HUMBOLDT COUNTY, CALIFORNIA

RADIO SYSTEM REPLACEMENT PROJECT
RFP #18-100-COMM

EXECUTIVE SUMMARY

MOTOROLA SOLUTIONS

MOTOROLA'S PLAN TO MEET YOUR CHALLENGES

- **Meeting and Exceeding Coverage Requirements.**
- **Most Trusted and Reliable Radio Equipment in the Industry.**
- **Unmatched Relevant Experience, Expertise, and Resources-Lowest Risk.**
- **Trusted Industry Leading Partners.**
- **Best Value End-to-End Solution for Humboldt County.**

Celebrating its 165th birthday, Humboldt County is known for its Giant Redwood Forests, over 100 miles of beautiful coastline, fishing, logging, oysters and agriculture. The region's rural character and geographic isolation foster a community and culture of inter-reliance and cooperation demonstrated by the County's support of neighboring communities in need during the fires. The magnificent redwoods and scenic coastal areas provide grandeur unlike any other in the world, and pose significant challenges when designing radio coverage for the diverse terrain and environment. Celebrating our 90th birthday, Motorola Solutions is one of the oldest and most trusted public safety technology companies in the world. Motorola is known for dependable, reliable products and services laser focused on Public Safety and Public Service. We strive to embody our corporate mission of helping people be their best in the moments that matter. That is our purpose. Humboldt County and Motorola share a rich history and have a proud heritage. What makes Humboldt County and Motorola special are our people; the citizens and employees within.

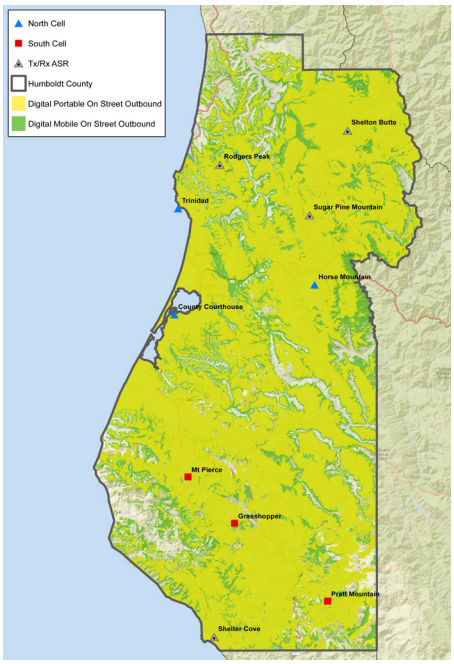
We have carefully designed our solution to meet and exceed the requirements in this RFP and maximize its value to Humboldt County in every way possible. From expanded coverage and performance, to the selection of our exclusive partners, the industry's highest quality products, guaranteed coverage design, and most importantly our qualified and experienced personnel, we are confident that our proposal to Humboldt County is truly unique and comprehensive to meet your current communication needs today and well into the future.

IMPROVING THE COUNTY'S RADIO COVERAGE

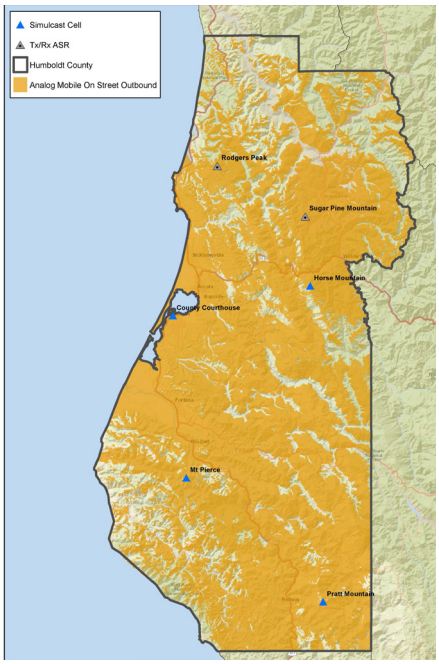
Ensuring that you have required coverage where you need it is fundamental to our proposed system design. In fact, in Attachment G, the only system description prioritized as critical is "Coverage Areas". The RFP requirements make clear the need for guaranteed coverage. In order to meet your requirements, Motorola Solutions has designed a comprehensive, 10 site P25 VHF radio simulcast system for the Sheriff's Office that will serve the first responders and residents of Humboldt county for today and years to come. We have proposed the 8 sites you have provided, in addition to 2 state-owned sites which will meet and exceed your coverage requirements. The proposed system will provide the best expanded coverage and serve as a foundation for new features and enhancements, including P25 digital signaling, and other advanced capabilities. In addition, we have designed a 6 site, analog VHF simulcast system for Public Works which also meets and exceeds the coverage requirements.

From our response to your RFP, during the equipment demonstrations and oral interviews, and through contract execution, it's our goal to prove how we will meet and deliver the best value for your requirements. Beyond contract execution, Motorola Solutions is ready and uniquely positioned to deliver on these requirements, and we look forward to working closely with Humboldt County as you join the hundreds of other California agencies who have selected Motorola Solutions.

Humboldt County Sheriff's Office
Outbound Mobile (Green)/Outbound Portable (Yellow) Coverage



Humboldt County Department of Public Works Outbound Mobile Coverage



Type of Coverage	Humboldt County Requirement (Bounded Area)	Motorola Solutions' Proposed Design (Bounded Area)
P25 Portable Inbound	56%	59.6% - Exceeds Requirement
P25 Portable Outbound	56%	70.5% - Exceeds Requirement
P25 Mobile Inbound	86%	92.8% - Exceeds Requirement
P25 Mobile Outbound	86%	86.3% - Exceeds Requirement
Analog Mobile Inbound	70%	83.0% - Exceeds Requirement
Analog Mobile Outbound	70%	74.4% - Exceeds Requirement
*In addition, Motorola Solutions' proposed coverage design provides **98%** average reliability in the painted areas.*		

"It has been identified that equipment manufactured by Motorola Solutions sets the bar for the rigors of public safety use. The Motorola APX series radio is a proven platform having been deployed across the world, and has earned a stellar reputation as the "go-to" radio for emergency services use."

– SOURCE: City of Salinas, CA City Council Staff Report, August 7,2018

MOST TRUSTED RADIO EQUIPMENT IN THE INDUSTRY

Motorola Solutions' infrastructure equipment is the most reliable, longest lasting in the world. The proposed G-series infrastructure is Motorola Solutions' newest platform for P25 simulcast, with thousands of products in this family shipped each year since its introduction. Motorola Solutions has proposed specific models of APX radios, to both the Sheriff and Public Works which meet and exceed the technical and operational specifications required by the RFP. In addition to our radios being the highest quality and most durable in the industry, they also excel in harsh environments of rain, fog and wind with the best in class audio quality. While many people picture all of California as sunshine and palm trees, it is certainly not the case in Eureka! With annual rainfall over 40" a year, it is critical your subscriber radios can thrive under these conditions. This is why almost all public safety agencies in states like Alaska and Washington have chosen Motorola Solutions' rugged and proven devices. Our APX line of subscriber radios was designed by First Responders for First Responders in all types of environments.

Motorola Solutions' APX radios have been tested side-by-side against the competition – in both laboratory and real-life situations – with the same result every time: No other radio is as trusted by public safety in the moments that matter. Last December, Los Angeles PD and Los Angeles FD selected the APX platform after exhaustive in-house testing and field trials of multiple manufacturers. In the past 12 months, 14 agencies in Monterey County alone have migrated from their existing non-Motorola Solutions subscribers to the APX family of radios.

MOST TRUSTED RADIOS

With $500M+ in R&D investment year-over-year in Land Mobile Radio, Motorola Solutions is on the cutting edge of mission critical communication. This commitment to our customers has led to the purchase of more than 3 million APX radios worldwide – the same product line proposed for Humboldt County.

At the peak of Hurricane Harvey, Houston's first responders needed a radio they could count on

"At one point during a water rescue, my radio fell out of its pouch on my flotation device.....Once I located it – after several minutes submerged in more than 5 feet of water – it worked just fine. Needless to say, the radios performed far beyond our expectations, and we are extremely impressed with their quality."

– Captain Larry Baimbridge, Division Commander,
Houston Police Department Tactical Operations Division

INDUSTRY LEADING

TRANSFORMING YOUR RADIO USER EXPERIENCE

To meet the County's needs for best-in-class user radios, Motorola Solutions proposes our APX subscribers.

RUGGED LIKE NO OTHER

- Goes beyond Military Standard specifications with accelerated life testing to expose subscribers to extreme conditions that simulate years of abuse and testing, including: severe shock, vibration, and exposure to salt, fog, UV radiation, dust, and electrostatic discharge.
- Tempered, scratch-resistant glass lens that can take a beating.
- Submersible to six feet.

LOUDEST AND CLEAREST AUDIO

- Audible no matter the device's orientation because of Adaptive Dual–Microphone Noise Suppression and Reduction technology.
- Extreme Audio Profile is a new software algorithm that improves communications whenever an excessive amount of background noise is prevalent.

PURPOSE-BUILT USER EXPERIENCE

- Easy "T" grip ensures a good grip, even in wet conditions.
- Spacing between controls for gloved operation.
- Large accessible emergency button.
- Smaller size and lighter weight.
- Shielded Push-to-Talk.
- Better viewing with large color LCD and Intelligent lighting.
- Automated power technology with our patented Impres battery technology.

"The Motorola APX radios out perform our previous portable radios in reception and transmission capabilities as well as their durability and functionality."

– Sergeant Gavin Wells,
Lake County Sheriff's Office

UNMATCHED RELEVANT EXPERIENCE, EXPERTISE AND TRUSTED INDUSTRY LEADING PARTNERS

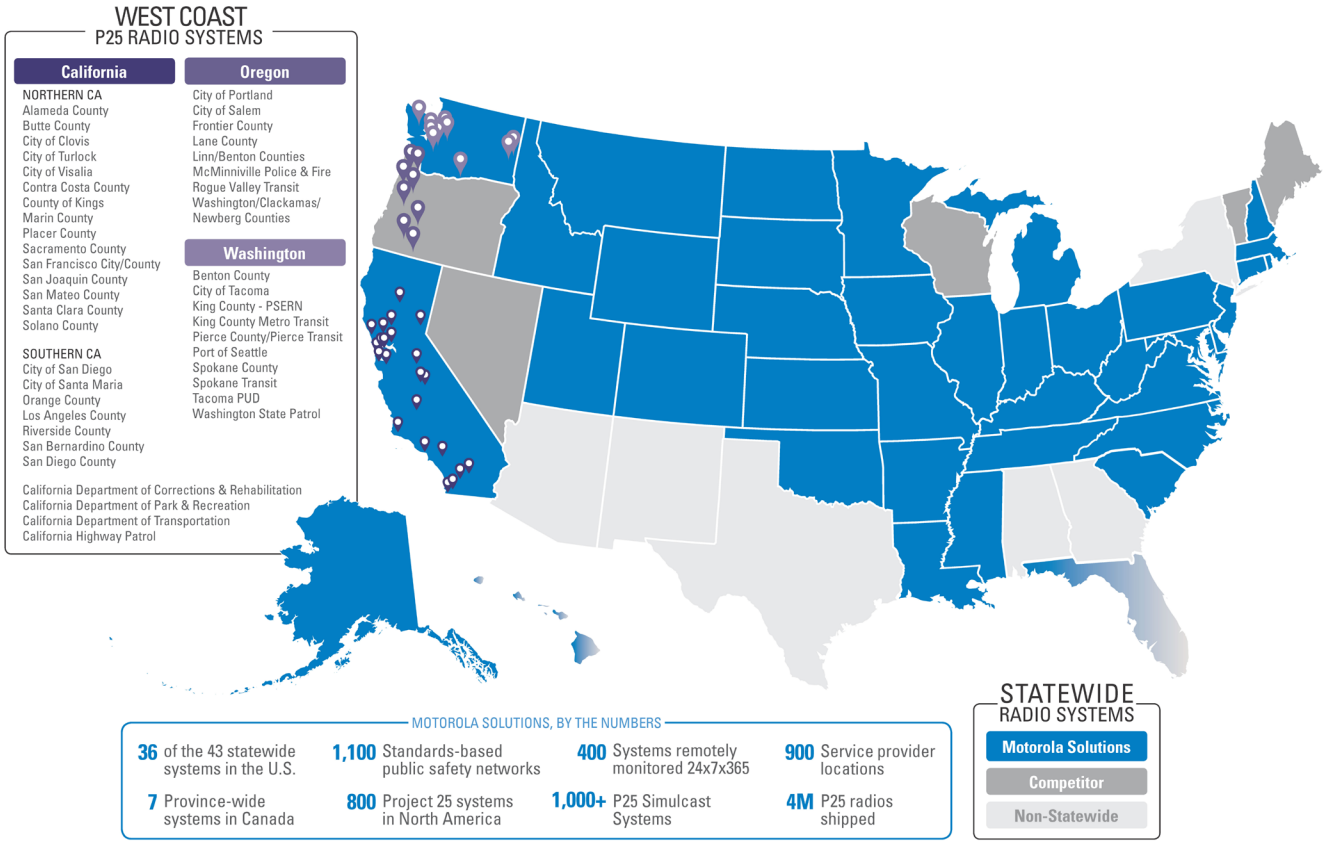
RELEVANT AND COMPARABLE EXPERIENCE

We understand this is a significant financial investment for Humboldt County. With Motorola Solutions' Industry-leading team of engineers, system integration specialists, system technologists, field service organization, and our exclusive partners, we are best positioned to maximize this significant investment and minimize your risk. We both understand the importance of high quality, efficient and reliable services to keep the community safe for everyone. There is no compromise when it comes to the safety of the people and community we serve. We judge our success based on how well we have met the specific needs of each of our customers. Motorola Solutions has over 1,100 Project 25 systems worldwide, over 20 - P25 systems in California and almost 20 more in Oregon and Washington. Some of these systems cover thousands of square miles and serve tens of thousands of government and public safety users. We understand customers and their needs are diverse and so too, is our experience. Motorola Solutions works with some of the largest agencies in the state and the world with P25 trunked systems which also use conventional layers for interoperability and fall back operations. Motorola Solutions also works with rural counties and smaller towns as well making Motorola Solutions the global leader in public safety communications. We will apply this global leadership, knowledge, and experience to ensure a successful project for Humboldt County.

