review

Project Schedule Maintenance

Provider shall maintain the project schedule including tasks, milestones, start and end dates, task predecessors, and task owners based on an approved work breakdown structure (WBS), if requested. The schedule shall represent tasks associated with completing work on all items identified in the WBS. The project schedule shall be updated with actual dates as tasks are completed. The updated schedule shall be provided as an agenda item for all County/Provider weekly status meetings.

The project schedule shall address the following at a minimum:

1. Site surveys
2. Permitting
3. Detailed design review
4. Required site modification, if determined necessary
5. Required shelter modification, if determined necessary
6. Equipment manufacturing
7. Staging acceptance test
8. Equipment delivery
9. System installation
10. System configuration
11. System optimization
12. Acceptance testing
13. User training
14. System cutover
15. System documentation development and delivery
16. System and equipment warranty

Project Punch List

Provider shall establish and maintain a punch list, as mutually agreed to with the County for equipment, installation, and acceptance tests. The punch list shall be maintained in real time and published weekly. The punch list shall include the following at a minimum:

1. Sequential punch-list item numbers
2. Date identified
3. Item description
4. The party responsible for resolution
5. Expected resolution date
6. Resolution date
7. Details about how each punch-list item was resolved and tested
8. Notes about the item

If responsibility for resolving an item is transferred to another person or group, a new entry shall be added to the punch list and the original entry shall be appropriately noted.

Provider shall be responsible for reviewing each punch-list item and advising the County of any changes. The status of punch-list items shall be updated during each weekly status meeting.

QA/QC Plan

Provider shall provide a Quality Assurance (QA)/Quality Control (QC) plan, which shall be submitted to County for review and approval during Preliminary Design Review. The plan shall address all stages of the project, including, but not limited to:

1. Procurement
2. System overview
3. Installation
4. Implementation
5. Testing
6. Cutover

Provider shall ensure the QA/QC plan specifically describes the plans and procedures to ensure the System is configured and implemented in accordance with the descriptions and requirements described in this Statement of Work. This QA/QC plan shall also be included as part of the Project Management Plan and developed by Provider's Project Manager.

The QA/QC plan shall be an integral part of the project and shall include the input of County staff as part of the review-and-approval process for all deliverables and submittals.

The QA/QC plan shall address the following project tasks, at a minimum:

1. System configuration and implementation analysis and verification
2. System changes and document control
3. Material shipping, receiving, and storage
4. Site preparation (if required)
5. Field installation and inspection
6. Equipment inventory and tracking

7. System testing and validation
8. Software regression testing
9. Deficiency reporting and correction
10. Implementation and cutover
11. Training and certification

Quality Assurance (QA) Process

Provider shall ensure the QA process, includes the following elements, at a minimum:

1. Deliverables Validation

A contract deliverable requirements list (CDRL) shall be created and used over the course of the project. This shall be used to validate design and delivery against, and will reference this SOW's deliverables at a minimum.

2. Design review and control

Preliminary and final design reviews shall validate that deliverables are addressed. After final design review the design is frozen, and put under formal change control. Subsequent changes shall be communicated by distribution lists referencing online archives.

3. Document management, revision and distribution control

A project library shall be maintained online in DropBox or equivalent cloud storage, with password-controlled access. Email distribution lists will reference online documents. A master Index shall be maintained listing titles, short descriptions, and other salient references.

4. Materials management

A system-level bill of materials (BOM) shall be created and maintained over the course of the project. Materials will be ordered from the BOM. All items on the BOM shall be made available for asset tagging by Broward County. Materials from the BOM shall be tracked and managed using spreadsheets, database, or other electronic means, and packing/delivery lists will be maintained in the project library.

5. Configuration control

Each configurable piece of equipment shall have its parameters archived in the project library. After staging is complete, all configurations shall be archived with an index file documenting changes.

6. Installation specification, execution

Installation drawings shall be created and reviewed with customers. Necessary permit drawings and supporting files shall be created and archived in the project library. Installation drawings shall be marked up on-site and revised to form the as-built documentation for each site.

7. Test management

An Acceptance Test Plan shall be run during staging, and a Final Acceptance test plan shall be run at the completion of physical installation. Separate ATP sections or documents for FSA functions

including CAD integration, FireNet, General Electric, network and network management and other components shall be developed and executed to validate the deliverables.

8. Problem resolution

A problem report form shall be created to capture problem reports and track their status. Copies shall be archived in the project library. Problem reports will be used starting at the OTP.

9. Training

Vendor training classes shall be provided on FSA functions (USDD). Keylite shall present management and operations classes. Users will be surveyed, and classes may be offered at additional cost if desired.

As-built Documentation

Provider shall submit three (3) final and complete sets of as-built documentation in their native editable formats and PDF at the completion of the installation at each site, including the following:

1. Documentation index
2. Field test reports, with dates and actual readings
3. Coverage test reports
4. Warranty documentation
5. Detailed list of equipment materials for each site
6. Plan and elevation drawings of all equipment, including antennas on towers
7. A copy of all redline documents for each site prior to issuance of the as-built documentation
8. As-built System-level and block diagrams (in Visio format and PDF)
9. Fleet mapping and programming for fixed fire station radios
10. Setup and alignment information
11. As-built site drawings, including all cabling and terminations (in Visio format and PDF)
12. Site layout drawings, as appropriate (in Visio format and PDF)
13. Tower drawings showing any new installations (in Visio format and PDF)
14. Successfully completed, signed, and dated Staging ATP
15. A complete set of maintenance and operations manuals shall be provided at each installation location
16. Antenna System layout for towers and fire stations
17. Antenna line sweeps reports
18. Station documentation of RX sensitivity, TX power out, TX power at the bulk head
19. Cable matrix demonstrating source and destination ports
20. Radio programming code plugs
21. Network diagrams (physical and logical)

Staffing

Provider will ensure that the persons responsible for Provider's performance of the Services under this Agreement and, to the extent applicable, identified below (collectively "Key Personnel") are appropriately trained and experienced and have adequate time and resources to perform in accordance with the terms of this Agreement. To the extent Provider seeks or is required to make any change to the composition of the Key Personnel, Provider will provide County with thirty (30) days' advance notice (or as much advance notice as is possible if thirty (30) days' notice is not possible) regarding such changes and the management plan associated with such changes. County shall not be responsible for any additional costs associated with a change in Key Personnel.

Key Personnel:

Provider Participants:	Title	Email	Address/Phone
Jonathan Franklin	Project Manager	jf@signalcommunications.com	(954) 275-8854
Dan Deveson	Project Engineer	dan.deveson@gmail.com	(305) 970-9220
Tom Sullivan	Connectivity Manager	tls@econocomm.com	(954) 275-0016

Jonathan Franklin, Project Manager: Provider's Project Manager shall be the primary point of contact (POC) between the County and Provider. Provider's Project Manager shall bear full responsibility for supervising and coordinating the installation and deployment of the communications system; be responsible for development and acceptance of the PMP; manage the execution of the project against that plan; and oversee the day-to-day project activities, deliverables, and milestones completion. Provider's Project Manager shall be responsible for coordination of the weekly status meetings.

Dan Deveson, Project Engineer: Provider's Project Engineer shall have the primary responsibility for managing the System configuration and implementation and ensuring that the System is installed in accordance with the performance specifications. Provider's Project Engineer shall ensure the development of block diagrams, System-level diagrams, and rack diagrams to assist the installation team in completing the System installation.

Project staffing shall be managed by Provider based on workload and the level of effort throughout the implementation/installation process; however, the positions identified below shall be staffed throughout the duration of the project and shall not be changed without prior approval of the County.

Approved Subcontractors

County has approves the following subcontractors for the services designated:

- For FSA equipment and services: US Digital Designs

- For Backhaul Equipment: Econo-Comm Inc., d/b/a Mobile Comm, 3733 NW 16th Street, Suite B, Lauderhill, FL 33311
- For Design Support: Kale Kublacik
- For Conventional Data Network: General Electric
- For support and maintenance: Mobile Comm
- For tower work: Kirms Communication
- For tower structural analysis: Pate Engineering
- For App (if elected by fire station(s) as part of Optional Services): US Digital Designs
- For frequency coordination services: ComSearch
- For permit and professional engineering, site planning, surveying: Lakdas/Yohalem Engineering, Inc.

Any other subcontractor shall require prior written approval from County Contract Administrator, which approval may be conditioned upon appropriate background checks for subcontractor's assigned personnel.

Included in the foregoing authorized subcontractors are specific subcontracted services that shall constitute "Subcontractor Pass-Thru Services," which are included as part of scope of services authorized within this Agreement but are not included in the System Implementation Fee; fees for these Subcontractor Pass-Thru Services (inclusive of equipment utilized by the authorized subcontractor in providing these pass-thru services) only shall be invoiced to County on a pass-thru basis subject to the not-to-exceeds listed below. No services shall be authorized by Provider for these Subcontractor Pass-Thru Services unless and until County Contractor Administrator has provided written approval by of the quote from the subcontractor for these services.

Subcontractor Pass-Thru Services

SUBCONTRACTOR	NOT TO EXCEED	SCOPE OF WORK
Kirms Communications	$25,000.00	Crane work
Pate Engineering	$65,000.00	Tower analysis, climb, tower mapping
Lakdas/Yohalem Engineering Inc.	$40,000.00	Permit support engineering, including siting plans, structural, and mechanical engineering drawings.
Applicable municipality fees or other permit related fees	$40,000.00	Permit processing
Motorola Solutions Inc.	$74,958.00	Motorola API quote 17-PS-76006A

5. Training

Provider shall prepare and conduct two types of training sessions: operator training and technical/System management training. Provider shall work with the County to develop the schedule dates/times/locations, and shall require the approval of the County Contract Administrator. Training sessions shall occur as near to System cutover as possible.

Each training session, will conform to the training requirements listed below:

Proposed Training Plan

Provider shall fully describe all proposed training programs detailing how Provider intends to provide training. The training description shall include the following:

1. A list of all subjects with a description of each
2. Class material to be provided by Provider
3. Number of classes
4. Class duration
5. Need for recurring training
6. Class size
7. Class cost

Training Materials

Provider shall provide all instructional materials, including printed manuals, audio, video, interactive self-paced PC programs, and complete equipment operating instructions for all technical and operational training classes. Actual and/or exact model and series of equipment being delivered shall be made available for hands-on use and operation during training. All instructional materials shall be subject to the approval of the County and shall become property of the County. Provider shall also provide all necessary written course materials for these classes, as well as electronic copies of the material for use by County in customizing the training for their personnel.

Training Classes:

Each of the following six (6) training classes are included as part of the Services provided under this Agreement:

G2 Communications gateway System Administration/Configuration Training Session(s)
Target Audience: System Administrators /Dispatch Operations/System Technicians
Number of Sessions: 1
Length: 3 hours
Number of Attendees: To be determined
Location: Broward County

Provider will conduct on-site training on the administration of the communications gateway including adding additional stations, units or groups, adding incident nature and unit type translations and other configuration tasks. Also included will be the use of the statistics and logs for troubleshooting tasks. Training will also be conducted on configuring and monitoring the Station controller, including setting volume levels, adding or configuring peripheral devices, adding I/O Rules, firmware updating and use of logs for trouble shooting.

Class Topics:

- System Introduction
- Communications gateways
- GaRi and Radio Integration Communications gateway User Interface Overview
- Stations & Units Stations
    - Units
    - Groups
    - Aliases
    - Shadows
- Alert Settings
    - Communications Paths
    - Look and Feel
    - Stock Alerts
    - Tone Sequences
- System
    - Alerts and Notifications Cluster Status Email Settings
    - Alert Log and Debug Log
    - Network Addresses
    - Statistics
    - Users

G2 Station controller (G2 ATX) System Configuration Training Sessions(s)
Target Audience: Information Technology Personnel/Communications Services Personnel
Number of Sessions: 1
Length: 3 hours
Number of Attendees: 10
Location: Broward County

Class Topics:

- System Overview
    - Station controller
- Message / Sign Remote
    - Room Remote
    - IO Remote
    - LED Speaker Lights / Strobe Light
    - HDTV Remote
    - Color Indicator Remote
- Station Settings
    - Network Configuration
    - Audio Interfaces / Prioritization Audio Levels
    - SNMP Client
- SIP Client
- Units

- DTMF and Tone Decoding
- Peripherals and Peripheral Settings
- Printers
- Station Area Settings
- IO Rules
- Software Updates / Configuration Management Log Review
- Test Alerts

G2 Communications gateway Manual Alerting Client Training Session(s)
Target Audience: Dispatch Trainer/Dispatchers
Number of Sessions: 3
Length: 1 hour each
Number of Attendees: 30 per class
Location: Broward County

Class Topics:

- System Overview
- Communications gateway Web User Interface Overview
- System Dashboard
- Working with Dispatch Alerts
- Working with Administrative Alerts
- Working with Stock Alerts
- Station Alarms and Monitoring
- Station Device Control

G2 Voice Editor Application (G2 Communication Gateway) Training Session(s)
Target Audience: System Administrators / Dispatcher Operations
Number of Sessions: 3
Length: 1 hour each
Number of Attendees: 20 per class
Location: Broward County

Provider shall conduct training on the use of the VoiceEditor Application to adjust street name and other VoiceAlert pronunciations.

Class Topics:

- System Overview
- Communications gateway Web User Interface Overview
- How VoiceAlert Works
    - User Dictionary
    - CAD Element Tables
- User Substitution ListsVoiceEditor User Interface
- Speech Preview

Number of Sessions: 3
Number of Attendees: 20 per class
Location: Broward County

FSA System Overview Class
Target Audience: technical and operations managers and staff who need a high-level understanding of the FSA system
Number of Sessions: 3
Length: 3 hours each
Number of Attendees: 12 per class
Location: Broward County

This class will provide an end-to-end technical overview of the Fire Station Alerting System. It will identify system components, describe their basic functions, and provide a high-level architectural overview of the integrated system, comprising US Digital Designs, General Electric, Cambium, and attached peripheral equipment.

FSA System Comms Configuration Class
Target Audience: technicians and engineers
Number of Sessions: 1
Length: 4 hours each
Number of Attendees: 6 per class
Location: Broward County

This class will teach hands-on configuration management of each of the communications components of the system – excluding USDD hardware and software. Both GE and Cambium components will be configured. Attendees will take archived configuration files and load them into each component, using vendor programming tools.

FSA System Troubleshooting Class
Target Audience: technicians and engineers
Number of Sessions: 1
Length: 4 hours each
Number of Attendees: 6 per class
Location: Broward County

This class will teach basic troubleshooting techniques of the fire station alerting system, end to end. Integral and network diagnostic tools will be used to identify induced faults. A set of faults will be traced to the root causes, and remedial actions and escalation procedures will be demonstrated.

6. System Standards

Provider shall ensure the System meets and exceeds the applicable standards cited below as follows:

1. NFPA 1221 (current edition) requirements
2. Fire Suppression Rating Schedule (FSRS) monitoring for integrity criteria
3. Insurance Services Office (ISO) requirements for alarm systems and communications centers

Provider will maintain strict adherence to documented procedures including Motorola's Standards and Guidelines for Communication Sites (R56) manual. Provider will also adhere to TIA, FCC, National Electric Code, and all applicable federal, state, and county codes and ordinances as defined in the RFP. Successfully completing these audits ensure that the quality of the installation will support the system's performance and safeguard against site safety issues.

Provider shall comply with the following standards, rules, regulations, and industry guidelines:

1. American National Standards Institute (ANSI)
2. National Electrical Manufacturers Association (NEMA)
3. Electronic Industries Alliance (EIA)
4. Telecommunications Industry Association (TIA)
5. Telecommunications Distribution Methods Manual (TDMM)
6. National Electrical Code® (NEC)
7. Institute of Electrical and Electronics Engineers (IEEE)
8. Federal Communications Commission (FCC)
9. Underwriters Laboratories, Inc. (UL)
10. American Society of Testing Materials (ASTM)
11. National Fire Protection Association (NFPA) 1221 (latest revision)

Provider shall comply with industry best practices for system installation, grounding, bonding, and transient voltage surge suppression (TVSS), as outlined in the Motorola R56®, Standards and Guidelines for Communication Sites (latest revision).

7. Authorized Third Party Users & Integration of Stations

System access will be made available to fire stations, municipalities, Broward Sheriff's Office, and mobile application users from any agency authorized by Broward County ("Authorized Third Party Users"). Authorized Third Party Users approved by Broward County will be provided access to the System to the extent and level of permissions and access approved by Broward County.

8. Redundancy

Provider shall ensure the Core System is established with redundancy for all critical systems, and shall have no single point of failure. An analysis of the System redundancies has been included in Exhibit A-2. Provider shall establish the System with the following points of redundancy:

Redundant System Alerting Paths

The System shall provide multiple, redundant alerting paths to ensure alerts reach the station even during an outage of the primary alerting path. The communications gateway shall monitor all two-way alerting circuits for integrity using periodic handshakes. The success or failure of these handshakes is logged on the communications gateway. The communications gateway, shall test communications with each station every thirty (30) seconds.

The station controller shall respond to each handshake with an acknowledgement and the status of all active components, its software version, and the state of a USB-connected UPS, if present. If a station controller fails to acknowledge three (3) consecutive handshakes, the station is marked as "Down" by the communications gateway, and the web interface displays "Communications Down" for that station, and plays an alert tone. The communications gateway shall also send email notifications for this event. This failure shall also notify station personnel using visual and audible notifications.

Station controllers

Each station controller shall log loss of handshakes. The station controller located in each fire station shall poll each peripheral which is connected to the station controller one (1) time every twenty (20) seconds. In the event of a failure, the station controller logs the failure and a message is sent to the communications gateway, notifying it of the failure. The communications gateway shall log this message, and display the error condition and shall send an email to personnel. When the station controller detects a link failure, the station controller shall show the link as “Down” on the touchscreen, and any “Link Down” event actions configured in the station controller shall be executed. Event actions typically for link failure include turning on speakers and routing dispatch audio and playing an alert tone and displaying text on message displays. All station-based functions including but not limited to doorbell, local radio routing/prioritization, local push-button alerting, time-based functions shall be available, but CAD messages or map displays will not appear, and remote reporting of alarms to the dispatch center or remote monitoring of the System would function. Limited local speech shall only function based on local triggers, such as contact closures or tone decoding.

Manual Alerting Function

The System shall provide a manual alerting function as part of the web-based application on the communications gateway. The manual alerting application has 3 different sections allowing dispatchers to send Dispatch, Administrative and Pre-defined alerts from the System. The application is usually configured as part of the System Dashboard which also displays Active Alerts and System Alarms. This means that the Dashboard can be the single display for all dispatch-related information and control.

Provider shall ensure the System provides a manual alerting function as part of the web-based application on the communications gateway. The manual alerting application has three (3) different sections allowing dispatchers to send dispatch, administrative and pre-defined alerts

from the System. The application shall be configured as part of the System dashboard that also displays active alerts and System alarms. This means that the dashboard shall be the single display for all dispatch-related information and control. All status information normally provided to the CAD system is then provided directly to the dispatcher via the manual alerting application. The manual alerting application allows dispatchers to alert stations, units or groups of stations or units with dispatch or administrative messages. The dispatch alert tab of the application is formatted with destination, location and incident nature fields to allow speech and message sign text formatting.

The administrative alert tab in the manual alerting application allows free-form text messages to be input into the System and the System will announce them in the stations, which shall be useful for storm notifications, daily morning announcements and other similar announcements.

The system administrator shall have the ability to configure stock alerts that are pre-formatted administrative alerts. These can be configured for manual activation, or automatic activation by day-of-week and time-of-day and are useful for daily system test announcements or wake-up announcements.

Dispatches generated from the manual alerting user will be transmitted to the selected fire station(s) and over the radio in the same manner, as if generated from the CAD system. Upon receipt of the manual alert, the station controller shall activate peripherals, play the appropriate tone associated with the dispatch incident, and play/display the dispatch exactly as if the dispatch originated from the CAD system.

The manual alerting application is web-based and accessible from any device with a compatible web-browser by authorized users. Accordingly, no client software installation on individual consoles is necessary and any authorized user with access to a web browser can generate alerts and allows dispatchers to alert stations, units or groups of stations or units with dispatch or administrative messages. The Dispatch alert tab of the application is formatted with destination, location and incident nature fields to allow speech and message sign text formatting.

The manual alerting application has a drop down menu listing all the incident types configured from the CAD system to allow dispatchers to select the appropriate incident when creating a dispatch. All status information normally provided to the CAD system is provided directly to the dispatcher via the manual alerting application. The manual alerting application has an active alerts display that shows the status of recent alerts. The status of all alerts is also available in real time on the active alerts display of the communications gateway's dashboard application. This application displays each alert as it is processed by the System. This display can be shown on the web application display using a web browser, and also on a dedicated display using the Dispatch Center version of the HDTV Remote.

Communications Gateway

Provider shall provide two (2) sets of communication gateway server pairs, with one pair to be located in each of the PSAP's where the CAD servers are located (the Primary at Sunrise and

Secondary at Coconut Creek). Each set shall be capable of full System operation, and the database used in the System shall be replicated from the Primary set to the Secondary set to keep System configuration in synchronization; this automatic synchronization occurs at a minimum of once per day. The two dispatch centers shall be configured with identical pairs of communications gateways, and the main gateway pair shall replicate configuration information to the second pair at the secondary dispatch center. Both sets of communications gateways are otherwise identical in functionality. The System shall support dispatching from all positions simultaneously while supported by the CAD system.

Provider shall ensure the communications gateways communicate with the station controllers using UDP/IP or various serial data protocols, including radio data systems and network data is secured using DTLS or TLS authentication and encryption to prevent interception and impersonation. Multiple communications paths shall be configured to operate together such that if one path fails, the System automatically uses the next operational path in priority order. The communications gateways continuously poll the station controllers at a rate such that all stations are polled to verify connectivity and operation twice each minute.

Provider shall ensure the System supports multiple alerting circuits including wireline and wireless IP networks, wireline and wireless serial data, voice over IP, 2-tone and DTMF tone decoding, contact closure, and telephone ring detection. Upon receipt of an alert, the communications gateway will use the primary alerting path to send the alert to individual station controllers located in the fire stations. The station controllers shall automatically send acknowledgments of successful receipt of an alert to the CAD system. The communications gateway shall retry any unacknowledged alert, and after exhausting all retries, the communication gateway shall automatically move to the next available communication path to deliver the alert.

The communications gateway shall be established as a redundant hot-standby pair of servers running a custom Linux kernel with RAID 1 mirrored data disks, to provide high availability. An application on each communications gateway server shall monitor the performance of the running processes and shall restart the running process or cause a System failover from one system to the other, in the event that the running System becomes unusable. The system administrator shall have the ability to cause a manual failover from the running System to the monitoring System.

The System has numerous fixed and ramping alert tones that customers can select from, or additional tones can be added by Provider meet individual customer requirements. Alert tones can be fixed or selected based on incident nature or other CAD data to meet operational requirements.

Radio channels connected to the System are independent and can announce different information across each channel.

The integrated network switch allows the GaRI to be connected directly to two Gateway servers in a hot-standby configuration, or to other network devices as necessary. In special applications, the GaRI can be connected to a customer data network to allow it to be distantly located from the Gateway servers.

9. Deliverable Products and Services

No.	Description	Durations	Requirements or Preliminary Acceptance Criteria
1.	Kickoff Meeting	7 calendar days	Written confirmation by Contract Administrator
2.	Final Design Completed	100 calendar days	Written confirmation by Contract Administrator
3.	Phase 1 Staging ATP Completed and successfully passed	120 calendar days	Written confirmation by Contract Administrator
4.	Equipment Delivered to Sites	45 Calendar Days	Written confirmation by Contract Administrator
5.	Equipment Installation Complete Including CAD Integration	30 Calendar Days	Written confirmation by Contract Administrator
6.	System submitted for Final Acceptance Testing	30 Calendar Days	Written confirmation by Contract Administrator
7.	30 Day Operational Test successfully completed	30 Calendar Days	Written confirmation by Contract Administrator
8.	FINAL ACCEPTANCE	30 Calendar Days	Written confirmation by County of successful completion of Final Acceptance Test Plan

10. Functional Acceptance Test Plan (Functional ATP)

The preliminary Functional ATP is included as Exhibit A-3.

Provider shall use the completed and approved Staging ATP and Functional ATP. It is expected that the Staging ATP and Functional ATP have been performed and all tests have been successful before the County witnesses the official Staging ATP and Functional ATP. The Staging ATP and Functional ATP shall be signed and dated by Provider and County representatives following completion of all tests. All tests in the Staging ATP and Functional ATP shall be marked as either pass, fail, or pass qualify.

Provider shall provide all necessary technical personnel and test equipment to conduct Staging ATP and Functional ATP tests. All deviations, anomalies, and test failures shall be resolved at the Provider's expense.

Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the Provider's expense. Retest of individual failed Functional ATP tests or the entire plan shall be at the County's discretion. The fully executed and completed Functional ATP document shall be provided to the County.

11. Operational Testing for 30 Calendar Days

Provider shall perform a 30-calendar day operational test of the System to ensure that all hardware and software defects have been corrected prior to entering final proof-of-performance testing. The fully integrated operation of the System, including all individual subsystems, shall be demonstrated during these tests. The tests shall be designed to demonstrate the reliability, long-term stability, and maintainability of the Systems. A failure of any critical component of the System during this test or by a failure which is deemed as a Critical failure between County and Provider, shall cause the test to restart after the repair is completed. Provider and the County shall agree on what constitutes a failure prior to commencing this test for any items not specifically identified below.

The following is a listing of examples that define a failure:

- System loses communications gateway connectivity
- Station equipment fails to trigger
- More than one fire dispatch console operator position off the air due to failure of supplied goods, services, or interfaces
- Loss of voice communications due to failure of supplied goods, services, or interfaces
- Loss of data communication
- Loss or failure of System configuration database
- Loss or failure of user database
- Failures not specifically defined as minor, at the discretion of the County
- Failures that prevent acceptance criteria from being achieved

12. Microwave Acceptance Testing (Microwave ATP)

A copy of the preliminary Microwave ATP is included in Exhibit A-5. Provider shall use the completed and approved Microwave ATP. It is expected that the Microwave ATP has been performed and all tests have been successful before the County witnesses the official Microwave ATP. The Microwave ATP shall be signed and dated by Provider and County representatives following completion of all tests. All tests in the Microwave ATP shall be marked as either pass, fail, or pass qualify.

Provider shall provide all necessary technical personnel and test equipment to conduct Microwave ATP tests. All deviations, anomalies, and test failures shall be resolved at the Provider's expense.

Failed tests shall be documented, corrected and retested. All defective components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at the Provider's expense. Retest of individual failed Microwave ATP tests or the entire plan shall be at the County's discretion. The fully executed and completed Microwave ATP document shall be provided to the County.

13. Final Acceptance Testing and Final Acceptance Test Plan

Provider shall submit the System to County for Final Acceptance testing following successful completion and approval of the following:

- Final design submittals
- Staging ATP
- System installation
- Functional ATP
- Microwave ATP
- 30-Day operational testing
- Final inspection and punch list resolution
- Submission of all required as-built documentation
- Completion of all required training, unless otherwise approved by Contract Administrator
- Resolution of all punch list items

Any deficiencies shall be documented on a punch list by Contract Administrator and provided to Provider for resolution. Final Acceptance testing shall not commence until Provider has notified County in writing that all punch-list items are resolved and the System is submitted for Final Acceptance testing.

Prior to Final Acceptance testing, Provider shall verify and document that all equipment, hardware and software are upgraded to the latest factory revision. Multiple revision levels among similar equipment are not acceptable. The County shall be given one week notice before the System is ready for Final Acceptance testing, or as otherwise approved by the County Contract Administrator.

County shall use the completed Final Acceptance testing plan included below, as may be modified and approved by the County Contract Administrator and Provider. Provider will have previously performed the test plan and all tests have been successful before the County conducts the official Final Acceptance testing. The Final Acceptance test plan shall be signed and dated by Provider and County's Contract Administrator following completion of all tests. Provider shall provide all necessary technical personnel and test equipment to conduct Final Acceptance tests.

All tests in the Final Acceptance test plan shall be marked as either pass, fail, or qualified pass. All deviations, anomalies, and test failures (including qualified pass) shall be resolved at Provider's expense. Failed tests shall be documented, corrected and retested. All defective

components shall be replaced and retested. Defective components that cannot be corrected shall be replaced at Provider's expense. Retest of individual failed Final Acceptance tests or the entire plan shall be at the County's discretion. The fully executed and completed Final Acceptance document shall be provided to the County.

Final Acceptance Test Plan
County's Contract Administrator will provide written Final Acceptance only upon successful completion of all the Final Acceptance Test Criteria stated below:

No.	Description	Final Acceptance Test Criteria	Pass/Fail
1.	Staging ATP	All tests in Staging ATP passed	
2.	Functional ATP	All tests in Functional ATP passed	
3.	Microwave ATP	All tests in Microwave ATP passed	
4.	30 Day OTP	Test period completed without any failures	
5.	Design Documentation	All final design documentation provided to County	
6.	Final inspection and punch list resolution	All equipment properly installed per specifications and industry standards	
7.	As-built Documentation	All final as-built documented provided to County	
8.	Training completed	All training classes completed	
9.	Resolution of punch-list items	Any outstanding punch-list items from the system testing and inspections resolved	

14. Optional Services, Additional Software/Licenses:

A. Transition & Disentanglement Services

The Parties acknowledge and agree that upon the expiration or termination of this Agreement, the good faith efforts of Provider to facilitate the smooth, efficient, and secure transition of data and services to another provider (or to County, to the extent applicable) without any unnecessary interruption or adverse impact on County operations ("Disentanglement") is a critical objective of the Parties and a material obligation of Provider under this Agreement. All obligations of Provider under this Agreement shall be construed consistent with this objective.

At request of County, Provider shall provide prompt, good faith, and reasonable assistance to County in disentangling County data, business, and operations from the Software and, to the extent applicable, transitioning to a new software, system, or provider.

B. Additional Software/Modules

- ***FSA Mobile Application*** *(including licenses to fire stations and BSO)*

County may acquire access and configuration services for the G2-FSA Mobile Application to enable 24 application licenses for each ATX Station Controller purchased by County and/or each Authorized Third Party User (total 106 fire stations) at no additional cost to County or the fire station (additional licenses may have incremental costs). **This optional software requires execution of a Work Authorization that shall incorporate the required Service Level Agreement**; neither County nor any Authorized Third Party User may execute this option without an established, County-approved Service Level Agreement in place for the app.

This Mobile alerting app for iOS and Android platforms interfaces with the CAD system to send the same alerts received in the station. Provider will provide the download information, log-in information and any and all configuration necessary for each fire station for 24 application licenses, and shall be responsible for fully integrating the applications in with the System. The individual fire station(s) may negotiate additional terms and conditions, provided that nothing in any such negotiated agreements shall be binding on County or prevail over the terms and conditions of this Agreement.

The FSA Mobile Application ("App") will deliver dispatch announcements, administrative alerts, IT support notifications, and application update notifications to authorized personnel via their smartphone or tablet using the Phoenix G2 FSA Mobile Application. The App is compatible and supported for use by iOS and Android devices. The App interfaces with County's CAD system to send simultaneous mobile alerts. Personnel using the App can select notification settings so they can be alerted as individuals or groups (e.g., stations, battalions, districts, etc.) wherever they are and select on or off duty. The mobile alerts plays the same tones as those in the station, shows incident location using the device's built-in mapping capabilities, and enables users to save notifications for future reference and search for previous notifications. In addition, the App provides an easy-access email address and phone link to local IT support. Each ATX Station Controller will include and be configured to interface with 24 App licenses at no additional charge as long as the System is under warranty or support contract. The performance of mobile alerting is subject to network reliability and coverage.

Any terms and conditions included in the acquisition of the FSA Mobile Application must be approved by the Other Eligible Purchaser in the purchase order or purchasing document, and in no event shall any term or condition in any such purchase be binding on the County unless County expressly agrees to such term or condition in an appropriate Work Authorization or amendment.

- ***VoiceAlert***

VoiceAlert is an option in the Station controller for announcements in the response station, and an option for radio channel or talkgroup announcements and/or over our GS FSA smartphone App for iOS and Android and provides the audible component of the fully-automated dispatch

system and reads the dispatch information in the customer's format using a clear, understandable male or female voice to provide full text-to-speech capabilities.

Full text-to-speech allows the Alerting System to announce any information provided to the system: dispatches, weather warnings, or administrative announcements. This can provide fire dispatch positions the ability to alert fire stations concurrently and not receive a "system busy" indication. Multiple stations can be alerted simultaneously and automated announcements for the alerted stations can be played over the dispatch radio channel or talkgroup. If multiple alerts come in to the communications gateway for multiple dispatches, the stations are alerted immediately and played in the stations, and radio voice announcements queue for the radio channel, as necessary. With VoiceAlert in the stations, multiple dispatches can be announcing different dispatches in different stations simultaneously, while VoiceAlert on the radio announces each dispatch sequentially. A radio channel announcement queuing feature can alter the dispatch announcement during periods of heavy activity to shorten the announcement length by, for example, not repeating the dispatch information. The order of the play queue can be configured by priority by the Provider, based upon information provided by a CAD system. (i.e. A "drowning" may receive a higher priority for dispatch than a "wellness check" and be played prior to the wellness check dispatch).

- ***VoiceEditor Application***

The VoiceEditor application allows customers to modify the pronunciation of words that are not familiar to the VoiceAlert speech system. This is typically necessary where there are local pronunciations for street names. Other types of pronunciation adjustments can be made for unit types and street types and directions. A user-editable table is also used to convert CAD incident types into speakable forms.

- ***Station Zoning***

Station Zoning is optional and may be requested on a per-station or per-jurisdiction basis. Provider is requested to provide the options and pricing for each option, to be selected by the individual jurisdictions.

The ATX Station controller, which is part of the Basic Design, already provides x4 individual/zoned audio amps and x1 line-level audio output, each of which can be configured as a separate zone and initially provide each station five separate audio zones. Each zone can be uniquely cued, or can be combined and alerted the same as other zones. Further, each zone can be scheduled (shift changes, etc.) in almost any order to meet an agency's individual station needs and wants.

Station zoning is accomplished in the following manner: In the Station controller, individual Peripheral devices and audio amplifiers are associated with Station Areas (or zones). All devices in a Station Area are activated for an alert that involves that area. Each Station Area is then associated with one or more units, and is activated whenever an associated unit is alerted. Unit to Station Area association is configured using the web configuration in the Station controller.

If configured, the front panel touch screen can also be used to select the units associated with a Station Area to allow firefighters to select unit associations for example when necessary to change dorm rooms.

The ATX Station controller supports more than 200 zones in each station through the use of these built-in amps, audio outputs, and the use of Message Remotes, Room Remotes or by switching audio outputs using IO Remotes

- ***Addition or Replacement of Peripherals***

System Administrators will have the ability to add or replace peripherals at any time, without extra licensing costs. Additional peripherals will be at an additional cost, and will incur additional costs for cabling and installation. Peripherals can be configured for any condition or station layouts enabling each station to phase in alerting System upgrades at any time.

C. Additional Equipment/Hardware

County may acquire any of the additional equipment identified on Exhibit A-1 utilizing a purchase order (if no additional services are required) or Work Authorization. This pricing will be extended to any Authorized Third Party User (including any jurisdiction or agency) within Broward County.

Peripherals offered by Provider for a station include the following:

G2 Illuminated Speaker Lights (or LED Lights)

- G2 Strobe Light: The G2 Strobe Light provides a high-intensity LED blinking strobe that visually alerts crews in areas with high ambient noise levels (i.e., showers, kitchen, apparatus bay, workshops, or compressor rooms.) The Strobe Lights flash 180 degrees in a series for 4-per cycle to simulate a quad-flash strobe, and have the benefit of 100,000 hours life. Each unit has 21 LED lights, three which burn steadily to maintain visual contact during the off period of the flash.

- G2 Color Indicator Remote: The G2 Color Indicator Remote offers an alternative alerting method, featuring high-intensity LED lights. The CI Remote can be configured through the Station controller to display colors for various system events including Station and Unit alerts, Doorbell and other input activations, and system status changes. The CI Remote provides 1 illuminated speaker output; 1 dry contact input; 1 Form-relay output, 10,000 + hours LED lifespan; surface mount, powered by single CAT5/6 cable (easy to install); fully programmable providing use for many functions; up to 3 G2 Color Indicator Remotes may be linked to a single PoE port.