To deliver on your requirements for backhaul, installation and service, Motorola Solutions has carefully selected trusted and industry-leading partners. Each of these partners brings subject matter expertise and verifiable success on similar projects with Motorola Solutions and local government in California. Two of the most notable partners for this project are Day Wireless for radio programming and equipment installation and Nokia for the microwave backhaul design and implementation. Finally, we understand that you need straightforward answers and options when it comes to civil and site upgrades. We have engaged Pyramid Network Services, who with their national coverage and experience upgrading over 60,000 sites, will assist and advise on civil aspects throughout the project and per your PSA requirements.

Day Wireless Systems is a premier provider of wireless solutions for voice, data, and video and a Motorola Solutions Premier Service Partner. The company designs, installs, and supports systems for government, public safety, healthcare, commercial, and education customers. Founded in 1969, the company is based in the Portland area and now operates from 28 locations in five States. Day Wireless Systems employs more than 320 employees, including 175 technical staff made up of engineers, senior technicians and skilled installers. The company is privately held and led by third generation family members. Day Wireless sells to and services many of the rural state/local customers on the West coast including Eureka, Aracta and the Humboldt State Police Department as well as Del Norte, Curry, Jackson, Coos and Douglas Counties.

Nokia and Motorola Solutions have partnered for over two decades providing robust and secure communications solutions to meet the mission critical needs of first responders. Scaling from small networks to large statewide networks the Motorola Solutions and Nokia team provides a solution scaled for the service needs of today and ready to expand to support future needs as they arise. Nokia's backhaul solution is the perfect complement to the Motorola Solutions P25 radio network. Beyond the years of experience of working together and honing our interworking business processes to ensure the entire network implementation is painless to you the customer, the Nokia and Motorola solution is field tested for full product interoperability with a dedicated Nokia team for Motorola Solutions to help with response and escalation processes. Whether the solution requires a simpler Carrier Ethernet or a higher feature rich IP/MPLS service, Nokia has the product lines to support your P25 and legacy traffic requirements and are visible to the Motorola Solutions Unified Element Manager. Nokia and Motorola Solutions are familiar with the existing Humboldt County system (the County is currently utilizing Nokia MDR 8000 Microwave today). As part of this solution, it will be upgraded to the next generation Nokia Wavence Microwave platform.



TEAMING FOR SUCCESS

UNMATCHED P25 EXPERIENCE

Motorola Solutions has been the market leader in implementing mission-critical wireless communications for over 65 years. We are proud to provide over 80% of all federal, state, and local public safety departments with quality products and services. Surveys show our customers consistently rate us, "very satisfied" because we deliver high-quality projects with exceptional performance. Systems integration management is the reason for our favorable performance in this arena. Our Systems Integration groups have successfully completed over 1,100 customer installations, with 95% of our systems delivered on time and within budget. We have over 650 installations of public safety mission-critical wireless communications systems. Not only is this experience unmatched in the industry, but we are also highly committed to Project 25 standards, .with more P25 systems in operation than all other suppliers combined.

Motorola Solutions has assembled a local project team for Humboldt County that has worked together on many mission critical systems. Our team will have the highest regard for what's important to you to ensure your goals are achieved. Motorola Solutions' understanding and approach to your requirements are to provide a secure, reliable, cost effective, state-of-the-art radio system to replace your existing radio system. We feel we are most fit to provide this solution, due to our broad portfolio of the industry's highest quality products, our guaranteed coverage design, and most importantly our qualified and experienced personnel.

Our project approach and proposed implementation is supported by a team of experts starting with your Motorola Solutions Senior Account Manager, Bill Vlahandreas, who brings many years of account management, local knowledge and experience. Supporting Humboldt County with Bill is Motorola's project team, assembled from the best of the best within Motorola Solutions. We are proud to serve Humboldt County with our team and to be a recognized corporate citizen within California, along with our partners and representatives. Our team consists of Motorola Solutions management and employees who represent all aspects of designing and implementing land mobile radio communications, including:

• Engineers • Project Managers • System Technologists • Service and Support • Account Managers.

We have hand selected the Humboldt County project team specifically based on their experience in projects of similar scope and size to the Humboldt County project, their familiarity with one another having worked on multiple P25 Systems together in the past, and geographically, they are located in Northern California. In the Business Profile Section of our response, you will see more detailed information on each individual, their resume's and relevant experience.

PREPARING HUMBOLDT COUNTY FOR MOMENTS THAT MATTER

Motorola's partnership extends beyond the network of local resources we are proposing today for Humboldt County. We also work closely with many of the state of California agencies including the California Highway Patrol, California Department of Corrections and Rehabilitation, California Department of Transportation, and the California Department Parks and Recreation.

Motorola Solutions also has access to nationwide resources in case of a major emergency and/or natural disaster like hurricanes, floods and wildfires. These resources were recently deployed locally with the City of Redding Fire, Trinity, Mendocino and Lake County Sheriff's offices.

Motorola Solutions has a Disaster Recovery/Emergency Response Team ready to deploy at a moment's notice. We can get a temporary site up and running within days. We take a proactive as well as reactive approach when it comes to worldwide event or emergencies. We constantly monitor worldwide news to get a head start on any potential disaster. Once an event is declared, we set up a dedicated 24x7 private phone line to support you during those critical moments.

PROVING OUR COMMITMENT

- Hurricane Katrina
- Cedar Rapids, Iowa Flooding
- Arizona Earthquake
- Haiti Earthquake
- BP Oil Spill
- Alaska Redoubt Volcano
- 2011 Chile Earthquake
- 2011 Tornado Outbreak
- 2012 NATO Summit in Chicago
- 2012 Hurricane Sandy
- 2015 Pope's Visit to NY, DC and NJ
- Alaska Cleveland Volcano
- Popocatepetl Volcano near Mexico City
- 2016 Storm and Tornado season
- 2016 Hurricane season
- 2016 Typhoon season
- 2016 Olympic Games in Brazil
- 2016 Presidential Election
- 2017 Hurricane Irma
- 2017 Hurricane Harvey (Picture below)

2017 Hurricane Harvey

A BEST-VALUE, END-TO-END COMMUNICATIONS SOLUTION FOR HUMBOLDT COUNTY

Because of our experience installing similar systems to Humboldt County, we understand that overall cost is really an overall value. While we are very competitive in the market and all of our solutions are available on wholesale cooperative purchasing agreements, this RFP affords us an opportunity to provide a complete, end to end solution, designed specifically for Humboldt County and with a total value, not simply cost, in mind.

Motorola Solutions is proud of our long-term partnership with so many of the mission critical agencies in California, and we take very seriously our role as a dedicated solutions provider, problem solver, and trusted advisor. Our local team's unique combination of unmatched experience, proven technology, product reliability, service and support as well as fully engaged on-site presence ensures the best value and lowest risk choice for your next generation radio system.

Part of our 'Best Value' proposition stems from our in-house financing arm, Motorola Solutions Credit Corporation. Motorola Solutions not only stands for the industry's highest quality communications systems, but also offers competitive solutions-oriented financing programs. For the past 45 years, Motorola Solutions Customer Financing has provided governmental entities with funding solutions designed to facilitate the acquisition of essential public safety communications equipment. Since 1980, Motorola Solutions has committed to, entered into or arranged over $8.5 billion of equipment finance transactions for its U.S. customers. Additionally, Motorola Solutions has privately placed in excess of $2.4 billion of financing to third party financial institutions. Motorola Solutions Customer Financing recognizes that each opportunity presents unique issues and characteristics; therefore, our approach would involve understanding Humboldt County's operational goals and financial objectives when putting our finance program together.

By leveraging Motorola Solutions' financial strength and vendor alliances, you will be able to secure competitive interest rates through Motorola Solutions, Inc., while allowing existing credit lines and bond issuance capabilities to remain intact. Motorola Solutions would be pleased to discuss a financing program for the acquisition of your Motorola Solutions Project 25 communications network.

Our Financing option is a tax exempt municipal lease financing program, the proceeds of which will be used to fund the system contract price.


ONE WAY

MOTOROLA SOLUTIONS WORKING FOR HUMBOLDT COUNTY

When lives are on the line, you need reliable, unbroken communications. From the most extreme moments, to the day-to-day, emergency personnel depend on mission critical communications to do their jobs effectively and keep our community safe-it is your lifeline.

> **As Sheriff Honsal was quoted after a December 2017 shooting, "It has become a very, very violent place and we see it out in the hills, we see it in our communities, we are not immune to it because we wear a uniform".**

At Motorola Solutions, it is our mission to help our customers be their best in the moments that matter. We are committed to Public Safety and Public Service. This is in our DNA. We design, manufacture and implement proven, reliable Project 25 simulcast systems used throughout the world. We have designed a cost effective, state-of-the-art system to meet your needs today, and well into the future. We will validate this through our proposal, equipment hands on demonstrations, and our unwavering commitment to deliver your solution on time and within your budget, while always putting the needs of your users first. With 90 years of experience of innovation and quality, Motorola Solutions is ready to work for Humboldt County.

1928
2018

YEARS

Motorola Solutions, Inc. 500 West Monroe Street, Chicago, IL 60661 U.S.A. **motorolasolutions.com**

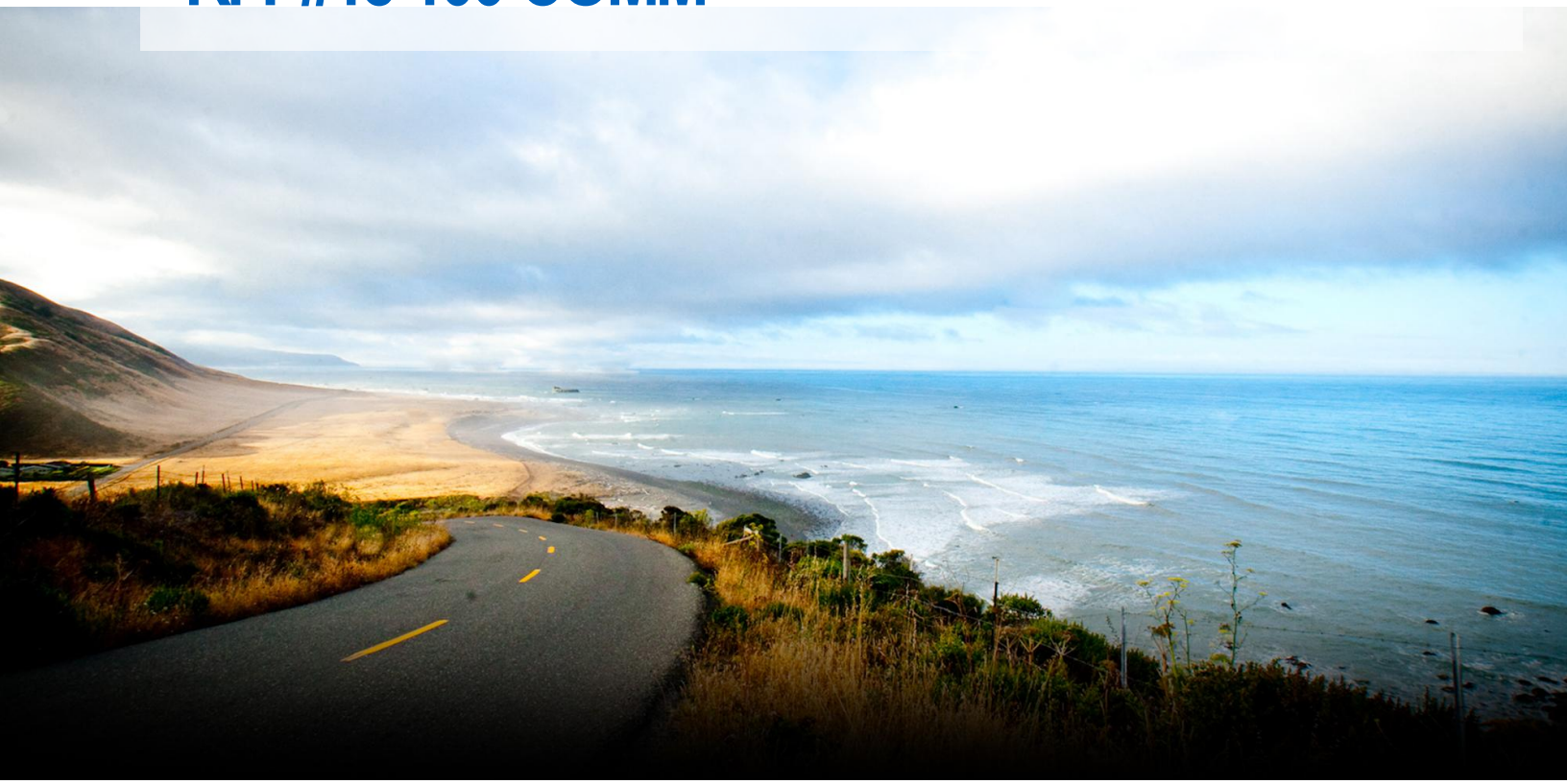
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 1
INTRODUCTORY LETTER

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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SECTION 1

INTRODUCTORY LETTER

The introductory letter shall, in one (1) page or less, summarize the Proposer's qualifications and experience regarding the provision of Radio System Packages and related services equivalent to those set forth in this RFP. The introductory letter must also provide the Proposer's federal tax identification number, the Proposer's current contact information, including, without limitation, the address and telephone number of the Proposer's headquarters, the address and telephone number of the offices at which the services related to the provision of the Radio System Package set forth in this RFP will be performed and the name, address and telephone number of a representative who will be authorized to communicate and negotiate with the County on behalf of the Proposer, and list any subcontractors that may be used to provide the Radio System Package and related services set forth in this RFP. The introductory letter shall be signed in blue ink by an authorized representative of the Proposer.