Incident Display Board

The incident display board shall be included as an optional feature in the FSA installation for visual alerting in addition to the audio alert (PA) system.

Provider shall ensure the incident display board shall be capable and configured to display the following information unless otherwise directed by the Contract Administrator, if the required information is provided by the CAD system API:

a. Emergency type (fire, EMS, hazmat, etc.)
b. Time of incident
c. Countdown timer
d. Address of incident
e. Incident location map
f. Type of unit responding

The incident display boards shall be installed by Provider at the location designated by each individual station and per the requirements of that fire station, and each incident display board and capable of and configured to the selection of that fire station: Being activated and controlled in various colors and sequences to alert station personnel of conditions and warnings.

G2 Message Remote. The G2 Message Remote provides x2 15-watt amplifiers with independent volume controls and also can connect to 2 LED Message Signs to display dispatch units and information. The LED Message Signs are powered by the Message Remote and will not require any other external power supply. The Message Remotes can be provided with a wall bracket for mounting two signs back-to-back for use in hallways or common dorm rooms. Message Remotes include power and control for LED Speaker Lights, and 2 auxiliary relay outputs and 2 auxiliary inputs.

G2 LED Message Signs. The legacy BetaBrite and new Gamma signs provide a single line message, either scrolling or static, depending upon the length of the message. Allowing instantaneous alerting (don't have to wait for tones and voice announcement to complete, etc.), and can be mounted almost anywhere a visual dispatch/call reference would aid in comprehension and response, and more can always be easily added later for Turn Out Timing, Unit Status, etc. These signs outlast standard LCD/LED TVs, are much less expensive, and get their power and signal from the same UPS'd Station Controller the rest of the system peripherals do (inexpensive install, no need to tie to UPS/Generator 110V circuit, etc.).

The BetaBrite message sign is 25" long and can display 110 characters of information. The BetaBrite is powered by the ATX Station Controller or by the G2 Message Remote or G2S Sign Remote.

The Gamma Sign is designed to be powered directly by the ATX Station Controller; no Message Remotes or Sign Remotes are necessary. The Gamma Sign can be wired for up to three in one string. It comes in two screen sizes, a 24" active screen width, and 36" active screen width. The 36" screen Gamma can also be configured so a portion is dedicated as a turnout timer. This

allows the 36" Gamma sign to provide the dual functionality of providing the dispatch information and turnout timer in a single screen.

G2 Sign Remote

The G2 Sign Remote powers and controls one LED Message Sign, and does not provide any amplifiers, IO's, or lighting control.

G2 Room Remote

The G2 Room Remote is a peripheral connected to the ATX Station controller, and is designed to provide unique alerting zones in dorms or bunkrooms, conference rooms and office areas. The Room Remote provides a built-in LED message display that can display dispatch message text, unit status, volume control and audio state. The Room Remote can be either wall mounted or flush mounted. The Room Remote provides 15-watts of power to speakers and provides a contact closure on activation to turn on overhead lights. It also has a switched output to provide power to LED Speaker Lights and two auxiliary relay outputs and 2 auxiliary inputs. The three-colored LED display offers a clear and concise user interface to manage the units assigned to the room, unit changes, move ups, volume control, etc. The display offers four solid-state touch control buttons that never wear out, and infrared control with a universal remote.

G2 HDTV Remote

HDTV Remote provides the functionality to turn any high definition TV, screen, monitor or projector with a HDMI connection into a digital display monitor or "incident display board." The HDTV Remote connects the station controller with a HDTV display through an integrated HDMI output and is powered from AC power local to the HDTV display. The HDTV Remote can display dispatch information, including all of the incident information, incident location map and turnout timer simultaneously on the display. Provided the HDTV Display has Consumer Electronic Control (CEC), which is provided with most modern HDTV's, upon receipt of an alert, the HDTV Remote will automatically switch to the assigned HDMI input to display the incident information. After a configurable amount of time, the HDTV will automatically revert to the HDMI input prior to the alert, and resume the functions assigned to that HDMI port.

D. Additional Services to County or Authorized Third Party Users

County, any Authorized Third Party User, or any jurisdiction within Broward County may acquire any of additional services relating to the System, Software, Equipment, including without limitation additional training, spares, modules, or other services, utilizing a Work Authorization or an appropriate ordering document (for entities other than Broward County). For any additional equipment acquired by the County, any Support and Maintenance fees shall be invoiced in conjunction with the existing Support and Maintenance Fee schedule, and pro-rated accordingly. All equipment and services ordered by other entities shall be the sole financial responsibility of the ordering entity. To the extent any such additional equipment or services is stated in Exhibit B, the pricing stated in Exhibit B shall apply.

Exhibit A-1 – Equipment Lists

Core System Equipment

All of the Core System Equipment listed below, including associated Software and Services to achieve Final Acceptance, is included in the System Implementation Fee set forth on Exhibit B. The per unit fees stated below shall apply to the extent County or other Eligible Purchasers elect to purchase additional equipment as Optional Services.

Any Equipment or Software set forth herein may be exchanged for equivalent or better (as determined in the sole discretion of the County Contract Administrator) with no net increase in pricing to County upon written approval by County Contract Administrator prior to Final Acceptance. Any net decrease in costs for exchanged Equipment or Software shall be credited to County against the invoice for Final Acceptance.

Part Number	Description	Qty	List Price	Discount Price	Extended
BN-HE	Head-End Transmission system, comprising 4x MDS SD Base Stations; 4 11 dBi antennas installed on county towers; 2x APX1500 voice data radios; networking; network management; installation; spare parts	**1**	**$162,167.29**	**$145,950.56**	$145,950.56
G2-GW	G2 Communications Gateway Pair (Hardware for CAD interface) 2@2RU each	**2**	**$9,250**	**$8,325.00**	$16,650.00
GaRi-RM	G2 Gateway Audio Radio Interface (GaRi) - Rack Mount	**2**	**$1,885**	**$1,696.50**	$3,393.00
CAD-I	CAD Interface - Motorola PremierOne (USDD-side only)	**1**	**$16,335**	**$14,701.50**	$14,701.50
GW-CM	Gateway Configuration & Modifications	**85**	**$280**	**$252.00**	$21,420.00
					$364,540

Part Number	Description	Qty	Price	Extended	
FireNet PTP/PMP					
C110082B015	PTP820S 11 wGHz ODU	32	$4,250.00	$136,000	
C000000L033	Gigabit Surge Suppressor (56V)	64	$50.00	$3,200	
N000065L001	PTP 650 AC Power Injector	32	$80.00	$2,560	
N000065L003	US Line Cord Fig 8	32	$20.00	$640	
N000082L014	PTP 820 Glands_x5_KIT	32	$32.00	$1,024	
N000082L016	PTP 820 CAT5E Outdoor 100m drum	31	$295.00	$9,145	
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	75	$16.00	$1,200	

Part Number	Description	Qty	Price	Extended	
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	32	$1,360.00	$43,520	
N000082L073	PTP 820 GBE_Connector_kit	32	$16.00	$512	
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	32	$26.00	$832	
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	26	$1,665.00	$43,290	
N110082D100	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	6	$2,235.00	$13,410	
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	222	$26.00	$5,772	
C000065L007	LPU and Grounding Kit (1 kit per END)	44	$400.00	$17,600	
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	44	$3,195.00	$140,580	
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	27	$1,150.00	$31,050	
C000000L033	Gigabit Surge Suppressor (56V)	11	$50.00	$550	
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	11	$699.00	$7,689	
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	11	$25.00	$275	
N000045L002	Tilt Bracket Assembly	11	$29.00	$319	
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	11	$5.00	$55	
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	11	$3750	$41,250	
SG00TS4025A	4 additional years extended warranty (beyond initial manufacturer warranty) for PMP400 SERIES ACCESS POINT	44	$699	$30,756	
SG00TS4030A	4 additional years extended warranty (beyond initial manufacturer warranty) for CMM4	11	$821	$9,031	
CB-KLEW1	9 additional years extended warranty (beyond initial manufacturer warranty) for PTP820S (End Only) Extended Warranty (includes All Risks Advanced Replacement Program from manufacturer)	32	$4,000.00	$128,000	
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	16	$795.00	$12,720	
ET91000SC2	Media converter	4	$177.09	$708	
F6E3-10M5Y	Fiber jumper	4	$64.01	$256	
					$869,969

Part Number	Description	Qty	Price	Extended	
Network Mgmt	(including Software and Services)				
PowerEdge R630	Rackmount server pair, external SAN	1	$29,298.35	$29,298	
SMART1500RM 2U	Line Interactive UPS Smart Rackmount AVR 120V 2U	1	$979.20	$979	
082A7E01D	Network Performance Monitor SL250 (up to 250 elements) - License with 1st-year Maintenance	1	$6,495.00	$6,495	
072A7E01D	NetFlow Traffic Analyzer Module for SolarWinds Network Performance Monitor SL250 - License with 1st-year Maintenance	1	$4,125.00	$4,125	
401BIE01D	SolarWinds User Device Tracker UT2500 (up to 2500 ports) - License with 1st-Year Maintenance	1	$1,895.00	$1,895	
13250E01D	SolarWinds Network Configuration Manager DL50 (up to 50 nodes) - License with 1st-year Maintenance	1	$2,845.00	$2,845	
79101E01D	SolarWinds High Availability for SolarWinds Orion - License with 1st-Year Maintenance	1	$6,995.00	$6,995	
KL-SWCF1	Configuration	1	$18,000.00	$18,000	
B040-008-19	KVM	2	$1,688.00	$3,376	
DC-8050-BT	70 inch locking cabinet	2	$2,183.36	$4,367	
	Network Management Staging	1	$8,000.00	$8,000	
					$86,375

Contingency Equipment

The following additional equipment may be necessary to be included in Core System Equipment, depending upon the circumstances of the tower installations and other site conditions. If approved in advance in writing by the Contract Administrator, the equipment listed below – solely to the extent necessary and preapproved by Contract Administrator – shall be provided by Provider, subject to the not to exceed stated below. The equipment actually approved by County and provided by Provider shall be invoiced at the rates set forth below (or, if not specified, at the price invoiced by the equipment supplier to Provider or to the authorized subcontractor) simultaneously with the invoicing for Milestone 4.

Item	Qty	Unit Price	NOT TO EXCEED
Brackets used by subcontractor to mount antennas on the towers	As needed		$12,000.00
Hardware, kit, installation support and materials for antenna line installations	16	$1,000.00	$16,000.00
Point-To-Point Remote AP	10	$4,500.00	$45,000.00
GE Remote extender	10	$4,450.00	$44,500.00
19" open two-post rack	16	$859.56	$13,752.96
Total Contingency Equipment			**$131,252.96**

Required Spares

Provider shall provide spare equipment in the types and quantities requested by County Contract Administrator up to a not-to-exceed amount of $75,000.00. The spares as requested by County shall be provided and supported as part of the Core System Equipment (including any necessary configuration to enable the spare to be utilized in the System), and shall be invoiced in accordance with the pricing below (if listed) or 10% discount on the manufacturer listed pricing, whichever is less. Provider shall invoice for the spare equipment simultaneously with the invoicing for Milestone 4. County Contractor Administrator may elect by written request (without the need for a purchase order or Work Authorization) the precise composition of the spares to be provided pursuant to this section.

Spares (Required to be provided as part of scope)	Unit Price	Comments
1090CKHH	$ 3,750.00	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply
KLSP-1	$ 278.00	Spare GPS
N000000L053A	$ 795.00	PMP Power supply
C050045A005	$ 3,195.00	5 GHz PMP 450i Integrated Access Point, 90 degree
G2-ATX	$ 18,000.00	ATX controller
Any other Core System Equipment	Per Exhibit A-1	As may be requested by County up to applicable not-to-exceed

Site Index

Bill of Materials: Broward Fire Station Alerting **7/20/2017** V8

Site #	Link Name	Site Name	PTP	PMP	GE	NetMgr
1	Channel 2 to Miramar	Channel2	X	X	X	
2	Coconut Creek - 400 FT to Pompano Beach Tower	Coconut	X	X	X	
3	Coconut Creek PSAP to Coconut Creek - 400 FT	CoconutPSAP	X			X
4	Core to Sunrise PSAP	Core	X			
5	Davie to Markham Park	Davie	X	X		
6	EOC to Core	EOC	X			
7	Hollywood Waste Water Monopole to Channel 2	Hollywood	X			
8	Markham Park to EOC	Markham	X	X	X	
9	Miramar to Pembroke Pines PSAP	Miramar	X	X		
10	Pembroke Pines PSAP to Davie	Pembroke	X			
11	Playa Del Mar to EMS	Playa	X	X		
12	Point of Americas to EMS	EMS	X	X	X	
13	Point of Americas to Hollywood Waste Water Monopole	Points	X	X		
14	Pompano Beach Tower to Playa Del Mar	Pompano	X	X		
15	Sunrise PSAP to Tamarac	Sunrise	X			X
16	Tamarac to Coconut Creek PSAP	Tamarac	X	X		
17	Pompano Waste Water	PompanoWW	X	X		

PTP: Point to point subsystem 11GHz microwave
PMP: Point to multipoint access points GE: General Electric UHF
Net Mgr: Network Manager

Equipment Breakdowns by Site

Site:	**Channel2**	
Link Name:	**Channel 2 to Miramar**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC / PMP / GE**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	6
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D100	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
MPRL-4E-R-DX-S-W	MDS Master Station redundant with Orbit Licensed Narrowband LN4 Band E 406.1-470 MHz transceiver modules, dual power supplies and a duplexer.	1
ANT450F10	Base station antennas, 10 dB	1
KL-BSAK	Base station antenna kits, including 7/8" cable, jumpers, connectors, lighting protectors, ground straps.	1

Site:	**Coconut**	
Link Name:	**Coconut Creek - 400 FT to Pompano Beach Tower**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC / PMP / GE**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
ET91000SC2	Media converter	4
F6E3-10M5Y	Fiber jumper	4
MPRL-4E-R-DX-S-W	MDS Master Station redundant with Orbit Licensed Narrowband LN4 Band E 406.1-470 MHz transceiver modules, dual power supplies and a duplexer.	1
ANT450F10	Base station antennas, 10 dB	1
KL-BSAK	Base station antenna kits, including 7/8" cable, jumpers, connectors, lighting protectors, ground straps.	1

Site:	**Coconut PSAP**	
Link name:	**Coconut Creek PSAP to Coconut Creek - 400 FT**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC / NetMgr**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1
ET91000SC2	media converters	4
F6E3-10M5Y	fiber jumpers	4
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
G2-GW	G2 Communications Gateway Pair (Hardware for CAD interface) 2@2RU each	1
GaRi-RM	G2 Gateway Audio Radio Interface (GaRi) - Rack Mount	1
ATX-1500	Motorola trunked P25.Smartnet, Smartzone mobile, with power supply	1
		1

Site:	**Core**	
Link name:	**Core to Sunrise PSAP**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1

Site:	**Davie**	
Link name:	**Davie to Markham Park**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC / PMP**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
		1

Site:	**EOC**	
Link name:	**EOC to Core**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1

Site:	Hollywood	
Link name:	Hollywood Waste Water Monopole to Channel 2	
Description:		
Equipment Summary:	11 GHz / PTP11820S (Wide) / FCC	
Part Number	Description	Quantity
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	1
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
C110082B015	PTP820S 11 wGHz ODU	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1

Site:	Markham	
Link name:	Markham Park to EOC	
Description:		
Equipment Summary:	11 GHz / PTP11820S (Wide) / FCC / GE	
Part Number	Description	Quantity
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1

01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
MPRL-4E-R-DX-S-W	MDS Master Station redundant with Orbit Licensed Narrowband LN4 Band E 406.1-470 MHz transceiver modules, dual power supplies and a duplexer.	1
ANT450F10	Base station antennas, 10 dB	1
KL-BSAK	Base station antenna kits, including 7/8" cable, jumpers, connectors, lighting protectors, ground straps.	1

Site:	**Miramar**	
Link name:	**Miramar to Pembroke Pines PSAP**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D100	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1

Site:	**Pembroke**	
Link name	**Pembroke Pines PSAP to Davie**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	4
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1

Site:	**Playa**	
Link name	**Playa Del Mar to EMS**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1

Site:	**EMS**	
Link name:	**Point of Americas to EMS**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	6
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
MPRL-4E-R-DX-S-W	MDS Master Station redundant with Orbit Licensed Narrowband LN4 Band E 406.1-470 MHz transceiver modules, dual power supplies and a duplexer.	1
ANT450F10	Base station antennas, 10 dB (11 dB bid, selected closed diople	1
KL-BSAK	Base station antenna kits, including 7/8" cable, jumpers, connectors, lighting protectors, ground straps.	1

Site:	**Points**	
Link name	**Point of Americas to Hollywood Waste Water Monopole**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1
Site:	Pompano	
Link name:	Pompano Beach Tower to Playa Del Mar	
Description:		
Equipment Summary:	11 GHz / PTP11820S (Wide) / FCC	

Part Number	Description	Quantity
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D100	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1

Site:	**Sunrise**	
Link name	**Sunrise PSAP to Tamarac**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC / NetMgr**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
G2-GW	G2 Communications Gateway Pair (Hardware for CAD interface) 2@2RU each	
GaRi-RM	G2 Gateway Audio Radio Interface (GaRi) - Rack Mount	1
ATX-1500	Motorola trunked P25.Smartnet, Smartzone mobile, with power supply	1
		1
		1
PowerEdge R630	Rackmount server pair, external SAN	1
SMART1500RM2U	Line Interactive UPS Smart Rackmount AVR 120V 2U	1
082A7E01D	Network Performance Monitor SL250 (up to 250 elements) - License with 1st-year Maintenance	1
072A7E01D	NetFlow Traffic Analyzer Module for SolarWinds Network Performance Monitor SL250 - License with 1st-year Maintenance	1
401BIE01D	SolarWinds User Device Tracker UT2500 (up to 2500 ports) - License with 1st-Year Maintenance	1
13250E01D	SolarWinds Network Configuration Manager DL50 (up to 50 nodes) - License with 1st-year Maintenance	
79101E01D	SolarWinds High Availability for SolarWinds Orion - License with 1st-Year Maintenance	
KL-SWCF1	Configuration	

Site:	**Tamarac**	
Link name:	**Tamarac to Coconut Creek PSAP**	
Description:		
Equipment Summary:	**11 GHz / PTP11820S (Wide) / FCC**	
Part Number	**Description**	**Quantity**
C110082B015	PTP820S 11 wGHz ODU	2
C000000L033	Gigabit Surge Suppressor (56V)	4
N000065L001	PTP 650 AC Power Injector	2
N000065L003	US Line Cord Fig 8	2
N000082L014	PTP 820 Glands_x5_KIT	2
N000082L016	PTP 820 CAT5E Outdoor 100m drum	2
N000082L017	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable	5
N000082L033	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan	2
N000082L073	PTP 820 GBE_Connector_kit	2
N000082L116	PTP 820 GROUND CABLE FOR IDU and ODU	2
N110082D098	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave	2
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	16
C000065L007	LPU and Grounding Kit (1 kit per END)	16
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
WB3175	1000 ft Reel Outdoor Copper Clad CAT5E (Recommended for PTP)	2
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4
1090CKHH	CMM4 with Outdoor enclosure, GPS Antenna, with Switch and Power Supply	1
C000000L033	Gigabit Surge Suppressor (56V)	1
C050045C002	5 GHz PMP 450i SM, Integrated High Gain Antenna	1
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	1
N000045L002	Tilt Bracket Assembly	1
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	1

Site:	Pompano WW	
Link name:	Pompano PMP	
Description:	AP cluster backhauled with SM	
Part Number	**Description**	**Quantity**
N000000L053A	AC power supply 56VDC DIN-Rail for CMM4, LWN1740-6EM1	1
01010419001	Coaxial Cable Grounding Kits for 1/4" and 3/8" Cable	8
C000065L007	LPU and Grounding Kit (1 kit per END)	8
C050045A005	5 GHz PMP 450i Integrated Access Point, 90 degree	4
N000000L034	POWER SUPPLY, 30W, 56V - Gbps support	4
N000900L007	CABLE, UL POWER SUPPLY CORD SET, US	4

Fire Station Equipment and Services (including Pricing)

Provider shall provide fire station equipment in accordance with the pricing below (if listed, and subject to the CPI/3% Escalator stated below) or 10% discount on the then-current manufacturer listed pricing, whichever is less. All Fire Station Equipment includes at no additional cost an 18 month warranty from date of shipment by manufacturer. Provider shall not increase the pricing listed below for Fire Station Equipment for the first six (6) months following the Effective Date of this Agreement; for time periods thereafter, the annual CPI/3% Escalator may be applied.

CPI/3% Escalator: For applicable time periods, Provider may only increase its fees on an annual basis, provided that such increase per annum shall not exceed the lesser of 3% or CPI. The increase or decrease in CPI shall be calculated as follows: the difference of CPI current period less CPI previous period, divided by CPI previous period, times 100. The CPI current period shall mean the most recent published monthly index prior to contract anniversary. The CPI previous period shall mean for the same month of the prior year. All CPI indices shall be obtained from the U.S. Department of Labor table for Consumer Price Index - All Urban Consumers (CPl-U): US city average, with a base period of 1982-84 = 100, and not seasonally adjusted.

Fire Station Equipment basic equipment package ("Basic Station Option")

Unit	Description	Part No.	List Price	Broward Contract Price	Quantity	Total
	STATION LICENSES					
Ea/Yr	G2 MOBILE FSAS APP - Single Device License. Up to 24 Licenses-Per-ATX are offered at $0.00 cost each as long as system is currently under warranty or elected recurring annual support coverage.	G2-APP-DL	$ -	$ -	24	$0
	STATION CONTROLLER					
Kit	G2 ATX STATION CONTROLLER - Power/Signal/Control up to 8 peripheral Remote Options. 4 Unique Amps/Zones available.	ATX	$20,000.00	$18,000.00	1	$18,000
	STATION PERIPHERALS					
Ea	MESSAGE SIGN, Digital LED (BetaBrite - LEGACY Replacement 24" Screen Width)	MS-B	$360.00	$324.00	1	$324

Unit	Description	Part No.	List Price	Broward Contract Price	Quantity	Total
Ea	G2 I/O REMOTE w/ 8 In & 8 Out	IOR	$1,165.00	$1,048.50	1	$1,048.50
Ea	G2 LED SPEAKER - Flush Mount, 70v	SPK-LED-FM	$297.00	$267.30	3	$801.90
Ea	MDS Data radio, installed	KL-OR2	$2,241.53	$2,017.38	1	$1,917.38
Ea	MDS Data radio network management, installed	KL-NM	$122.22	$110.00	1	$110
Ea	Motorola APX-1500 P25 radio with power-supply, speaker/cable, installed	KL-APX	$4,351.30	$3,916.17	1	$3,916.17
Ea	Radio Cable, voice, installed	KL-RC	$51.33	$46.20	1	$46.20
Ea	WAN router firewall, installed	KL-RF	$1,793.00	$1,613.70	1	$1,613.70
Ea	Yagi antenna, installed	KL-YA	$1,527.78	$1,375.00	1	$1,375.00
	STATION LEVEL SERVICES					
Ea	Station Installation per standard design (absent materially changed conditions or design)	ST-INST		per design		$10,936.13
Ea	Station Configuration & Start-Up	ST-SU		per design		$1,391.78
Ea	Station USDD Project Management	ST-PM2		per design		$1,378.24
Ea	Station Engineering / Design Services	ST-ES		per design		$198.83
Ea	Station Documentation	ST-DM		per design		$29.82
Ea	Radio System Provider Project Management	KL-PM	$1,320.00	$1,188.00		$1,188.00
Ea	Support and maintenance (first 18 months after shipment included as part of warranty)			No additional cost		No additional cost
					Sub Total	$44,275.65
					Shipping	$470
					Grand Total	$44,545.65

The Basic Station Option contemplates installation per the fire station standard design which includes the elements stated above. Any design changes or modifications to the standard system installation design (e.g., adding additional components or removing components) may result in an increase or decrease to the total stated above; Provider shall itemize to the applicable fire

station or Eligible Purchaser the pricing for any modification to the fire station standard design, or otherwise shall charge any additional design and installation services to the fire station at the agreed rate set forth in the applicable ordering document by the Eligible Purchaser, or otherwise at the hourly rates for Optional Services Rates set forth on Exhibit B. Individual fire station installation quotations shall be prepared by Provider for each Eligible Purchaser or fire station and shall be based on final configuration and site installation requirement and conditions.

Additional Fire Station Equipment (Optional to Fire Stations and Eligible Purchasers)

Fire stations and Eligible Purchasers may acquire any additional equipment routinely made available by Provider to its customers, including without limitation any USDD equipment, at the rates set forth below (if listed, and subject to the CPI/3% Escalator stated above) or at a 10% discount off then-current manufacturer list price. Provider shall not increase the pricing listed below for Additional Fire Station Equipment for the first six (6) months following the Effective Date of this Agreement; for time periods thereafter, the annual CPI/3% Escalator may be applied.

Item	Unit	Description	Part No.	List Price	County or Eligible Purchaser Price
		STATION LICENSES			
1	Ea	G2 VOICEALERT - Single Station License. One-Time/Perpetual (unless further USDD modification is needed)	VA	$ 927.00	$ 834.30
2	Ea/Yr	G2 MOBILE FSAS APP - Single Device License. Up to 24 Licenses-Per-ATX are offered at $0.00 cost each as long as system is currently under warranty or elected recurring annual support coverage.	G2-APP-DL	$ 0	0
		STATION CONTROLLER			
3	Kit	G2 ATX STATION CONTROLLER - Power/Signal/Control up to 8 peripheral Remote Options. 4 Unique Amps/Zones available.	ATX	$ 20,000.00	$ 18,000.00
4	Kit	Rack Mount Ears	ATX-E	$ 54.00	$ 48.60
5	Kit	Base Plate	ATX-P	$ 54.00	$ 48.60
		STATION PERIPHERALS			
6	Kit	ATX EXPANSION KIT - Allows ability to Power/Signal/Control up to 12 more peripheral Remote options per EXP.	ATX-EXP	$ 6,660.00	$ 5,994.00
7	Kit	Rack Mount Ears	ATX-E	$ 54.00	$ 48.60
8	Kit	Base Plate	ATX-P	$ 54.00	$ 48.60
9	Ea	G2 ROOM REMOTE Module	RR2	$ 1,830.00	$ 1,647.00
10	Ea	RR Trim Plate, for Flush-Mount	RR-TP	$ 46.00	$ 41.40
11	Ea	RR Back-Straps, for solid-wall flush-mounting	RR-BS	$ 27.00	$ 24.30

Item	Unit	Description	Part No.	List Price	County or Eligible Purchaser Price
12	Ea	RR Back-Box, for solid-wall flush-mounting	RR-BB	$ 86.00	$ 77.40
13	Ea	G2 MESSAGE REMOTE Module	MR	$ 1,167.00	$ 1,050.30
14	Ea	G2 SIGN REMOTE Module	SR	$ 583.00	$ 524.70
15	Ea	G2 HDTV REMOTE / STATION Module (TV & Electrical Outlet by Others)	TVR-S	$ 875.00	$ 787.50
16	Ea	G2 MESSAGE SIGN, Digital LED (STANDARD GammaSign / 24" Active Screen Width)	MS-G2-S	$ 883.00	$ 794.70
17	Ea	G2 MESSAGE SIGN, Digital LED (EXTENDED GammaSign / 36" Active Screen Width)	MS-G2-E	$ 1,325.00	$ 1,192.50
18	Ea	MESSAGE SIGN, Digital LED (BetaBrite - LEGACY Replacement 24" Screen Width)	MS-B	$ 360.00	$ 324.00
19	Ea	MS Adapter Plate, VESA 100	MS-ADPT-V100	$ 60.00	$ 54.00
20	Ea	MS Tie-Straps (pair) - join two MSs	MS-ADPT-STRP	$ 27.00	$ 24.30
21	Ea	MS Mount - Articulating, Long reach	MS-MNT-ART-L	$ 287.00	$ 258.30
22	Ea	G2 DOUBLE MS KIT (MR, 90-deg Mount, x2MS)	MS-X2K	$ 2,065.00	$ 1,858.50
23	Ea	G2 I/O REMOTE w/ 8 In & 8 Out	IOR	$ 1,165.00	$ 1,048.50
24	Ea	G2 Strobe Light / Red LED	STR	$ 500.00	$ 450.00
25	Ea	G2 Color Indicator Remote - Up to 8 unique colors	CIR	$ 635.00	$ 571.50
26	Ea	Push Button, Standard (Black)	PB-B	$ 100.00	$ 90.00
27	Ea	Push Button, Emergency (Red)	PB-R	$ 100.00	$ 90.00
28	Ea	Audio Amplifier, External, Standard	AMP	$ 987.00	$ 888.30
29	Ea	Shelf, Under Table or Wall Mount, for 1U 1/2 Rack	AMP-S	$ 66.00	$ 59.40
30	Ea	Speaker-APP/Weatherized (A2T), Surface, 70v	SPK-W-SM	$ 280.00	$ 252.00
31	Ea	Speaker - Standard, Flush Mount, 70v (S86)	SPK-STD-FM	$ 73.00	$ 65.70
32	Ea	Speaker - Standard, Surface Mount (MB), 70v	SPK-STD-SM	$ 73.00	$ 65.70
33	Ea	G2 LED SPEAKER - Flush Mount, 70v	SPK-LED-FM	$ 297.00	$ 267.30
34	Ea	G2 LED SPEAKER - Surface Mount (MB), 70v	SPK-LED-SM	$ 297.00	$ 267.30
35	Ea	Transformer, 8ohm to 70V, External	XFMR	$ 53.00	$ 47.70
36	Ea	ATX UPS, Standard	UPS-STD	$ 923.00	$ 830.70
37	Ea	Shelf/Bracket, Wall-Mount for UPS	UPS-WMB	$ 57.00	$ 51.30
38	Ea	MDS Data radio, installed	KL-OR2	$ 2,241.53	$ 2,017.38
39	Ea	MDS Data radio network management, installed	KL-NM	$ 122.22	$ 110.00
40	Ea	Motorola APX-1500 P25 radio with power-supply, speaker/cable, installed	KL-APX	$ 4,351.30	$ 3,916.17
41	Ea	Radio Cable, voice, installed	KL-RC	$ 51.33	$ 46.20
42	Ea	WAN router firewall, installed	KL-RF	$ 1,793.00	$ 1,613.70

Item	Unit	Description	Part No.	List Price	County or Eligible Purchaser Price
43	Ea	Yagi antenna, installed	KL-YA	$ 1,527.78	$ 1,375.00
		STATION LEVEL SERVICES			
44	Ea	Station Installation (Estimated/TBD - Pending final approved station system design)	ST-INST		As negotiated in applicable Work Authorization
45	Ea	Station Configuration & Start-Up	ST-SU		
46	Ea	Station Project Management	ST-PM2		
47	Ea	Station Engineering / Design Services	ST-ES		
48	Ea	Station Documentation	ST-DM		
49	Ea	Station Training - User/Technician via streamed online video with per-station license and participant registration/verification. Intended as refresher class	TRA-UT-VID		$800.00
50	Ea	Station Training - User/Technician. On-Site @ Station. Price includes 3 classes, 1 hour each (planned to cover 3 shifts)	TRA-UT-OS		$ 4,424.00
51	Ea	FireNet Subscriber Module, installed. (Assume existing mount)	KL-FNSM		$ 1,705.00
		STATION SUPPORT AND MAINTENANCE			
1	Annual	Annual support and maintenance after first 18 months at level elected by Eligible Purchaser from Support Option Plans listed below			At Support Option Rates listed below

Fire Station Equipment Support Option Plans

To the extent ordered by the applicable Eligible Purchaser, Provider shall provide Support and Maintenance Services for the applicable fire station(s) for all Provider-installed equipment and software from the following options (unless otherwise agreed in an applicable ordering document). For each option listed below, the support services from the lower level of support are included in the greater (i.e., Option A includes the services of both Option B and Option C, and Option B includes the services of Option C). The rates listed below shall not increase for the first two years following Final Acceptance of the System under this Agreement; for time periods thereafter, Provider may increase its fees on an annual basis with at least ninety (90) days' advance written notice to the applicable Eligible Purchaser, provided that such increase per annum shall not exceed the CPI/3% Escalator stated above.

Option A: **Premium Support ($7,426.97 annually for Basic Station Equipment)**

Includes 24/7/365 1 hour telephone support

24/7/365 2 hours onsite response, +4 hours uptime guarantee

Includes all active parts and equipment supplied to repair or replace

Includes all station wiring, connectors
Includes batteries
Includes annual on-site test and optimization.
Includes software maintenance.
Includes onsite software upgrades as necessary
Includes annual remedial training class if necessary
includes annual engineering review
Includes 24 licenses G2 Mobile FSAS application (iPhone or Android)
Includes priority restoration service, external antenna wind

Option B: **Standard Support ($4,951.31 annually for Basic Station Equipment)**
Includes 24/7/365 1 hour telephone support
Includes 24/7/365 2 hours onsite response, +4 hours uptime guarantee
Includes all parts and active equipment supplied to repair or replace.
Includes software maintenance.
Includes onsite software upgrades as necessary
Includes 24 licenses G2 Mobile FSAS application (iPhone or Android)

Option C: Basic Support ($2,623.76/annually for Basic Station Equipment)
Includes 24/7/365 1 hour telephone support
Includes Next Business Day priority shipping from factory replacement, field replacements
Includes remote software maintenance, upgrades
Includes 24 licenses G2 Mobile FSAS application (iPhone or Android)
On-site field labor rates per Optional Services Rates set forth on Exhibit B plus return mileage for onsite work

Exhibit A-2 – Failure Mode Analysis

Element #	Element Name	Severity	Element location	Failure Effect	Detection	Remediation	Action
1	Primary FireNet radio/interface	2	Sunrise PSAP	Momentary loss of dispatch	FireNetMgr	Automatic loop switch	Automatic
2	Primary CAD	2	Sunrise PSAP	Partial or total loss of dispatch	User, CAD diagnostics	Engage backup CAD Server	Manual
3	PSI Net Connection, Primary	2	Sunrise PSAP	Loss of outbound comms	Heartbeat, missing Acks	Engage backup CAD Server	Manual
4	Primary CISCO 4351	2	Sunrise PSAP	Loss of outbound comms	FireNetMgr	Engage backup CAD Server	Manual
5	USDD Primary Comms Gateway A	2	Sunrise PSAP	Loss of outbound comms	FireNetMgr, USDD Comm B	Automatic failover to Gateway B	Automatic
6	USDD Primary Comms Gateway B	3	Sunrise PSAP	Loss of backup comms at Sunrise	FireNetMgr, USDD Comm A	Create service ticket, resolve	Manual
7	USDD Primary GaRI	2	Sunrise PSAP	Loss of automatic voice at Sunrise	USDD Primary/Secondary	Engage backup CAD Server or redirect to Secondary GaRI	Manual
8	Primary Motorola Radio	2	Sunrise PSAP	Loss of automatic voice at Sunrise	User, field	Engage backup CAD Server or redirect to Secondary GaRI	Manual
9	Secondary FireNet radio/interface	2	Coconut PSAP	Momentary loss of dispatch (if active)	FireNetMgr	Automatic loop switch	Automatic
10	Secondary CAD	2	Coconut PSAP	Partial or total loss of dispatch (if active)	User, CAD diagnostics	Engage backup CAD Server	Manual
11	PSI Net Connection, Primary	2	Coconut PSAP	Loss of outbound comms(if active)	Heartbeat, missing Acks	Engage backup CAD Server	Manual
12	Secondary CISCO 4351	2	Coconut PSAP	Loss of outbound comms (if active)	FireNetMgr	Engage backup CAD Server	Manual

13	USDD Secondary Comms Gateway A	2	Coconut PSAP	Loss of outbound comms (if active)	FireNetMgr, USDD Comm B	Automatic failover to Gateway B	Automatic
14	USDD Secondary Comms Gateway B	3	Coconut PSAP	Loss of backup comms at Coconut	FireNetMgr, USDD Comm A	Create service ticket, resolve	Manual
15	USDD Secondary GaRI	2	Coconut PSAP	Loss of automatic voice at Coconut	USDD Primary/Secondary	Engage backup CAD Server or redirect to Primary GaRI	Manual
16	Secondary Motorola Radio	2	Coconut PSAP	Loss of automatic voice at Coconut	User, field	Engage backup CAD Server or redirect to Primary GaRI	Manual
17	FireNet Microwave Radio 1	2	Site 3	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
18	FireNet Microwave Radio 2	2	Site 3	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
19	FireNet CMM	2	Site 3	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
20	FireNet AP1	3	Site 3	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
21	FireNet AP2	3	Site 3	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
22	FireNet AP3	3	Site 3	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
23	FireNet AP4	3	Site 3	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic

24	Site Cisco 4351	1	Site 3	Loss of Site connectivity (note 1)	FireNetMgr	Create service ticket, resolve	Manual
25	(if equipped) GE Base Station RF Tx	3	Site 3	Momentary loss of GE Tx	GE/FireNetMgr	Engage backup RF	Automatic
26	(if equipped) GE Base Station Internal power supply	3	Site 3	Momentary loss of GE Tx/Rx	GE/FireNetMgr	Engage backup power supply	Automatic
27	UHF Antenna/feed	3	Site 3	Loss of GE Tx/Rx	GE/FireNetMgr	Create service ticket, resolve	Manual
28	FireNet Microwave Radio 1	3	Site 4	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
29	FireNet Microwave Radio 2	3	Site 4	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
30	FireNet CMM	3	Site 4	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
31	FireNet AP1	3	Site 4	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
32	FireNet AP2	3	Site 4	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
33	FireNet AP3	3	Site 4	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
34	FireNet AP4	3	Site 4	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
35	Site Cisco 4351	1	Site 4	Loss of Site connectivity (note 2)	FireNetMgr	Create service ticket, resolve	Manual

36	(if equipped) GE Base Station RF Tx	3	Site 4	Momentary loss of GE Tx	GE/FireNetMgr	Engage backup RF	Automatic
37	(if equipped) GE Base Station Internal power supply	3	Site 4	Momentary loss of GE Tx/Rx	GE/FireNetMgr	Engage backup power supply	Automatic
38	UHF Antenna/feed	3	Site 4	Loss of GE Tx/Rx	GE/FireNetMgr	Create service ticket, resolve	Manual
39	FireNet Microwave Radio 1	3	Site 5	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
40	FireNet Microwave Radio 2	3	Site 5	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
41	FireNet CMM	3	Site 5	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
42	FireNet AP1	3	Site 5	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
43	FireNet AP2	3	Site 5	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
44	FireNet AP3	3	Site 5	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
45	FireNet AP4	3	Site 5	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
46	Site Cisco 4351	1	Site 5	Loss of Site connectivity (note 2)	FireNetMgr	Create service ticket, resolve	Manual
47	(if equipped) GE Base Station RF Tx	3	Site 5	Momentary loss of GE Tx	GE/FireNetMgr	Engage backup RF	Automatic

48	(if equipped) GE Base Station Internal power supply	3	Site 5	Momentary loss of GE Tx/Rx	GE/FireNetMgr	Engage backup power supply	Automatic
49	UHF Antenna/feed	3	Site 5	Loss of GE Tx/Rx	GE/FireNetMgr	Create service ticket, resolve	Manual
50	FireNet Microwave Radio 1	3	Site 6	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
51	FireNet Microwave Radio 2	3	Site 6	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
52	FireNet CMM	1	Site 6	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
53	FireNet AP1	3	Site 6	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
54	FireNet AP2	3	Site 6	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
55	FireNet AP3	3	Site 6	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
56	FireNet AP4	3	Site 6	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
57	Site Cisco 4351	1	Site 6	Loss of Site connectivity (note 2)	FireNetMgr	Create service ticket, resolve	Manual
58	(if equipped) GE Base Station RF Tx	3	Site 6	Momentary loss of GE Tx	GE/FireNetMgr	Engage backup RF	Automatic
59	(if equipped) GE Base Station Internal power supply	3	Site 6	Momentary loss of GE Tx/Rx	GE/FireNetMgr	Engage backup power supply	Automatic

60	UHF Antenna/feed	3	Site 6	Loss of GE Tx/Rx	GE/FireNetMgr	Create service ticket, resolve	Manual
61	FireNet Microwave Radio 1	3	Site 7	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
62	FireNet Microwave Radio 2	3	Site 7	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
63	FireNet CMM	3	Site 7	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
64	FireNet AP1	3	Site 7	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
65	FireNet AP2	3	Site 7	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
66	FireNet AP3	3	Site 7	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
67	FireNet AP4	3	Site 7	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
68	Site Cisco 4351	3	Site 7	Loss of Site connectivity (note 2)	FireNetMgr	Create service ticket, resolve	Manual
69	FireNet Microwave Radio 1	3	Site 8	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
70	FireNet Microwave Radio 2	3	Site 8	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
71	FireNet CMM	3	Site 8	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
72	FireNet AP1	3	Site 8	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup	Automatic

						dispatch to stations	
73	FireNet AP2	3	Site 8	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
74	FireNet AP3	3	Site 8	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
75	FireNet AP4	3	Site 8	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
76	Site Cisco 4351	3	Site 8	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
77	FireNet Microwave Radio 1	3	Site 9	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
78	FireNet Microwave Radio 2	3	Site 9	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
79	FireNet CMM	3	Site 9	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
80	FireNet AP1	3	Site 9	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
81	FireNet AP2	3	Site 9	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
82	FireNet AP3	3	Site 9	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
83	FireNet AP4	3	Site 9	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic

84	Site Cisco 4351	3	Site 9	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
85	FireNet Microwave Radio 1	3	Site 10	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
86	FireNet Microwave Radio 2	3	Site 10	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
87	FireNet CMM	3	Site 10	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
88	FireNet AP1	3	Site 10	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
89	FireNet AP2	3	Site 10	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
90	FireNet AP3	3	Site 10	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
91	FireNet AP4	3	Site 10	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
92	Site Cisco 4351	3	Site 10	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
93	FireNet Microwave Radio 1	3	Site 11	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
94	FireNet Microwave Radio 2	3	Site 11	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
95	FireNet CMM	3	Site 11	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
96	FireNet AP1	3	Site 11	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup	Automatic

						dispatch to stations	
97	FireNet AP2	3	Site 11	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
98	FireNet AP3	3	Site 11	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
99	FireNet AP4	3	Site 11	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
100	Site Cisco 4351	3	Site 11	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
101	FireNet Microwave Radio 1	3	Site 12	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
102	FireNet Microwave Radio 2	3	Site 12	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
103	FireNet CMM	3	Site 12	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
104	FireNet AP1	3	Site 12	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
105	FireNet AP2	3	Site 12	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
106	FireNet AP3	3	Site 12	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
107	FireNet AP4	3	Site 12	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic

108	Site Cisco 4351	3	Site 12	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
109	FireNet Microwave Radio 1	3	Site 13	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
110	FireNet Microwave Radio 2	3	Site 13	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
111	FireNet CMM	3	Site 13	Loss of PMP for Site	Cambium/FireNet Mgr	Create service ticket, resolve	Manual
112	FireNet AP1	3	Site 13	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
113	FireNet AP2	3	Site 13	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
114	FireNet AP3	3	Site 13	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
115	FireNet AP4	3	Site 13	Loss of quadrant coverage	Cambium/FireNet Mgr	GE radio to support backup dispatch to stations	Automatic
116	Site Cisco 4351	3	Site 13	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
117	FireNet Microwave Radio 1	3	Site 14	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
118	FireNet Microwave Radio 2	3	Site 14	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
119	Site Cisco 4351	3	Site 14	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
120	FireNet Microwave Radio 1	3	Site 15	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic

121	FireNet Microwave Radio 2	3	Site 15	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
122	Site Cisco 4351	3	Site 15	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
123	FireNet Microwave Radio 1	3	Site 16	Loss of Radio 1	Cambium/FireNet Mgr	Loop switch	Automatic
124	FireNet Microwave Radio 2	3	Site 16	Loss of Radio 2	Cambium/FireNet Mgr	Loop switch	Automatic
125	Site Cisco 4351	3	Site 16	Loss of Site connectivity	FireNetMgr	Create service ticket, resolve	Manual
126	Station ATX Controller	1	Each Fire Station	Loss of Station Alerting	USDD Active Comm Server	Create service ticket, resolve	Fire Watch
127	FireNet Subscriber	3	Each Fire Station	Loss of FireNet IP connectivity	Cambium/FireNet Mgr	Create service ticket, resolve	Automatic
128	GE Subscriber radio	3	Each Fire Station	Loss of GE serial connectivity	GR/FireNetMgr	Create service ticket, resolve	Automatic

Exhibit A-3 – Preliminary Functional Acceptance Test Plan

Table of Contents

TEST REQUIREMENTS

Provide a user with the ability to enter, dispatch, and manage Fire and EMS incidents must be logged into a VisiCAD workstation and prepared to enter, dispatch, and manage incidents.

The test or production servers used for these tests must have the USDD Fire Station Alerting service running and connected to the appropriate USDD Communications Gateway.

The Unit, Station, Incident Nature, and other tables must be synchronized between the CAD system and the Station Alerting system.

Personnel should be physically in the monitored fire stations to observe the operation of the Station Alerting system in the station.

At least one portable radio must be available to monitor the VoiceAlert dispatch announcements transmitted over the radio system.

GENERAL

1. Test Alert

Step Name	Description	Expected
Step 1	Using CAD, generate a test station alert	The specified station will alert and display the test alert message.

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

EMS

2. Single Unit EMS Response

Step Name	Description	Expected
Step 1	Enter and dispatch an EMS incident with an incident type that will produce a single unit response. Use a location in "house number" form with an apartment number included.	The alerting system will alert the portable radio associated with the EMS unit dispatched, and the VoiceAlert dispatch message will play over the configured talkgroup.
Step 2	Leave this incident open for next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

3. Special Call Unit to Existing EMS Response

Step Name	Description	Expected
Step 1	Using the incident created in the previous test, add a single EMS unit to the incident and dispatch.	The system will alert the portable radio associated with the dispatched unit, and the VoiceAlert dispatch message will play over the configured talkgroup.
Step 2	Leave this incident open for the next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

4. Multi-Station / Multi-Unit EMS Response

Step Name	Description	Expected
Step 1	Using the incident used in the previous test, modify the incident nature to a type that requires at least 2 additional EMS units. Ensure that the suggested units are from different stations prior to dispatch, then dispatch the units.	The system will alert the portable radios associated with the dispatched units, and the VoiceAlert dispatch message will play over the configured talkgroup.
Step 2	Leave this incident open for the next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

5. Greater Alarm EMS Response

Step Name	Description	Expected
Step 1	Using the incident used in the previous test, make the incident a 2nd or 3rd alarm and dispatch the suggested units.	The system will alert the portable radios associated with the dispatched units, and the VoiceAlert dispatch message will play over the configured talkgroup.
Step 2	Release the units from the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

6. Move EMS Unit to Temporary Quarters

Step Name	Description	Expected
Step 1	Move an EMS unit from its normal quarters to a different quarters.	The system will alert the portable radios associated with the moved unit, and the VoiceAlert move message will play over the configured talkgroup.
Step 2	Complete any steps necessary to make the unit available in the new station.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

7. Single Unit EMS Response - Moved-Up Unit

Step Name	Description	Expected
Step 1	Enter an EMS incident with an incident type that will produce a single unit response. Use a location in "intersection" form that will select the unit moved in the previous test.	The alerting system will alert the portable radio associated with the EMS unit dispatched, and the VoiceAlert dispatch message will play over the configured talkgroup.
Step 2	Release the unit from the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

8. Move EMS Unit Back to Home Quarters

Step Name	Description	Expected
Step 1	Using the unit used in the previous test, move the unit back to its home quarters.	The system will alert the portable radios associated with the moved unit, and the VoiceAlert move message will play over the configured talkgroup.
Step 2	Complete any steps necessary to make the unit available in the home station.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

FIRE

9. Single Unit Fire Response

Step Name	Description	Expected
Step 1	Enter and dispatch a Fire incident with an incident type that will produce a single unit response. Use a location in "Common Place" form.	The alerting system will alert the station and unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Leave this incident open for next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

10. Special Call Unit to Existing Fire Response

Step Name	Description	Expected
Step 1	Using the incident created in the previous test, add a single Fire unit to the incident and dispatch.	The alerting system will alert the station and unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Leave this incident open for the next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

11. Multi-Station / Multi-Unit Fire Response

Step Name	Description	Expected
Step 1	Using the incident used in the previous test, modify the incident nature to a type that requires at least 2 additional Fire units. Ensure that the suggested units are from different stations prior to dispatch, then dispatch the units.	The alerting system will alert the stations and units dispatched. The dispatch information will display on the message signs, VoiceAlert announcement will play on both the dispatch talkgroup and in the stations, and the LED speaker lights will illuminate.
Step 2	Leave this incident open for next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

12. Greater Alarm Fire Response

Step Name	Description	Expected
Step 1	Using the incident used in the previous test, make the incident a 2nd or 3rd alarm and dispatch the suggested units.	The alerting system will alert the stations and units dispatched. The dispatch information will display on the message signs, VoiceAlert announcement will play on both the dispatch talkgroup and in the stations, and the LED speaker lights will illuminate.
Step 2	Release all units from this incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

13. Move Fire Unit to Temporary Quarters

Step Name	Description	Expected
Step 1	Move a Fire unit from its normal quarters to a different quarters.	The alerting system will alert the home station and unit moved. The move-up information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Complete any steps necessary to make the unit available in the new station.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

14. Single Unit Fire Response - Moved-Up Unit

Step Name	Description	Expected
Step 1	Enter a Fire response with an incident type that will produce a single unit response. Use a location in "Highway" form that will select the unit moved in the previous test.	The alerting system will alert the home station and unit moved. The move-up information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Close the incident created in the Step 2 and make the assigned unit available in quarters.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

15. Move Fire Unit back to Home Quarters

Step Name	Description	Expected
Step 1	Using the unit used in the previous test, move the unit back to its home quarters.	The alerting system will alert the new station and unit moved. The move-up information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate. The unit displayed on the message sign will be "Moved Up".
Step 2	Complete any steps necessary to make the unit available in the home station.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

FIRE AND EMS

16. Combined Fire & EMS Response

Step Name	Description	Expected
Step 1	Enter and dispatch a Fire & EMS incident with an incident type that will produce a single unit response for each Fire and EMS. Use a location in "Interstate Highway" form.	The alerting system will alert the portable radio associated with the EMS unit dispatched, and the VoiceAlert dispatch message will play over the configured talkgroup. The alerting system will alert the station of the Fire unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the configured talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Leave this incident open for the next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

17. Special Call for Fire and EMS Units

Step Name	Description	Expected
Step 1	Using the incident created in the previous test, add a single Fire unit and a single EMS unit to the incident and dispatch.	The alerting system will alert the portable radio associated with the EMS unit dispatched, and the VoiceAlert dispatch message will play over the configured talkgroup. The alerting system will alert the station of the Fire unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the configured talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Leave this incident open for the next test.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

18. Greater Alarm Fire and EMS Response

Step Name	Description	Expected
Step 1	Using the incident used in the previous test, make the incident a 2nd or 3rd alarm, ensuring that both Fire and EMS units are assigned on the greater alarm.	The alerting system will alert the portable radio associated with the EMS unit dispatched, and the VoiceAlert dispatch message will play over the configured talkgroup. The alerting system will alert the station of the Fire unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the configured talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Release all units on the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

INCIDENTS WITH OTHER LOCATION TYPES

19. Limited Access Highway - Ramp or Transition

Step Name	Description	Expected
Step 1	Enter and dispatch a Fire incident with an incident type that will produce a single unit response. Use a location in "Limited Access Highway Ramp" form.	The alerting system will alert the station and unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Release the unit from the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

20. Highway Mile Post

Step Name	Description	Expected
Step 1	Enter and dispatch a Fire incident with an incident type that will produce a single unit response. Use a location in "Highway with Mile Post" form.	The alerting system will alert the station and unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Release the unit from the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

21. Point Location (Lat-Lon)

Step Name	Description	Expected
Step 1	Enter and dispatch a Fire incident with an incident type that will produce a single unit response. Use a location in "Point (Lat-Lon)" form.	The alerting system will alert the station and unit dispatched. The dispatch information will display on the message sign, VoiceAlert announcement will play on both the dispatch talkgroup and in the station, and the LED speaker lights will illuminate.
Step 2	Release the unit from the incident and close the incident.	

Test Passed ☐ Test Failed ☐ Test Skipped ☐

Witnessed by _____
Date _____

Exhibit A-4 – Coverage Maps and Path Calculations

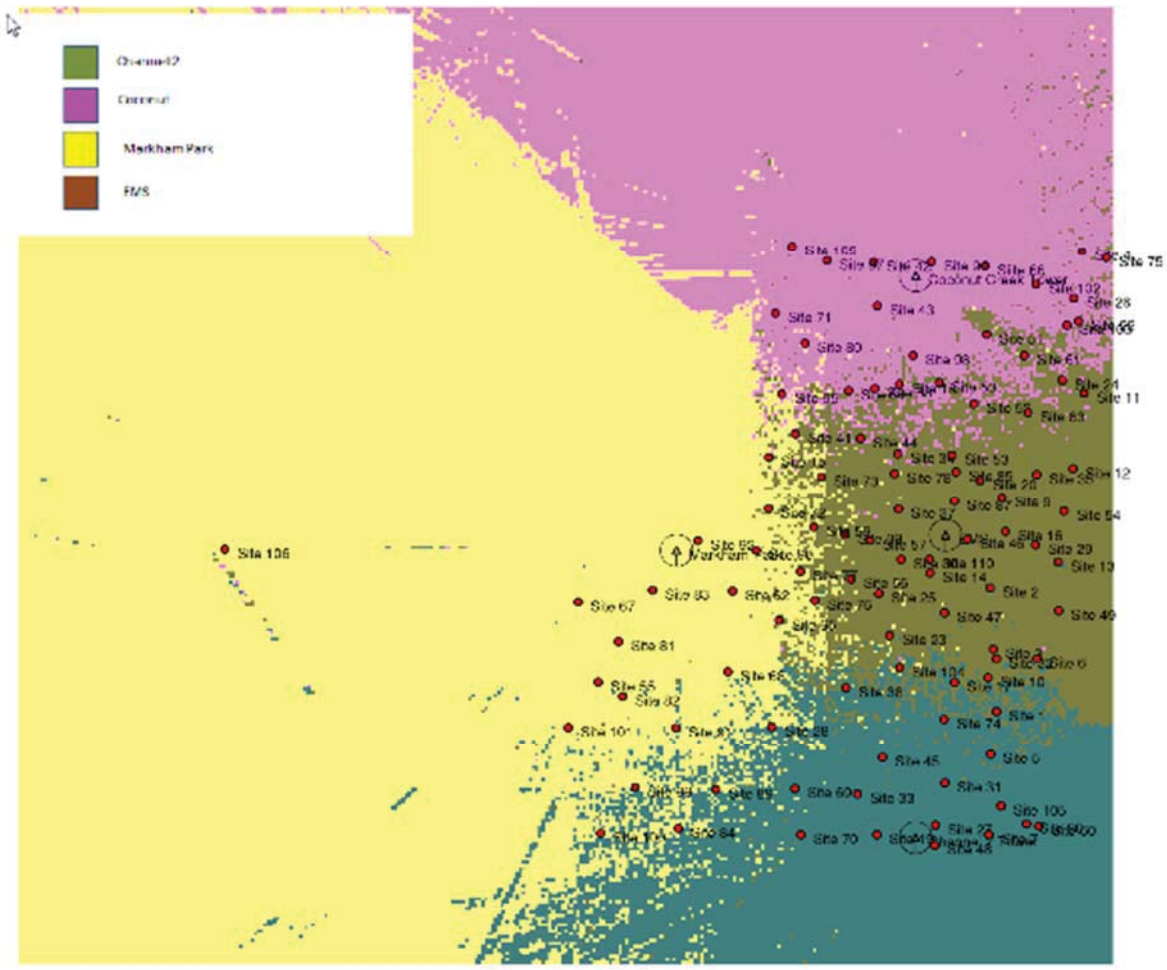


Figure 1 - Most Likely Base station by color – Remote in that color will most likely be reached by Base Station identified

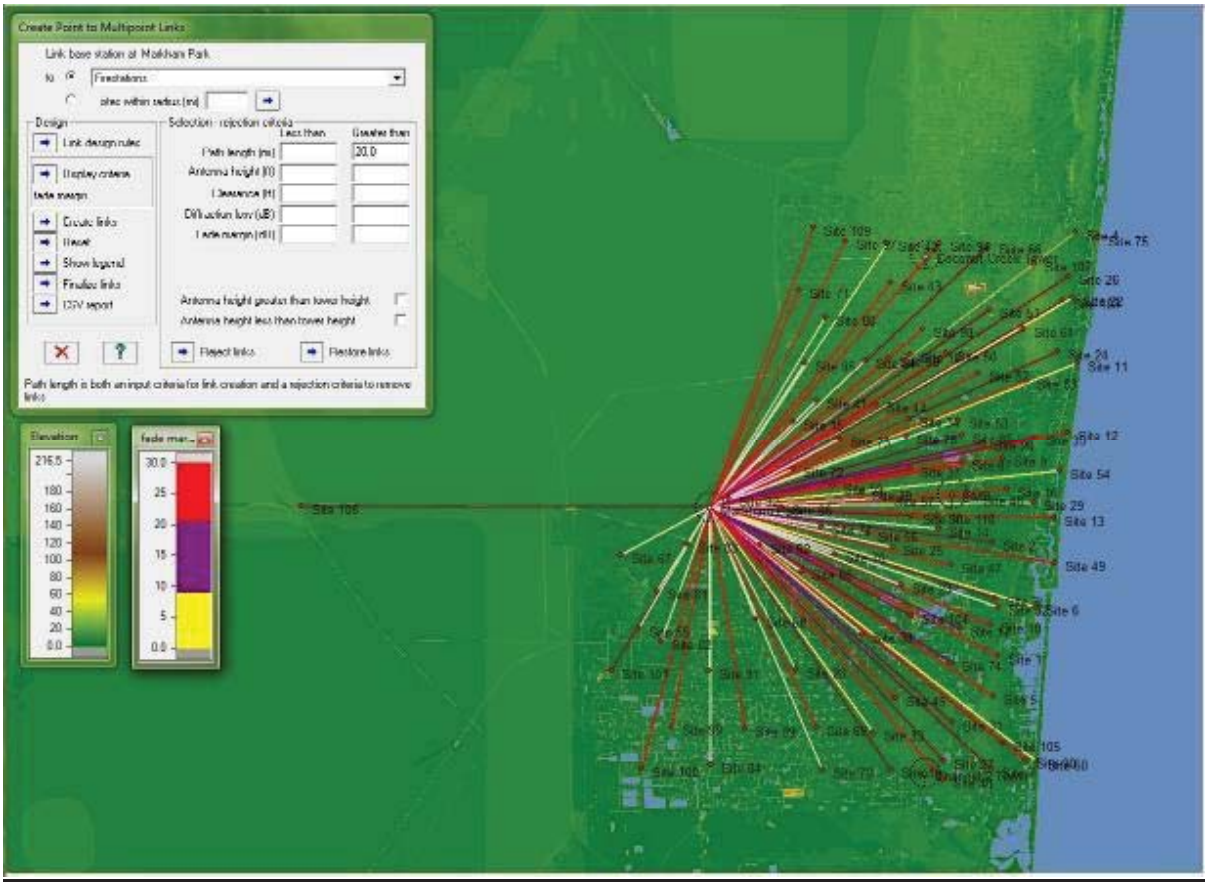


Figure 2 - Markham Park Base Station

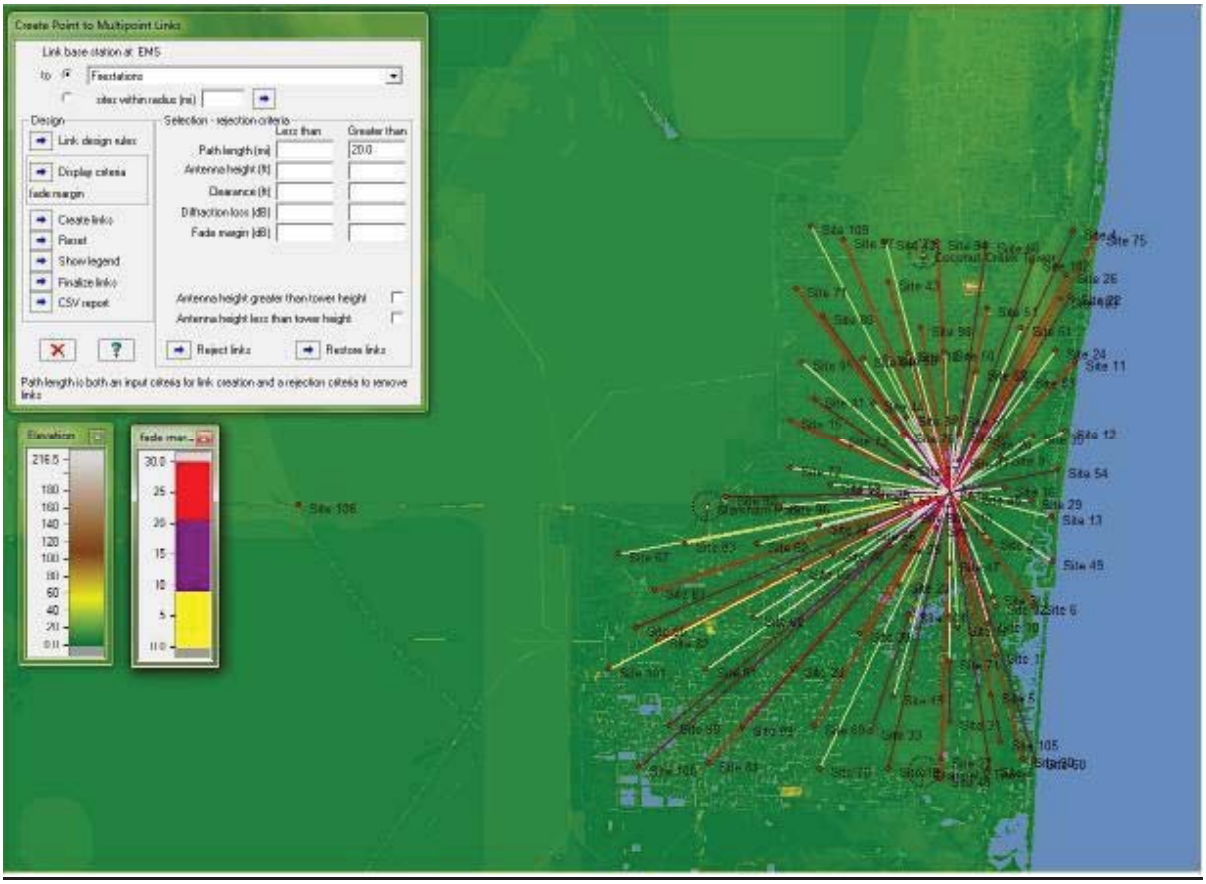


Figure 3 - EMS Base Station

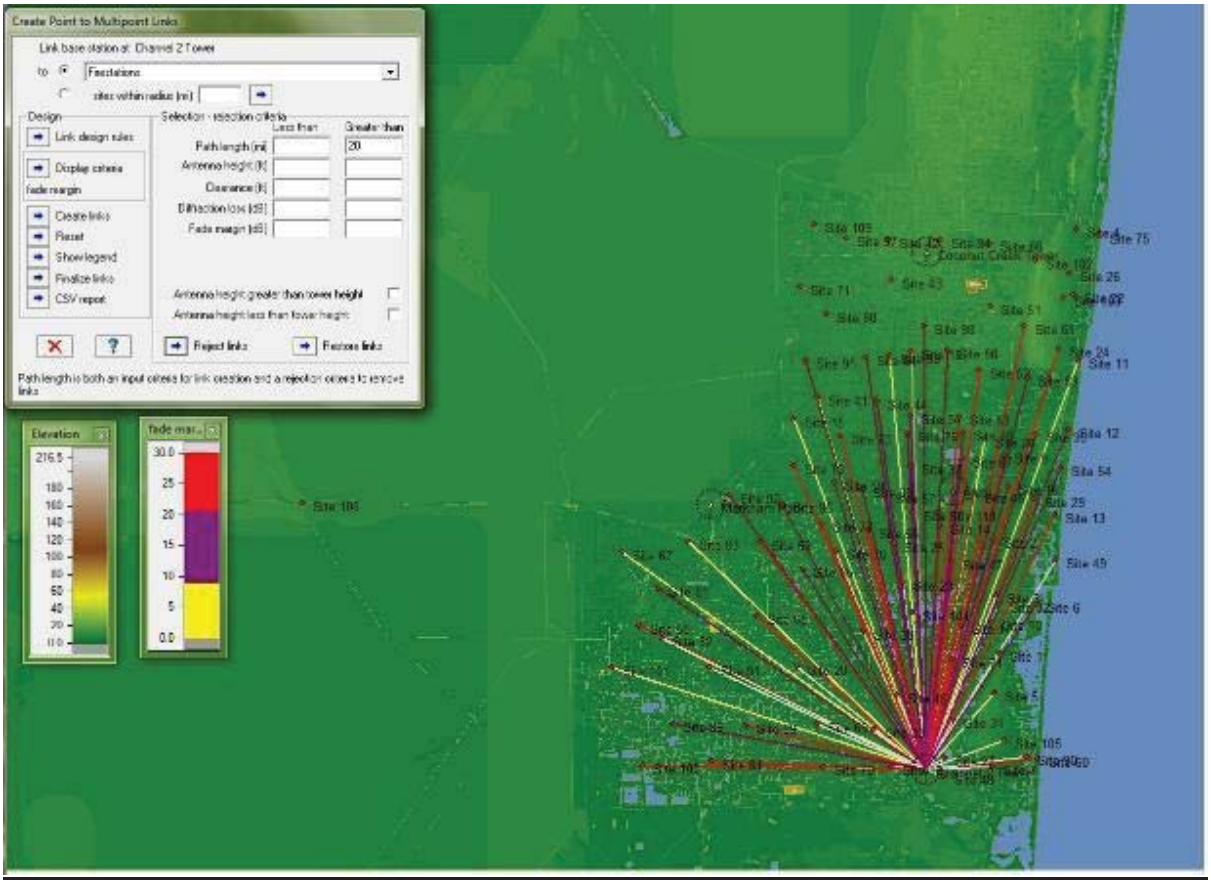


Figure 4 - Channel 2 Base Station

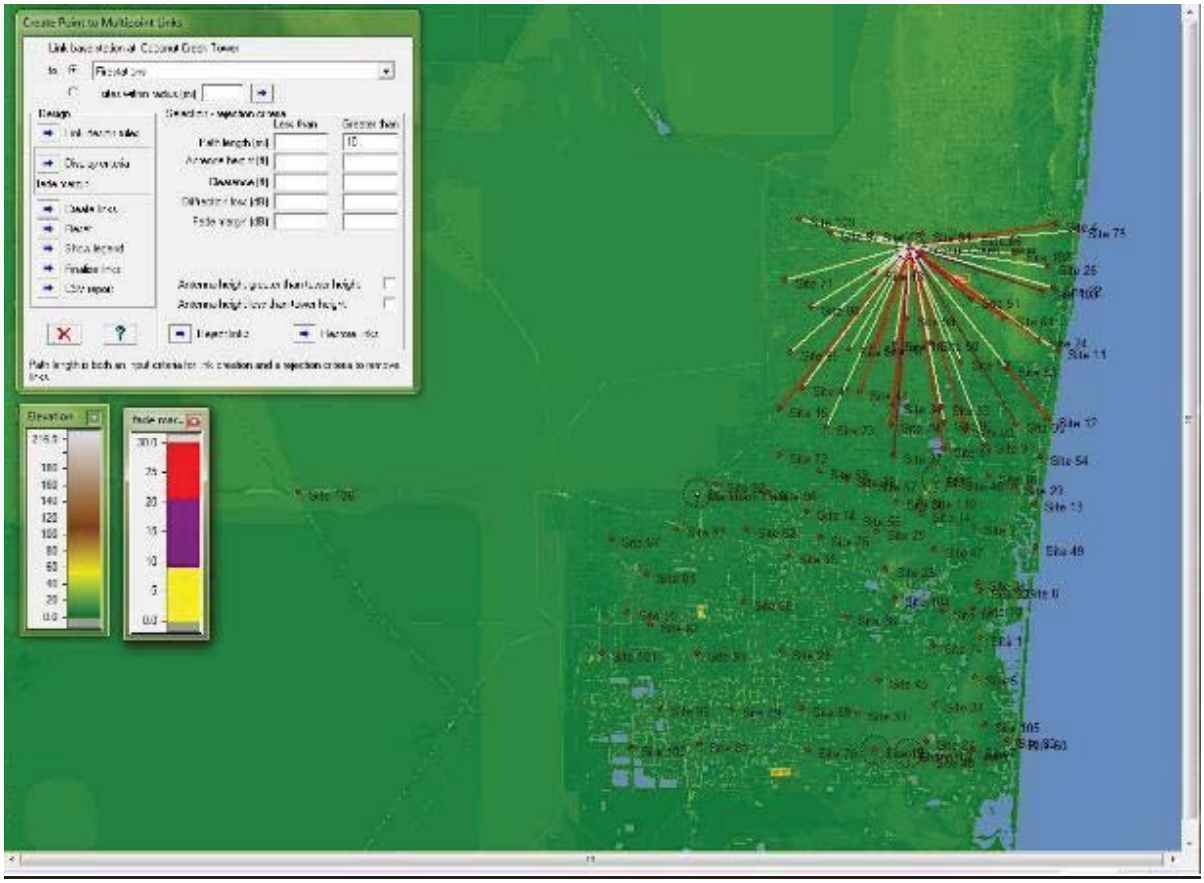


Figure 5 - Coconut Creek Tower

Exhibit A-5 – Microwave Acceptance Test Plan

Cambium PMP4XX Series

Field Acceptance Test Plan

Baseline Tests Document

Issue 4 March 2013

Table of Contents

Overview

This customer Demonstration Test Plan (DTP) document provides suggested test procedures to customer product evaluation teams which reveal key and/or differentiated features of Cambium Network's Point-to-Multipoint (PMP) 4XX series products. We outline systematic, consistent, and industry accepted performance measures for conducting a series of tests in both **lab bench** and **outdoor pilot network** test environments. The obvious intent is to demonstrate the exceptional performance of how Cambium's PMP 4XX series products operate with LOS, nLOS, and NLOS radio paths in both pristine and high noise spectrum environments, thus facilitating end customer confidence and rapid acceptance of a future deployed solution. None of the tests or work flows defined within this document are being stated as "required" or "most important" criteria as part of a customer's own multi-vendor product evaluation matrix, but are simply key performance tests suggested by Cambium given our long history and knowledge of competitive product claims and shortcomings in the unlicensed PMP space.

There are generally three categories of tests being defined in this document.

1. **Proposed Indoor Lab Bench Tests**

   A series of tests designed to demonstrate fundamental radio performance criteria as well as key operational features which can be appropriately conducted in a controlled RF cabled configuration. These types of tests would typically be conducted on a lab bench test setup.

2. **Proposed Outdoor Pilot Network Tests**

   A series of tests designed to demonstrate complex radio performance criteria best observed as part of a full outdoor pilot deployment with fully radiating antennas at both the AP and RM devices. These tests would highlight radio performance as part of a collocated network (cluster) configuration, as well as in real-world challenging RF path and spectrum conditions.

3. **Network Management Work Flows**

   A series of work flows designed to demonstrate fundamental radio management criteria as well as holistic network management features which can be appropriately conducted in either a RF cabled configuration or an outdoor pilot environment. These NM procedures can typically be conducted at any time during the execution of the above lab or outdoor network testing without much variation in demonstrated capabilities.

General Assumptions and Preparation

It is assumed that the person(s) executing this DTP is familiar with basic RF and Ethernet performance terminology, and has a strong understanding of using TDD PMP radios as a whole. They should have a good working knowledge of the RFC 2544 suite of Ethernet test performance standards, and hands-on working experience with their respective protocol test sets. This document is NOT intended to provide detailed step-by-step procedures specifically for test equipment setup or usage to the user.

Cambium Network's PMP products all have extensive built-in test facilities which provide the most convenient method for quickly testing and verifying correct operation of a link. It is recommended to utilize these as much as possible.

The following needs to be completed before the DTP test cases can be executed:

1. A documented IP plan for all radios, switches, test equipment, and network management PCs that will be involved in the testing
2. A documented RF channel plan for all radios involved in the testing
3. Verification that all PMP radios are operating with latest released version of firmware
4. All RF cabling, attenuators, splitters, and power meters (optional) necessary for desired lab bench tests

The following figure shows a generic PMP test setup. It is assumed that IP address of the test computers be configured reasonably to allow access to the radios. Note if a test case requires a different setup, it will be present in the test case detail.