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MOTOROLA SOLUTIONS

Motorola Solutions, Inc.
1001 Bayhill Drive, Suite 261
San Bruno, CA 94066
Telephone: 707-321-7007

Headquarters: Motorola Solutions, Inc.
500 W. Monroe Street
Chicago, IL 60661
Telephone: 847-576-5000
Federal Tax ID: 36-1115800

August 24, 2018

Jim Storm
Information Technology
Director
Humboldt County
839 Fourth Street
Eureka, CA 95501

Re: Humboldt County Radio System Replacement Project RFP No. 18-100-COMM

Dear Mr. Storm:

Please accept Motorola Solutions, Inc.'s ("Motorola Solutions" or "Motorola") response to your request for Proposal (RFP) No. 18-100-COMM entitled "Humboldt County Radio System Replacement Project." We are excited to provide the next-generation of equipment and services to your first-responders and public works department.

We hope the County will be pleased with our response as our team has worked diligently to ensure that our proposal provides the best coverage, highest quality products and services as well as value to the County.

Motorola Solutions is proud to provide over 80% of all federal, state and local public safety departments with quality products and services today. Combined with our industry leading partners Nokia, Day Wireless, and Pyramid Networks, we firmly believe that we will provide the best value to Humboldt County – both in terms of financial and operational considerations. Humboldt County can be confident that a partnership with Motorola Solutions will provide greater system reliability & performance, improved coverage and unparalleled experience & support when compared to other bidders.

Motorola Solutions would be pleased to address any questions you might have regarding this proposal. Please feel free to contact your Motorola Solutions Senior Account Manager, Bill Vlahandreas, at (707) 321-7007 or Bill.Vlahandreas@motorolasolutions.com.

Sincerely,

Micah Applewhite
MSSSI Vice President
Motorola Solutions, Inc.

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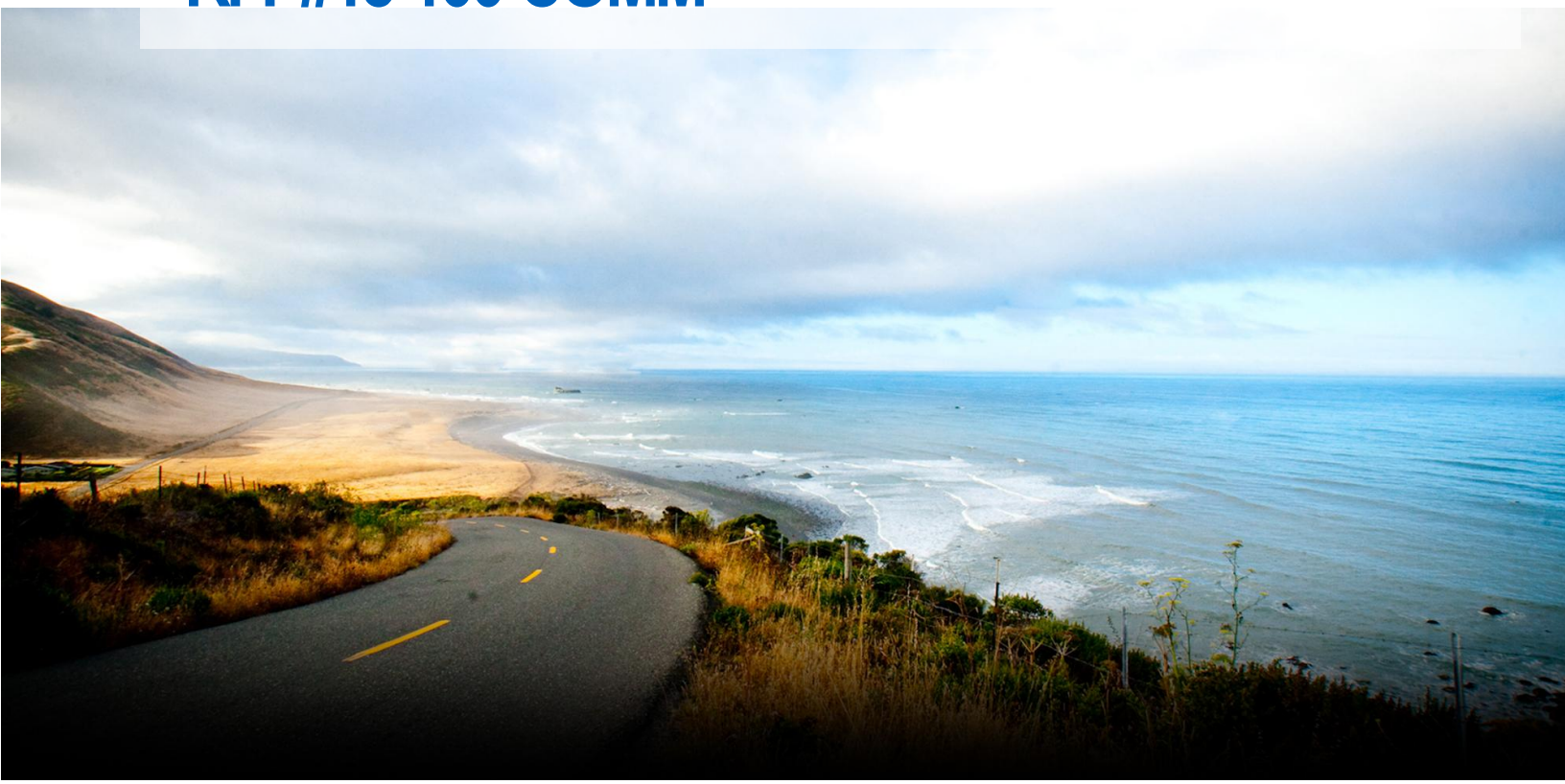
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 2
SIGNATURE AFFIDAVIT

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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SECTION 2

SIGNATURE AFFIDAVIT

Each Proposal must contain a signed and completed Signature Affidavit, which is attached to this RFP as Attachment D – Signature Affidavit and incorporated herein by reference. The Signature Affidavit must be signed by an authorized representative of the Proposer. Signature authorization on the Signature Affidavit shall constitute a warranty, the falsity of which shall entitle the County to pursue any and all remedies authorized by law. Receipt of all Addenda, if any, must be acknowledged on the bottom of the Signature Affidavit.

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REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT D – SIGNATURE AFFIDAVIT
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM SIGNATURE AFFIDAVIT	
NAME OF FIRM:	Motorola Solutions, Inc.
STREET ADDRESS:	10680 Treena Street Suite 200
CITY, STATE, ZIP	San Diego, CA 92131
CONTACT PERSON:	Micah Applewhite
PHONE #:	817-532-7099
FAX #:	858-653-5822
EMAIL:	MicahApplewhite@Motorolasolutions.com

California Government Code Sections 6250, *et seq.*, the "California Public Records Act," define a public record as any writing containing information relating to the conduct of public business. The California Public Records Act provides that public records shall be disclosed upon written request, and that any citizen has a right to inspect any public record, unless such record is exempted from disclosure.

In signing this Proposal, I certify that this firm has not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a Proposal; that this Proposal has been independently arrived at without collusion with any other Proposer, competitor or potential competitor; that this Proposal has not been knowingly disclosed prior to the opening thereof to any other Proposer or competitor; and that the above statement is accurate under penalty of perjury.

The undersigned is an authorized representative of the above named firm and hereby agrees to all the terms, conditions, and specifications required by the County in this Request for Proposals and declares that the attached Proposal is in conformity therewith.

Signature _____ **Title: MSSSI Vice President**

Name: Micah Applewhite **Date: August 2, 2018**

This Proposer hereby acknowledges receipt / review of the following Addendum(s), if any
Addendum # [1 (6-15-18)] Addendum # [2 (6-18-18)] Addendum # [3 (7-2-18)] Addendum # [_____]

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Received by: Micah Applewhite
MSSSI Vice President
Motorola Solutions, 6-15-18

1. It has been brought to the attention of the County that the email address provided for the communication of questions was not working properly and that some emails may be returned as 'undeliverable'. The County has corrected the issue. In light of this and other questions already posed, the County is extending the dates for final questions to be submitted. The new schedule for questions and proposal submittal is:

Deadline for Submission of Questions	July 2, 2018, 1:30 p.m. PST
Deadline for Responses to Questions	July 6, 2018
Deadline for Proposals to be Received	August 24, 2018, 1:30 p.m. PST

2. **QUESTION:** Reference: Para 7.6.B.5 ...The Proposer's compliance matrix shall be completed in its entirety and have a response code of one (1) or higher for all mandatory items.... What do the "response code" numbers signify? Is there a legend that describes the meaning of codes 0, 1, 2, etc.? Please clarify.
    a. **ANSWER:** Within Attachment G there is a Tab labeled "Instructions". Please expand the tab selection by clicking on the '...' located to the left of the Compliance Matrix tab at the bottom of the Excel window. Alternately clicking the left arrow will expose the Instructions tab.
3. **QUESTION:** Reference: Attach F, Para 4.B. The specific rates and costs applicable to this Agreement are set forth in Exhibit B – Schedule of Rates, which is attached hereto and incorporated herein by reference. Can the County provide Exhibit B?
    a. **ANSWER:** Attachment F is the sample contract template that Humboldt County would use in the development of a final negotiated Professional Services Agreement. As such, Exhibit B would be developed during the course of negotiations and is not available as a template.
4. **QUESTION:** Reference: Page 1 Special Instructions states: "Submit one (1) original with six (6) additional copies of proposal...." while section 6.1 states: "...prepare and submit seven (7) original Proposals..." Please clarify whether 1 original and 6 copies or 7 original proposals are required.
    a. **ANSWER:** Section 6.1 is amended to now read:

    "Proposers shall prepare and submit ~~seven (7) original Proposals~~ one (1) original Proposal, six (6) paper copies thereof, and one (1) electronic copy thereof, in portable document format, on a universal serial bus thumb-drive, compact disc or digital versatile disc, by 1:30 p.m. PST on August 10, 2018. Proposals shall be signed by an authorized agent of the Proposer, and must be placed in a sealed envelope clearly marked "RFP No. 18-100-COMM" along with the name and address of the Proposer and the closing date and time for submission of Proposals. Proposals that are unsigned, or signed by an individual not authorized to bind the Proposer, will be considered nonresponsive and rejected by the County. Proposals shall be personally delivered or mailed to:

    COUNTY: Humboldt County Administrative Office – Information Technology Division

Attention: Jim Storm, Information Technology Director

839 Fourth Street

Eureka, California 95501

Email: RFP@co.humboldt.ca.us

Proposals submitted to any other County office will be rejected and returned to the Proposer unopened. Additionally, time is of the essence and any Proposals received after the above-referenced date and time for submittal, whether by mail or otherwise, will be rejected and returned to the Proposer unopened. It is the sole responsibility of the Proposer to ensure that its Proposal is received before the submittal deadline and postmarks will not be accepted in lieu of this requirement."

5. **QUESTION:** Will Humboldt County allow the vendors access to all existing site locations for purpose of site analysis and capturing site modification costs accurately? Will the county be scheduling formal site surveys? If access and/or site surveys are not permitted, please provide shelter floor plans showing available space, HVAC excess capacity, and power availability within shelters. Also, information regarding current antenna placement and available tower space for additional antennas will be required to provide an accurate design for each site listed in the RFP.
    a. **ANSWER:** The County has scheduled a **three-day sitewalk visitation for June 26-28** to allow vendors to gather details about sites and their overall condition. Transportation will not be provided so all participants will caravan in their own vehicles to access the sites. Many sites are accessed via dirt road and may require a 4-wheel drive vehicle to access depending on road conditions, so vendors are encouraged to make appropriate arrangements for vehicles prior to departing.