Demonstration Test Execution Overview and Conduct

These tests reflect the extent of the testing to be provided to our customer. Each demonstration test is conducted to ensure that the equipment meets the requirements as stated within the statement of work. Any changes to these plans may result in a change to the scope of statement of work and the Cambium Networks Project Manager may issue a change order for the additional testing requirements and time required.

Glossary:

Acronym	Meaning
CIR	Committed Information Rate
QoS	Quality of Service
PMP	Point-to-Multipoint
DTP	Demonstration Test Plan
VLAN	Virtual Local Area Network
PC	Personal Computer
BERT	Bit Error Rate Test
MIR	Maximum Information Rate

Acronym	Meaning
TCP	Transport Control Protocol
IP	Internet Protocol
UDP	User Datagram Protocol
AP	Access Point
RM	Remote Module
LOS	Line of Site
nLOS	Near Line of Site
NLOS	Non Line of Site

Test Cases and Work Flows Defined

This section will provide a matrix of high level test cases and dive into detail of each test case in the sub-sections.

Test Matrix

Proposed Indoor Lab Bench Tests		
Test Case ID	**Test Case Title**	**Pass/Fail**
Lab_001	Symmetric and Asymmetric TDD Operation	
Lab_002	PMP Ethernet Traffic Performance RFC 2544 @ 10 MHz Channel Operation	
Lab_003	PMP Ethernet Traffic Performance RFC 2544 @ 20 MHz Channel Operation	
Lab_004	AP & RM RX Sensitivity / ACM Performance @ 10 MHz Channel Operation	
Lab_005	AP & RM RX Sensitivity / ACM Performance @ 20 MHz Channel Operation	
Lab_006	High Priority Channel Operation	
Lab_007	RADIUS Authentication Operation	
Lab_008	End to End Application Test	
Lab_009	Max Ethernet Frame Size Test	
Proposed Outdoor Pilot Network Tests		
Test Case ID	**Test Case Title**	
Outdoor_001	AP Cluster Synchronization Performance Effects	
Outdoor_002	Radio Link Performance in LOS, nLOS, NLOS Path Conditions	
Outdoor_003	Link Budget Performance Enhancements with use of CLIP and Reflector Accessories	
Network Management Work Flows		
Test Case ID	**Test Case Title**	
NetMan_001	FCAPS Operational Overview of Cambium's Wireless Manager Application	
NetMan_002	System Level and Node Level Dashboards	
NetMan_003	Wireless Network and Link Performance Visualization via Goggle Maps	

Lab_001: Symmetric and Asymmetric TDD Operation

Test Purpose:

This test verifies that a user can specify the percentage of the aggregate throughput for the downlink (frames transmitted from the AP to the subscriber). For example, if the aggregate (uplink and downlink total) throughput on the AP is 90 Mb, then 75% specified for this parameter allocates 67.5 Mb for the downlink and 22.5 Mb for the uplink. The default for this parameter is 75%. This parameter must be set in the range of 15% - 85%.

Required Equipment and Preparation for Test Execution:

- Test Computer for PMP management/configuration purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters.
- IP Throughput tester (Internal Radio Link Test tool, iperf, JDSU Ethernet test set, etc.)
- Test Setup using the following diagram

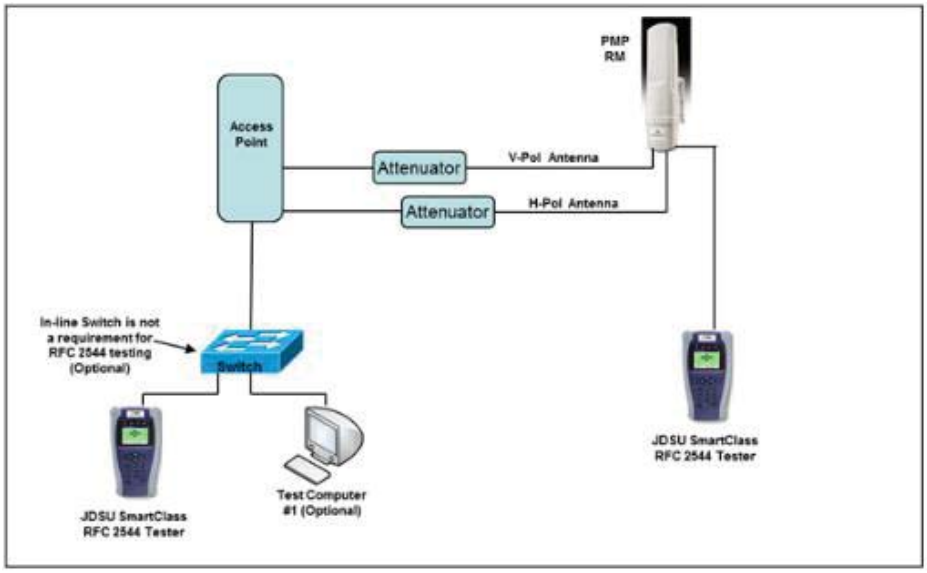


Figure 1

Radio tab of the AP

Figure 31 Radio tab of the AP

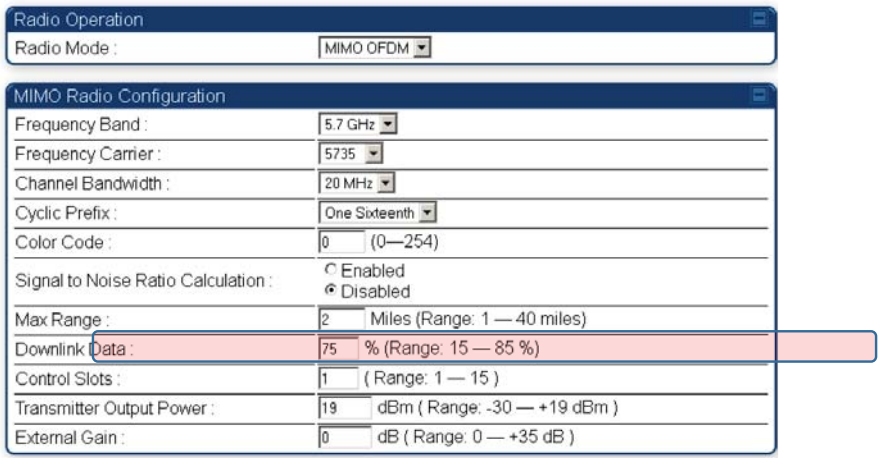


Figure 2

Test Procedure:	**Expected Result:**
1. Connect to the AP's management web interface and configure the desired Downlink Data percentage. 2. Configure the JDSU test set for Ethernet frame size to be 1518 bytes. 3. Use the JDSU test set to measure downlink throughput 4. Use the JDSU test set to measure the uplink throughput	1. Radio Link Uplink / Downlink throughput should follow defined parameter settings.

Lab_002: PMP Ethernet Traffic Performance RFC 2544 @ 10 MHz Channel Operation

Test Purpose:

This series of tests (RFC 2544) measures and proves performance criteria of the Ethernet network provided by the PMP link at 10 MHz Channel Size. The test standard provides an out-of-service benchmarking methodology to evaluate the performance of network devices (PMP) using **throughput**, **back-to-back (bursting)**, **frame loss** and **latency** tests, with each test validating a specific part of a customer Service Level Agreement (SLA). The methodology defines the frame size, test duration and number of test iterations. Once completed, these tests will provide performance metrics of the Ethernet network under test.

In order to ensure that an Ethernet network is capable of supporting a variety of services (such as VoIP, video, etc.), the RFC 2544 test suite supports seven pre-defined frame sizes (64, 128, 256, 512, 1024, 1280 and 1518 bytes) to simulate various traffic conditions. Small frame sizes increase the number of frames transmitted, thereby stressing the network device as it must switch a large number of frames.

Required Equipment and Preparation for Test Execution:

- Test Computer for PMP monitoring and management purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters. Channel size configured to 10MHz.
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)

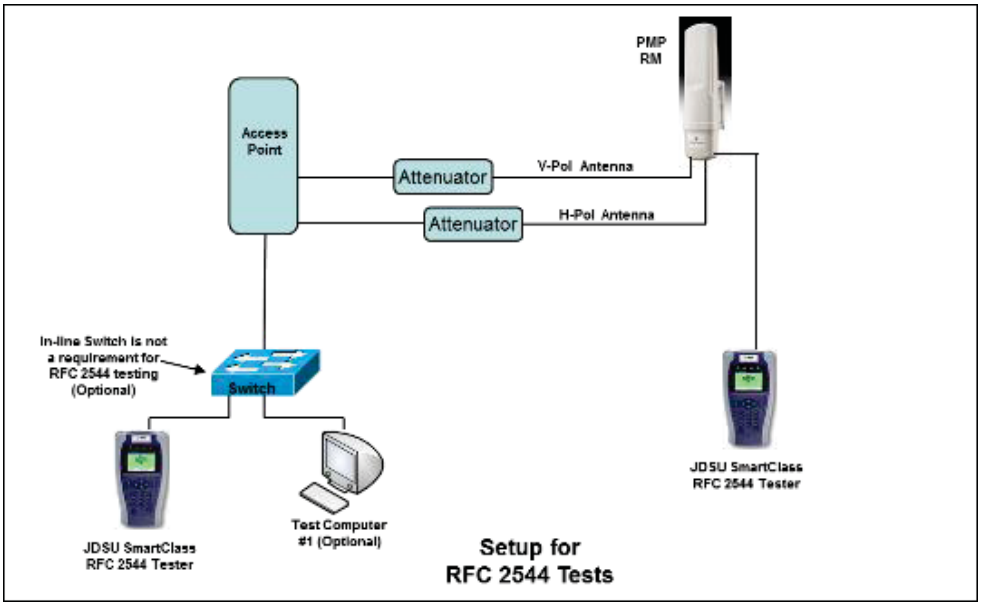


Figure 3

Test Procedure:	**Expected Result:**
1. Connect the PMP link's Ethernet port and JDSU test equipment so that it closely represents the setup shown in the "Setup for RFC 2544 tests" figure above. 2. Configure the PMP Link to Auto-Negotiate 1000Mbps Ethernet Link speed, and the RFC 2544 test-set to Auto-Negotiate Ethernet Link. Ensure the test set status page shows that the negotiated Ethernet wire speed is 1000Mbps. 3. By default, the test-set will begin generating Ethernet traffic for the full suite of RFC 2544 tests at its current Ethernet wire speed (1Gbps). Therefore you need to ensure you've configured the test-set to limit the Ethernet traffic it generates in order to match the known PMP RF Link capacity. If this is not done, it is likely that most test results will fail over the PMP link. 4. Execute the RFC 2544 test suite 5. Transfer the test results to a PC using the JDSU SmartClass tester Excel macro tool and USB cable. Create a formatted report document summarizing the test results.	1. Link throughput should match with the expected 10 MHz throughput documented in related product specs.

Lab_003: PMP Ethernet Traffic Performance RFC 2544 @ 20 MHz Channel

Test Purpose:

This series of tests (RFC 2544) measures and proves performance criteria of the Ethernet network provided by the PMP link at 20MHz channel size.

Test Setup and Procedure:

Please follow test case Lab_002 for test setup and test procedure. Configure the PMP AP to use 20MHz channel size instead of 10MHz for testing.

Expected Result:

Link throughput should match with the expected 20 MHz throughput documented in related product specs.

Lab_004: AP & RM RX Sensitivity / ACM Performance @ 10 MHz Channel

Test Purpose:

This test measures and proves that at 10MHz Channel size, the PMP radios will adjust its modulation mode based on RX sensitivity. It also proves that the PMP modulation mode and throughput vs. Rx Signal strength matches with documented RF performance specs.

.

Required Equipment and Preparation for Test Execution:

- Test Computer for PMP monitoring and management purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters. Channel size configured to 10MHz.
- Two 10 dB step attenuators, two 1 dB step attenuators
- RF cable and attenuator be calibrated for any dB offset.
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)
- One switch

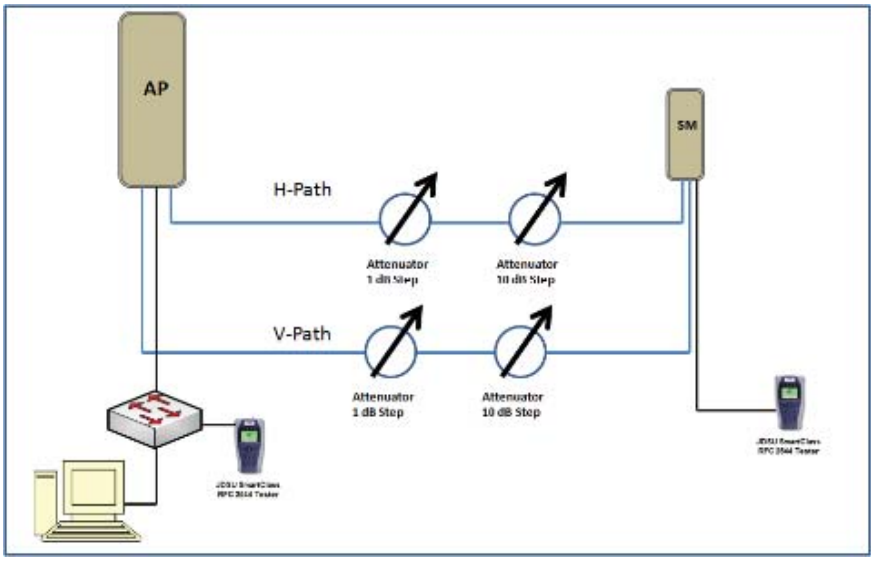

AP
SM
H-Path
Attenuator
1 dB Step
Attenuator
10 dB Step
V-Path
Attenuator
1 dB Step
Attenuator
10 dB Step

Figure 4

Test Procedure:	**Expected Result:**
1. Configure PMP AP/SM Tx power to desired low Tx power (e.g. 3dBm) 2. Tune the attenuator so that initial Rx power of AP and SM be at -45dBm 3. Run RFC2544 for uplink downlink throughput test, using 1518 as the Ethernet frame size. 4. Logon to the AP and SM to record the modulation mode, also record the throughput test result 5. Increase the attenuation of both horizontal and vertical path by step size of 1 dB at a time, each time, record the modulation mode, RSSI reading from both SM and AP. Perform RFC2544 throughput testing and record the test result 6. Repeat step 5, record the result until the SM becomes un-reachable (link connection is lost). Note, the attenuation step size can be adjusted depending on expectation from the customer and the time allowed for the demo. Increasing the step size will reduce the test time.	1. PMP should automatically adjust modulation mode when path loss is increased 2. Throughput and RSSI reading should match with expected performance spec.

Lab_005: AP & RM RX Sensitivity / ACM Performance @ 20 MHz Channel

Test Purpose:

This test measures and proves that at 20MHz Channel size, the PMP radios will adjust its modulation mode based on RX sensitivity. It also proves that the PMP modulation mode and throughput vs. Rx Signal strength matches with documented RF performance specs.

Test Setup and Procedure:

This test is identical to Lab_004 except that channel size if configured to 20MHz.

Expected Result:

This test is identical to Lab_004 except that channel size if configured to 20MHz.

Lab_006: High Priority Channel Operation

Test Purpose:

This test demonstrates that in a PMP network, traffic provisioned with high priority will be immediately served ahead of other lower priority traffic

Required Equipment and Preparation for Test Execution:

- One test computer at the AP side for PMP monitoring and management purpose
- Two Switches (no VLAN configured so we use layer 3 for priority demo)
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters. Link operated at highest modulation mode
- Two pairs (4 units) of JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)
- Optional PC at the AP side and an optional PC at the RM side
- Network setup as following:

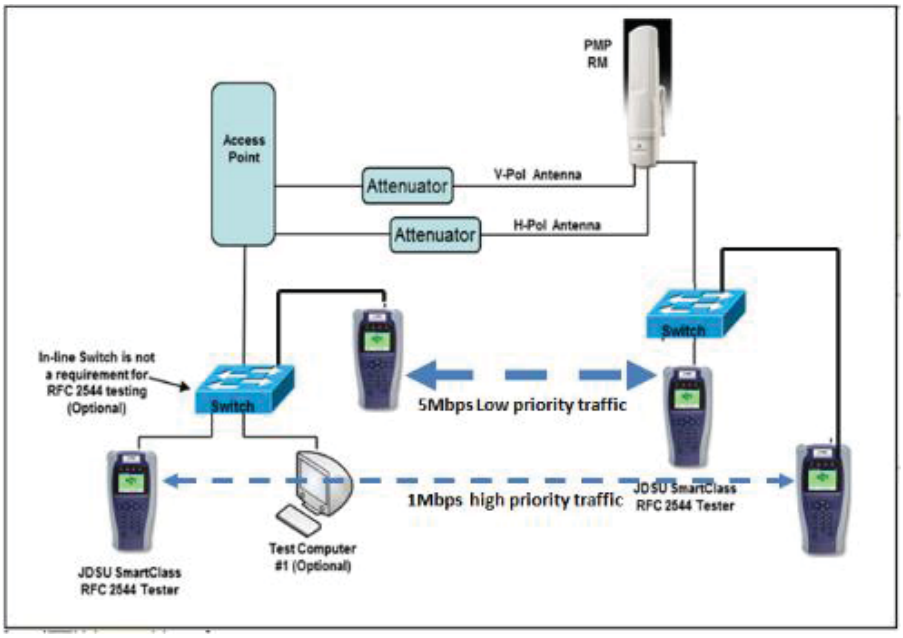


Figure 5

Test Procedure:	**Expected Result:**
1. Enable high-priority channel on the PMP link (refer to user guide on how to do it). 2. Configure the RM to have both uplink/downlink MIR to 5Mbps, Uplink/Downlink Burst allocation also be 5Mbps. 3. Start a stream of UDP in between one pair of the test sets, with DSCP field set to 0x00, configure the traffic load to be 5Mbps full duplex. 4. Simultaneously, start another stream of UDP in between the other pair of the test sets, with DSCP field set to 0x47. Configure the traffic load to be 1Mbps full duplex. 5. Monitor traffic loss ratio from the test sets	1. No traffic loss with the high priority traffic. 2. There is traffic loss with the low priority traffic.

Lab_007: RADIUS Authentication Operation

Test Purpose:
This test demonstrates that PMP network can rely on RADIUS to perform PMP RM authentication.

Required Equipment and Preparation for Test Execution:

- One test computer at the AP side for PMP monitoring and management purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters.
- One test computer at the RM side
- One switch
- Optional internet access to demonstrate network service availability to the RM client device
- RADIUS AAA server
- Network setup using the following diagram:

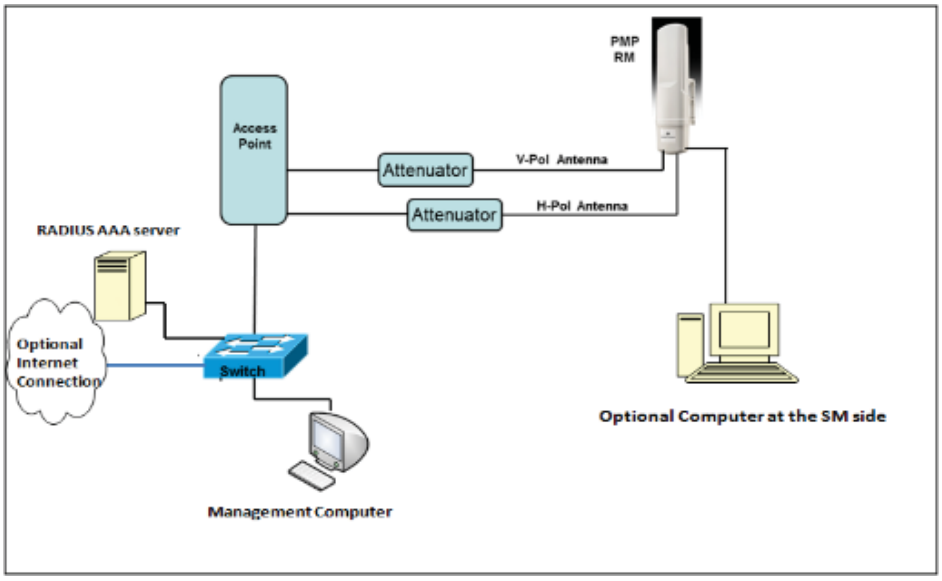


Figure 6

Test Procedure:	**Expected Result:**
1. Provision a user ID/password pair in the RADIUS AAA server 2. From the Security tab of AP web page, configure the PMP AP to user RADIUS authentication (refer to user guide if needed), point the AP to use the RADIUS server (IP address) as authentication server, configure the correct Shared Secret. 3. From the Security tab of the RM web page, configure the RM with "Enforce Authentication" and proper authentication credentials (refer to user guide for detail) 4. Register the RM, test to show that the RM site computer can access PMP service by performing internet surfing (if internet is available), or by pinging the AP side computer. 5. Set an invalid password to the RM, test to show that the RM site computer can no longer access PMP service by performing internet surfing (if internet is available), or by pinging the AP side computer. Note: If desired, other RADIUS related parameters (e.g. CIR) as defined in the user guide can be configured on the RADIUS server and demonstrated as part of this procedure.	1. When correct authentication credential is configured on the RM, the RM side PC can ping the AP side PC, or surf the internet 2. When incorrect password is configured on the RM, the RM side PC can no longer ping the AP side PC, or surf the internet.

Lab_008: End to End Application Test

Test Purpose:
This test is to demonstrate the networking/service perspective of the PMP product. This test shows how to hookup a simple end to end PMP network and allow the end users to surf the internet.

Required Equipment and Preparation for Test Execution:

- One test computer at the AP side for PMP monitoring and management purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters.
- One test computer at the RM side
- One test computer at the AP side
- One switch
- Internet connection available at the switch
- One DHCP/DNS server, configured to assign proper IP address
- Network setup as following

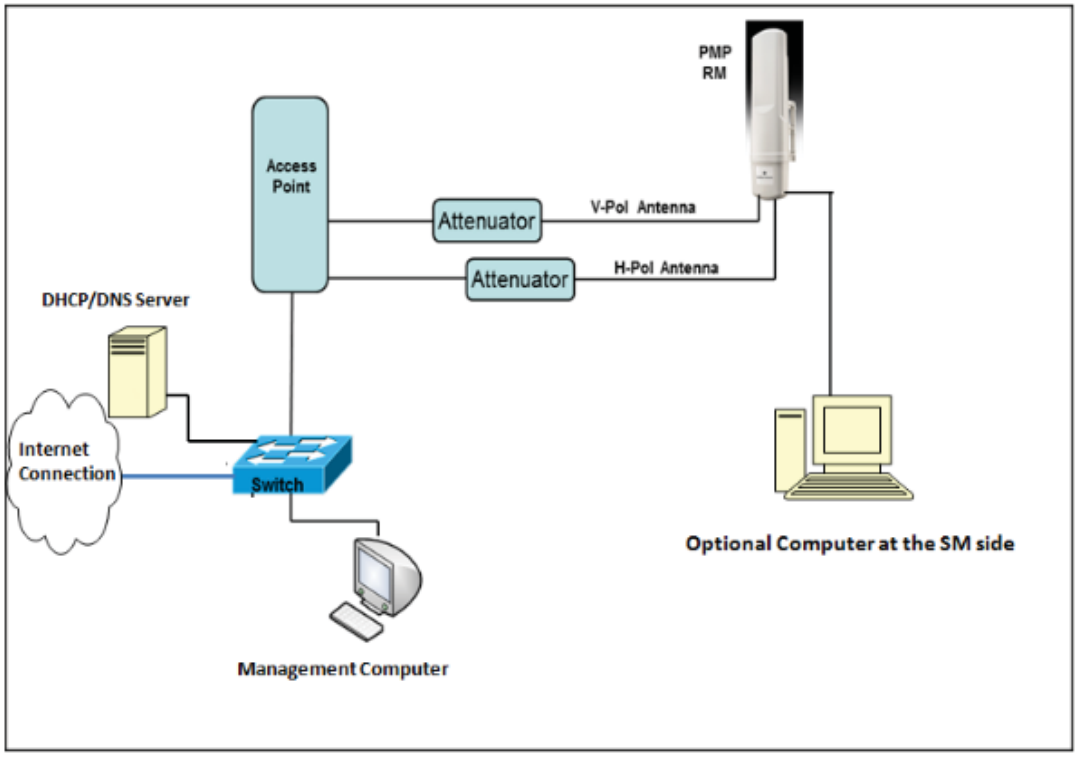


Figure 7

Test Procedure:	**Expected Result:**
1. Configure the RM side PC to use DHCP for IP address assignment 2. Make sure that the PMP RM is successfully registered with the AP 3. Verify that the PC successfully perform DHCP and proper IP address is assigned automatically 4. Surf the internet from the RM side PC	1. The RM side PC should be able to surf the internet and view any webpage.

Lab_009: Max Ethernet Frame Size Test

Test Purpose:
This test is to demonstrate that the PMP product can transport Ethernet frame of up to 1532 bytes frame size.

Required Equipment and Preparation for Test Execution:

- One test computer at the AP side for PMP monitoring and management purpose
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters.
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)
- Test Setup using the following diagram

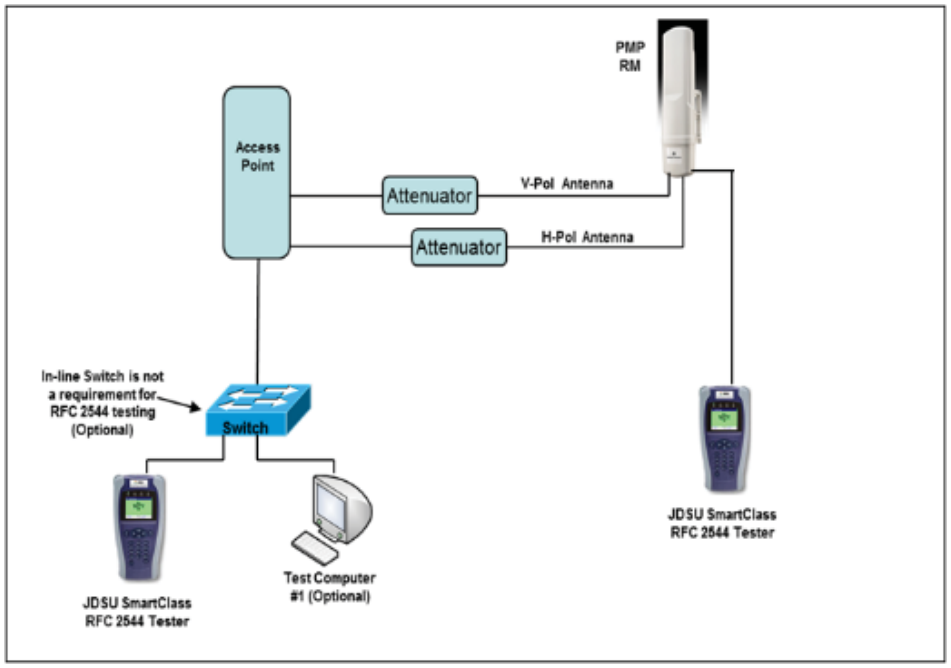


Figure 8

Test Procedure:	**Expected Result:**
1. Configure the PMP AP/RM both uplink/down link capacity to be greater than 1Mbps 2. Configure the JDSU test-sets with Ethernet Frame size to be 1532 Bytes 3. Make sure that the PMP RM is successfully registered with the AP 4. Run the JDSU test set to generate 1Mbps of Ethernet traffic uplink and 1Mbps of Ethernet traffic downlink 5. Observe the test result	1. No frame lost during JDSU layer 2 traffic load testing

Outdoor_001: AP Cluster Synchronization Performance Effects

Test Purpose:

This test demonstrates the PMP AP Cluster Sync feature where multiple APs can be installed in a cluster and rely on GPS sync to avoid interference among each other and maximize network throughput.

Network Setup:

Network logical layout is shown in the following diagram:

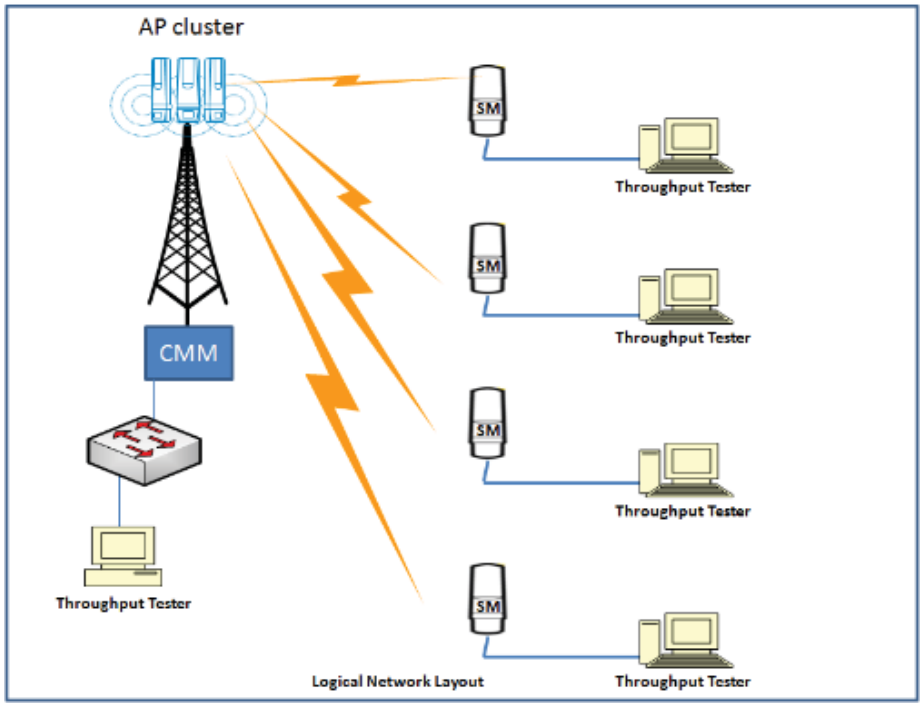


Figure 9

- A cluster of at least 2 APs (we are using 4 APs as example here) will be installed, with equal number of SMs each connected to a unique AP.
- A throughput tester (could be PC running Iperf or JDSU throughput test set, depending availability of the equipment, JDSU is preferred) connect to each SM.
- Optional switch.
- Throughput tester at the AP cluster site. If on tester is used, the tester needs to be able to generate multiple unique IP streams of traffic at the same time. Otherwise multiple testers are needed at the AP cluster site to generate multiple IP streams.

- Spatial layout of the APs and SM, as well as RF channels assignment for the AP should follow the spec of PMP planner/installation guide. Using the following layout as example:

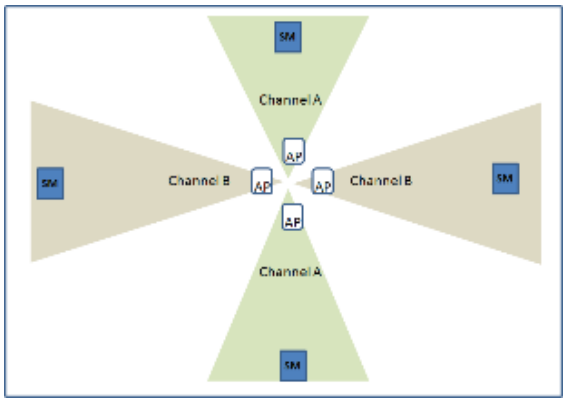


Figure 10

Required Equipment and Preparation for Test Execution:

- At least 2AP/SM pairs (we are using 4AP/SM pairs here)
- One CMM
- Multiple IP throughput test sets (JDSU or just PC, depending on equipment availability)
- One optional switch, depending on the number of test sets to be installed at the AP site.
- Network installed and configured with desired IP scheme
- Each SM is registered with a unique AP. The SMs show approximately the same RSSI value.
- All the APs configured to half the same up/down throughput percentage of 15/85 (or an desired number)

Test Procedure:	**Expected Result:**
1. Run multiple UDP down streams (Iperf, etc.) at the same time from the cluster test set, each IP stream target a throughput test set connected with a unique SM. Record the MAX throughput of each stream. 2. Run UDP up streams at the same time from each SM test-set, record the MAX throughput of each stream. 3. Run one single downstream from an AP/SM pair 4. Run one single upstream from an AP/SM pair 5. Disable GPS sync on all the AP and re-run step 1-3. Note: An alternate way to perform this test is to use the built-in link test tool to generate traffic both before and after GPS-sync is disabled, and observes the throughput/link efficiency differences.	1. Upstream and downstream aggregate throughput should matches with expected throughput as defined by product spec. 2. Throughput on each AP/SM pair should be approximately identical. 3. Single stream throughput should be approximately identical to a link pair's throughput when multiple streams are run at the same time. 4. At Step #5, the throughput would be significantly lower than when GPS sync is enabled.

Outdoor_002: Radio Link Performance in LOS, nLOS, NLOS Path Conditions

Test Purpose:

This test is to prove the radio link performance under different RF path conditions including LOS, nLOS, NLOS. IP throughput is measured to demonstrate the performance. The customer can use this result to compare with competitors product. And this will show that our PMP product is comparable or better than any competitor's products.

Required Equipment and Preparation for Test Execution:

- One AP installed on fixed location
- One SM installed on a tripod with power supply for portable deployment.
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)
- AP installed outdoor
- AP configured with desired up/down link percentage (e.g. 25/75), and selected channel size (e.g. 20 MHz)
- Identify three different locations for SM deployment. The three locations will have different AP/SM RF path profile, namely LOS, nLOS, NLOS.

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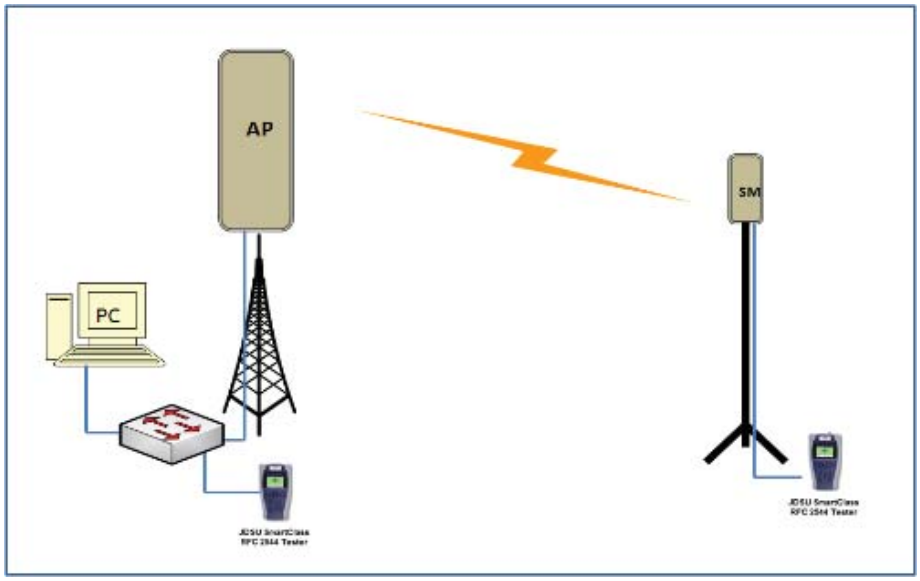

Figure 11

Test Procedure:	**Expected Result:**
1. Install the SM at the pre-selected location where clear LOS path profile is achieved 2. Perform UDP throughput uplink/downlink testing with 1518 Ethernet frame size, record the throughput. 3. Install the SM at the pre-selected location where near line-of-sight (nLOS) path profile is achieved. 4. Perform UDP throughput uplink/downlink testing with 1518 Ethernet frame size, record the throughput. 5. Install the SM at the pre-selected location where none line-of-sight path (NLOS) profile is achieved. 6. Perform UDP throughput uplink/downlink testing with 1518 Ethernet frame size, record the throughput.	1. Link throughput should match with the expected throughput documented in related product specs.

Outdoor_003: Link Budget Performance Enhancements with use of CLIP and Reflector Accessories

Test Purpose:

This test proves that use of CLIP and Reflector with the SM would greatly enhance the link budget of an SM. CLIP will provide approximately 8dB gain and Reflector will provide approximately 15dB addition gain.

Required Equipment and Preparation for Test Execution:

- Operational PMP AP and SM installed at locations, where clear LOS in between the AP and SM is achieved.
- CLIP and accessories
- Reflector and Accessories
- One PC
- One Switch

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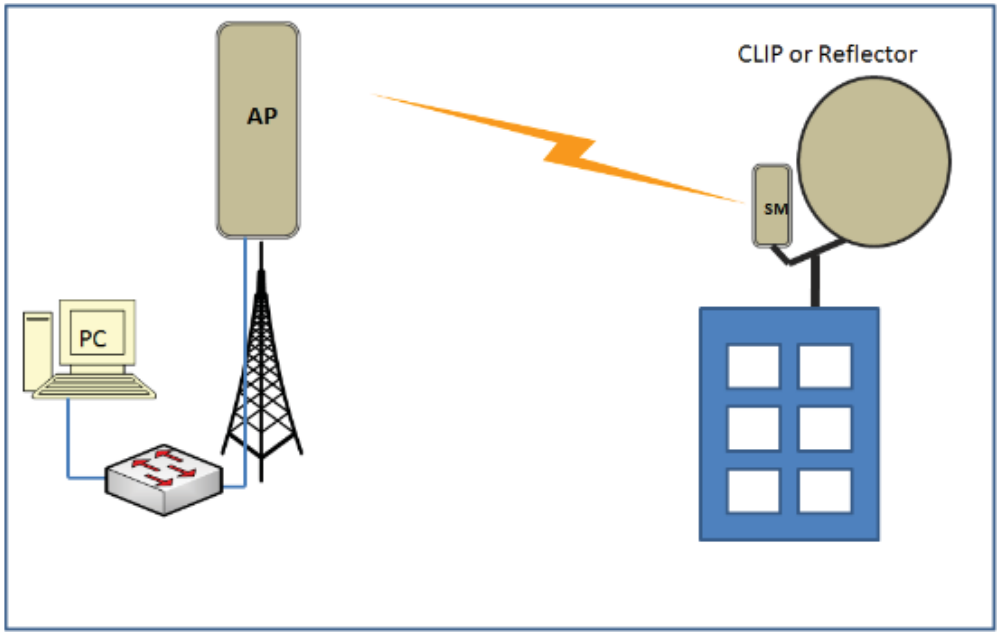

Figure 12

Test Procedure:	**Expected Result:**
1. SM installed initially without CLIP or Reflector 2. Logon to the AP and SM to read the RSSI of both the AP and the SM. 3. Install the CLIP on the SM 4. Logon to the AP and SM to read the RSSI of both the AP and the SM. 5. Uninstall the CLIP, install the Reflector 6. Logon to the AP and SM to read the RSSI of both the AP and the SM.	1. Using the signal strength reading from the SM when no CLIP or Reflector is used as a base line, with CLIP installed, the signal strength reading should be increased by approximately 8dB. With Reflector installed, the signal strength reading should be increased by approximately 15dB.

NetMan_001: FCAPS Operational Overview of Cambium's Wireless Manager Application

Test Purpose:

This test is used to demonstrate that the PMP product can be managed by a centralized wireless network manager. This test can be performed either indoor or outdoor depending on which condition is available.

Required Equipment and Preparation for Test Execution:

- Test Computer installed with wireless manager
- Operational PMP AP directly RF cabled to one or more RMs with appropriate RF attenuators and/or splitters. Channel size configured to 10MHz.

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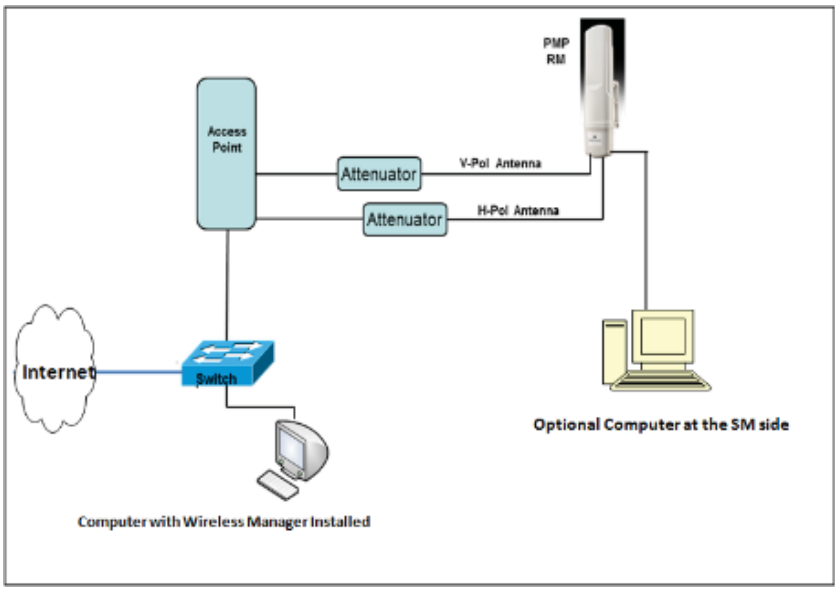


Figure 13

NetMan_002: System Level and Node Level Dashboards

Test Purpose:

This test demonstrates that the KPIs (key performance Indicators) of the PMP network can be viewed from wireless manager dashboard.

Required Equipment and Preparation for Test Execution:

- Test setup is the same as NetMan_001

Test Procedure:	**Expected Result:**
1. Logon to Wireless Manager, after the AP and SM are successfully discovered, click on the Dash Board to show all the KPIs of the PMP networks	1. KPIs shown correctly from the WM Dashboard

NetMan_003: Wireless Network and Link Performance Visualization via Goggle Maps

Test Purpose:

This test demonstrates that using the Wireless Manager, the operator can view the link performance via Google Map.

Required Equipment and Preparation for Test Execution:

- Test setup is the same as NetMan_001
- Make sure that the WM can access the internet so that Google Map is available to the application

Test Procedure:	**Expected Result:**
1. After the AP and SM are successfully discovered, follow WM user guide to provision the AP and SM on the Google Map 2. Demonstrate that Link Performance can be view from the Google Map GUI on the WM.	1. See test procedure.

Cambium PTP800 Field Acceptance Test Plan (ATP)

Baseline Tests Document

Issue 2 December 2012

Table of Contents

Overview

This Acceptance Test Plan (ATP) document provides the means for field implementers of Cambium Network's PTP links and/or networks to perform systematic, consistent, and industry accepted performance measures on newly deployed PTP systems, thereby facilitating end customer confidence and acceptance of the deployed solution.

There are generally two categories of test procedures detailed in this document. The first being **"box"** level testing, where basic aspects such as following are exercised and/or measured against pre-sale design requirements (as applicable).

- Verification of 'PTP Installation Checklist' Completed (Configuration Backups)
- Node / Link Accessibility
- Node Manageability (Add Out-Of-Band)
- Node Security (Basic User Accounts)
- Link Ethernet Performance (RFC 2544)
- Node 1+1 Hot Standby Node Redundant Power Supply Failure test

The second category being "**system**" level testing, where more complex aspects such as following are exercised and/or measured against pre-sale design requirements (as applicable).

- Network Loop/Ring convergence
- End-to-End Ethernet Performance (RFC 2544)
- Link 2+0 Link Aggregation Validation
- 3rd Party T1/E1 Pseudowire Performance
- Network TDD Sync functionality
- Network Management Integration Validation (Fault and Performance)
- Node Advanced Security (i.e. Radius, Syslog, Https, etc.)
- End-to-End QoS Performance
- Network Time Sync

Based on the results of the selected testing, the overall pass/fail of each ATP test will be indicated on the bottom of its procedure page.

Naming convention of the test case identity would go by **BOX-xxx** for box level ATPs, and **SYS-xxx** for system level ATPs. The "**xxx**" is a three digit test number designation for the specific test.

The expectation is that this ATP document will cover the vast majority of relevant customer facing box level acceptance test requirements, and as such should be the starting point document where field teams can simply remove or ignore any test(s) not relevant to their particular PTP implementation.

System level test cases are typically designed particularly based on the deployment scenario. As such, it is expected that field teams will add system-level test cases if required by the customer.

General Assumptions and Preparation

This document assumes that all related PTP node / network installation tasks and checklists have been fully completed (reference applicable PTP Series Deployment or User Guide), and any noted problem resolutions executed. It is also assumed that detailed PTP LINKPlanner studies (or equivalent Hydra, Pathloss, etc.) have been completed and reconciled of any pre-sale and post-deployment design or path variances, so that they can be used as performance benchmarks for relevant ATP tests contained within.

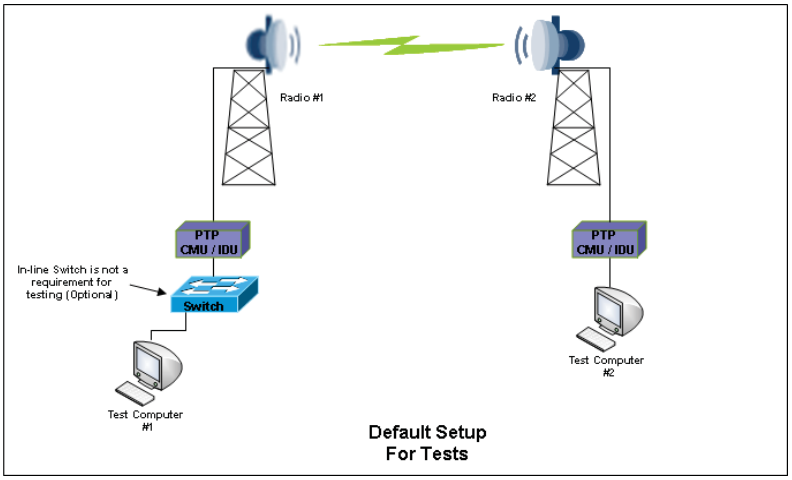
It is assumed that the person(s) executing this ATP have a strong understanding of using PTP radios as a whole, good working knowledge of the RFC 2544 suite of Ethernet test performance standards, good industry knowledge of T1/E1 facilities, and hands-on working experience with their respective protocol test sets. This document is NOT intended to provide detailed step-by-step procedures specifically for test equipment setup or usage to the user.

Cambium Network's PTP product all have extensive built-in test facilities which provide the most convenient method for quickly testing and verifying correct operation of a link. It is recommended to utilize these as much as possible.

The following needs to be completed before the test cases can be executed:

5. Completed PTP link installation per design document / LINKPlanner
6. PTP radios should be installed with the latest version of firmware: VERSION _____ (Fill the blank)
7. Reset all PTP performance counters and histograms using the built-in Web based management pages
8. Run PTP Link for several hours without max load
9. Review Byte Error Ratio to insure minimum acceptable error rate is being achieved. 10-6 is minimum and 10-9 or higher is usual target
10. Review Wireless Availability to insure minimum acceptable Link availability is being achieved. 99.99 to 99.999% is usual target
11. IP address of the radios are configured based on IP plan

The following figure shows a generic PTP test setup. It is assumed that IP address of the test computers be configured reasonably to allow access to the radios. Note if a test case requires a different setup, it will be present in the test case detail.


Radio #1
Radio #2
PTP
CMU / IDU
PTP
CMU / IDU
In-line Switch is not a requirement for testing (Optional)
Switch
Test Computer #1
Test Computer #2
Default Setup
For Tests

Acceptance Test Execution Overview and Conduct

These tests reflect the extent of the testing to be provided to our customer. This field functional test is conducted to ensure that the equipment meets the requirements as stated within the statement of work. Any changes to these plans may result in a change to the scope of statement of work and the Cambium Networks Project Manager may issue a change order for the additional testing requirements and time required.

Each test will begin on the date agreed upon by Cambium Networks and the customer's assigned technical personnel as stated within the statement of work. After the test has been completed, the test procedure documents will be submitted as part of the certification of acceptance. During test conduct, all measurements or outcomes will be recorded within the test procedure, if indicated, resulting in either a "Pass" or "Fail".

Pass - A check mark in the "Pass" field or in the appropriate box will be sufficient to indicate that a step has passed the test. When all steps in a specific test pass, a representative from Cambium Networks and customer will sign the test procedure form to indicate the system has passed that test.

Fail - If a failure occurs, a check will be placed in the fail column within the test procedure and an entry made on a punch list. The punch list will include the date and time the entry was opened, the date closed, the test number and step, a description of the failure. In the case that the correction of variances may invalidate some or all previously completed acceptance tests (depending upon the extent of the changes made), Cambium Networks and customer will agree as to which test must be repeated once the variance is fixed.

Glossary:

Acronym	Meaning
DFS	Dynamic Frequency Switching
QoS	Quality of Service
PTP	Point-to-Point
ATP	Acceptance Test Plan
VLAN	Virtual Local Area Network
PC	Personal Computer
BERT	Bit Error Rate Test

Acronym	Meaning
TCP	Transport Control Protocol
IP	Internet Protocol
UDP	User Datagram Protocol

Test Cases

This section will provide a matrix of high level test cases and dive into detail of each test case in the sub-sections.

Test Matrix

Test Case ID	Test Case Title	Pass/Fail Result
BOX_001	Radio Device Management Access	Pass:_____ Fail:_____
BOX_002	PTP Radio User Account Control	Pass:_____ Fail:_____
BOX_003	Key PTP RF Statistics Validation / Reconciliation	Pass:_____ Fail:_____
	- Link Capacity	
	- RX Signal Level	
	- TX/RX Modulation	
	- Range	
BOX_004	Self-Recovery of PTP link after Power loss / Reboot	Pass:_____ Fail:_____
BOX_005	PTP Ethernet Traffic Performance – RFC2544	Pass:_____ Fail:_____
	- Link Throughput testing (Small / Med / Large Frames)	
	- Traffic Burst (Back-to-Back) testing (Small Med / Large Frames)	
	- Frame Loss testing	
	- Latency testing	
BOX_006	1+1 Hot Standby Verification	Pass:_____ Fail:_____
BOX_007	QoS Verification	Pass:_____ Fail:_____
BOX_008	2+0 Testing	Pass:_____ Fail:_____

BOX_001: PTP Radio Device Management Access

Test Purpose:

This test verifies that all PTP radio nodes are accessible and manageable from the customer's IP network. More specifically, this test verifies that all PTP web-based management GUI pages can be successfully accessed from the Customer Enterprise Network (CEN).

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network with HTTP access enabled and "Disable FrontPage Login" not checked (this config parameter is checked by default).
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs

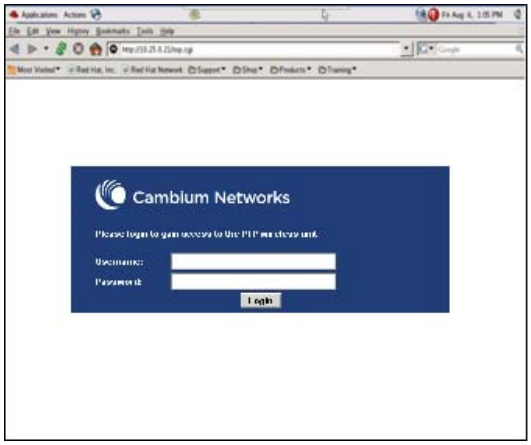
---

Test Procedure:

1. From the TC#1, launch a web browser (IE or FireFox are recommended). Type in http://IPaddress where IPaddress is the IP Address of Radio #1.
2. Verify that the browser shows the PTP management user interface Login Page. (If the FrontPage Login has been disabled, and no User Accounts created, the user will have unrestricted access to all PTP management Web pages without the need to provide login credentials).
3. Repeat Step 1-3 with remaining PTP radios in network.

Expected Result:

Users should see PTP Login Page (example):



Pass: _____ Fail: _____

BOX_002: PTP Radio User Account Control

Test Purpose:

This test verifies that access levels to the PTP radio web-based management interface are controllable via configurable User Account privileges. It also proves out the proper operation of restricted access levels based on configured Account login privileges (in accordance with the network operator's security policy).

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs

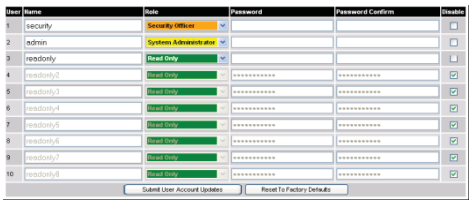
Test Procedure:

1. From the TC#1, launch a web browser (IE or FireFox are recommended). Type in http://IPaddress where IPaddress is the IP Address of Radio #1.
2. Navigate to the "User Accounts" link under the "Security Administration" submenu
3. Follow the PTP user guide to create three(3) user accounts:
    a. Username = security, Role = Security Officer
    b. Username = admin, Role = System Administrator
    c. Username = random, Role = Read Only
4. Verify that all the three accounts can be created successfully

Repeat Step 1-5 with Test Computer #1 and Radio #2

Expected Result:

1. Screen defining User Accounts should match PTP Login access results



Pass: _____ Fail: _____

Additional Related Tests for Consideration:

Testing of RADIUS based User Authentication as configured
Testing FIPS140-2 operation as configured.
Testing HTTPS / TLS operation as configured

BOX_003: Key PTP RF Statistics Validation / Reconciliation

Test Purpose:

This test verifies that key PTP RF performance indicators (KPI) available from the PTP radio's Status page (**Link Capacity**, **RX Power**, **TX/RX Modulation** modes, **Range**) can be reasonably reconciled with the pre-deployment planning numbers calculated by the PTP LINKPlanner tool (or equivalent).

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs
- Pre-Deployment LINKPlanner file for each PTP link under tests

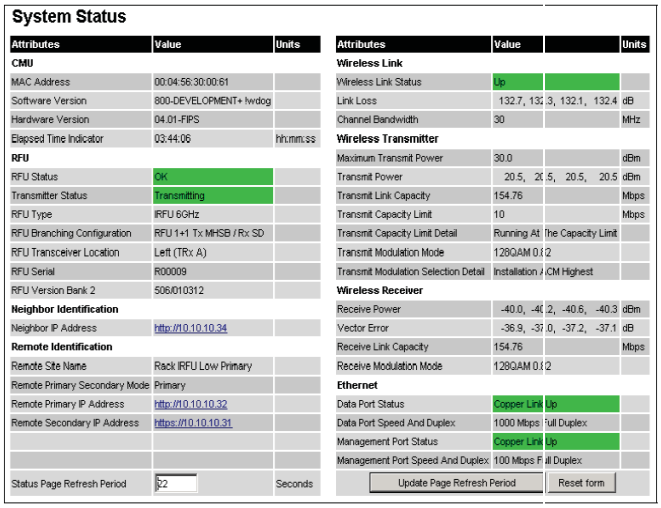
---

Test Procedure:

1. From the TC#1, launch a web browser (IE or FireFox are recommended). Type in http://IPaddress where IPaddress is the IP Address of Radio #1.
2. Navigate to the "System Status" page under the "Status" submenu
3. Read the value of the following KPI and compare to LINKPlanner modeling data (refer to the Engineering Report from the LINKPlanner):
   a. Reconcile **Link Capacity** value

Expected Result:

1. Example System Status page shown below



System Status

Attributes	Value	Units
CMU		
MAC Address	00:04:56:30:00:61	
Software Version	800-DEVELOPMENT+ fwdog	
Hardware Version	04.01-FIPS	
Elapsed Time Indicator	03:44:06	hh:mm:ss
RFU		
RFU Status	OK	
Transmitter Status	Transmitting	
RFU Type	IRFU 6GHz	
RFU Branching Configuration	RFU 1+1 Tx MHSB / Rx SD	
RFU Transceiver Location	Left (TRx A)	
RFU Serial	R00009	
RFU Version Bank 2	506/010312	
Neighbor Identification		
Neighbor IP Address	http://10.10.10.34	
Remote Identification		
Remote Site Name	Rack IRFU Low Primary	
Remote Primary Secondary Mode	Primary	
Remote Primary IP Address	http://10.10.10.32	
Remote Secondary IP Address	https://10.10.10.31	
Status Page Refresh Period	02	Seconds

Attributes	Value		Units
Wireless Link			
Wireless Link Status	Up		
Link Loss	132.7, 132	3, 132.1, 132.4	dB
Channel Bandwidth	30		MHz
Wireless Transmitter			
Maximum Transmit Power	30.0		dBm
Transmit Power	20.5, 2	5, 20.5, 20.5	dBm
Transmit Link Capacity	154.76		Mbps
Transmit Capacity Limit	10		Mbps
Transmit Capacity Limit Detail	Running At	he Capacity Limit	
Transmit Modulation Mode	128QAM 0.8	2	
Transmit Modulation Selection Detail	Installation A	CM Highest	
Wireless Receiver			
Receive Power	-40.0, -40	2, -40.6, -40.3	dBm
Vector Error	-36.9, -37	0, -37.2, -37.1	dB
Receive Link Capacity	154.76		Mbps
Receive Modulation Mode	128QAM 0.8	2	
Ethernet			
Data Port Status	Copper Link	Up	
Data Port Speed And Duplex	1000 Mbps	ull Duplex	
Management Port Status	Copper Link	Up	
Management Port Speed And Duplex	100 Mbps F	ll Duplex	

Update Page Refresh Period | Reset form

b. Reconcile **RX Power** value
c. Reconcile **TX/RX Modulation** Modes
d. Reconcile **Range** value

Pass: _____ Fail: _____

Additional Related Tests for Consideration: None

BOX_004: Self Recovery of PTP link after Power loss / Reboot

Test Purpose:

This test verifies that a PTP link will fully recover from power loss or reboot without any manual user intervention.

Required Equipment and Preparation for Test Execution:

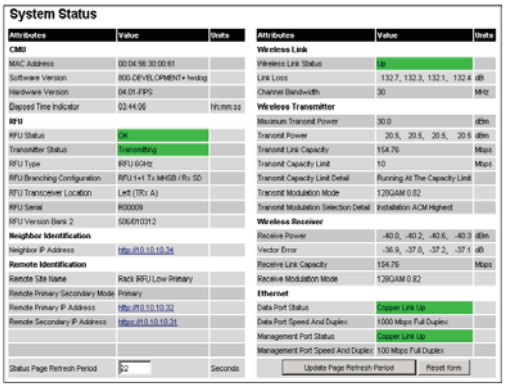
- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs

Test Procedure:

1. From the TC#1, launch a web browser (IE or FireFox are recommended). Type in http://IPaddress where IPaddress is the IP Address of Radio #1.
2. Navigate to the "System Status" page under the "Status" submenu and confirm the Wireless and Ethernet Link status "Up"
3. Reboot the far end PTP radio by logging into its management web pages and selecting "Reboot Wireless Unit" under the System submenu.
4. Navigate back to the "System Status" page under the "Status" submenu and confirm the Wireless and Ethernet Link status shows "Down"
5. Remove power from the local PTP radio link. Confirm that you can no longer access the Status page for radio(s) that was powered down.
6. Re-apply power to the PTP radio(s). Wait for power-up sequence of the radios to complete (approx 60 seconds).

Expected Result:

2. Example System Status page shown below



7. Verify that the PTP link has been fully reestablished on its own by accessing the management web pages of both radios and observing that the Wireless and Ethernet Link status shows “Up”

Pass: _____ Fail: _____

Additional Related Tests for Consideration:

None

BOX_005: PTP Ethernet Traffic Performance – RFC2544

Test Purpose:

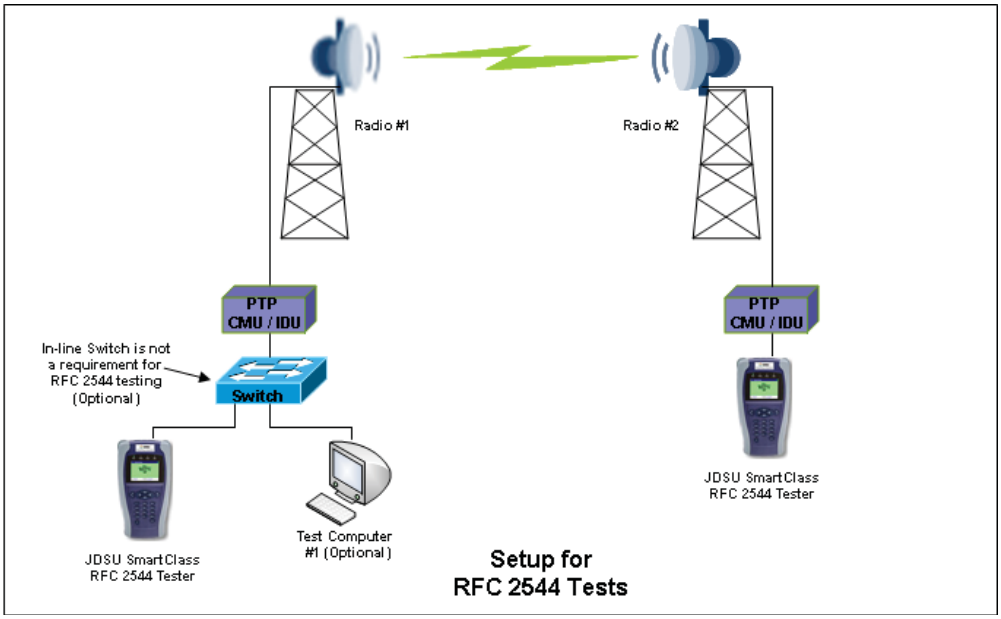
This series of tests (RFC 2544) measures and proves performance criteria of the Ethernet network provided by the PTP link. The test standard provides an out-of-service benchmarking methodology to evaluate the performance of network devices (PTP) using **throughput**, **back-to-back (bursting)**, **frame loss** and **latency** tests, with each test validating a specific part of a customer Service Level Agreement (SLA). The methodology defines the frame size, test duration and number of test iterations. Once completed, these tests will provide performance metrics of the Ethernet network under test.

In order to ensure that an Ethernet network is capable of supporting a variety of services (such as VoIP, video, etc.), the RFC 2544 test suite supports seven pre-defined frame sizes (64, 128, 256, 512, 1024, 1280 and 1518 bytes) to simulate various traffic conditions. Small frame sizes increase the number of frames transmitted, thereby stressing the network device as it must switch a large number of frames.

It is assumed that the tester has a good knowledge of the test set and understands how to correctly configure the test set for the designated test suite. Depending on the deployment scenario, the tester could choose different performance parameters for the RFC2544 test suite (for example, if majority of the customer's traffic has frame size between 1280 and 1518, the test suite may not include measurement of packet size smaller than 1280).

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)



Test Procedure:

Connect the PTP link's Ethernet port and JDSU test equipment so that it closely represents the setup shown in the "Setup for RFC 2544 tests" figure above.

Configure the PTP Link to Auto-Negotiate 1000Mbps Ethernet Link speed, and the RFC 2544 test-set to Auto-Negotiate Ethernet Link. Ensure the test set status page shows that the negotiated Ethernet wire speed is 1000Mbps.

By default, the test-set will begin generating Ethernet traffic for the full suite of RFC 2544 tests at its current Ethernet wire speed (1Gbps). Therefore you need to ensure you've configured

Expected Result:

1. Example System Status page shown below

System Status

Attributes	Value	Units
CMU		
MAC Address	00:04:56:30:00:61	
Software Version	800-DEVELOPMENT+ hwdog	
Hardware Version	04.01-FIPS	
Elapsed Time Indicator	03:44:06	hh:mm:ss
RFU		
RFU Status	OK	
Transmitter Status	Transmitting	
RFU Type	IRFU 6GHz	
RFU Branching Configuration	RFU 1+1 Tx MHSB / Rx SD	
RFU Transceiver Location	Left (TRx A)	
RFU Serial	R00009	
RFU Version Bank 2	506/010312	
Neighbor Identification		
Neighbor IP Address	http://10.10.10.34	
Remote Identification		
Remote Site Name	Rack IRFU Low Primary	
Remote Primary Secondary Mode	Primary	
Remote Primary IP Address	http://10.10.10.32	
Remote Secondary IP Address	https://10.10.10.31	
Status Page Refresh Period	2	Seconds

Attributes	Value	Units
Wireless Link		
Wireless Link Status	Up	
Link Loss	132.7, 132.3, 132.1, 132.4	dB
Channel Bandwidth	30	MHz
Wireless Transmitter		
Maximum Transmit Power	30.0	dBm
Transmit Power	20.5, 20.5, 20.5, 20.5	dBm
Transmit Link Capacity	154.76	Mbps
Transmit Capacity Limit	10	Mbps
Transmit Capacity Limit Detail	Running At The Capacity Limit	
Transmit Modulation Mode	128QAM 0.82	
Transmit Modulation Selection Detail	Installation ACM Highest	
Wireless Receiver		
Receive Power	-40.0, -40.2, -40.6, -40.3	dBm
Vector Error	-36.9, -37.0, -37.2, -37.1	dB
Receive Link Capacity	154.76	Mbps
Receive Modulation Mode	128QAM 0.82	
Ethernet		
Data Port Status	Copper Link Up	
Data Port Speed And Duplex	1000 Mbps Full Duplex	
Management Port Status	Copper Link Up	
Management Port Speed And Duplex	100 Mbps Full Duplex	

Update Page Refresh Period | Reset form

	the test-set to limit the Ethernet traffic it generates in order to match the known PTP RF Link capacity. If this is not done, it is likely that most test results will fail over the PTP link. Execute the RFC 2544 test suite . Transfer the test results to a PC using the JDSU SmartClass tester Excel macro tool and USB cable. Create a formatted report document summarizing the test results. . Verify that the link throughput from the RFC2544 test agrees with LINKPlanner design expectation.	
		Pass: _____ Fail: _____

Additional Related Tests for Consideration:

None

BOX_006: 1+1 Hot Standby Verification

Test Purpose:

This test verifies that PTP 800 1+1 radio link has been configured correctly to provide 1+1 hot standby service

Required Equipment and Preparation for Test Execution:

- Two Test Computers (PCs connected to both ends of a PTP link)
- Operational PTP800 1+1 Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs

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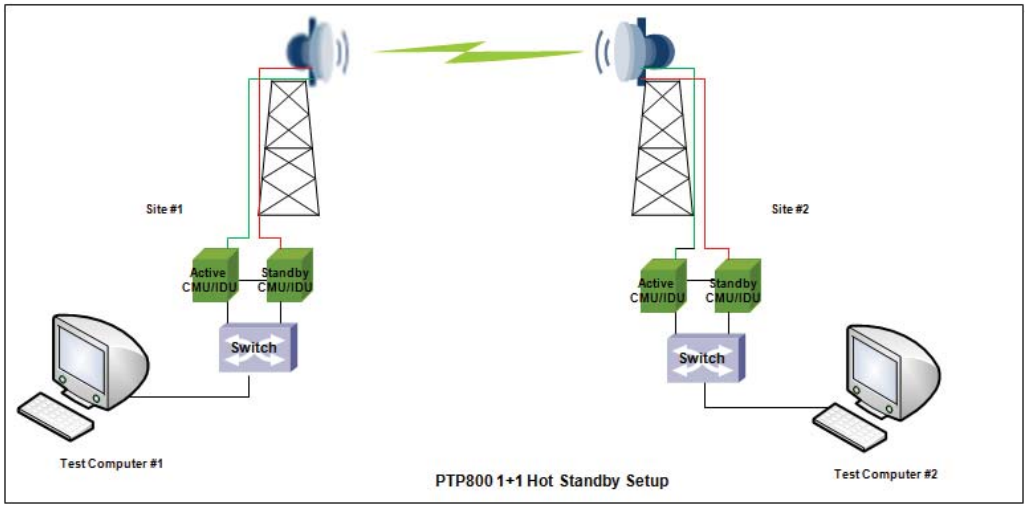


Test Procedure

1. From Test Computer #1, launch a web browser (IE or FireFox are recommended).

   Connect to the web page of the 4 CMUs in the link. Verify from the web page that all the CMUs are accessible and that at each site, there is one CMU in primary mode and one in secondary mode.

   Verify from the protection configuration page that all the CMUs are properly configured to “Hot Standby1+1” mode or “Hot Standby 1+1 with Rx Diversity” mode, depending on the deployment.

   Navigate to the protection page to verify that all the radios are in “Green” status.
2. Verify the Computer #1 is able to ping Computer #2
3. Run a ping session between Computer #1 and Computer #2, One by one, power cycle the CMUs using the web interface. Start from Site #1, Active CMU, then the Standby CMU, then Site #2 Active CMU, then Standby CMU. Before power cycling the next CMU, make sure that the power cycled CMU is back on life by logging onto that CMU’s webpage.

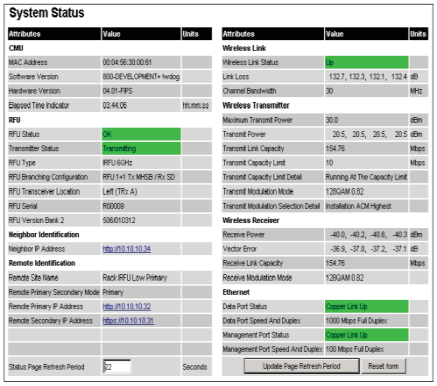
   After the power cycled CMU is back on line, from the system status page of all the 4 CMUs, reconcile the following RF performance parameters:

   - Link Capacity
   - Rx Signal Level
   - Tx/Rx Modulation

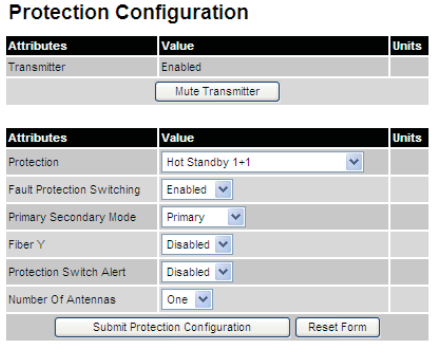
Expected Result:

1. Step #1 at each site, one CMU is in primary mode, and one is in secondary mode. At each site, one CMU transmitter is in “Transmitting” state and the other one is in “Inactive” State.

   Sample system status page is shown below:



   Sample protection page for “Hot Standby 1+1”



   Sample protection page for “Hot Standby 1+1 with Rx Diversity”

- Range

Verify that protection web page also show a switch-over to the standby radio after each power cycle.

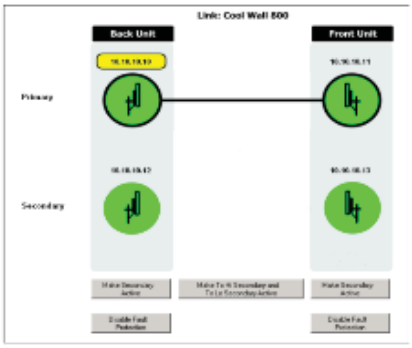
4. Verify the CMU status after step #3

Protection Configuration

Attributes	Value	Units
Transmitter	Enabled	
	Mute Transmitter	

Attributes	Value	Units
Protection	Hot Standby 1+1 with Rx Diversity	
Rx Diversity Vlan Tpid	IEEE 802.1Q Tagged (C-Tag, Type 8100)	
Rx Diversity Vid	1	
Fault Protection Switching	Enabled	
Primary Secondary Mode	Primary	
Fiber Y	Disabled	
Protection Switch Alert	Disabled	
Number Of Antennas	One	
	Submit Protection Configuration / Reset Form	

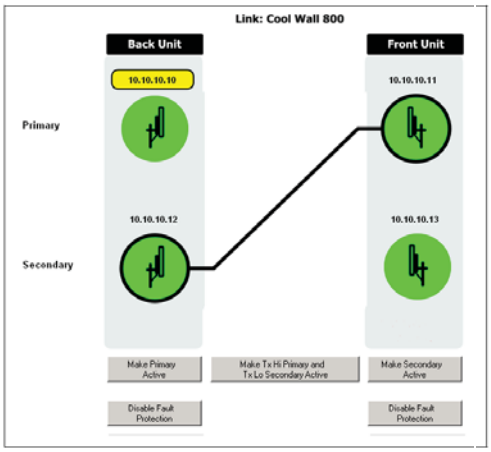
Sample protection status page is shown below:



2. Step #2, Computer #1 is able to ping Computer #2,
3. Step #3, Ping session should continue to be successful even when any one of the CMU is rebooted. You may see at most 1 ping packet drop during each power cycle.

   From the system status page, the RF performance parameter should match with design expectation.