       Sitewalk participants are to meet at **9 AM on June 26th** at:

       Humboldt County IT
       839 Fourth St
       Eureka, CA 95501

       No drawings or other site information will be provided so this will be the only opportunity to gather site related information.

6. **QUESTION:** Is it the County's intent to receive proposals with covered area reliability or bounded area guarantees for both the P25 radio system and the analog subsystem?
    a. **ANSWER**: Section 7.6.B.2.f is amended to now read:

       "A detailed description of the predicted reliability of the radio coverage that will be made available by the Radio System Package provided pursuant to the terms and conditions of a Professional Services Agreement, including, without limitation, coverage reliability maps that graphically depict all coverage areas that meet or exceed the coverage reliability requirements set forth in this RFP and Attachment B – Product Features and Requirements. Coverage reliability maps shall integrate signal strength, bit

error rate, if applicable, and time domain interference into a single ninety-five percent (95%) reliability display ~~that depicts "Covered Area Reliability" as defined by TSB-88.1D~~ for P25 Phase 1 operation. Coverage reliability maps that depict these elements separately will not be accepted by the County. Coverage reliability shall be depicted by shading or cross-hatching coverage areas that meet or exceed the applicable coverage requirements. Any and all depictions of coverage reliability shall be distinct so as not to cause confusion with other map elements, and shall have a level of transparency to see underlying map elements. All coverage reliability maps shall be provided in eleven (11) by seventeen (17) inch, full color hardcopy format and ESRI ArcView Shapefile, including, shapefile attribute (DBF), shapefile spatial index (SBN), shapefile shape index (SHX) and projection (PRJ) files or Google Earth formats on compact disc, digital versatile disc or universal serial bus thumb-drive. The coverage reliability maps provided as part of the Proposer's radio coverage plan shall include, without limitation, all of the following:"

b. For both the P25 radio subsystem and the Analog subsystem, the County requires maps that depict coverage wherein each colored tile represents 95% or greater tile reliability at a Delivered Audio Quality of 3.4 or greater. Each map's covered area shall then cover the overall service area of Humboldt County at the percentages specified in Section 3.4.1 of Attachment B.

7. **QUESTION**: Will the existing TAC channels require repeater and antenna replacement?
   a. **ANSWER**: Repeaters and base stations, as listed in Attachment A, will not require replacement, however each existing base/repeater will be incorporated into the new transmitter combiner/receiver multicoupler scheme for each site and thusly utilize the new antenna system. All old antennas and antenna lines shall be removed and disposed according to Section 3.1.H.10.
8. **QUESTION**: Reference: Attachment B Questions - Section 1.0 ...The county is in the process of licensing the frequencies. We respectfully request the County to share the licensing information for both the P25 radio system and the analog subsystem to allow all vendors to design a licensable and implementable design.
   a. **ANSWER**: The County will provide submitted licensing information in a subsequent addendum.
9. **QUESTION**: Reference: Attachment B Questions - Section 1.0 For the new analog subsystem, will transmissions received at any cell/site be repeated at all cells/sites, or just within the cell/site in which it was received?
   a. **ANSWER**: All transmissions received at any site in the system will be repeated to all sites in the system.
10. **QUESTION**: Reference: Attachment B Questions - Paragraphs 2.2.1 and 3.4.1 Please define the 'Service Area' referenced.
    a. **ANSWER**: The service area is the Administrative Boundary of Humboldt County, CA.
11. **QUESTION**: Reference: Attachment B Questions - Paragraph 8.1.1 Are the backup times and duty cycle for Radio Equipment same as for the Non-Radio Equipment? Two-hour backup with an 80/20 duty cycle?
    a. **ANSWER**: Yes. Section 8.1.1 is amended to now read:

"Any and all radio equipment that will be located at the radio sites utilized by the Radio System Package provided pursuant to the terms and conditions of a final Professional Agreement, including, without limitation, radio repeaters and base stations, shall be capable of operating from a power source of 48 volts of direct current. The Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement shall include batteries that are sufficiently sized to accommodate one hundred twenty percent (120%) of the load required by the radio equipment that will be utilized thereby and rectifiers that will be powered by the appropriate power circuits located at the radio sites. The Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement shall include sufficient battery capacity to power all connected equipment for a minimum of two (2) hours plus the anticipated travel time from the radio site at which the non-radio equipment is located to the downtown Eureka area. For power calculations purposes, the Radio System Package should be designed to accommodate an eighty/twenty (80/20) duty cycle, with the stations actively transmitting for twenty percent (20%) of the time and in standby mode for the remaining eighty percent (80%) of the time, in order to allow for troubleshooting and /or repair in the event of an alternating current power loss alarm notification and failure of the on-site generator."

All other items remain the same.

Received by: Micah Applewhite
MSSSI Vice President
Motorola Solutions, 6-18-18

1. **QUESTION:** Is there any existing site documentation that illustrates the existing site layouts, equipment configuration, and tower heights?
    a. **ANSWER:** The County has scheduled a **three-day sitewalk visitation for June 26-28** to allow vendors to gather details about sites and their overall condition. Transportation will not be provided so all participants will caravan in their own vehicles to access the sites. Many sites are accessed via dirt road and may require a 4-wheel drive vehicle to access depending on road conditions, so vendors are encouraged to make appropriate arrangements for vehicles prior to departing.

       Sitewalk participants are to meet at **9 AM on June 26th** at:

       Humboldt County IT
       839 Fourth St
       Eureka, CA 95501

       No drawings or other site information will be provided so this will be the only opportunity to gather site related information.

2. **QUESTION:** Does the County require licensed microwave frequencies to mitigate interference?
    a. **ANSWER:** Yes the County requires licensed microwave frequencies.

3. **QUESTION:** Is it required to propose microwave equipment that can support a single centralized end to end network monitoring and configuration system for both indoor and outdoor units?
    a. **ANSWER:** Yes. See Section 4.3 of Attachment B for requirements.

4. **QUESTION:** For microwave redundancy, is it required to utilize hardware configurations that are non-standby for ring links and hot-standby for spur links with a fully redundant microwave controller shelf that protects both data and network management?
    a. **ANSWER:** Yes.

5. **QUESTION:** Is the per path microwave availability requirement 99.999%?
    a. **ANSWER:** Yes.

6. **QUESTION:** Are high performance Type A microwave antenna required?
    a. **ANSWER:** Yes.

7. **QUESTION:** In order to ascertain our ability to provide the Radio System Package requested in the RFP, it will be necessary to perform site survey visits at all the sites intended for installation. A site visit schedule was absent from the RFP. Dailey & Wells hereby requests that a site visit schedule be added to the RFP for all vendors. Please advise.

a. **ANSWER**: Please see the answer to Question 1.

8. **QUESTION**: Please provide copies of the existing FCC Licenses for all frequencies to be used in the new Radio System.
   a. **ANSWER**: The frequencies, their locations, and their associated callsigns are listed in Attachment A - Current Repeater Site, Frequency and Call Sign Table. In those cases where a transmit frequency is listed at a site with no corresponding FCC callsign, it is the County's intent to modify the appropriate license for that site when a final radio system design is completed.

9. **QUESTION:** Please identify how many repeater pairs (channels) are intended for the P25 VHF Phase 1 Digital Conventional Simulcast Radio Subsystem.
   a. **ANSWER:** As described in the RFP, the County would like to see one (1) receiver input frequency for all sites (159.225 MHz) and potentially up to three (3) transmitter output frequencies located at the following sites:

   155.5425 MHz located at Mt. Pierce and Pratt Mtn.

   155.5575 MHz located at Trinidad and Shelter Cove

   155.6475 MHz located at County Courthouse, Horse Mtn, Rodgers Pk, and Sugarpine

   Site and ERP information for the various sites are as follows.

Site	Lat	Long	Potential Antenna Hgt (meters)	Potential ERP (watts)
County Courthouse	40-48-11.2	-124-9-43.7	27	500
Horse	40-52-27.1	-123-44-0.86	21	110
Pierce	40-25-2.3	-124-7-13	21	200
Pratt	40-7-13.52	-123-41-35.76	21	120
Rodgers	41-9-28.07	-124-1-23.51	21	280
Shelter Cove	40-2-1.84	-124-2-25.63	18	40
Sugarpine	41-2-18.7	-123-44-55.6	18	230
Trinidad	41-3-15.8	-124-9-2.7	24	500

   These frequencies have not yet been granted to the County in an FCC license, however this information should be used for the purposes of draft system design and RFP response.

10. **QUESTION**: Please identify how many repeater pairs (channels) are intended for the Analog VHF Conventional Simulcast Radio Subsystem.
    a. **ANSWER**: As described in the RFP, the County would like to see one (1) receiver input frequency for all sites (158.985 MHz) and potentially up to two (2) transmitter output frequencies located at the following sites:

    153.9050 MHz is the current transmitter output frequency.

    155.3175 MHz is a new potential frequency located at Mt. Pierce and Pratt Mtn.

    Site and ERP information for the various sites are as follows.

Site	Lat	Long	Potential Antenna Hgt (meters)	Potential ERP (watts)
Pierce	40-25-2.3	-124-7-13	21	200
Pratt	40-7-13.52	-123-41-35.76	21	120

These frequencies have not yet been granted to the County in an FCC license, however this information should be used for the purposes of draft system design and RFP response.

All other items remain the same.

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Received by: Micah Applewhite
MSSSI Vice President
Motorola Solutions, 7-2-18

1. As a result of the sitewalks completed between 6/26 and 6/28 the following tower and site information is provided:
    a. Sugarpine
        i. Rohn 45 type Guyed Tower. Approximately 80' tall.
        ii. 12 vdc solar array and battery system provides onsite power. There is no commercial AC power at this site.
        iii. Site is owned and operated by the Hoopa Tribe.
    b. Horse Mountain
        i. Self-supporting Lattice Tower. Approximately 100' tall.
        ii. Onsite power is from Commercial AC power with generator.
        iii. Site is operated by Humboldt County.
    c. County Courthouse
        i. Tower A (primarily used for microwave dishes) – Self-supporting Lattice Tower. Approximately 60' tall.
        ii. Tower B (primarily used for LMR antennas) – Self-supporting Lattice Tower. Approximately 60' tall.
        iii. Tower C (used by Cellular Carrier). Not to be used for this project.
        iv. The building itself is a 6-story building with a height of 70 feet, assuming 10 feet per story plus the rooftop mechanical room.
        v. Onsite power is from Commercial AC power with generator.
        vi. Site is owned and operated by Humboldt County.
    d. Mount Pierce
        i. Self-supporting Lattice Tower. Approximately 100' tall.
        ii. Onsite power is from Commercial AC power with generator.
        iii. Site is operated by Humboldt County.
    e. Pratt Mountain
        i. Self-supporting Lattice Tower. Approximately 100' tall.
        ii. Onsite power is from Commercial AC power with generator.
        iii. Site is operated by Humboldt County.
    f. Shelter Cove
        i. Self-supporting Lattice Tower. Approximately 120' tall.
        ii. Onsite power is from Commercial AC power with generator.
        iii. Site is owned and operated by the State of California.
        iv. Current SO repeater is integrated into the site's combining scheme.
            a) Top of Receive Antenna located at approximately 120' level. Telewave ANT150-D3 4.8 dB Gain
            b) Top of Transmit Antenna located at approximately 100' level. Telewave ANT150-D3 4.8 dB Gain
            c) Assume 3.5 dB insertion loss for transmit combiner plus associated cable losses.
            d) Assume 2.5 dB noise figure and 14 dB gain for receiver multicoupler plus associated cable losses.
        v. If the site combining scheme is not compatible with the proposer's design. The proposer must provide all pertinent information (antenna types and heights,

transmitter combining losses, receiver multicoupler parameters, etc.) to verify if their design is compatible with the site owner.

g. Rodgers Peak
    i. Rohn 45 type Guyed Tower. Approximately 97' tall.
    ii. 12 vdc solar array and battery system provides onsite power. There is no commercial AC power at this site.
    iii. Site is operated by Humboldt County on National Park Service land.
h. Trinidad Head
    i. Guyed Tower. Approximately 50' tall.
    ii. Onsite power is from Commercial AC power with generator.
    iii. Site is owned and operated by the Coast Guard.

2. As the Sugarpine and Rodgers Peak sites are 12 VDC solar powered sites, Proposers shall include in their design a 48 VDC solar array and battery system that will power any **new** radio, microwave, or ancillary equipment at that site. Proposers shall assume 4-hours of sunlight per day. Battery system and charger shall be sized to provide power to the system utilizing a 90/10 duty cycle, with the stations actively transmitting for ten percent (10%) of the time and in standby mode for the remaining ninety percent (90%) of the time. Charger systems shall sized for expansion purposes to accommodate one hundred twenty percent (120%) of the load required by the radio equipment that will be utilized.

3. **QUESTION**: Is Attachment E required to appear twice in an RFP response - Section 7.9 and Section 11?

    - RFP Section 7.9 References: A. Reference Data Sheet. Proposals shall include a completed reference list, which is attached hereto as Attachment E – Reference Data Sheet and incorporated herein by reference, containing present and past performance information from a minimum of three (3) clients, preferably government agencies, to whom the Proposer has provided Radio System Packages and related services equivalent to those set forth in this RFP within the past five (5) years.

    - Section 11 Attachments requires the same document (Attachment E) included with the proposal.

    a. **ANSWER**: One copy of Attachment E in either section is sufficient to meet the requirement.