   Sample protection status page is shown below:



4. After step #3, The CMUs status should be identical to results from step #1

Pass: _____ Fail: _____

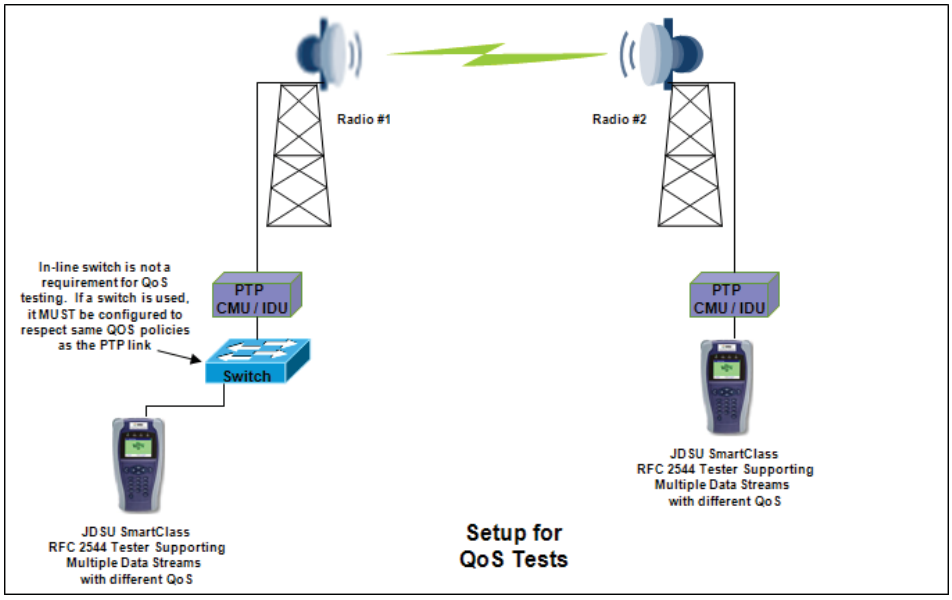
BOX_007: QoS Testing

Test Purpose:

This test verifies that PTP radio link has been configured to provide QoS services as specified by the user settings of the 8 priority queues. For purposes of this test, we will use VLANs and their associated 802.1p priority bits to exercise the QoS attributes of the PTP radios.

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP Microwave Radio Link connected to Customer Network
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs
- 2 JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices)



Test Procedure

1. Configure the JDSU test set (master) to generate 3 concurrent streams of data, each using different VLAN tags with incrementing 802.1p priority:

   VLAN 10 = QoS Priority 5

   VLAN 20 = QoS Priority 6

   VLAN 30 = QoS Priority 7

   The configured data-rate for streams related to VLAN 20 and 30 should add up to 80% of the available throughput of the PTP link. The configured data-rate for stream related to VLAN 10 should be purposely assigned to something greater than the remaining capacity of the PTP link, such as 30% of the available throughput of the PTP link. The three streams from the JDSU now add up to 110% of what the PTP link can support. This will force QoS to be used to determine what traffic will successfully make it across the PTP link.
2. Configure PTP radio #1 and PTP radio #2 so that 802.1p priority fields have been set using the default QoS priority queues.
3. Set the remote JDSU test set (slave) to loopback mode. Start traffic for all 3 data streams for 10 minutes

Expected Result:

1. Verify that the test results for the streams associated with VLAN 20 and 30 show all Results OK. Verify that the test results for the stream associated with VLAN 10 show lost frames (due to VLAN 10 having the lowest QoS priority).

Pass: _____ Fail: _____

BOX_008: 2+0 Testing

Test Purpose:

This test verifies that the 2+0 PTP800 setup is installed and configured properly to deliver the expected throughput using RFC2544 test suite. And in case that one link of the 2+0 pair fails, the impaired 2+0 link will continue to function with half the designed capacity.

This test case assumes that the tester has very good understanding of how PTP800 2+0 is implemented from the networking level (networking level implementation of 2+0 is completely a deployment/design decision).

Due to the flexibility of networking design to achieve 2+0, this test case needs to be tailored/modified to match with the specific deployment itself.

Required Equipment and Preparation for Test Execution:

- Test Computer #1 (PC connected to Customer Enterprise Network (CEN))
- Operational PTP800 2+0 Microwave Radio Link connected to Customer Network, with network level link aggregation configured properly based on the system design.
- Final IP Plan for PTP radio network implemented along with Test Equipment IPs
- Two JDSU SmartClass Ethernet test sets (or equivalent RFC 2544 testing devices) that can be configured to generate multiple concurrent streams of traffic to fully utilize the 2+0 link capacity (depending on the networking design, multiple streams of different VLANs or source destination MAC/IP/Ports/VLAN may be required to load balance the 2+0 link).
- Network/Test Setup is not defined here and need to be provided depending on the deployment scenario.

Test Procedure	**Expected Result:**
1. Configure the test sets to perform RFC2544 throughput testing. 2. Break one link (link “A”) of the 2+0 pair by disconnecting the IF cable from the CMU, run RFC2544 throughput testing again. 3. Connect the network back to normal 2+0 working condition, break the other link	1. When 2+0 is functioning normally, the throughput must matches with the expected 2+0 throughput as predicted by the LINKPlanner.

(link “B”) of the 2+0 pair, run RFC2544 throughput testing again.	2. When one link of the 2+0 pair fails, the throughput must be half that of normal 2+0 throughput. Pass: _____ Fail: _____

EXHIBIT A-6 Preliminary Path Studies

Cambium Networks™

Project BCFSA Mircrowave 4-3-17
LINKPlanner PTP Proposal Report

17 April 2017

Thomas Sullivan
Organization: mobile Comm.
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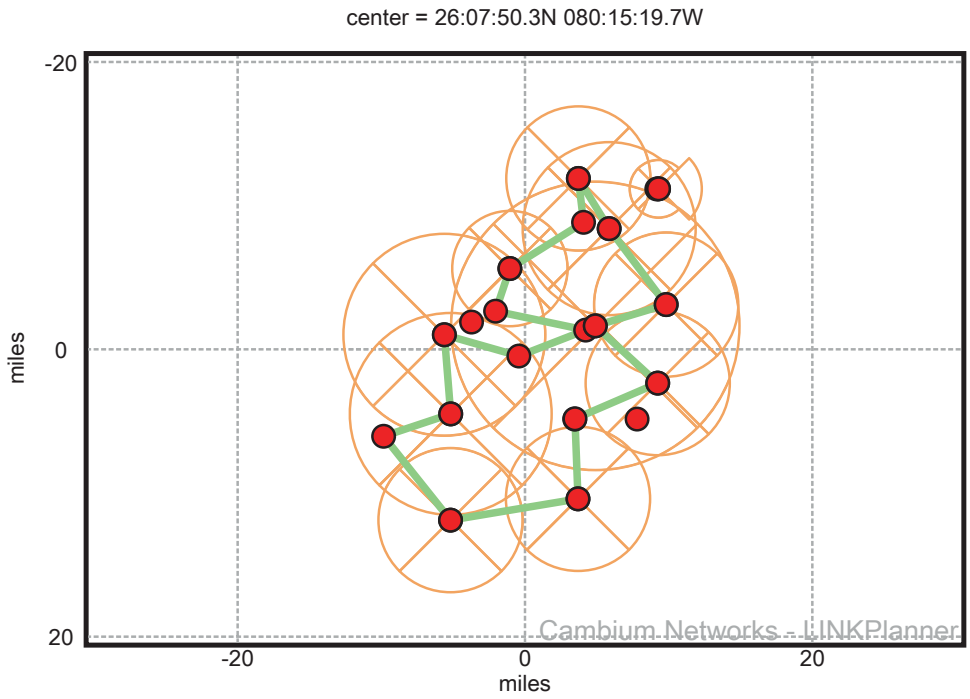
Cambium Networks™



Cambium Networks

Table of Contents

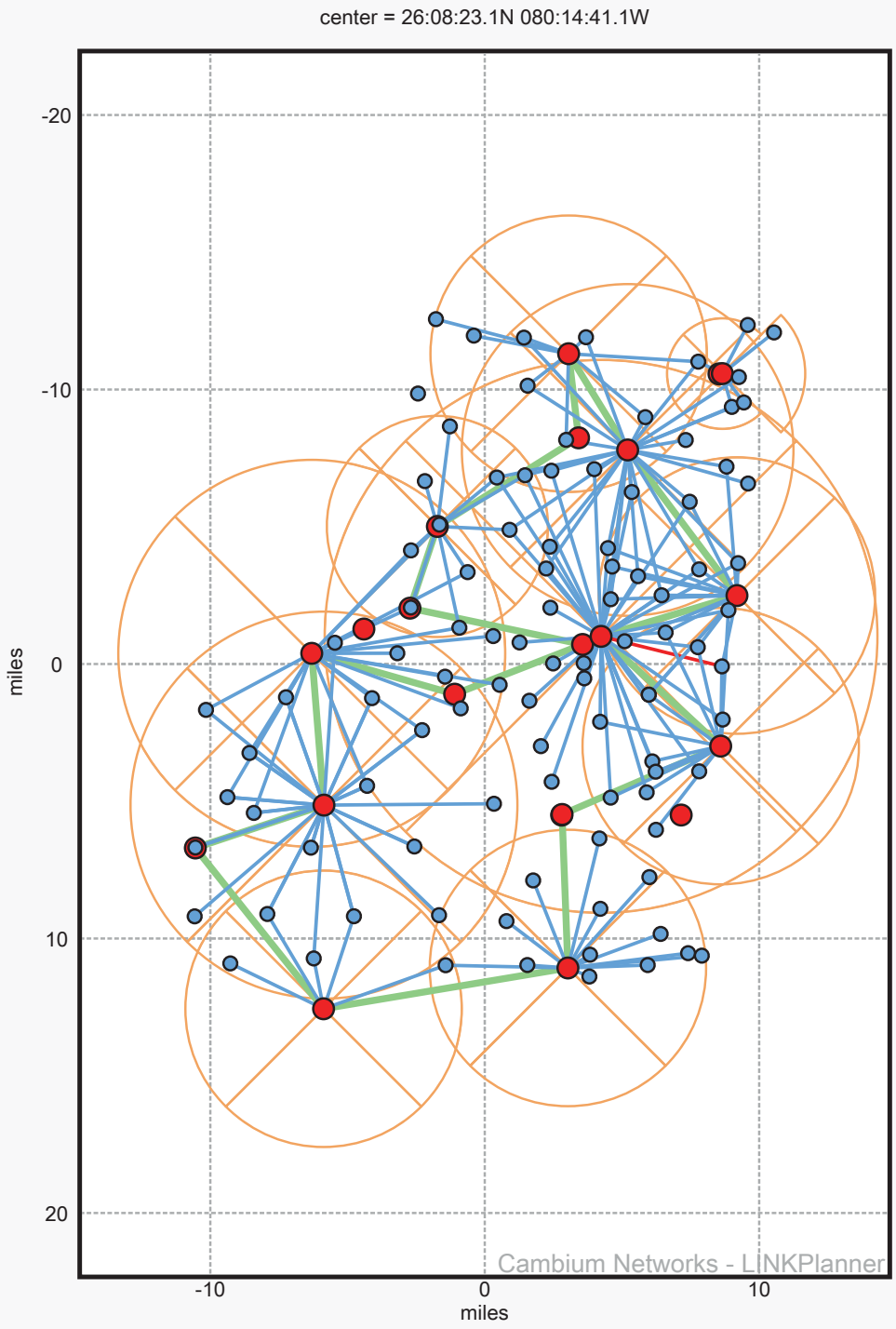
Cambium Networks

1. Project Summary

Project: BCFSA Mircrowave 4-3-17

General Information	
Customer Name	Broward County
Company Name	Mobile Comm.
Address	
Phone	
Cell Phone	
Email	

Network Map


center = 26:08:23.1N 080:14:41.1W
-20
-10
0
10
20
miles
-10
0
10
miles
Cambium Networks - LINKPlanner

Link name	Product	Local antenna	Remote antenna	Max aggregate IP throughput
Sunrise PSAP to Tamarac	PTP11820S (Wide)	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	1191.93 Mbps
Tamarac to Coconut Creek PSAP	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.92 Mbps
Coconut Creek PSAP to Coconut Creek - 400 FT	PTP11820S (Wide)	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	1191.93 Mbps
Playa Del Mar to EMS	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.93 Mbps
Channel 2 to Miramar	PTP11820S (Wide)	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	1191.91 Mbps
Miramar to Pembroke Pines PSAP	PTP11820S (Wide)	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	1191.92 Mbps
Pembroke Pines PSAP to Davie	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.93 Mbps
Davie to Markham Park	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct	1191.92 Mbps
Markham Park to EOC	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.92 Mbps
Point of Americas to Hollywood Waste Water Monopole	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.92 Mbps
Hollywood Waste Water Monopole to Channel 2	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.92 Mbps
Point of Americas to EMS	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	1191.92 Mbps

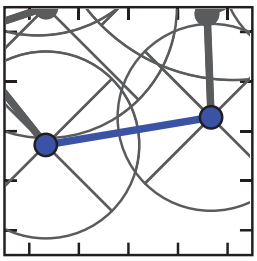
(continued)

Link name	Product	Local antenna	Remote antenna	Max aggregate IP throughput
EOC to Core	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct	Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct	1191.93 Mbps
Core to Sunrise PSAP	PTP11820S (Wide)	Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct	Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct	1191.92 Mbps
Pompano Beach Tower to Playa Del Mar	PTP11820S (Wide)	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct	1191.92 Mbps
Coconut Creek - 400 FT to Pompano Beach Tower	PTP11820S (Wide)	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	Cambium Networks 2ft Single Pol (Global) N110082D072 - Direct	1191.92 Mbps

Bill of Materials : PTP Network		
Part Number	Qty	Description
(no part number)	32	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	64	Gigabit Surge Suppressor (56V)
N000065L001	32	PTP 650 AC Power Injector
N000065L003	32	US Line Cord Fig 8
N000082L014	32	PTP 820 Glands_x5_KIT
N000082L016	31	PTP 820 CAT5E Outdoor 100m drum
N000082L017	75	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	32	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan
N000082L073	32	PTP 820 GBE_Connector_kit
N000082L116	32	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D072	6	PTP 820 2' ANT,SP,11GHz,RFU-C TYPE&Std UBR100 - Andrew. Available in all regions
N110082D098	16	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions
N110082D100	6	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions
N110082D110	4	PTP 820 3' ANT,SP,10_11GHz,RFU-C & UBR100 - CNT. Only available for order in APAC and EMEA regions

Cambium Networks

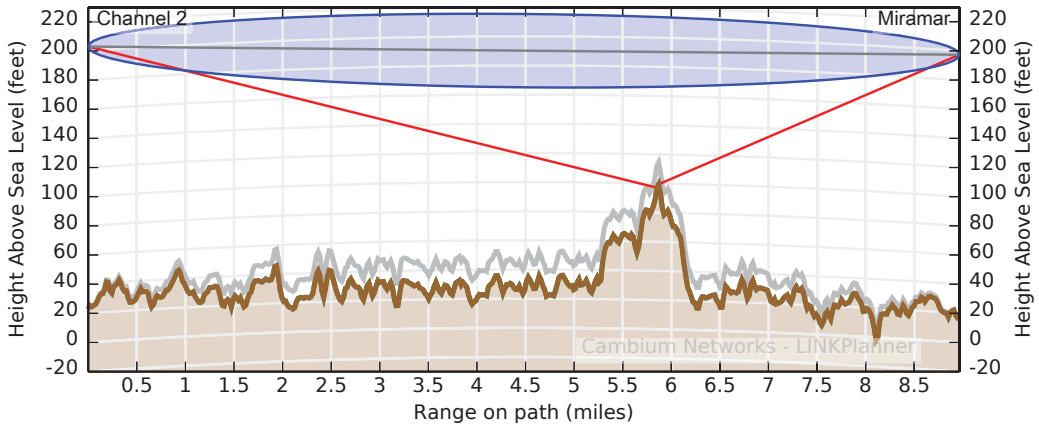
Channel 2 to Miramar



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 180 ft

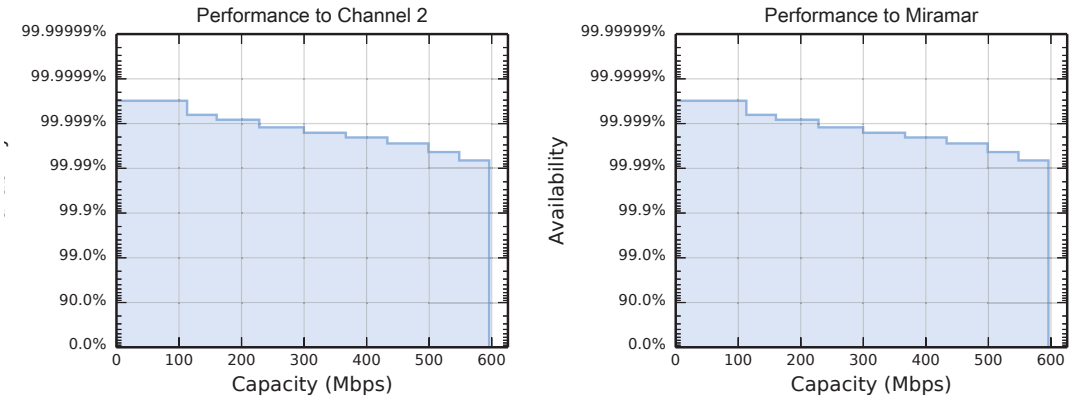
Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 180 ft



	Performance to Channel 2	Performance to Miramar
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9997 % for 100.0 Mbps	99.9997 % for 100.0 Mbps

Link Summary			
Link Length	8.964 mi.	System Gain Margin	54.21 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9997 %
Modulation	Adaptive	Annual Link Unavailability	1.7 mins/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	136.89 dB	Prediction Model	ITU-R
System Gain	191.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-215.25 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.00 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.51e-04	Annual 2-way Unavailability	2 secs/year
Fade Occurrence Factor (P0)	3.27e-02	Rain Availability	99.9997 %
Path inclination	0.12 mr	Rain Unavailability	1.6 mins/year
Value of K Exceeded for 99.99% (ke)	0.50	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	89.15 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	136.61 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.28 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

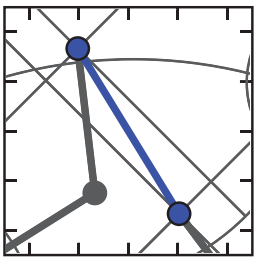
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	6	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D100	2	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

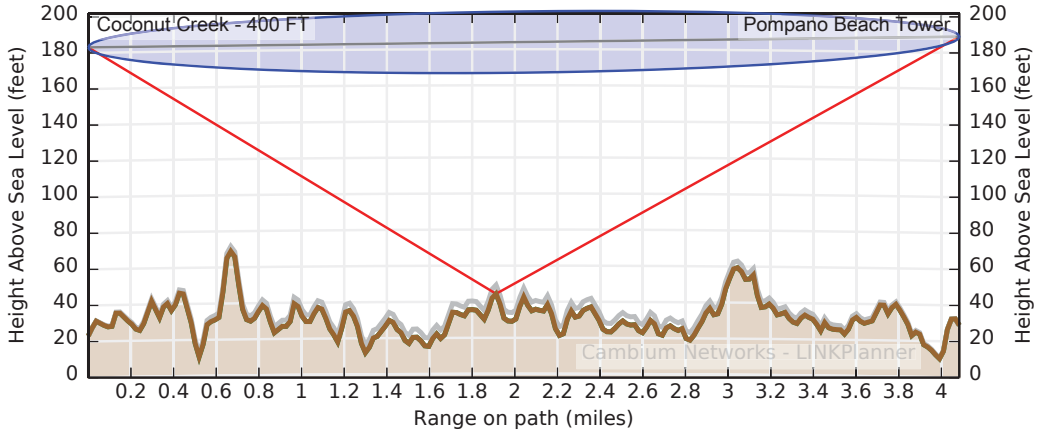
Coconut Creek - 400 FT to Pompano Beach Tower



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 160 ft

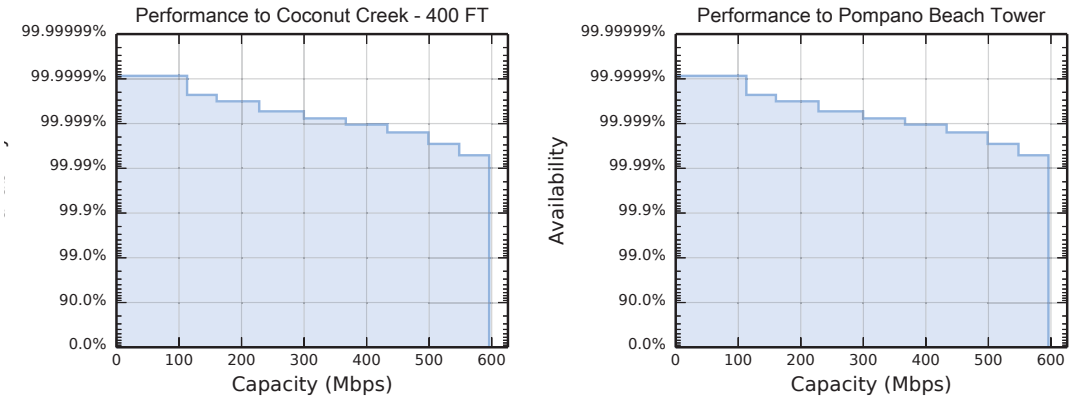
Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 160 ft



	Performance to Coconut Creek - 400 FT	Performance to Pompano Beach Tower
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 1.0 Mbps	99.9999 % for 1.0 Mbps

Link Summary			
Link Length	4.084 mi.	System Gain Margin	48.73 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	27 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	129.91 dB	Prediction Model	ITU-R
System Gain	178.64 dB		

Performance Charts



Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-209.11 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	4.00 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	2.98e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	2.00e-03	Rain Availability	99.9999 %
Path inclination	0.27 mr	Rain Unavailability	27 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.11 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	129.79 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.13 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

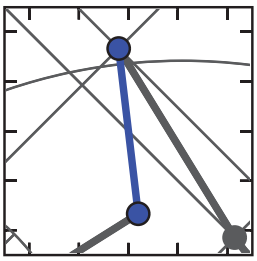
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D072	2	PTP 820 2' ANT,SP,11GHz,RFU-C TYPE&Std UBR100 - Andrew. Available in all regions

Cambium Networks

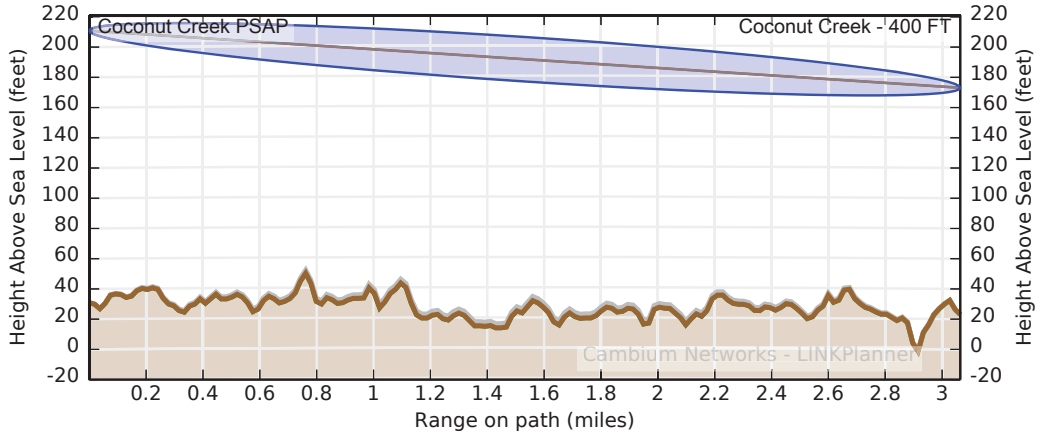
Coconut Creek PSAP to Coconut Creek - 400 FT



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 180 ft

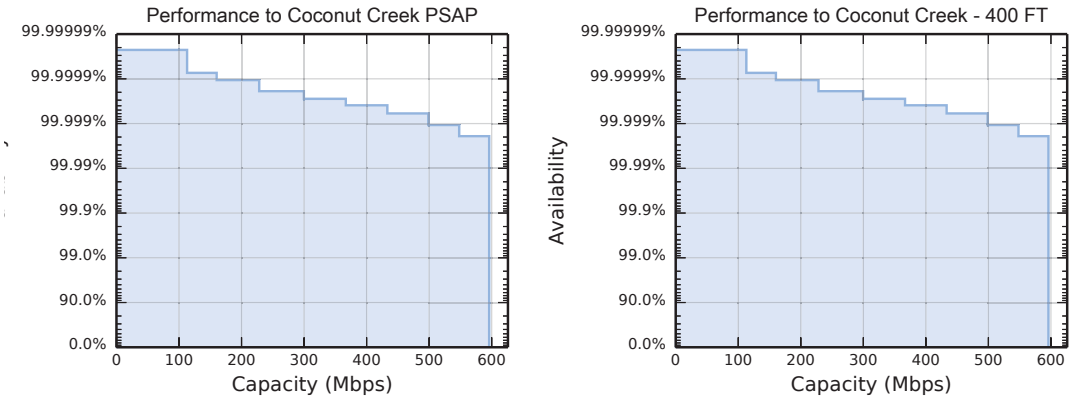
Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 150 ft



	Performance to Coconut Creek PSAP	Performance to Coconut Creek - 400 FT
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	100.0000 % for 100.0 Mbps	100.0000 % for 100.0 Mbps

Link Summary			
Link Length	3.064 mi.	System Gain Margin	51.25 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	7 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	127.39 dB	Prediction Model	ITU-R
System Gain	178.64 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-210.29 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	4.00 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.01e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	3.17e-04	Rain Availability	100.0000 %
Path inclination	2.34 mr	Rain Unavailability	7 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.13 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	127.29 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.10 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

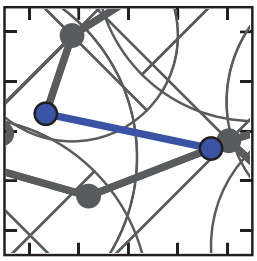
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D072	2	PTP 820 2' ANT,SP,11GHz,RFU-C TYPE&Std UBR100 - Andrew. Available in all regions

Cambium Networks

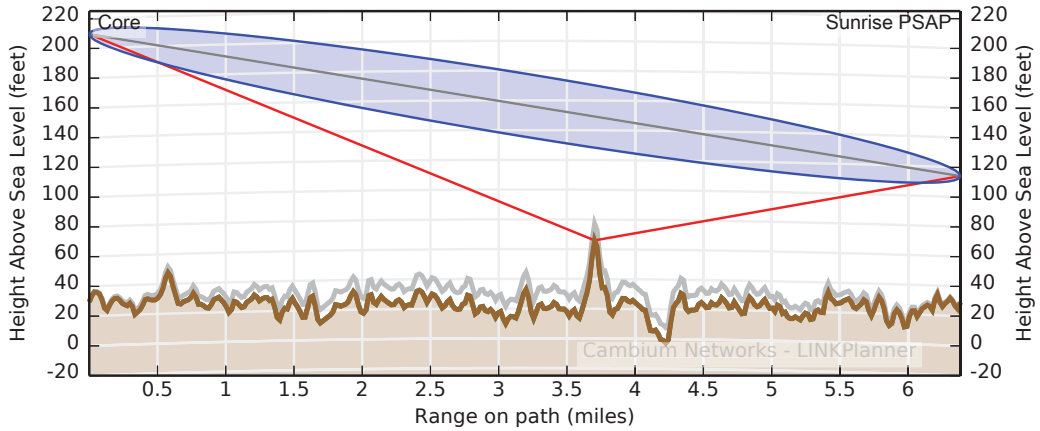
Core to Sunrise PSAP



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct @ 180 ft

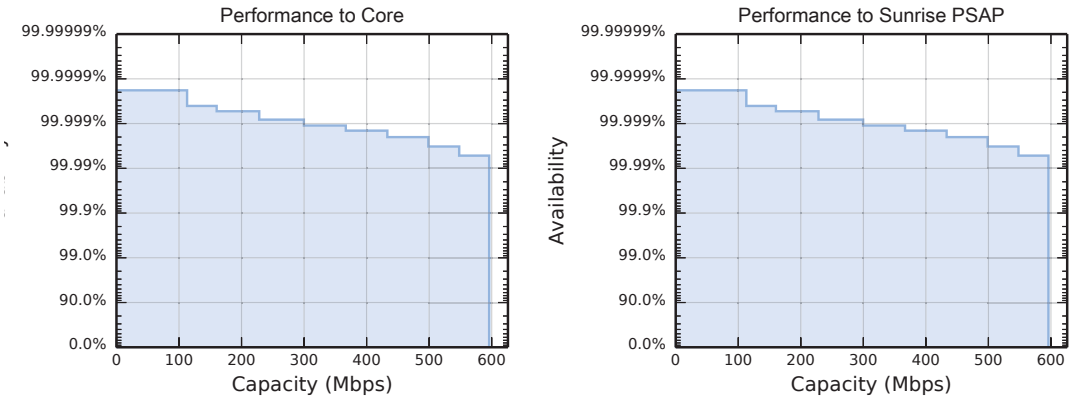
Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct @ 85 ft



	Performance to Core	Performance to Sunrise PSAP
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9998 % for 1.0 Mbps	99.9998 % for 1.0 Mbps

Link Summary			
Link Length	6.382 mi.	System Gain Margin	52.94 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9998 %
Modulation	Adaptive	Annual Link Unavailability	57 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	133.86 dB	Prediction Model	ITU-R
System Gain	186.80 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-213.49 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.64 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.20e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	3.20e-03	Rain Availability	99.9998 %
Path inclination	2.83 mr	Rain Unavailability	57 secs/year
Value of K Exceeded for 99.99% (ke)	0.41	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.54 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	133.66 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.20 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

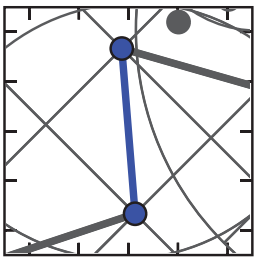
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D110	2	PTP 820 3' ANT,SP,10_11GHz,RFU-C & UBR100 - CNT. Only available for order in APAC and EMEA regions

Cambium Networks

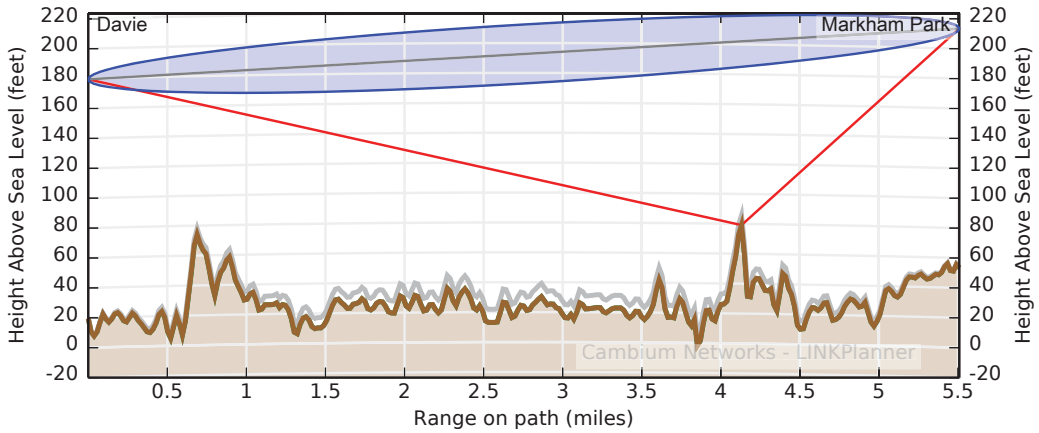
Davie to Markham Park



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 160 ft

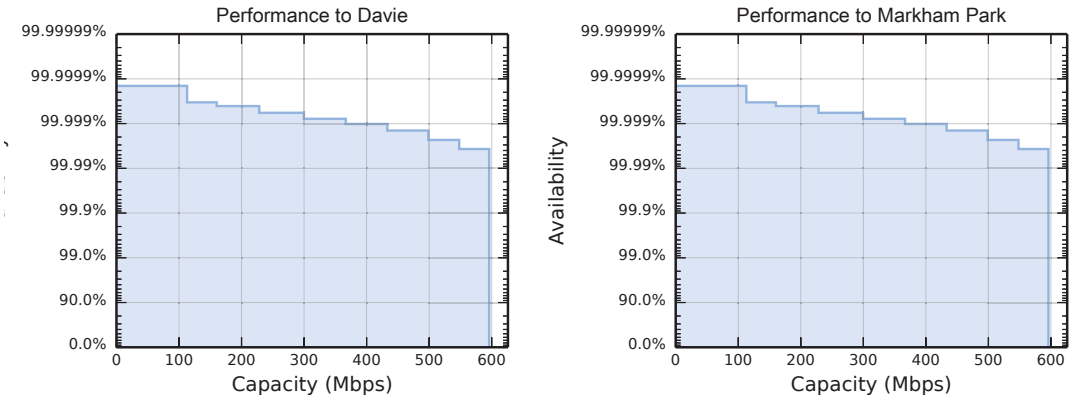
Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct @ 160 ft



	Performance to Davie	Performance to Markham Park
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9997 % for 150.0 Mbps	99.9997 % for 150.0 Mbps

Link Summary			
Link Length	5.508 mi.	System Gain Margin	51.89 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	46 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	132.56 dB	Prediction Model	ITU-R
System Gain	184.45 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-222.05 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.27 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.55e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	3.71e-03	Rain Availability	99.9999 %
Path inclination	1.17 mr	Rain Unavailability	45 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.98 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	132.39 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.17 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

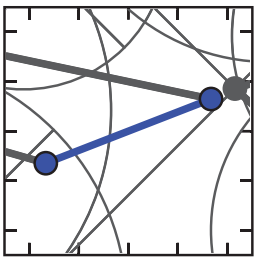
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	1	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions
N110082D110	1	PTP 820 3' ANT,SP,10_11GHz,RFU-C & UBR100 - CNT. Only available for order in APAC and EMEA regions

Cambium Networks

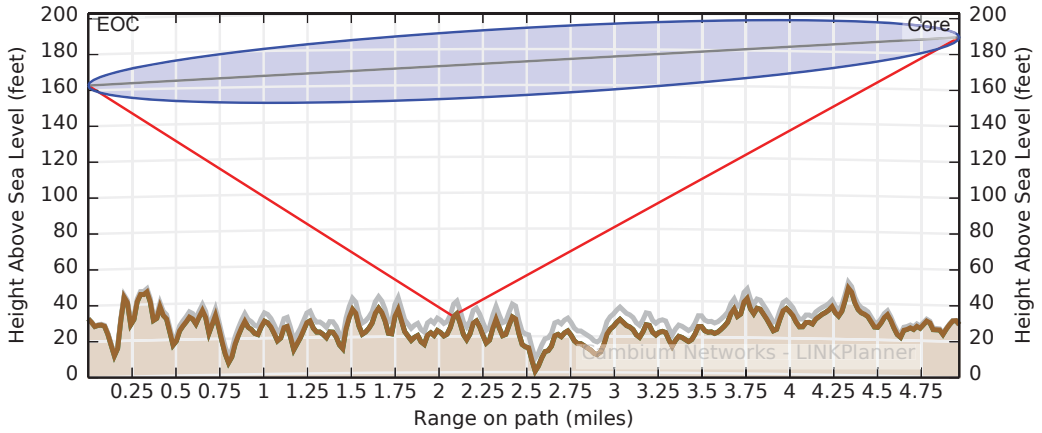
EOC to Core



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 130 ft

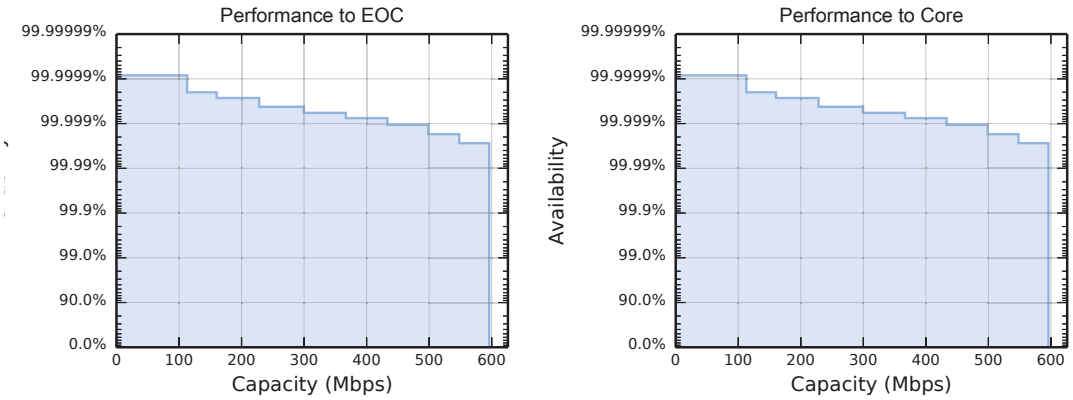
Cambium Networks 3ft Single Pol (APAC & EMEA Only) N110082D110 - Direct @ 160 ft