4. **QUESTION**: Are portable user radios required to be rain tolerant with an IP68 rating with 2M of water for 2 hours?
    a. **ANSWER**: No.

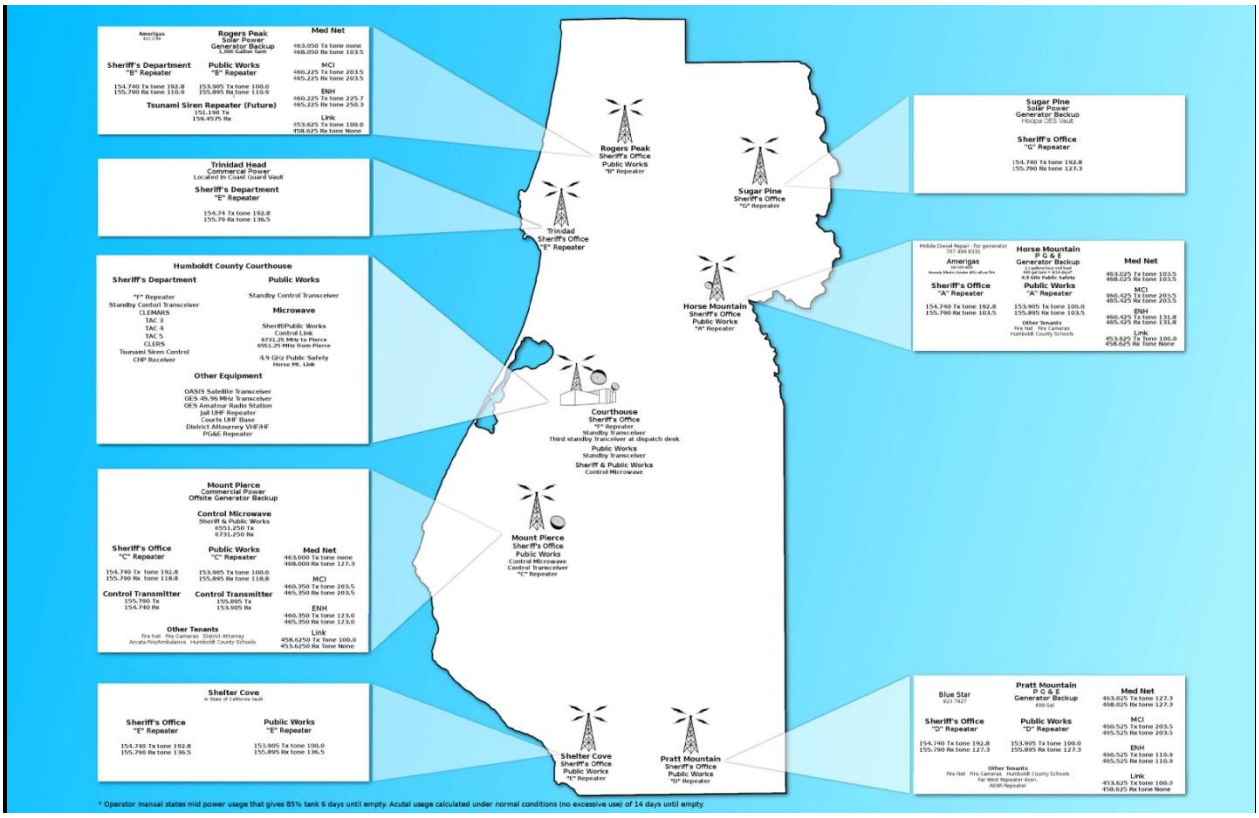
5. **QUESTION**: Are portable speaker microphones required to have the same rain tolerant rating as the portable radio?
    a. **ANSWER**: No.

6. **QUESTION**: Are portable speaker microphones required to be rated to operate in wind?
    a. **ANSWER**: No.

7. **QUESTION**: Are vendors required to demonstrate their user radios in the required environmental conditions during the vendor interviews?
    a. **ANSWER**: The agenda and content of the Vendor Interview process will be partially based on responses received and therefore the County will not include or exclude certain items from the Vendor Interviews. If Vendor Interviews are deemed necessary by the County, information regarding the content and expectations of the Vendor Interviews will be relayed to participating proposers during the scheduling of interviews.

8. **QUESTION**: Can the County please provide the physical location and manufacturer/model number for the Avtec console system logging recorder at the county courthouse location.
    a. **ANSWER**: The logging recorder is manufactured by Stancil Corp. The recorder was upgraded in the Fall of 2016 to a SLR NG-911 version recorder. The recorder is physically located in the equipment room/closet of the dispatch center.

All other items remain the same.


Rogers Peak
Solar Power
Generator Backup
Med Net
Sheriff's Department
"B" Repeater
Public Works
"B" Repeater
MCI
ENH
Tsunami Siren Repeater (Future)
Link
Trinidad Head
Commercial Power
Located in Coast Guard Vault
Sheriff's Department
"E" Repeater
Humboldt County Courthouse
Sheriff's Department
Public Works
Standby Control Transceiver
Microwave
Other Equipment
Mount Pierce
Commercial Power
Offsite Generator Backup
Control Microwave
Sheriff & Public Works
Sheriff's Office
"C" Repeater
Public Works
"C" Repeater
Med Net
Control Transmitter
Control Transmitter
MCI
ENH
Other Tenants
Link
Shelter Cove
Sheriff's Office
"E" Repeater
Public Works
"E" Repeater
Sugar Pine
Solar Power
Generator Backup
Hoopa OES Vault
Sheriff's Office
"D" Repeater
Horse Mountain
P G & E
Generator Backup
Amerigas
Sheriff's Office
"A" Repeater
Public Works
"A" Repeater
Med Net
MCI
ENH
Other Tenants
Link
Pratt Mountain
P G & E
Generator Backup
Blue Star
Sheriff's Office
"D" Repeater
Public Works
"D" Repeater
Med Net
MCI
ENH
Other Tenants
Link
Rogers Peak
Sheriff's Office
Public Works
"B" Repeater
Sugar Pine
Sheriff's Office
"D" Repeater
Trinidad
Sheriff's Office
"E" Repeater
Horse Mountain
Sheriff's Office
Public Works
"A" Repeater
Courthouse
Sheriff's Office
"E" Repeater
Standby Transceiver
Third standby Transceiver at dispatch desk
Public Works
Standby Transceiver
Sheriff & Public Works
Control Microwave
Mount Pierce
Sheriff's Office
Public Works
Control Microwave
Control Transceiver
"C" Repeater
Shelter Cove
Sheriff's Office
Public Works
"E" Repeater
Pratt Mountain
Sheriff's Office
Public Works
"D" Repeater
* Operator manual states mid power usage that gives 85% tank 6 days until empty. Acutal usage calculated under normal conditions (no excesive use) of 14 days until empty.

MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 3
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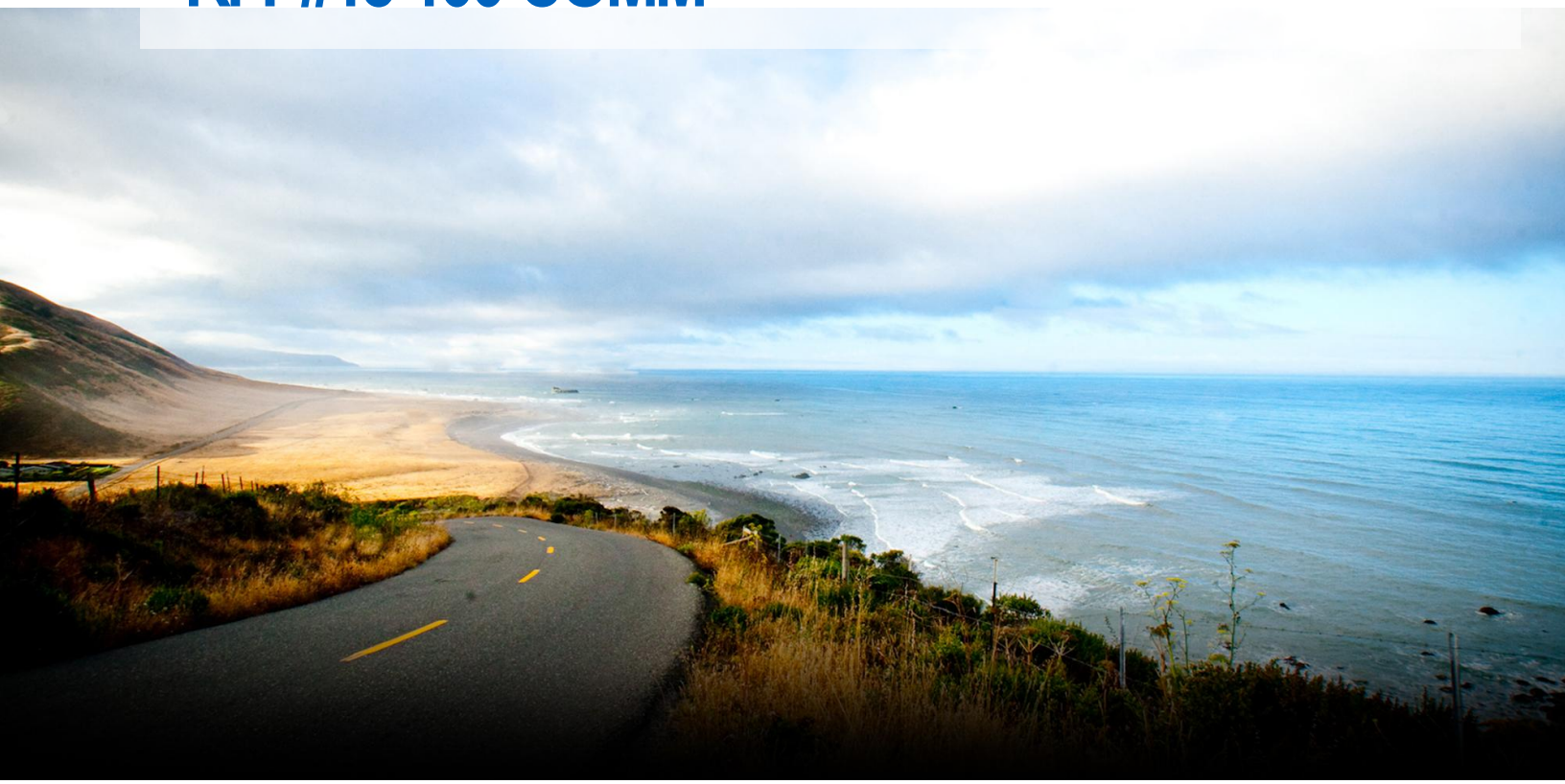
RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 10, 2018**

RFP#18-100-COMM



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Section 3

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SECTION 3

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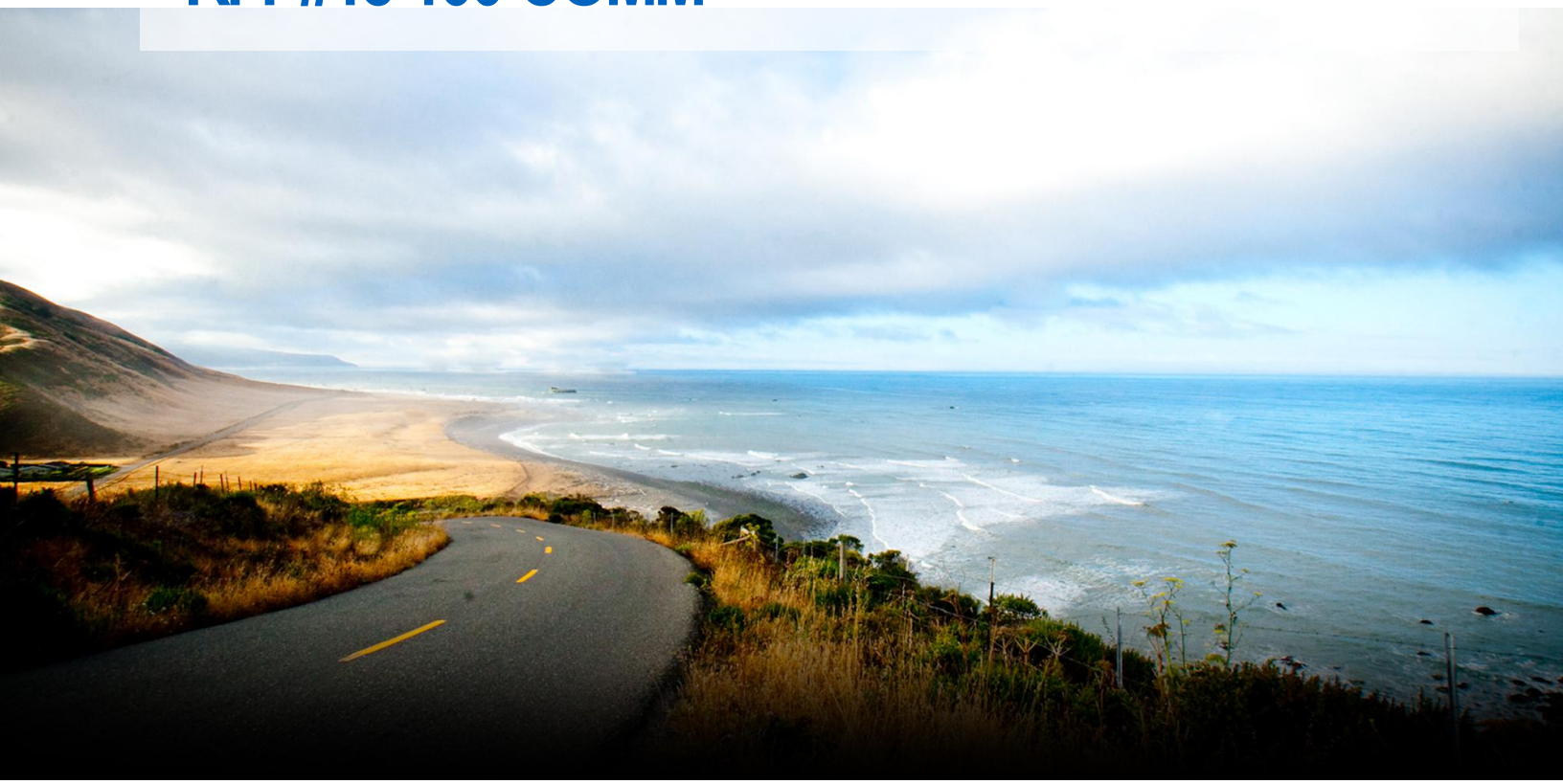
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 4
BUSINESS PROFILE

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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Section 4

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SECTION 4

BUSINESS PROFILE

4.1 COMPANY OVERVIEW

A. Company Overview. The business profile must include an overview of the business structure and operation of the Proposer's company. The company overview should include, at a minimum, all of the following items:

1. The Proposer's business name, physical location, mission statement, legal business status, such as partnership, corporation, limited liability company or sole proprietorship, and the Proposer's current staffing levels.

MOTOROLA SOLUTIONS RESPONSE

Motorola Solutions Inc.
500 West Monroe
Chicago, Illinois, USA

Mission Statement

Motorola Solutions creates innovative, mission-critical communication solutions and services that help public safety and commercial customers build safer cities and thriving communities.

Motorola Solutions Overview

Motorola Solutions Inc., a Delaware Corporation with headquarters located at 500 W. Monroe Street, Chicago, Illinois, 60661, USA.

STOCK SYMBOL
NYSE: MSI

CHAIRMAN AND CEO
Greg Brown

QUICK NUMBERS

- 2017 annual sales: $6.4 billion
- 2017 research and development spend: $568 million
- Customers: More than 100,000 in over 100 countries
- Employees: 17,000 in 60 countries
- Thousands of patents focused on mission-critical and wireless technologies

2. A detailed description of the Proposer's current and previous business activities, including, without limitation:

a. The history of the Proposer's company, including the date when the company was founded and how innovation and high-quality performance is fostered thereby.

MOTOROLA SOLUTIONS RESPONSE

On September 25, 1928, Paul V. Galvin and his brother, Joseph, incorporated Motorola's founding company—the Galvin Manufacturing Corporation—in Chicago, Illinois, USA.

Motorola is a global leader in providing mission-critical communication solutions, products, and services for the public safety, government and enterprise markets consisting of retail, energy and utilities, transportation, manufacturing, healthcare and other commercial customers. Motorola's market leadership in public safety communications provides solutions from infrastructure to applications to two-way radios and mobile computing devices. Motorola also produces professional and commercial two-way radios and solutions for business enterprise markets.

Since 1928, Motorola has been committed to innovation in communications and electronics. During its 90-year history, Motorola has proudly served the public safety and government markets by providing reliable mission-critical interoperable wireless communications systems, products, and services. Our 17,000 employees worldwide are focused exclusively on our public safety, government and enterprise customers. From the development of our first public safety two-way vehicular radio in 1931, to the advanced digital trunking networks being deployed today, Motorola is very proud of its heritage and ability to provide reliable communications for our customers. We will provide the same level of performance to Humboldt County.

Research and Development

Motorola Solutions continues to prioritize investments in R&D to expand and improve our portfolio of products through both new product introductions and continuous enhancements to our core products. Our R&D programs are focused on the development of: (i) new public safety devices, infrastructure, software and solutions, (ii) Command Center applications that include voice, data, and video, and (iii) public safety broadband solutions based on the LTE technology. We have design centers around the globe that focus on human dynamics, functionality of products and systems, application development, and the improvement of advanced Internet Protocol (IP) platforms.

R&D expenditures were $568 million in 2017, $553 million in 2016, and $620 million in 2015. As of December 31, 2017, we had approximately 5,000 employees engaged in R&D activities. In addition, we engage in R&D activities with joint development and manufacturing partners and outsource certain activities to engineering firms to further supplement our internal spend.

Environment

Motorola Solutions is working to be part of the solution to climate change and to reduce the environmental footprint of our products, operations and supply chain.

We approach this in several ways — improving the environmental profile of our products, running our operations in a safe and energy-efficient manner and helping our customers to be greener when they use our products.

The following long-term objectives reflect our ideals and provide a vision of how we intend to contribute to sustainable development:

- Product stewardship: Evaluate and improve environmental attributes and safety of new products.
- Zero waste: Minimize waste generation and reuse or recycle all waste materials.
- Benign emissions: Eliminate from manufacturing sites all emissions that adversely impact the environment.
- Closed loop: Promote the use of recycled materials to conserve natural resources.
- Green energy: Use energy in highly efficient ways at sites, and increase use of renewable energy.
- Zero occupational injuries and illnesses: Create a workplace free of occupational injuries and illnesses.

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b. The number of years the Proposer has been operating under the present business name, and any prior business names under which the Proposer has provided Radio System Packages and related services equivalent to those set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

We have been operating under our present business name of Motorola Solutions, Inc. since January 4, 2011. Motorola Solutions Inc. (Stock symbol MSI) has operated for 90 years (2018) starting first as Galvin Manufacturing then Motorola Limited.

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c. The number of years the Proposer has been providing Radio System Packages and related services equivalent to those set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

Motorola has been providing Radio System Packages and services equivalent to those set forth in this RFP since1991, 28 years.

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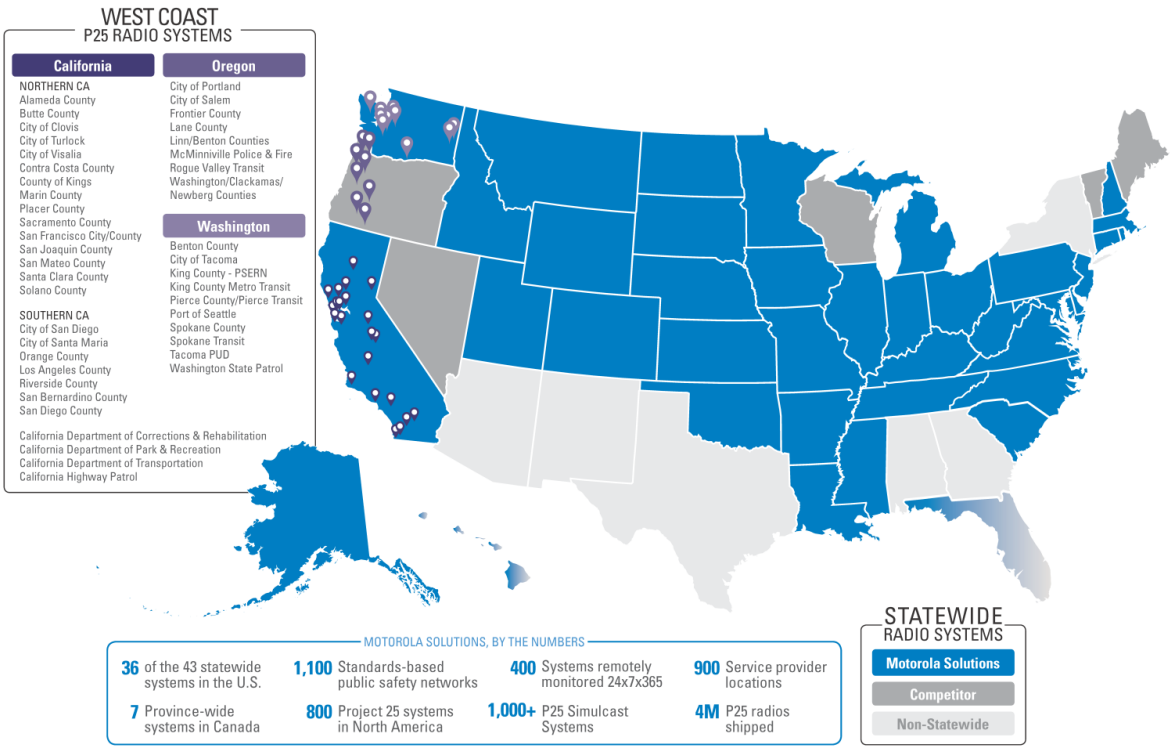
d. The total number of government agencies for which the Proposer has provided Radio System Packages and related services equivalent to those set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE



Motorola's heritage began with providing communications equipment to public safety customers. Over the years, we have utilized our innovation and experience across all of our business units to become the global leader in designing, manufacturing and implementing standards based public safety systems. We demonstrate this leadership with over 1,100 Association of Public Safety Communications Officials Project 25 (APCO P25) trunked and conventional systems, and Terrestrial Trunked Radio (TETRA) systems worldwide. We will apply this global leadership, knowledge, and capabilities to ensure a successful program for Humboldt County. Closer to Humboldt County, Motorola has installed and/or implementing over (20) P25 systems in California, including many of the State of California agencies working closelywith the California Highway Patrol, California Department of Correction and Rehabilitation, California DOT, and the California Department of Parks and Recreation. In addition, we have implemented just under another (20) P25 systems in Oregon and Washington.

3. A detailed description of any litigation regarding the provision of Radio System Packages and/or related services equivalent to those set forth in this RFP that has been brought by or against the Proposer, including the nature and result of such litigation, if applicable.

MOTOROLA SOLUTIONS RESPONSE

Motorola Solutions, Inc. ("Motorola") is a public company. Motorola and its subsidiaries have been a party to many civil lawsuits in the past 10 years. However, Motorola discloses all material litigation in its Annual and Quarterly reports filed with the United States Securities and Exchange Commission. The Annual Report on Form 10-K, as filed with the SEC for the fiscal year ended December 31, 2017, and any subsequent Quarterly Reports on Form 10-Q, contain a description of litigation considered to be material in accordance with the public disclosure requirements of the SEC. Because the Annual Report and Quarterly Reports contain only such litigation as is material for public disclosure under SEC rules, it may not list all litigation with which Motorola or its subsidiaries are presently involved.

In addition, Motorola is not currently aware of any litigation associated with the products or related services that are the subject of the RFP. Our Annual Report on Form 10-K and Quarterly Reports on Form 10-Q can be found at www.sec.gov or on our website, www.motorolasolutions.com/financials.cfm.

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4. A detailed description of any fraud convictions related to the provision of Radio System Packages and/or related services equivalent to those set forth in this RFP, if applicable.

MOTOROLA SOLUTIONS RESPONSE

Not applicable.

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5. A detailed description of any current or prior debarments, suspensions or other ineligibility to participate in public contracts, if applicable.

MOTOROLA SOLUTIONS RESPONSE

Not applicable.

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6. A detailed description of any violations of local, state and/or federal industry or regulatory requirements, if applicable.

MOTOROLA SOLUTIONS RESPONSE

Not applicable.

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7. A detailed description of any controlling or financial interest the Proposer has in any other firms or organizations, or whether the Proposer's company is owned or controlled by any other firms or organizations. If the Proposer does not hold a controlling or financial interest in any other firms or organizations, that must be stated.

MOTOROLA SOLUTIONS RESPONSE

Link to Motorola venture: https://www.motorolasolutions.com/en_us/about/company-overview/ventures.html

- **CHICAGO – March 28, 2018 – Motorola Solutions (NYSE: MSI) today announced it has completed the acquisition of Avigilon, a leader in advanced video surveillance and analytics.** Avigilon designs, develops and manufactures advanced security surveillance solutions, including video analytics, network video management software and hardware, surveillance cameras and access control solutions used by commercial and government customers. Avigilon holds more than 750 U.S. and international patents and manufactures its products in the U.S. and Canada.

- **CHICAGO – March 7, 2018 – Motorola Solutions (NYSE: MSI) today announced it has completed the acquisition of Plant Holdings, Inc**., which holds the Airbus DS Communications business, from Airbus Defense and Space, Inc., an indirect subsidiary of Airbus SE. Airbus DS Communications is a leading provider in North America of command center software for emergency call-handling. The company's VESTA® suite is a comprehensive 911 call-handling solution, operating on a flexible, open software architecture. It also delivers text-to-911, mapping, data management and analytics, providing customers a comprehensive transition strategy from legacy systems to a standards-based, unified Next-Generation 911 system. The acquisition of Airbus DS Communications strengthens Motorola Solutions' command center software portfolio and the company's Software Enterprise.

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8. A detailed description of any and all contracts in effect within twelve (12) months prior to the date of Proposal submission between the Proposer and any local, state and/or federal agencies, which allow for the purchase of equipment from outside agencies. Such information shall include, without limitation, the name and contract information of the contracting agencies.