	Performance to EOC	Performance to Core
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 1.0 Mbps	99.9999 % for 1.0 Mbps

Link Summary			
Link Length	4.966 mi.	System Gain Margin	54.81 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	27 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	131.64 dB	Prediction Model	ITU-R
System Gain	186.45 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-212.31 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.55 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.21e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	2.59e-03	Rain Availability	99.9999 %
Path inclination	1.02 mr	Rain Unavailability	26 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.57 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	131.49 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.16 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

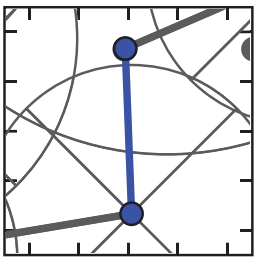
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	1	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions
N110082D110	1	PTP 820 3' ANT,SP,10_11GHz,RFU-C & UBR100 - CNT. Only available for order in APAC and EMEA regions

Cambium Networks

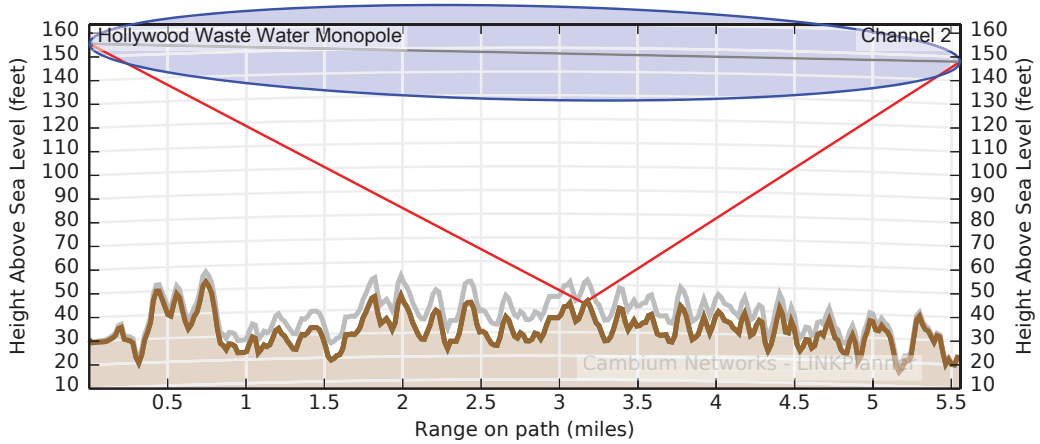
Hollywood Waste Water Monopole to Channel 2



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 125 ft

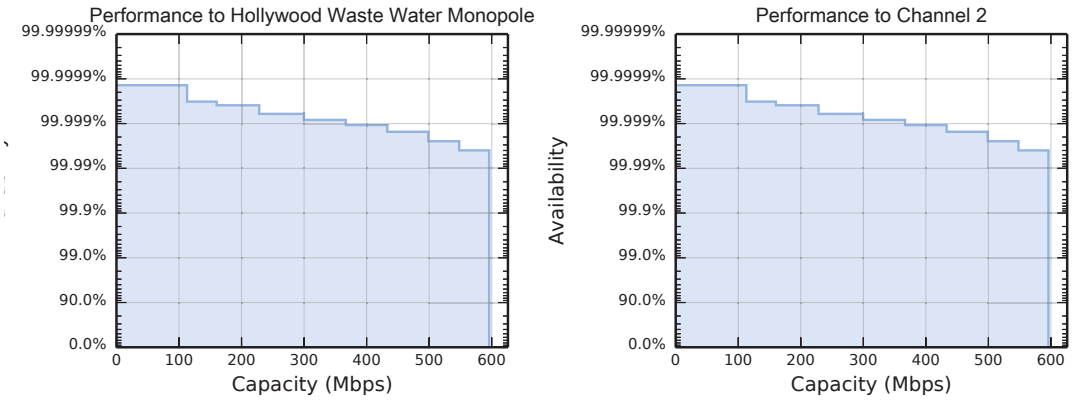
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 125 ft



	Performance to Hollywood Waste Water Monopole	Performance to Channel 2
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 100.0 Mbps	99.9999 % for 100.0 Mbps

Link Summary			
Link Length	5.557 mi.	System Gain Margin	52.46 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	44 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	132.64 dB	Prediction Model	ITU-R
System Gain	185.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-209.50 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.08 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.34e-04	Annual 2-way Unavailability	1 secs/year
Fade Occurrence Factor (P0)	6.19e-03	Rain Availability	99.9999 %
Path inclination	0.26 mr	Rain Unavailability	44 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.78 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	132.46 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.17 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

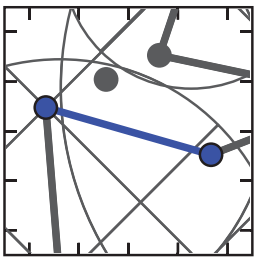
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	1	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

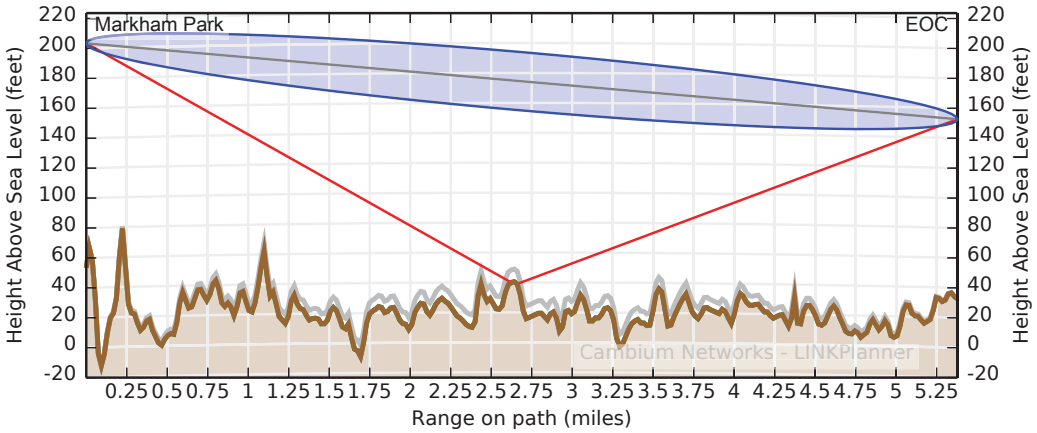
Markham Park to EOC



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 150 ft

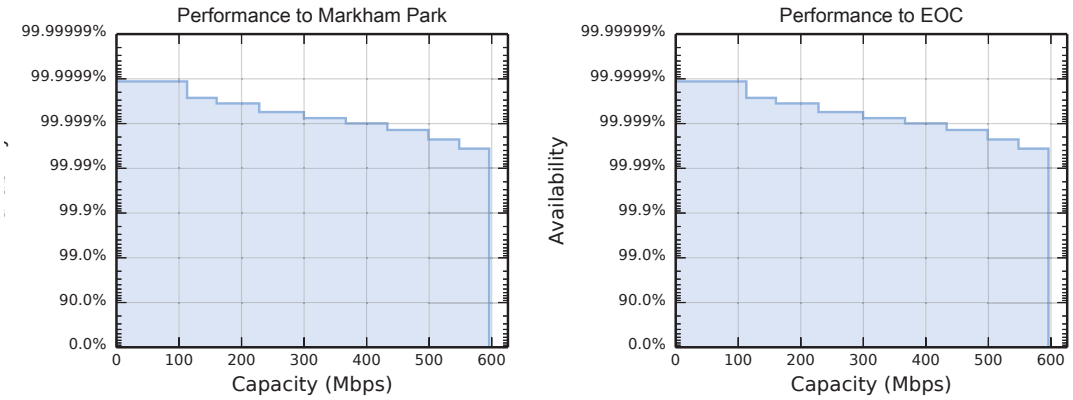
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 120 ft



	Performance to Markham Park	Performance to EOC
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 100.0 Mbps	99.9999 % for 100.0 Mbps

Link Summary			
Link Length	5.378 mi.	System Gain Margin	53.75 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	36 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	132.35 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts



Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-218.93 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.42 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.41e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	2.62e-03	Rain Availability	99.9999 %
Path inclination	1.79 mr	Rain Unavailability	36 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.78 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	132.18 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.17 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

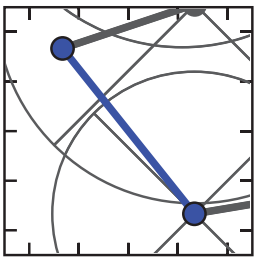
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

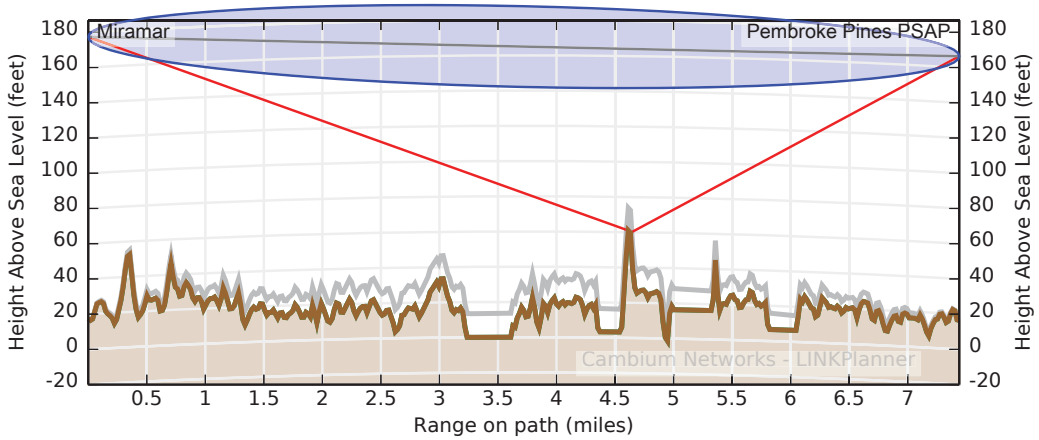
Miramar to Pembroke Pines PSAP



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 160 ft

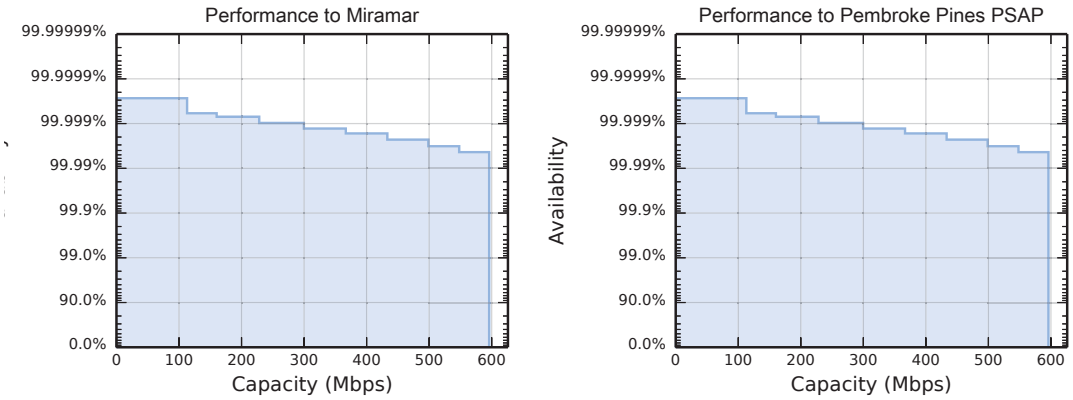
Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 150 ft



	Performance to Miramar	Performance to Pembroke Pines PSAP
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9997 % for 100.0 Mbps	99.9997 % for 100.0 Mbps

Link Summary			
Link Length	7.441 mi.	System Gain Margin	51.87 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9997 %
Modulation	Adaptive	Annual Link Unavailability	1.5 mins/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	135.23 dB	Prediction Model	ITU-R
System Gain	187.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-224.69 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.00 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.75e-04	Annual 2-way Unavailability	2 secs/year
Fade Occurrence Factor (P0)	1.72e-02	Rain Availability	99.9997 %
Path inclination	0.28 mr	Rain Unavailability	1.4 mins/year
Value of K Exceeded for 99.99% (ke)	0.45	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	89.42 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	135.00 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.23 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

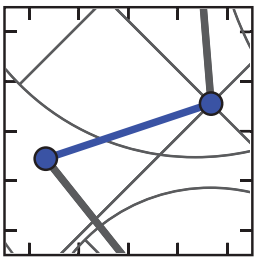
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D100	2	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

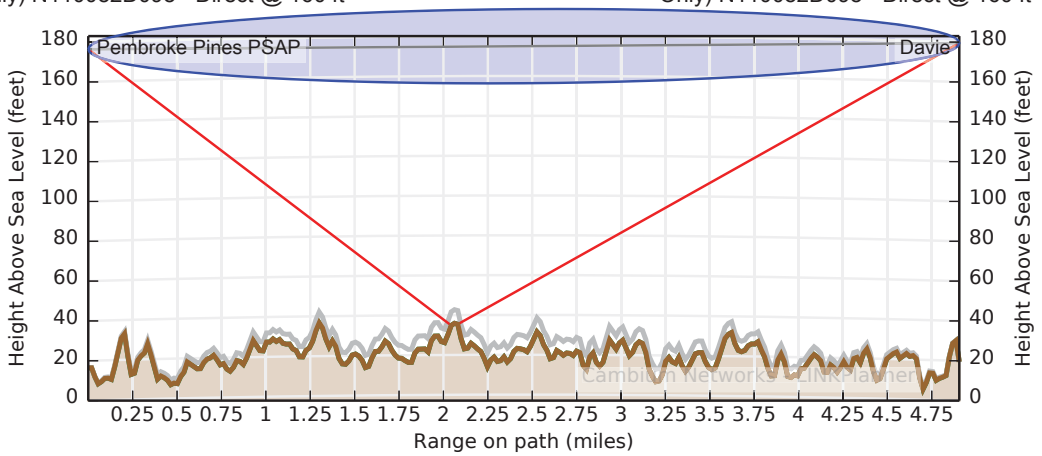
Pembroke Pines PSAP to Davie



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 160 ft

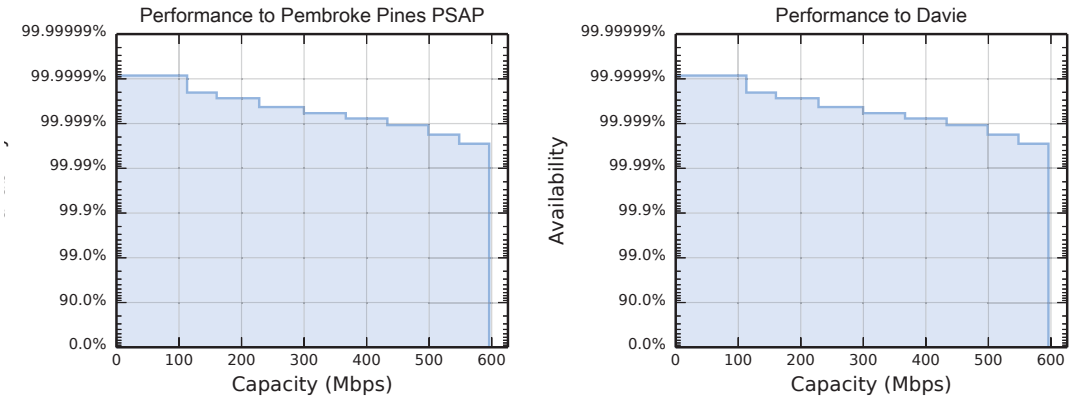
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 160 ft



	Performance to Pembroke Pines PSAP	Performance to Davie
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9998 % for 150.0 Mbps	99.9998 % for 150.0 Mbps

Link Summary			
Link Length	4.905 mi.	System Gain Margin	54.57 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	27 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	131.53 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts



Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-224.80 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.11 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.69e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	5.06e-03	Rain Availability	99.9999 %
Path inclination	0.12 mr	Rain Unavailability	27 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	89.24 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	131.38 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.15 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

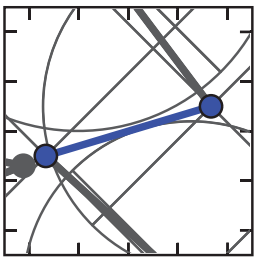
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	4	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

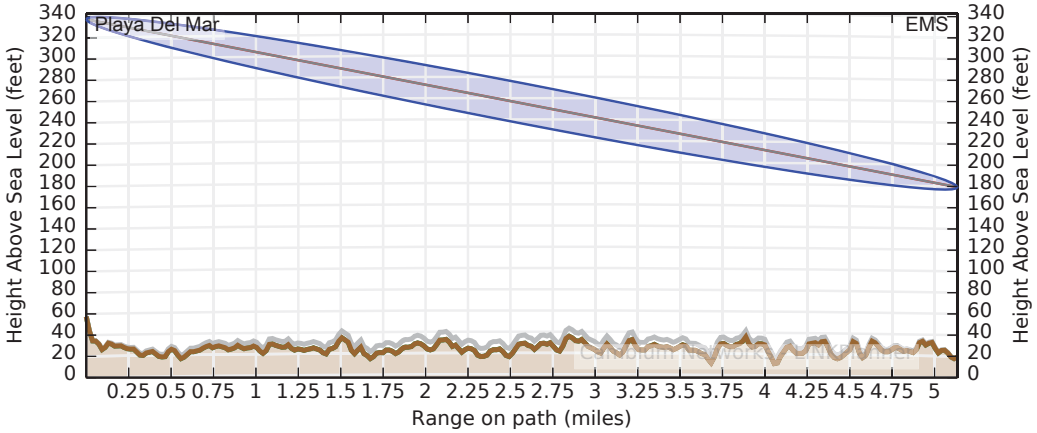
Playa Del Mar to EMS



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 280 ft

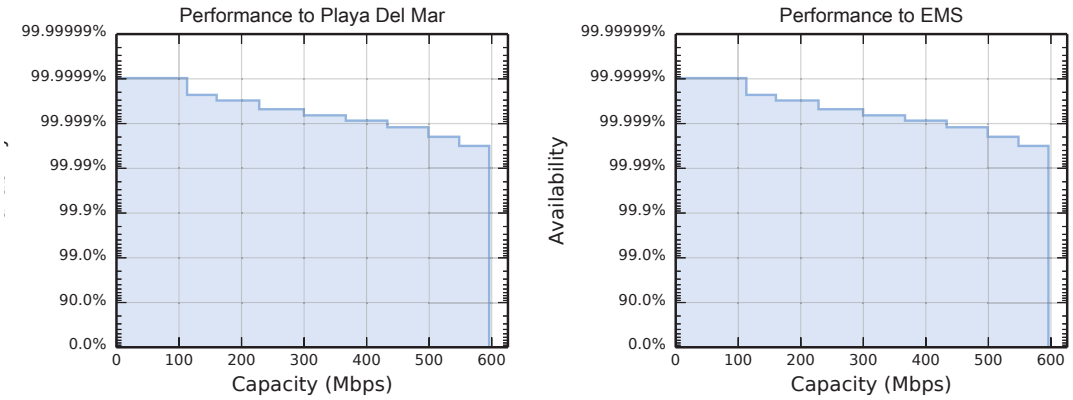
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 160 ft



	Performance to Playa Del Mar	Performance to EMS
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9998 % for 150.0 Mbps	99.9998 % for 150.0 Mbps

Link Summary			
Link Length	5.134 mi.	System Gain Margin	54.17 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	30 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	131.93 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-205.10 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.66 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.01e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	8.24e-04	Rain Availability	99.9999 %
Path inclination	5.83 mr	Rain Unavailability	30 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.27 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	131.77 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.16 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

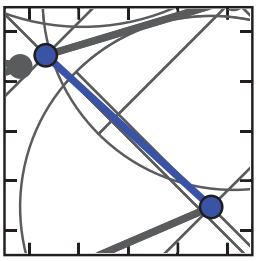
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

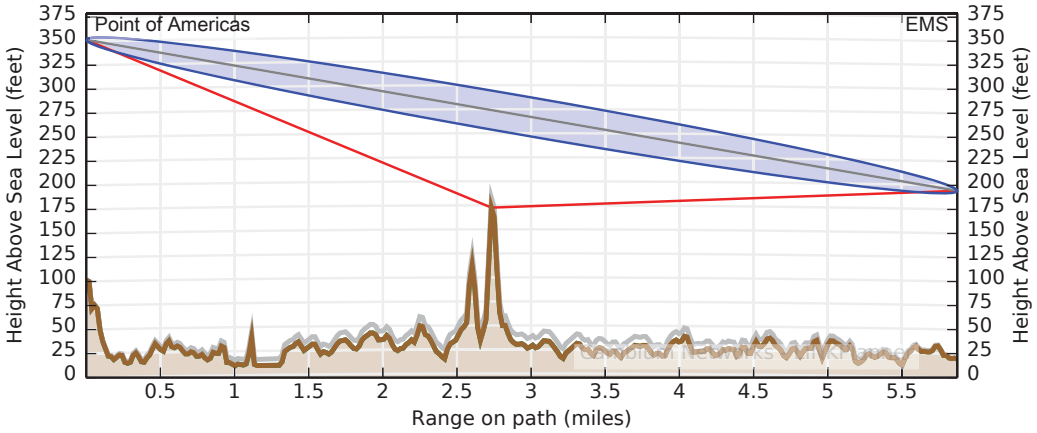
Point of Americas to EMS



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 250 ft

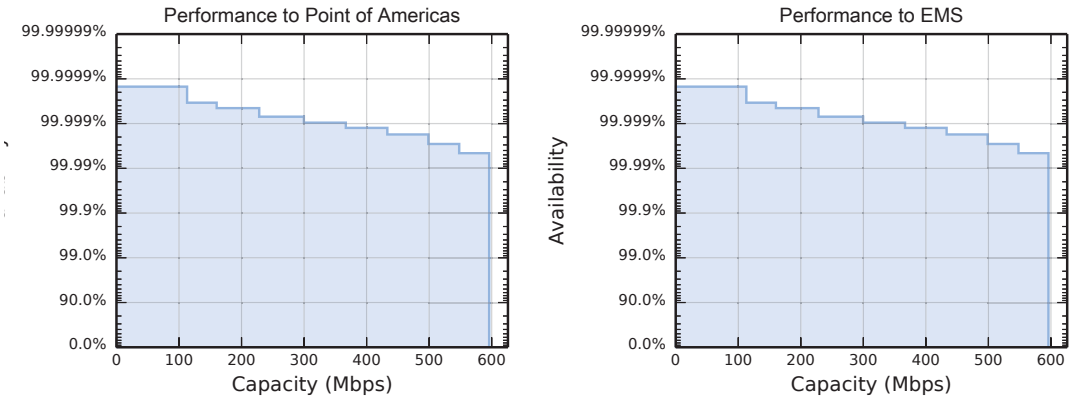
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 175 ft



	Performance to Point of Americas	Performance to EMS
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 1.0 Mbps	99.9999 % for 1.0 Mbps

Link Summary			
Link Length	5.874 mi.	System Gain Margin	52.97 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9998 %
Modulation	Adaptive	Annual Link Unavailability	47 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	133.13 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-205.28 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.50 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.07e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	1.44e-03	Rain Availability	99.9999 %
Path inclination	5.07 mr	Rain Unavailability	47 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.36 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	132.94 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.18 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

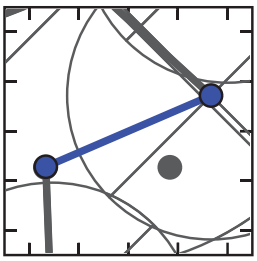
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	6	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

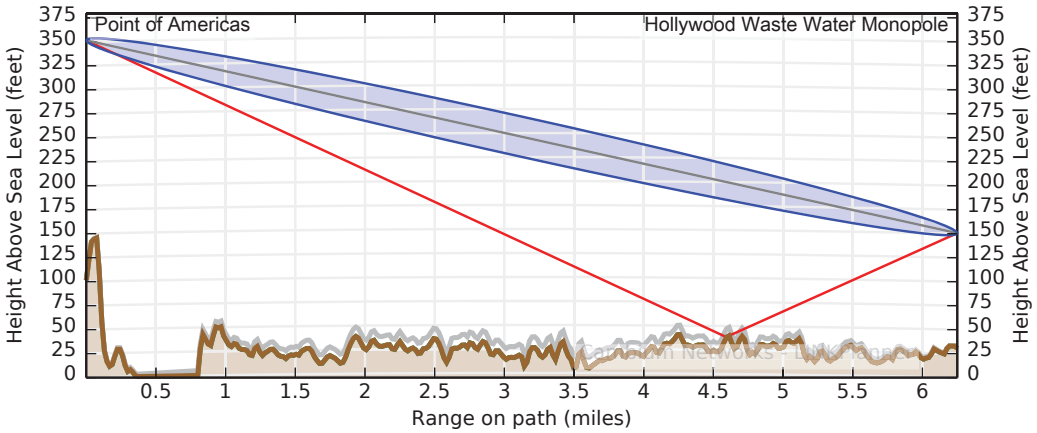
Point of Americas to Hollywood Waste Water Monopole



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 250 ft

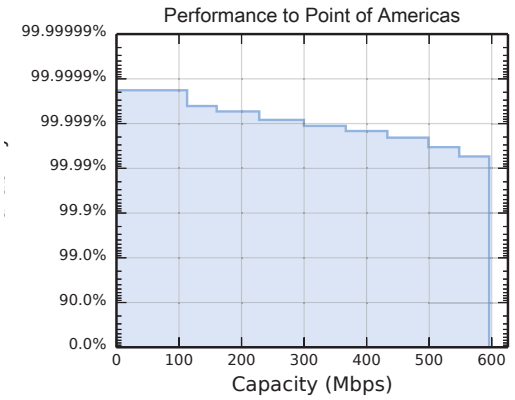
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 120 ft

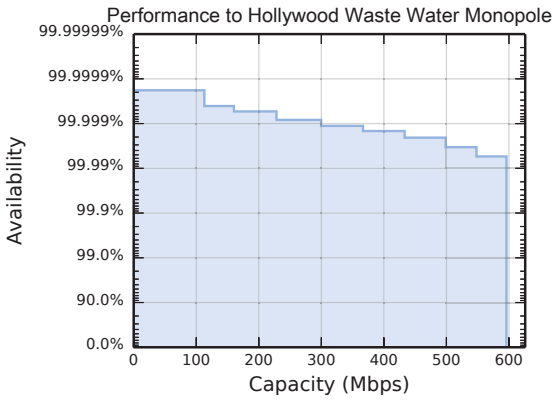


	Performance to Point of Americas	Performance to Hollywood Waste Water Monopole
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9998 % for 100.0 Mbps	99.9998 % for 100.0 Mbps

Link Summary			
Link Length	6.250 mi.	System Gain Margin	52.42 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9998 %
Modulation	Adaptive	Annual Link Unavailability	57 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	133.68 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts





Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-205.99 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.31 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.16e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	1.59e-03	Rain Availability	99.9998 %
Path inclination	6.09 mr	Rain Unavailability	57 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.50 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	133.48 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.19 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

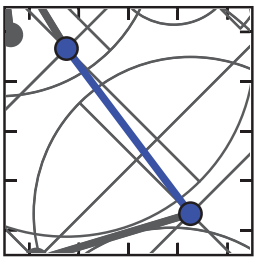
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

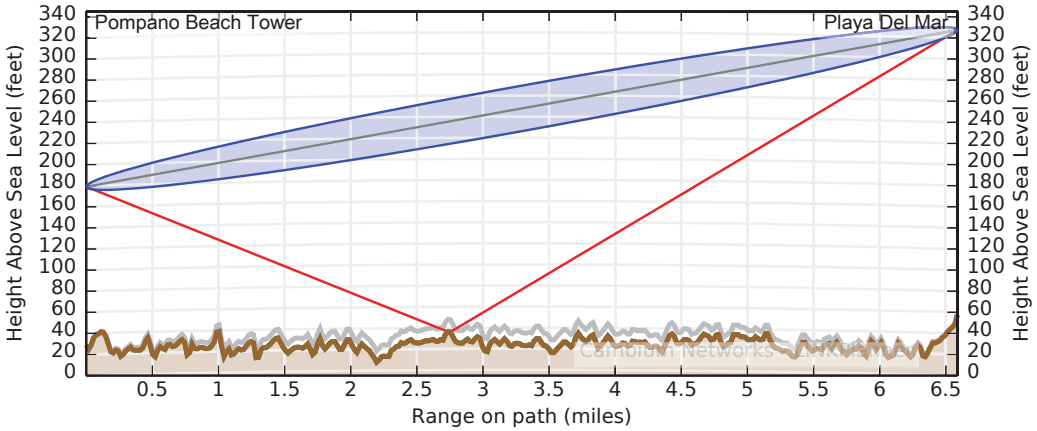
Pompano Beach Tower to Playa Del Mar



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 150 ft

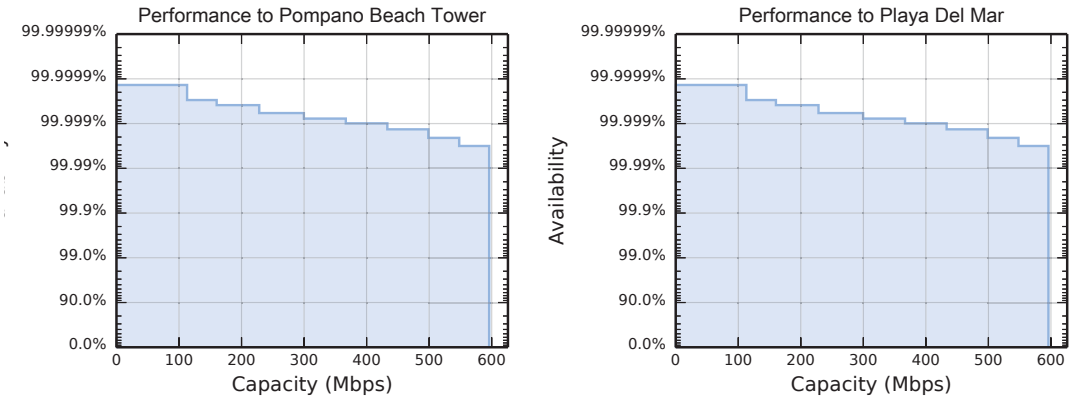
Cambium Networks 4ft Single Pol (NA & CALA Only) N110082D100 - Direct @ 270 ft



	Performance to Pompano Beach Tower	Performance to Playa Del Mar
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 1.0 Mbps	99.9999 % for 1.0 Mbps

Link Summary			
Link Length	6.587 mi.	System Gain Margin	56.96 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9999 %
Modulation	Adaptive	Annual Link Unavailability	43 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	134.14 dB	Prediction Model	ITU-R
System Gain	191.10 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-204.73 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.86 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	2.94e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	2.30e-03	Rain Availability	99.9999 %
Path inclination	4.27 mr	Rain Unavailability	43 secs/year
Value of K Exceeded for 99.99% (ke)	0.42	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.14 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	133.94 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.20 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

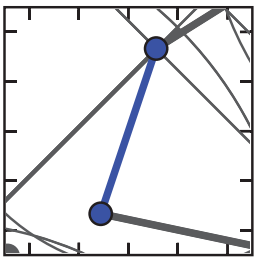
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D100	2	PTP 820 4' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Cambium Networks

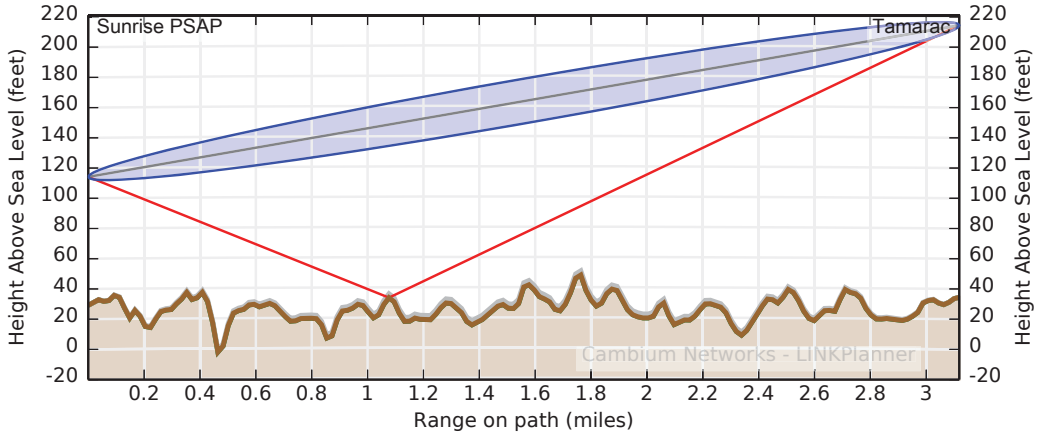
Sunrise PSAP to Tamarac



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 85 ft

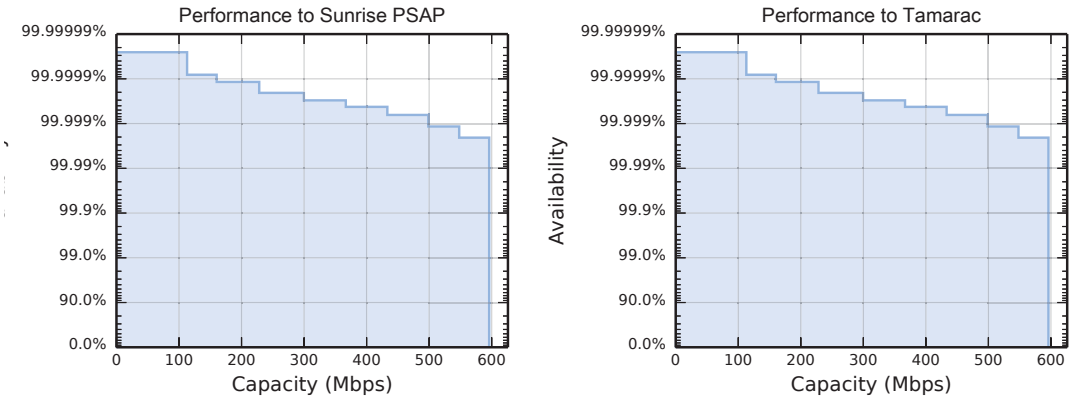
Cambium Networks 2ft Single Pol (Global)
N110082D072 - Direct @ 180 ft



	Performance to Sunrise PSAP	Performance to Tamarac
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9999 % for 150.0 Mbps	99.9999 % for 150.0 Mbps

Link Summary			
Link Length	3.118 mi.	System Gain Margin	51.10 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	100.0000 %
Modulation	Adaptive	Annual Link Unavailability	8 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	127.54 dB	Prediction Model	ITU-R
System Gain	178.64 dB		

Performance Charts



Climatic Factors, Losses and Standards

dN/dH not exceeded for 1% of time	-217.14 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.67 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.27e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	1.82e-04	Rain Availability	100.0000 %
Path inclination	6.09 mr	Rain Unavailability	8 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.56 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	127.44 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.10 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

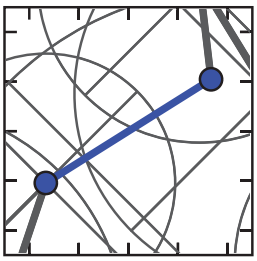
Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D072	2	PTP 820 2' ANT,SP,11GHz,RFU-C TYPE&Std UBR100 - Andrew. Available in all regions