MOTOROLA SOLUTIONS RESPONSE

Motorola has multiple contracts throughout the Unites States that allow various entities to purchase equipment based upon the pricing and/or terms and conditions of the contract. Many are limited to purchases for use on the system that is the subject of the underlying contract. The two nation-wide contracts under which a governmental agency (depending upon their procurement regulations) can purchase equipment from MSI are the NASPO contract and the H-GAC contract. The NASPO contract can be found at www.naspo.org and information about H-GAC can be found at www.hgacbuy.org. There are also two contracts within the state of California and they are the County of Los Angeles Master Agreement Contract MA-IS-174031, and the State of California, STPD-SW-1311-01, administered by the CA Statewide Technology Procurement Division.

4.2 OVERVIEW OF QUALIFICATIONS AND EXPERIENCE

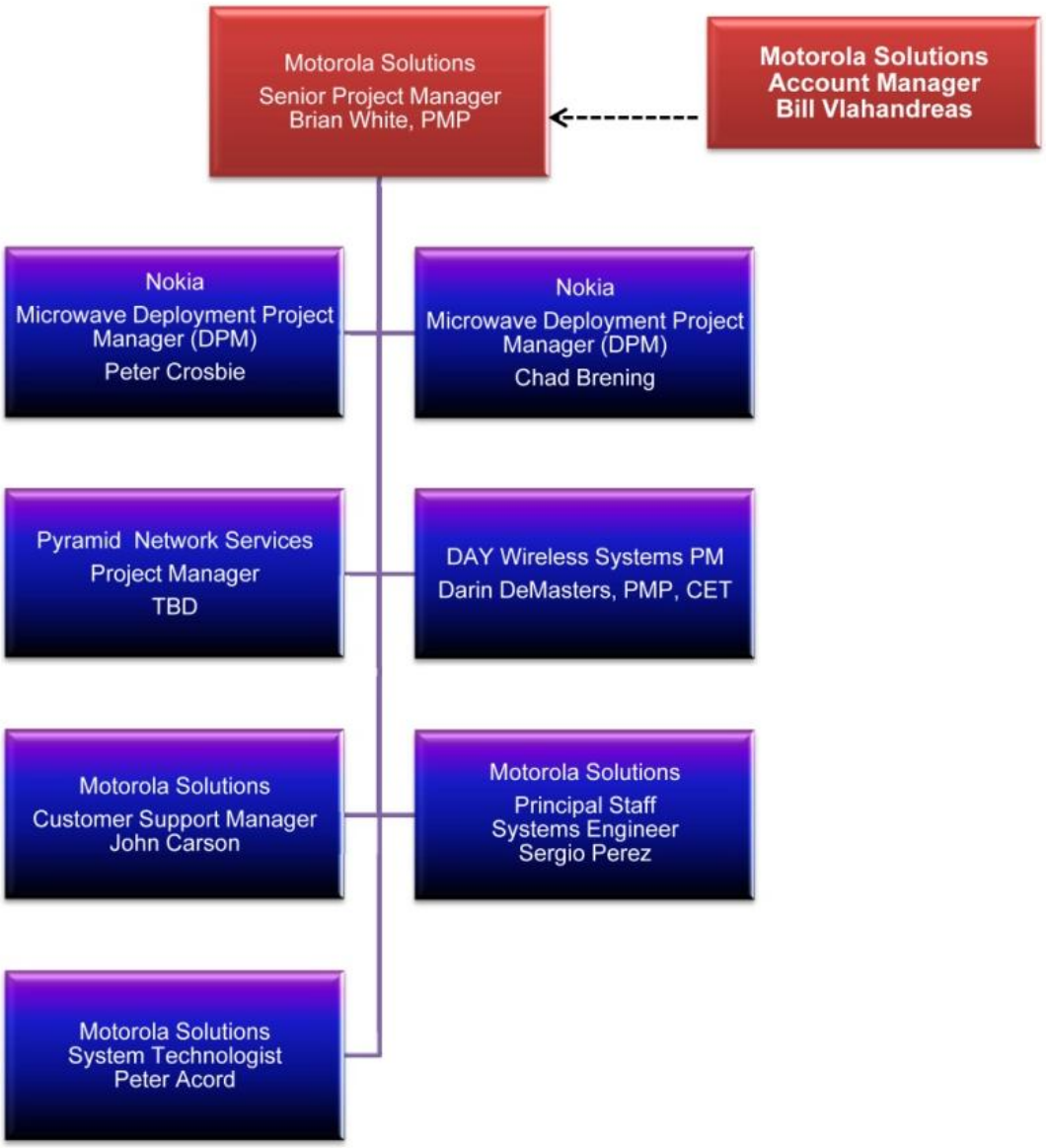
B. Overview of Qualifications and Experience. The Business Profile must include an overview of the Project Team's qualifications and experience regarding the provision of Radio System Packages and related services equivalent to those set forth in this RFP. The overview of qualifications and experience shall include, at a minimum, all of the following:

4.2.1 Project Team Description

1. Identification of the Project Team, including, without limitation, an organizational chart which identifies all key personnel and subcontractors that will be responsible for providing the Radio System Package and related services set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

The local project team, reporting to our San Diego based senior management, will have the day-to-day responsibility for ensuring Motorola fulfills its obligations for a smooth and on-time implementation. Our combination of a locally based and focused project team and a direct line of escalation into Motorola's West Region leadership in San Bruno and San Diego will enable us to manage and mitigate any issues that might arise. Organizational chart is shown on the next page.


Motorola Solutions
Senior Project Manager
Brian White, PMP
Motorola Solutions
Account Manager
Bill Vlahandreas
Nokia
Microwave Deployment Project Manager (DPM)
Peter Crosbie
Nokia
Microwave Deployment Project Manager (DPM)
Chad Brening
Pyramid Network Services
Project Manager
TBD
DAY Wireless Systems PM
Darin DeMasters, PMP, CET
Motorola Solutions
Customer Support Manager
John Carson
Motorola Solutions
Principal Staff
Systems Engineer
Sergio Perez
Motorola Solutions
System Technologist
Peter Acord

2. The number of staff members employed by each subcontractor included in the Project Team that are currently providing Radio System Packages and related services equivalent to those set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

Day Wireless Systems – 360 Employees

Nokia – 3,000 employees in the US

Pyramid Network Services, LLC – 150 employees

4.2.2 Project Team Experience

3. A detailed description of the Project Team's overall experience regarding the provision of Radio System Packages and related services equivalent to those set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

The individuals on this Project Team have worked on other projects of similar or more complex scope to this project as a team before. As a result, this team is very efficient and understands how to work well together. Motorola's dedicated team will be led by Brian White, who will be the Project Manager. The Project Manager holds overall responsibility for delivery and implementation of the Radio System Packages and services. Our Project Team including the Project Manager, Post-Sales Engineer, System Technologist, and Customer Service Manager, and Partners have a combined 70+ years of experience on projects similar to this RFP. All of the Motorola Project Team members, with the exception of John Carson-San Diego- are based in Northern California and have worked or are working on Northern California P25 projects including Butte County, city of Visalia, Sacramento County, city of Turlock, and San Mateo County to name just a few.

4. A detailed description of the Project Team's knowledge of the legal and procedural requirements pertaining to the provision of Radio System Packages and related services equivalent to those set forth in this RFP for public entities.

MOTOROLA SOLUTIONS RESPONSE

Motorola has provided Radio System Packages to numerous public entities within California including projects at the state, county, and city levels. Motorola and this project team are familiar with projects containing legal and procedural obligations typical of those set forth in this RFP and is confident it will be able to fulfill its legal requirements.

5. A detailed description of the qualifications and experience of each Project Team member regarding the provision of Radio System Packages and related services equivalent to those set forth in this RFP, including, without limitation, the responsibilities, special training, licenses, certifications, current contact information and résumés of the account manager, project manager, project engineer, project technician, training staff and subcontractor lead, that will be responsible for providing the Radio System Package and related services set forth in this RFP.

MOTOROLA SOLUTIONS RESPONSE

Account Manager – Bill Vlahandreas

The Account Manager, Bill Vlahandreas, will have overall responsibility for the satisfaction of Humboldt County throughout the project cycle.

Bill lives in Santa Rosa, and has been with Motorola since 2017 after spending 20+ years in the wireless industry. Bill has demonstrated an ability to help his customers navigate through budget challenges, political concerns, and complex migrations. Bill has taken a leadership role in assisting the numerous county and city agencies who have been impacted with devastating fires from Santa Rosa to Shasta County providing them with radios, base stations, spare batteries and accessories in 24-hour notice.

He will interface with Humboldt County customer contacts to fully understand the needs of each department. Additionally, he will be responsible for answering any questions that may arise within Humboldt County. He will work with members of the implementation team including subcontractor partners and key members of the Humboldt County team, serving as the liaison between Motorola and the county. If technical issues arise during the implementation of the project, Bill will assign the correct resources(s) to resolve the problem.

Project Manager (PM) – Brian White

The Project Manager, Brian White, will serve as the primary Motorola lead for the project. Brian is based in our San Bruno office and has twenty years of experience in project management and project engineering within Motorola's Systems Integration organization. Brian's daily activities include all aspects of program management, project administration, team leadership, contract/customer negotiation, change control management, quality assurance, scheduling & cost control, financial analysis, and risk management. His major area of emphasis is with Motorola Project 25 IP systems such as that proposed for Humboldt County, including analog and IP-based dispatch systems, several microwave system deployments and FCC licensing.

Most recently, Brian has been the Project Manager for Butte County's new P25 system and Sacramento County's P25 simulcast system and consoles, as well as managing dispatch expansions for San Francisco MTA, SAMTRANS, and Oakland.

Brian will track the progress of the project and take proactive measures to ensure that the project remains on schedule. The PM will work with the designated Humboldt County Project Manager to ensure that contractual commitments are delivered and fulfilled. Brian will manage and allocate all required resources, personnel, budgets and materials to ensure that the system is implemented to the satisfaction of Humboldt County.

He will also ensure that the system meets Motorola standards on the specifications as agreed to during the Customer Design Review, while maintaining the highest standards of customer satisfaction

Brian will ensure quality workmanship by all Motorola vendors and subcontractors. He will coordinate with the factory, ensuring that the system is tested on time.

Motorola will conduct a complete inventory of all received equipment to verify complete delivery, inspect physical condition of all hardware to ensure that none is damaged during shipment, and verify that all site preparation is complete prior to the installation phase of the project. Brian will supervise field installation and implementation teams ensuring all onsite installation, integration, and optimization tasks are performed to contract requirements. The PM will coordinate and conduct regular progress meetings that include providing status reports, and reports from subordinates.

Lead Systems Engineer (SE) – Sergio Perez

The Lead Systems Engineer, Sergio Perez, will be responsible for the engineering and system design.

Sergio is a Principal Staff Systems Engineer based in Sacramento and has been with Motorola for 16 years. Sergio worked in development on the Network Transport Product Team, with expertise in networking which will be beneficial in integrating the Nokia microwave backhaul.

Sergio will develop Design Review documentation and ensure the system design meets Humboldt County's requirements. He will interface with Motorola factory engineers and plant production managers to ensure proper delivery for the required specification and functionality.

He will work with the subcontractor's engineers and review their specifications and products. The SE will develop and execute system acceptance test plans. He will direct the technical integration and testing of all the subsystems to ensure compliance with agreed upon overall system design.

Sergio will ensure the technical and engineering compliance of the system. He will also manage technical site planning, coverage and technical documentation content and system migration and cutover from existing system.

The SE will develop primary system documentation, define final system design, and verify the technical integrity of the system design. Sergio is working or has worked on Butte County's P25 system, city of Turlock P25 system, Sacramento County P25 system and the County of Kings P25 system-projects similar in size and scope to the Humboldt County system.

Lead System Technologist (ST) – Peter Acord

The Lead ST, Peter Acord, is responsible for ensuring that the system is tested and optimized to perform as designed and is based in our San Bruno office and has been working for Motorola since 2010 . For the last five years, Peter has been a leading System Technologist for Sacramento County and East Bay RCS. He has extensive experience with subscribers for multi-agency and mixed mode (analog and P25) technology, which is very relevant to the Humboldt County system. Peter was selected twice the Motorola Western Area Support Person of the Quarter.

The Lead ST will oversee installation quality, programming, optimization and testing of the integrated system to ensure it operates according to the specifications and system design. Peter will participate in the staging and testing of the system at Motorola's Customer Center for Solutions Integration (CCSi). He will ensure site link verification testing occurs to validate connectivity and adequate performance at the Humboldt County sites. In addition, he will oversee integration and optimization of all system hardware and software, which includes equipment programming and configuration development, optimization of RF equipment, optimization of the consoles, Acceptance Testing, Site Installation audits, and development of the system cutover plan.

Customer Service Manager (CSM) – John Carson

The Customer Service Manager, John Carson, is responsible for developing a service delivery plan and the Customer Support Plan for the warranty and ongoing maintenance. For five years, John has been with Motorola serving customers through Project and Customer Support Management. John is the face to our service organization. Motorola understands the importance of a service plan for Humboldt County. As such, the Motorola Customer Service Manager will work with Humboldt County to customize the plan to best meet your needs.

Worldwide Learning Services (Training)

Motorola Solutions' training experience and expertise enables our customers to gain the training they need to use during critical times in a variety of methods. We offer four interactive methods of training: Online Self-Paced, Virtual Instructor-Led, Instructor-Led, and our *new* Integrated Training Environment.