Cambium Networks

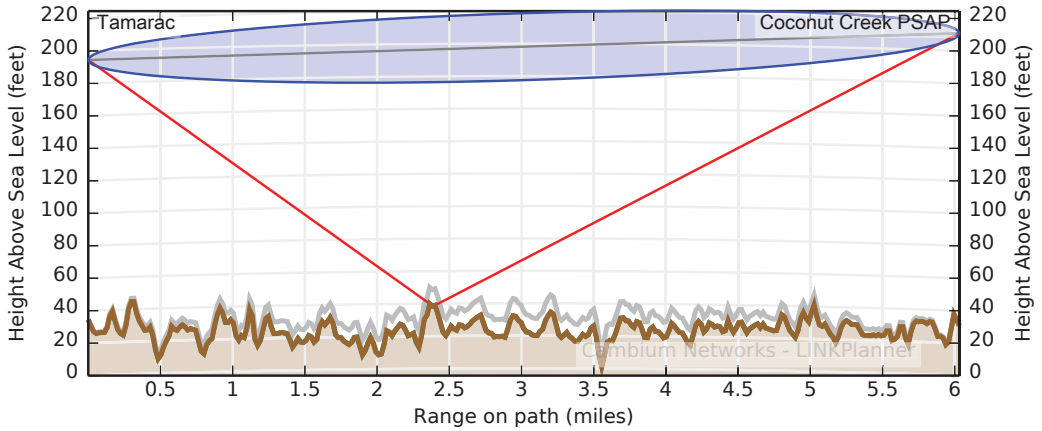
Tamarac to Coconut Creek PSAP



Equipment: Cambium Networks PTP11820S (Wide) - 1+0

Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 160 ft

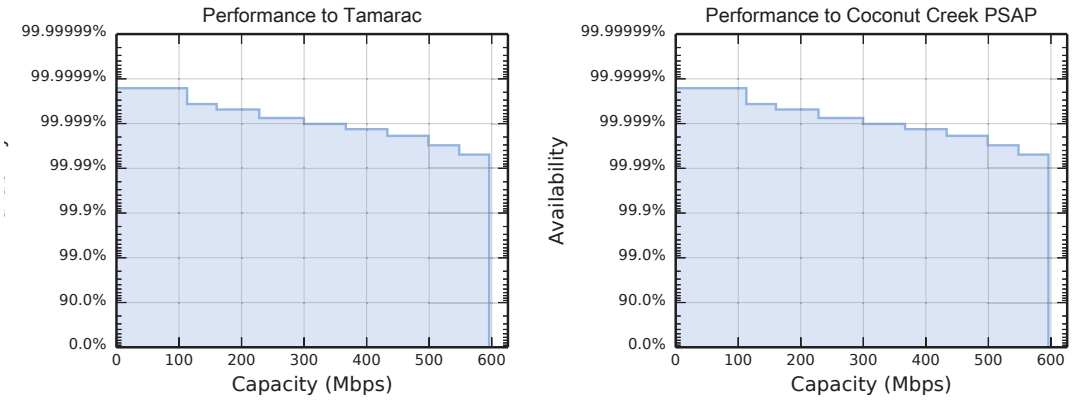
Cambium Networks 3ft Single Pol (NA & CALA Only) N110082D098 - Direct @ 180 ft



	Performance to Tamarac	Performance to Coconut Creek PSAP
Mean IP	596.0 Mbps	596.0 Mbps
IP Availability	99.9998 % for 1.0 Mbps	99.9998 % for 1.0 Mbps

Link Summary			
Link Length	6.031 mi.	System Gain Margin	52.74 dB
Band	11 GHz	Mean Aggregate Data Rate	1191.9 Mbps
Regulation	FCC	Annual Link Availability	99.9998 %
Modulation	Adaptive	Annual Link Unavailability	52 secs/year
Bandwidth	80 MHz	Frame Size	1518 Bytes
Total Path Loss	133.36 dB	Prediction Model	ITU-R
System Gain	186.10 dB		

Performance Charts



Climatic Factors, Losses and Standards			
dN/dH not exceeded for 1% of time	-213.24 N units/km	Excess Path Loss	0.00 dB
Area roughness 110x110km	3.94 metre	Annual 2-way Availability	100.0000 %
Geoclimatic factor	3.09e-04	Annual 2-way Unavailability	0 secs/year
Fade Occurrence Factor (P0)	6.04e-03	Rain Availability	99.9998 %
Path inclination	0.52 mr	Rain Unavailability	51 secs/year
Value of K Exceeded for 99.99% (ke)	0.40	Atmospheric Gasses	ITU-R P.676-7, ITU-R P.835-4
Excess Path Loss at ke	0.00 dB	Diffraction Loss	ITU-R P.526-10
0.01% Rain rate	88.33 mm/hr	Propagation	ITU-R P.530-12
Free Space Path Loss	133.17 dB	Rain Rate	ITU-R P.837-5
Gaseous Absorption Loss	0.19 dB	Refractivity Index	ITU-R P.453-9
Profile Type	Line-of-Sight		

Bill of Materials

Part Number	Qty	Description
(no part number)	2	Unspecified 11 GHz ODU (invalid TX frequency selection). Please select a TX frequency
C000000L033	4	Gigabit Surge Suppressor (56V)
N000065L001	2	PTP 650 AC Power Injector
N000065L003	2	US Line Cord Fig 8
N000082L014	2	PTP 820 Glands_x5_KIT
N000082L016	2	PTP 820 CAT5E Outdoor 100m drum
N000082L017	5	PTP 820 Grounding Kit for CAT5e F/UTP 8mm cable. Add 2 additional kits per PoE Injector that is installed outdoors
N000082L033	2	PTP 820S Act.Key - Capacity 500M with ACM Enabled, per Tx Chan

Bill of Materials (continued)		
Part Number	Qty	Description
N000082L073	2	PTP 820 GBE_Connector_kit
N000082L116	2	PTP 820 GROUND CABLE FOR IDU and ODU
N110082D098	2	PTP 820 3' ANT,SP,11GHz,RFU-C TYPE&UBR100 - Radiowave. Only available for order in North America and CALA regions

Exhibit A-7 - Broward FSA System Interface Control Document

Element #	Element Name	I/O #	Element location	Interface Type	From	To	Interface Protocol	Interface notes
1	Primary FireNet radio/interface	1	Sunrise PSAP	CAT6	Primary router Eth9	FireNet radio E	IP L2	PoE injector
2	Primary CAD Interface	2	Sunrise PSAP	CAT6	Primary router Eth0	PSI Net Switch 'N' Port "M"	XML, HTTP	Primary CAD Interface: 2-way XML I/O
		3	Sunrise PSAP	CAT6	Primary router Eth8	PSI Net Switch 'N' Port "M"	XML, HTTP	HTTP if PSI supports
5	USDD Primary Comms Gateway A	4	Sunrise PSAP	CAT6	Primary router Eth10	USDD CGA Eth0	TCP, UDP, HTTP, SSL, XML	
6	USDD Primary Comms Gateway B	5	Sunrise PSAP	CAT6	Primary router Eth 1	USDD CGB Eth0	TCP, UDP, HTTP, SSL, XML	
7	USDD Primary GaRI	6	Sunrise PSAP	CAT6	Primary router Eth2	Primary GaRI Eth0	TCP, UDP	GaRI may be remoted
		7	Sunrise PSAP	CAT6	Primary router Eth11	Primary GaRI Eth1	TCP, UDP	GaRI may be remoted
		8	Sunrise PSAP	Audio/Sig.	Primary GaRI R1	Primary Motorola Radio	COR. PTT	GaRI may be remoted
9	Secondary FireNet radio/interface	9	Coconut PSAP	CAT6	Secondary router Eth9	FireNet radio E	IP L2	PoE injector
10	Secondary CAD Interface	10	Coconut PSAP	CAT6	Secondary router Eth0	PSI Net Switch 'N' Port "M"	XML, HTTP	Secondary CAD Interface: 2-way XML I/O
11		11	Coconut PSAP	CAT6	Secondary router Eth8	PSI Net Switch 'N' Port "M"	XML, HTTP	if PSI supports,
12	USDD Secondary Comms Gateway A	12	Coconut PSAP	CAT6	Secondary router Eth10	USDD CGA Eth0	TCP, UDP, HTTP, SSL, XML	
13	USDD Secondary Comms Gateway B	13	Coconut PSAP	CAT6	Secondary router Eth 1	USDD CGB Eth0	TCP, UDP, HTTP, SSL, XML	
14	USDD Secondary GaRI	14	Coconut PSAP	CAT6	Secondary router Eth2	Secondary GaRI Eth0	TCP, UDP	GaRI may be remoted
15		15	Coconut PSAP	CAT6	Secondary router Eth11	Secondary GaRI Eth1	TCP, UDP	GaRI may be remoted
16		16	Coconut PSAP	Audio/Sig.	Secondary GaRI R1	Secondary Motorola Radio	COR. PTT	GaRI may be remoted
17	FireNet Microwave Radio 1	17	Site 3	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	

18	FireNet Microwave Radio 2	18	Site 3	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
19	FireNet CMM	19	Site 3	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
20	FireNet AP1	20	Site 3	CAT6, outdoor	CMM P1	AP1	IP L2	
21	FireNet AP2	21	Site 3	CAT6, outdoor	CMM P2	AP2	IP L2	
22	FireNet AP3	22	Site 3	CAT6, outdoor	CMM P3	AP3	IP L2	
23	FireNet AP4	23	Site 3	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
25	(if equipped) GE Base Station RF Tx	24	Site 3	CAT6	Site Router Eth1	GE Base Station Eth0	UDP, TCP, SNMP	UDP/TCP for transport and remote access, SNMP
28	FireNet Microwave Radio 1	25	Site 4	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
29	FireNet Microwave Radio 2	26	Site 4	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
30	FireNet CMM	27	Site 4	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
31	FireNet AP1	28	Site 4	CAT6, outdoor	CMM P1	AP1	IP L2	
32	FireNet AP2	29	Site 4	CAT6, outdoor	CMM P2	AP2	IP L2	
33	FireNet AP3	30	Site 4	CAT6, outdoor	CMM P3	AP3	IP L2	
34	FireNet AP4	31	Site 4	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
36	(if equipped) GE Base Station RF Tx	32	Site 4	CAT6	Site Router Eth1	GE Base Station Eth0	UDP, TCP, SNMP	UDP/TCP for transport and remote access, SNMP
39	FireNet Microwave Radio 1	33	Site 5	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
40	FireNet Microwave Radio 2	34	Site 5	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
41	FireNet CMM	35	Site 5	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
42	FireNet AP1	36	Site 5	CAT6, outdoor	CMM P1	AP1	IP L2	
43	FireNet AP2	37	Site 5	CAT6, outdoor	CMM P2	AP2	IP L2	

44	FireNet AP3	38	Site 5	CAT6, outdoor	CMM P3	AP3	IP L2	
45	FireNet AP4	39	Site 5	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
47	(if equipped) GE Base Station RF Tx	40	Site 5	CAT6	Site Router Eth1	GE Base Station Eth0	UDP, TCP, SNMP	UDP/TCP for transport and remote access, SNMP
50	FireNet Microwave Radio 1	41	Site 6	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
51	FireNet Microwave Radio 2	42	Site 6	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
52	FireNet CMM	43	Site 6	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
53	FireNet AP1	44	Site 6	CAT6, outdoor	CMM P1	AP1	IP L2	
54	FireNet AP2	45	Site 6	CAT6, outdoor	CMM P2	AP2	IP L2	
55	FireNet AP3	46	Site 6	CAT6, outdoor	CMM P3	AP3	IP L2	
56	FireNet AP4	47	Site 6	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
58	(if equipped) GE Base Station RF Tx	48	Site 6	CAT6	Site Router Eth1	GE Base Station Eth0	UDP, TCP, SNMP	UDP/TCP for transport and remote access, SNMP
61	FireNet Microwave Radio 1	49	Site 7	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
62	FireNet Microwave Radio 2	50	Site 7	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
63	FireNet CMM	51	Site 7	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
64	FireNet AP1	52	Site 7	CAT6, outdoor	CMM P1	AP1	IP L2	
65	FireNet AP2	53	Site 7	CAT6, outdoor	CMM P2	AP2	IP L2	
66	FireNet AP3	54	Site 7	CAT6, outdoor	CMM P3	AP3	IP L2	
67	FireNet AP4	55	Site 7	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
69	FireNet Microwave Radio 1	56	Site 8	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	

70	FireNet Microwave Radio 2	57	Site 8	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
71	FireNet CMM	58	Site 8	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
72	FireNet AP1	59	Site 8	CAT6, outdoor	CMM P1	AP1	IP L2	
73	FireNet AP2	60	Site 8	CAT6, outdoor	CMM P2	AP2	IP L2	
74	FireNet AP3	61	Site 8	CAT6, outdoor	CMM P3	AP3	IP L2	
75	FireNet AP4	62	Site 8	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
77	FireNet Microwave Radio 1	63	Site 9	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
78	FireNet Microwave Radio 2	64	Site 9	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
79	FireNet CMM	65	Site 9	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
80	FireNet AP1	66	Site 9	CAT6, outdoor	CMM P1	AP1	IP L2	
81	FireNet AP2	67	Site 9	CAT6, outdoor	CMM P2	AP2	IP L2	
82	FireNet AP3	68	Site 9	CAT6, outdoor	CMM P3	AP3	IP L2	
83	FireNet AP4	69	Site 9	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
85	FireNet Microwave Radio 1	70	Site 10	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
86	FireNet Microwave Radio 2	71	Site 10	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
87	FireNet CMM	72	Site 10	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
88	FireNet AP1	73	Site 10	CAT6, outdoor	CMM P1	AP1	IP L2	
89	FireNet AP2	74	Site 10	CAT6, outdoor	CMM P2	AP2	IP L2	
90	FireNet AP3	75	Site 10	CAT6, outdoor	CMM P3	AP3	IP L2	
91	FireNet AP4	76	Site 10	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
93	FireNet Microwave Radio 1	77	Site 11	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	

94	FireNet Microwave Radio 2	78	Site 11	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
95	FireNet CMM	79	Site 11	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
96	FireNet AP1	80	Site 11	CAT6, outdoor	CMM P1	AP1	IP L2	
97	FireNet AP2	81	Site 11	CAT6, outdoor	CMM P2	AP2	IP L2	
98	FireNet AP3	82	Site 11	CAT6, outdoor	CMM P3	AP3	IP L2	
99	FireNet AP4	83	Site 11	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
101	FireNet Microwave Radio 1	84	Site 12	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
102	FireNet Microwave Radio 2	85	Site 12	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
103	FireNet CMM	86	Site 12	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
104	FireNet AP1	87	Site 12	CAT6, outdoor	CMM P1	AP1	IP L2	
105	FireNet AP2	88	Site 12	CAT6, outdoor	CMM P2	AP2	IP L2	
106	FireNet AP3	89	Site 12	CAT6, outdoor	CMM P3	AP3	IP L2	
107	FireNet AP4	90	Site 12	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
109	FireNet Microwave Radio 1	91	Site 13	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
110	FireNet Microwave Radio 2	92	Site 13	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
111	FireNet CMM	93	Site 13	CAT6, outdoor	CMM P0	Site Router Eth1	IP L2	
112	FireNet AP1	94	Site 13	CAT6, outdoor	CMM P1	AP1	IP L2	
113	FireNet AP2	95	Site 13	CAT6, outdoor	CMM P2	AP2	IP L2	
114	FireNet AP3	96	Site 13	CAT6, outdoor	CMM P3	AP3	IP L2	
115	FireNet AP4	97	Site 13	CAT6, outdoor	CMM P4	AP4	IP L2	Strategic Sites may add AP5, AP6
117	FireNet Microwave Radio 1	98	Site 14	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	

118	FireNet Microwave Radio 2	99	Site 14	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
120	FireNet Microwave Radio 1	100	Site 15	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
121	FireNet Microwave Radio 2	101	Site 15	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
123	FireNet Microwave Radio 1	102	Site 16	CAT6, outdoor	Site radio 1	Site Router Eth0	IP L2	
124	FireNet Microwave Radio 2	103	Site 16	CAT6, outdoor	Site radio 2	Site Router Eth9	IP L2	
126	Station ATX Controller	104	Each Fire Station	CAT6	FireNet Subscriber	ATX Eth0	UPD, TCP	
127	GE Subscriber radio	105	Each Fire Station	RS-232, custom	GE Orbit	ATX Ser0	Serial Async	
128	Motorola APX-1500	106	Each Fire Station	Audio/Sig.	APX	ATX Aud1	Audio	Receive-only audio
129	NetMgr1	107	Unknown1	CAT6	Etho	Site Router Ethn	TCP, SNMP	
130	NetMgr2	108	Unknown1	CAT6	Etho	Site Router Ethn	TCP, SNMP	
	Notes:	1. Assumes 16 sites microwave to include 2 dispatch locations 11 sites Point-to-Multipoint AP's, 4 sites GE base stations						

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Exhibit B – Payment Schedule

The rates specified below shall be in effect for the entire term of the Agreement, including any renewal term, unless the contrary is expressly stated below. Any goods or services required under this Agreement for which no specific fee or cost is expressly stated in this Payment Schedule shall be deemed to be included, at no extra cost, within the costs and fees expressly provided for in this Exhibit B.

System Implementation Fees (inclusive of all Services and Core System Equipment other than Contingency Equipment, Required Spares, and Subcontractor Pass-Thru Fees, each as expressly defined in Exhibit A-1 and below and subject to the applicable not-to-exceeds):

Milestone payments shall only be invoiced upon written notice of preliminary acceptance of the Milestone Deliverables by County Contract Administrator.

Milestone No.	Description	% of Total System Cost	Milestone Payment
1	Kick Off Meeting	15%	$200,833
2	Final Design approved by County	30%	$401,665
3	Staging Acceptance testing completed	5%	$66,944
4	Equipment Delivered to location in Broward County	10%	$133,888
5	Installation of Equipment Complete	10%	$133,888
6	Commencement of Final Acceptance Testing	10%	$133,888
7	Final Acceptance	20%	$267,777
TOTAL			**$1,338,884**

Contingency Equipment:
Per pricing stated on Exhibit A-1, subject to not-to-exceed amount set forth in Section 5.1. Invoiced simultaneously with the invoicing for Milestone 4.

Additional Spares:
Per pricing stated on Exhibit A-1, subject to not-to-exceed amount set forth in Section 5.1. Invoiced simultaneously with the invoicing for Milestone 4

Subcontractor Pass-Thru Services Fees

Subcontractor	Scope	Not to Exceed
Pate Engineering	Tower analysis, tower mapping/climb	$65,000
Motorola Solutions, LLC	CAD API and Integration	$74,958
Kirms Communications LLC	Crane Work	$25,000
Lakdas/Yohalem Engineering, Inc.	Permit Exhibits, including professional engineering, surveying, site planning	$40,000
Applicable municipalities or local governments	Permit fees to municipalities	$40,000

Subcontractor fees shall be invoiced and paid only on a pass-thru basis, with no markup or added charges by Provider. The applicable subcontractor amounts shall be invoiced to County as incurred by Provider subject to prior written approval by County Contract Administrator.

Support and Maintenance Services

Specific Support and Maintenance Services	Unit or Term	Invoicing	Annual Fee
Support and Maintenance Services per Exhibit C	Year One after Final Acceptance	N/A	No additional charge
Support and Maintenance Services per Exhibit C	Annually commencing Year Two after Final Acceptance	Quarterly in arrears	$249,743/annually

Any travel expenses or fees incurred by Provider under this Agreement shall be the sole responsibility of Provider, unless otherwise expressly stated in this Agreement or applicable Work Authorization.

Optional Services Rates

Description	Unit/Term	Invoicing	Fee
Apprentice Electrician	Hourly	Monthly in arrears	$58/hour
Journeyman Electrician	Hourly	Monthly in arrears	$75/hour

Master Electrician	Hourly	Monthly in arrears	$95/hour
Electronics Technician	Hourly	Monthly in arrears	$105/hour
Consultant/Engineer	Hourly	Monthly in arrears	$195/hour
USDD Development	Hourly	Monthly in arrears	$300/hour
Additional Training - KL-TR1 FSA System Overview Class	Training Class	Monthly in arrears	$1,466.67 plus travel/expenses subject to Fla. Stat. § 112.061
Additional Training - KL-TR1 FSA System Overview Class	Training Class	Monthly in arrears	$4,800 plus travel/expenses subject to Fla. Stat. § 112.061
Additional Training - KL-TR1 FSA System Overview Class	Training Class	Monthly in arrears	$9,600 plus travel/expenses subject to Fla. Stat. § 112.061
Additional Optional Services or Equipment as set forth in Exhibit A	Per unit/project	Upon completion of Work Authorization	Per Exhibit A

The Support and Maintenance Services Fees and the Optional Services Rates shall not increase for the first two (2) years following Final Acceptance. For time periods thereafter, Provider may increase its fees on an annual basis with at least ninety (90) days' advance written notice to County, provided that such increase per annum shall not exceed the lesser of 3% or CPI. The increase or decrease in CPI shall be calculated as follows: the difference of CPI current period less CPI previous period, divided by CPI previous period, times 100. The CPI current period shall mean the most recent published monthly index prior to contract anniversary. The CPI previous period shall mean for the same month of the prior year. All CPI indices shall be obtained from the U.S. Department of Labor table for Consumer Price Index - All Urban Consumers (CPI-U): US city average, with a base period of 1982-84 = 100, and not seasonally adjusted.

Additional Equipment

County may purchase any additional equipment from Provider, including without limitation any USDD listed equipment, in accordance with the pricing below in Exhibit A (if listed) or 10% discount on the then-current manufacturer listed pricing, whichever is less.

Exhibit C - Support and Maintenance Services

Provider shall provide "bumper to bumper" support on both Equipment and Software in the System for all time periods for which County elects to continue Support and Maintenance Services. This includes repair of hardware defects, software updates and maintenance, remote support via telephone and VPN access curing normal business hours, and 24/7/365 support for the System Administrator in the event of a mission critical failure. The only items not covered under the Service Agreement are UPS batteries and any components used with the System provided by the customer (i.e., existing speakers, customer provided laptops, tablets, tvs, etc.).

Provider shall provide County with notice of any updated or newer versions of firmware or software, and County shall have the sole discretion as to whether or not to update the Equipment or System. Provider will specifically notify County to the extent any updated firmware or software addresses defects or security issues.

All components of the System including repairs and replacements shall be backward compatible with prior components and under current support by the manufacturer at issue (i.e., not out of support). In the event any component of the System fails or suffers and Event during a period of Support and Maintenance Services, Provider will replace the component at no cost to County.

1.1. MAINTENANCE GENERALLY

Provider shall maintain and repair all systems, equipment, hardware, and software throughout the implementation, migration, and warranty periods. The County reserves the right to have technical staff on-site to witness, and if desired, assist in the maintenance and troubleshooting procedures. This does not relieve the Provider from its warranty and maintenance responsibilities as defined in this Exhibit.

The approach to maintenance of this system shall be one of preventive maintenance. The equipment comprising the System was designed for extremely low maintenance, and Provider has designed the System so that only minimal routine maintenance is required (e.g., monitoring batteries for UPS and dusting/cleaning the outside of the components). Provider shall ensure all Equipment is maintained in a clean condition, including oil, dust and other foreign substances shall be removed by Provider on a routine basis.

In addition to preventive maintenance, comprehensive maintenance services shall be provided for the System. Support and Maintenance Services for the System covers not only the initial warranty period, but also for the duration of time for which County has requested Support and Maintenance Services. Provider's system components are network appliances, with hardware and software closely intertwined. Provider's Support and Maintenance Services covers all Software and Equipment that comprise the System.

Non-critical repair needs or system change requests shall be prioritized by severity and ordered by priority and time of call. Enhancement requests are reviewed and if approved (for requests that are to become part of the main product) can usually be completed within 1 week, depending on current workload.

1.2. SUPPORT SERVICES AND PROCEDURES

Provider will perform the following services as part of Support and Maintenance Services:

a. Monitor the County's system 24/7/365 via a remote access system to identify system alarms, remotely resolve issues, and dispatch the appropriate personnel to respond on-site.
b. Continuously receive and respond to technical service requests from the County or the Provider's maintenance personnel.
c. Open a case and gather information from the County to characterize the issue, determine a plan of action and assign and track the case to resolution

Provider's telephone and remote access support is provided by Software and Hardware Engineers and field support and maintenance. Calls for service shall be handled directly by personnel skilled with the System operation and maintenance, and are usually the personnel involved in the Customer's system implementation.

Calls for service shall initially be answered by a customer service representative who will collect and log the Customer's information and determine the best Provider associate to handle the incident. The call will be passed on to the associate directly through a transfer or via electronic means. The responsible associate will then call back the customer to handle the incident.

Provider's technicians shall be able to access County sites using VPN remote access to assess and provide support, when an Event can be resolved remotely.

Email support questions will be generally answered within minutes, but in no event is more than one business day. Provider will attempt to respond to telephone support questions in a similar timeframe, but the 2-way nature of a telephone call can sometimes require dedicated support that will take longer.

All Software shall be either shipped with the Equipment from Provider or uploaded by Provider during maintenance. No files can be transferred onto either the Communications Gateways or the Station Controllers except for software images installed by technical personnel and these must be transferred via an authenticated and encrypted (ssh) connection. The Station Controllers and Communications Gateways operate on a custom Linux kernel-based operating system specifically configured for this application. The applications do not have any general purpose services installed, and any installed services that are do not need to be accessed from outside the system are specifically prevented from any network access. If a virus or malware adversely

impacts the Fire Station Alerting System, Provider shall respond to the event in accordance with the response and resolution times in this contract.

1.3. REPLACEMENT PARTS AND PARTS AVAILABILITY

Replacement parts used in repairs shall be equal in quality and ratings to the original parts. If any Equipment or module fails more than twice during the acceptance test or twice during any 12 month period, the Provider shall meet with the County to discuss and explain such failures. If, in the opinion of the County, these failures indicate that the equipment is potentially prone to continuing failures, Provider shall replace it at no cost to the County. Replacement or repair of failed hardware at no charge is covered throughout the duration of Support and Maintenance Services.

From the date of final production to the seventh anniversary of the date after final production, Provider shall maintain replacement parts (original or equivalent) for all delivered equipment. In the event of a component failure for which the component is no longer manufactured, Provider shall offer a functionally equivalent component that is backward compatible with the remaining original system components.

In the event that the Provider plans to discontinue stocking any part required for maintenance after the seventh anniversary of acceptance, the Provider shall send written notice to the County 24 months prior to the date of discontinuance, to allow for last-time buys and replenishment.

All parts ordered on a priority basis shall be shipped for next-business-day delivery after placing an order. Provider shall provide year round, 24-hour ordering facilities via telephone, Internet, email and fax service.

1.4. SCOPE OF SUPPORT AND MAINTENANCE SERVICES

Provider shall provide County with Support and Maintenance Services so as to ensure and maintain optimal performance of the System consistent with the Statement of Work and the Documentation, which service shall include the following:

- Timely response and resolution of any errors, defects, malfunctions or other issues affecting the use or performance of the System (collectively, "Events") in keeping with the Required Response Times stated below;
- Providing and facilitating the installation of updates, upgrades and releases as they are made available to Provider's other clients;
- Notification of patches and updates affecting security, and applying, testing, and validating the appropriate patches and updates and/or workarounds on a test version of the application before distribution.

- On-call availability via telephone and e-mail during normal business hours to receive and respond to inquiries or questions from County regarding use, operation, or functionality of the System;
- Emergency availability via telephone and e-mail after hours to receive and respond to specific technical problems and questions relating to the operation or functionality of the System;
- Use of ongoing best efforts to maintain the optimal functioning of the Software, to correct programming and coding errors, and to provide solutions to known errors affecting the operation of the System;
- Routine notification to County as it becomes available of new or updated information pertaining to the System and the Documentation.

1.5. SUPPORT AND MAINTENANCE STANDARDS

Provider will be available for support and services requests through a toll-free telephone number, SMS, or email, available 24 hours a day, 7 days a week, 365 days a year (24 x 7 x 365). Provider will provide the toll-free telephone number and email to County prior to the commencement of Final Acceptance testing. Emails or SMS messages generated automatically by system monitoring applications shall constitute a request for support and services, subject to the contracted priorities and response times defined below in the Required Response and Resolution Times section. Provider will provide support and maintenance services consistent with this Exhibit on a 24/7/365 basis with no additional charges for work outside of normal business hours.

Support and Maintenance Services for the System will be is provided by Provider utilizing appropriate trained software and hardware engineers and field support and maintenance technicians. Calls for service shall be handled by Provider personal skilled with the System operation and maintenance, and are usually the personnel involved in the County's system implementation.

For fixed onsite maintenance, if Provider is unable to resolve the problem through telephone consultation, Provider staff will dispatch the proper technician in the Required Response Time to resolve the problem. If a system experiences a catastrophic failure and remote diagnostics will not suffice, Provider will provide on-site service within the Required Response Times. In all events, Provider shall ensure prompt service, with service personnel responding to the service request and arriving on-site when necessary to resolve the Event within the Required Response Times and resolving the issue within the Required Resolution Times set forth below.

Provider shall maintain and repair the System including all Equipment, Software, and any related hardware, including throughout the implementation, migration, and warranty periods, as well as for the duration of Support and Maintenance Services requested by the County. The County

reserves the right to have technical staff on-site to witness, and if desired, assist in the maintenance and troubleshooting procedures.

For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the Provider to track units to and from the factory/depot. Replacement parts shall be shipped immediately upon confirmation that the County's equipment has been shipped to the Provider.

Support and Maintenance Services shall be provided via telephone, electronic communication, on-site, or as otherwise appropriate to address the issue. Any update, upgrades, releases, or other modifications to the Software shall be provided via electronic communication and for download via the Internet, if practicable. To the extent necessary to resolve an Event or other support request, Provider shall provide support on-site at any office or location of a Broward County agency.

Provider agrees that its personnel shall be suitably trained in the operation, support and maintenance of the Software and System. If in the reasonable opinion of County, the personnel provided are not acceptable, Provider agrees to provide suitable replacements. Provider shall provide only factory-trained and -authorized maintenance personnel.

Required Response and Resolution Times. Upon notice by County of an Event, Provider shall address and resolve the Event consistent with the following priority, response and resolution levels for non-tower mounted equipment. Repairs for tower-mounted equipment are subject to tower crew availability.

Priority Description	Definition	Required Response Time After Notice	Required Resolution Time after Notice
Critical (Severity 1)	Major system failure or one or more fire stations offline. Examples include but are not limited to: Major system failure; Gateway Failure resulting in loss of Fire Station Alerting; Loss of CAD interface; IP-connectivity lost to one or more stations	2 hour on-site (unless resolved within 1 hour)	4 hours
Severe (Severity 2)	Event that results in a significant impairment of performance of the System or impairs essential operations or allows unauthorized access. Examples include but are not limited to: Significant system impairment; Failure of FSA alerting capability at one or more operator positions; System operating on backup	2 hours on-site during business hours, or 2 hours within the start of the next business day (unless resolved within 2 hours)	24 hours for non-Cambium equipment, next-business-day for Cambium equipment

	controller; and System operating on backup wireless station		
Minor (Severity 3)	Event that has minor impact to County's business and that does not impact normal operation of the System (e.g., parts questions, upgrades, configuration change support). Examples include but are not limited to: Parts questions; Upgrades; Intermittent problems; Operation and informational questions; and Configuration change support and workflow procedure questions	Next business day	30 days

Notwithstanding the above-stated schedule, Provider shall use its continuing best efforts to correct the Event as expeditiously as it can. The Priority Description for each error or issue shall be reasonably determined by the Contract Administrator.

Records and Reports. Provider shall maintain records to confirm all services provided under this Exhibit have been done at intervals defined by the County. Provider shall track and monitor service requests from creation to close through an electronic case-tracking process, through which each request is assigned a case number. Provider will maintain records of its Support and Maintenance Services, which shall include at least the following:

a) Date, time, and name of contact for each Event;
b) Date and time of response by Provider;
c) Description of Event and analysis of error, defect, or other issue causing Event;
d) All steps and actions taken to resolve the Event;
e) If County-owned spares are used to complete the repair, the model and serial number of both the defective unit and the spare shall be recorded;
f) Date and time of resolution and County representative notified of resolution; and
g) All equipment and/or labor costs associated with resolution.

At the request of County, Provider shall provide monthly reports of the foregoing records as well as statistics of Provider's average monthly compliance with the Required Response Times.

Provider will also maintain and, at request of County, provide written documentation indicating the cause of each Event, the resolution, and all post-repair testing procedures to ensure proper operation. In the event County-owned spares are used to complete the repair, the model and serial number of both the defective unit and the spare should be noted in the documentation. For all equipment needing factory or depot repairs, a comprehensive tracking system shall be put in place by the Provider to track units to and from the factory/depot.

Failure to Meet Required Response Times. If Provider fails to meet the Required Response Times, County may offset against any sums due Provider $250 for each hour that Provider's average response time in the preceding month exceeds the Required Response Times, which the parties agree is a fair and reasonable approximation of County's negative financial impact caused by the delay in Provider's response.

DownTime Maintenance Credit. If a Critical Event caused by equipment Provided by the Provider is not resolved or reduced to Minor priority level within the required resolution times, Provider will refund to County five percent (5%) of the monthly fee (or monthly pro rata equivalent, if the fee is other than monthly) for Support and Maintenance Services for each additional business hour that the Event remains unresolved or at the Critical priority level. Such refunds will be paid within 10 days or, at County's option, may be credited against future sums due to Provider. The refund for any month shall not exceed the applicable pro rata monthly Support and Maintenance Services fee. This refund shall be in addition to any other remedy that is available in the event of a breach of the Agreement.

EXHIBIT D - Insurance Requirements

The following coverage is deemed the minimum insurance required for this project. The selected firm must be prepared to provide proof of insurance commensurate with or in excess of this requirement. Any deviation is subject to the approval of Risk Management.

TYPE OF INSURANCE	MINIMUM LIABILITY LIMITS		
		Each Occurrence	Aggregate
COMMERCIAL GENERAL LIABILITY **Broad form or equivalent** *Including coverage for:* [**x**] Premises–Operations [ ] Explosion, Collapse, Underground Hazards [**x**] Products/Completed Operations [**x**] Contractual Insurance [**x**] Independent Contractors [**x**] Personal Injury [ ] Other:	Bodily Injury		
	Property Damage		
	Combined single limit Bodily Injury & Property Damage	**$ 3 mil**	**$ 5 mil**
	Minimum limits:		
BUSINESS AUTO LIABILITY **COMPREHENSIVE FORM** *Including Coverage for:* [**x**] Owned [**x**] Hired [**x**] Non-owned [**x**] Any Auto	Bodily Injury (each person)		
	Bodily Injury (each accident)		
	Property Damage		
	Combined single limit Bodily Injury & Property Damage	**$ 1 mil**	
EXCESS/UMBRELLA LIABILITY *May be used to supplement minimum liability coverage requirements.*	Follow form basis or Add'l insd endorse-ment is required		
[**x**] **WORKERS' COMPENSATION**	Chapter 440 FS	**STATUTORY**	U.S. Longshoremen & Harbor Workers' Act & Jones Act is required for any activities on or about navigable water
[**x**] **EMPLOYERS' LIABILITY**	(each accident)	**$ 1mil / accident**	
[**X**] **PROFESSIONAL LIABILITY – E & O**	(each accident)	**$ 5 mil**	
	Extended coverage period	**4 years**	
[X] **CYBER LIABILITY**	(each accident)	**$ 1 mil**	
	Notified individuals aggregate	**$ 2 mil**	**$ 5 mil**

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES

BROWARD COUNTY IS LISTED AS AN ADDITIONAL INSURED ON THE GENERAL LIABILITY POLICY AND THE BUSINESS AUTOMOBILE LIABILITY POLICY. **INDICATE BID #,RLL, RFP, & Project Manager on COI**

REFERENCE: Fire Station Alerting System

CERTIFICATE HOLDER:

Broward County
115 S. Andrews Avenue
Ft. Lauderdale, Florida 33301
Attn: Jose DeZayas - OCT

Revised 2015

ELIZABETH PLASKA
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Risk Management Division

VALID FOR ONE YEAR FROM THE DATE OF SIGNATURE

Exhibit E – Work Authorization Form
WORK AUTHORIZATION FOR AGREEMENT _____

Contract Number: _____
Work Authorization No. _____

This Work Authorization is between Broward County and _____ ("Provider") pursuant to the Agreement, executed on _____. In the event of any inconsistency between this Work Authorization and the Agreement, the provisions of the Agreement shall govern and control.

Services to be provided: [DESCRIBE IN DETAIL]

Agreement at issue is __ Lump Sum/ __Not-to-Exceed for amount: $_____

The time period for this Work Authorization will be from the date of complete execution until ____ (___) days after County's Notice to Proceed for the Services to be provided under this Work Authorization, unless otherwise extended or terminated by the Contract Administrator.

Fee Determination: Payment for services under this Work Authorization is as follows:

Professional Services	$_____
Goods/Equipment	$_____
Total Cost of this Work Authorization	$_____

The foregoing amounts shall be invoiced by Provider upon written acceptance by County of all goods and services provided under this Work Authorization.

County

_____
Contract Administrator Date

_____ _____
Project Manager Date Board and/or Designee Date

Provider

_____
Signed Date

Attest

_____
Typed Name

_____
Title