We have approximately 40 instructor resources distributed across North America. These instructors are available to train customers in our Technical Training Center located in Schaumburg, Illinois, while specific training courses are available at our facility in Plantation, Florida. Training can also be delivered directly on-site at customer locations. All instructors undergo an Instructional Skills and Technical

Knowledge Program, which is a globally-recognized training and instructor assessment program.

For Humboldt County, we are proposing (5) courses focusing on the infrastructure side of the proposed system and will be hosted at a Motorola facility. This training is open to all of our customers and we do this deliberately because we have learned by providing a public training forum like this, customers are able to learn from their peers as well with like systems. The proposed training is targeted specifically to the system we have proposed for you. In addition, we also propose a “hands-on” day training at the customer location on our subscriber radios. This is instructor led and provides a train the trainer environment.

MOTOROLA SOLUTIONS RESPONSE

4.2.2.1 Resume – Account Manager - Bill Vlahandreas

SENIOR ACCOUNT MANAGER—PUBLIC SAFETY SALES	1236 Melissa Ct. Santa Rosa, CA (707)321-7007
Date of Hire	2017
Motorola Professional Experience	Highly motivated, professional with proven experience in sales and managerial roles along with vast knowledge of the telecommunications industry and its products. Skilled in customer relationship building, consultative selling strategies and methodologies; experienced with solutions-based applications and vertical-based mobile technologies. *2017—Present* **Senior Account Manager: Public Safety—N. California** ▪ Responsible for sales, strategic account planning and overall relationship management for cities and counties within N. CA (Sonoma, Napa, Mendocino, Humboldt, Butte,). ▪ Act as a trusted advisor to influence customer's technology platform decisions and develop preference and loyalty for Motorola Solutions. ▪ Assemble and coordinate a diverse team of internal and external sales resources to assess agencies needs and address their requirements.
Other Professional Experience	Driven to always learn more and gain more knowledge, have experience in effectively collaborating with many levels of leadership and distribution. Technical proficiency in MS Office and sales tracking software, Salesforce and ACT. *Kyocera Communications, 2016—2017* **Senior Manager: Enterprise, Sales, Verizon, Pacific Market** ▪ In charge of managing the company's enterprise-, government-, retail-, and business-to-business (B2B) strategies and relationships with Verizon

SENIOR ACCOUNT MANAGER—PUBLIC SAFETY SALES	1236 Melissa Ct. Santa Rosa, CA (707)321-7007
	Wireless at all levels. ▪ Accountable for developing and implementing customer-specific sales strategies, and collaborating with the marketing department in cultivating successful product campaigns and effective direct channel/distribution programs to enhance customer satisfaction. ▪ Responsible for delivering compelling sales presentations for diverse audiences ranging from senior executives to retail sales representatives. *Ballistic Case Company, 2015—2016* **National Account Manager** ▪ Successfully partnered with U.S. distributors in order to place products in stores and attract additional dealer agents. ▪ Recruited to aide in the company's re-launch by Director of North American Distributor Sales based on strong and successful sales experience at LG Electronics. ▪ Efficiently executed the distributor program, which included: Volume Incentive Rebate (VIR), Market Development Funds (MDF) and other sales programs. ▪ Repaired and improved past company relationships with distributors and independent retailers to restore credibility; effectively secured new business opportunities. *T-Mobile/Metro PCS Team, 2013—2015* ▪ Led team in achieving 118% of sales goals by third quarter as team leader, and 115% of sales goals in the fourth quarter with other regions averaging only 70%. ▪ Surpassed sales projections by 375% for fiscal year 2014 on Metro PCS.

SENIOR ACCOUNT MANAGER—PUBLIC SAFETY SALES	1236 Melissa Ct. Santa Rosa, CA (707)321-7007
	Verizon Wireless Team, 1999—2013 ▪ Recruited by regional leadership based on previous successful experience at GTE; secured first purchase order on west coast with GTE Wireless. Streamlined “Subject Matter Expert Program”, which enhanced the expertise of key indirect store sales personnel, creating “go-to” for in-house product support that resulted in an immediate 10-17% increase in sales. *LG Electronics U.S.A, Inc., 1999—2015* **Western U.S. Regional Sales Manager: Mobile U.S. Handset Division** ▪ Accountable for building and maintaining vendor relationships with all sales channels and levels of management in assigned VZW regions and areas; responsible for generating sell-through of LG products and fostering sell-through of higher-tier products. ▪ Managed and implemented a regional sales and marketing budget along with strategic marketing programs within constraints. Obtained critical information concerning customers and competitors to assist the sales, marketing, and research/development (R&D) of current and future products. ▪ Key contacts included the Regional President, vice-presidents, general managers, sales directors, district sales managers, store managers, account managers, sales & operations managers, sales & customer service representatives, and business channels. ▪ Successfully identified competition and led product development through weekly calls with national and regional sales leadership teams. Supervised all handset product launches in Western U.S. territory by executing incentive-driven sales programs and

SENIOR ACCOUNT MANAGER— PUBLIC SAFETY SALES	1236 Melissa Ct. Santa Rosa, CA (707)321-7007
	leveraging marketing/training sessions. - Scheduled and conducted product presentations for retail, business and indirect sales channels; modified any components of presentations that needed changes to meet all needs of various levels of sales professionals, and followed up as needed. - Represented LG at events such as product launches, regional sales rallies, promotional events, open houses, vendor shows, customer events, and other related company activities. - Developed, scheduled and conducted training classes on LG products and new product technology for members of executive staff; established productive customer relationships with senior account management and sales teams.
Education	Business Administration Santa Rosa Junior College
Training, Certifications, and Memberships	**Santa Rosa Evening Active 20-30 Club President** Past President, Vice-President, Secretary, and Board of Directors Member Served as Chairperson for multiple fundraisers **American Red Cross, Monterey, CA Chapter** Disaster Services Committee **Rancho Penasquitos Pop Warner Football** Sponsor and Fundraising Chair **Rincon Valley Little League** Board of Directors, Senior League Commissioner, Vice-President

4.2.2.2 Resume – Senior Project Manager – Brian White, PMP

Brian White, PMP	
Senior Project Manager, PMP	Motorola Solutions, Inc. 847 980 4478
Date of Hire	April 1997
Motorola Professional Experience	Experience in project management and project engineering within Motorola Systems Integration organization. Responsibilities include all aspects of program management, project administration, team leadership, contract/customer negotiation, change control management, quality assurance, scheduling & cost control, financial analysis and risk management. Major area of emphasis is with Motorola Project 25 IP trunking systems, including analog and IP based dispatch systems, several microwave system deployments and FCC licensing. I served as primary contact responsible to execute and manage contract deliverables and drive all stakeholders for successful delivery of project requirements. **December 2016 - Present** **Project Manager, Butte County P25 System (J-RICS)** Primary contact for deployment of P25 communications system, microwave system and new DC power system and all new portable and mobile radio fleet. **February 2013 - Present** **Project Manager, Sacramento County P25 System** Serve as primary contact responsible to migrate and integrate existing 24 channel mixed mode simulcast cells with a new P25 Master site and two new P25 simulcast subsystems. Twelve dispatch centers are being replaced with MCC7500 dispatch centers and multiple logging solutions are also part of projects. **April 2015 – August 2016** **Project Manager, EBRCSA Oakland and Piedmont** Oakland and Piedmont are 29 MCC7500 positions at three locations interfacing to the EBRCSA system and replacing competitors P25 radio system. **September 2013 – January 2014** **Project Manager, San Francisco MTA Console**

Brian White, PMP	
	San Francisco MTA Console was the addition of 7 MCC7500 dispatch positions that interface to the San Francisco P25 system **January 2012 – February 2013** **Project Manager, Eastern Jackson County P25 System** Served as primary contact responsible to deploy an 8 site 10 Channel ASTRO P25 simulcast system with 2 green sites and 2 dispatch centers. It replaced the Independence P25 system, integrated Independence system with KCMO master site and expanded the Independence OC3 Alcatel Microwave system with two new Blue Springs sites. New site construction included one site with 350 self supporting tower building & generator and utility power. The second new site was built in and on a water tower with new shelter, custom antenna mounts, generator, ATS and power. Subscriber scope included re-programming P25 Independence subscribers from 700 Mhz to 800 Mhz system for 13 agencies and replacing VHF radios with P25 APEX radios for Blue Springs agencies. The system was implemented and VHF users were online within 10 months of kick off meeting to meet VHF narrow banding requirements. **July 2011 – February 2012** **Project Manager, City of Springfield Utilities / Green County** Served as primary contact responsible to deploy a new ASTRO P25 master site and 2 new MCC7500 dispatch centers that were integrated to the existing ASTRO 3.0 simulcast system through Motorola's SmartX converter . **May 2011 – September 2012** **Project Manager, Sarpy County** Served as primary contact responsible to deploy a P25 Voice & High Performance Data Master site with 3 new High Performance Data RF sites. A SmartX converter was used to integrate with the customer's existing ASTRO 3.0 system. The 3.0 dispatch was interfaced to the P25 Master using MGEG. **January 2010 – September 2011** **Project Manager, Butler County** Served as primary contact responsible to deploy a 5 site 10 channel P25 simulcast cell with 1-6 channel IR, 6 mutual aid repeaters, 3 dispatch centers, a VHF simulcast paging system overlay and NICE

Brian White, PMP	
	logging equipment. Also deployed a six hop DS3 Harris microwave system with J-Mux. This simulcast cell, IR NICE logger and three dispatch centers where interfaced to the KDOT ASTRO P25 system. **June 2007 – December 2009** **Project Manager, Leavenworth County** Served as primary contact responsible to deploy a 7 site, 10 channel P25 simulcast cell and a 10 position dispatch center that was added to the Kansas Department of Transportation's P25 system. First site included a 400' guyed tower, shelter, generator and power; second site included 250' self supporting tower, shelter, generator and power; third site was located in Fort Leavenworth and included new shelter, generator and power. An 8 hop DS3 Alcatel microwave system and J-Mux was deployed for connectivity. **May 2007 – May 2012** **Project Manager, Kansas Department of Transportation (KDOT)** Served as primary contact responsible to expand, upgrade and build out to 78 IR sites, 12 dispatch centers (one to twelve positions each) and multiple simulcast cells. **January 2001 – March 2007** **Project Manager for Customer Center for Systems Integration (CCSi)** Responsible for managing the staging and presentation of public and private communication systems. Insured proper integration of Motorola systems platforms with vendor sub-systems. Presented systems to customers and field teams. **April 1997 – January 2001** **Systems Engineer for CCSi and Upgrade Operations** Responsible for several system upgrades and system staging with Motorola field teams. Created system documentation packages and CCSi build books for DataTac, Smartnet, simulcast, and conventional systems. Performed customer witnessed tests.
Education	**COLLEGE** B.A., Business Management Roosevelt University – Schaumburg, IL

Brian White, PMP	
	CERTIFICATIONS Project Management Professional (PMP) Master's Certificate in Project Management Advanced Master's Certificate in Project Management **TRAINING** **Motorola –** PMI Courses, UNIX Fundamentals, Digital Communications, Omnilink, Frame Relay Hands-on TCP/IP Internetworking, Windows NT: Comprehensive workshop **California Microwave** - Digital Network Timing & Synchronization, Telestar 18/23 Ghz Microwave (MW), Starpoint MW, Starpoint 6000 MW, Network Management Systems, MNS 15/28/23GHz MW **Transector** - Lightning/EMP Solutions **US Navy** - Basic Electronics & Electricity, Weapons Control Systems, Digital Computer

4.2.2.3 Resume – Customer Support Manager – John Carson

Customer Support Manager	Motorola Solutions, Inc. TEL: 858 956 9143
Date of Hire	June 2013
Motorola Professional Experience	Five years of experience in service delivery and contract management within Motorola Solutions Managed Services organization. Responsibilities include all aspects of customer service, project administration, team leadership, contract/customer negotiation, change control management, quality assurance, scheduling & cost control, financial analysis and risk management. **Jan 2016 - Present** **Customer Support Manager, Sacramento Municipal Utility District.** Customer Support Manager who led the warranty and maintenance planning from the beginning of the system design. Moved the phased system implementation from installation into warranty and later a multi-year maintenance plan. **Jan 2016 – Present** **Customer Support Manager, Ukiah Police Dept.** Customer Support Manager who led the warranty after system Installation. Implemented the warranty. **June 2013 – Sept 2015** **Customer Support Manager, United State Marine Corp Installions West** Customer Support manager for the USMC MCIW, responsible for warranty and post warranty maintenance services. Involved in system warranty and maintenance services planning to help make implementation and warranty transition seamless. Also, involved with long term maintenance service planning for post warranty. **June 2013 – Sept 2015** **Customer Support Manager, United State Airforce Strike Command** Served as primary contact responsible for ongoing

Customer Support Manager	Motorola Solutions, Inc. TEL: 858 956 9143
	P25 maintenance and support activities; post system implementation. Assisted in planning for major system growth from one Strike Command base in California to eight Strike Command bases nationwide.
Other Professional Experience	**Sept 2001 – Oct 2008** **United States Marine, Team Leade/Maint. Supervisor** While Deployed, led Marines into combat and peace keeping missions. In garrison, was responsible for maintaining assets for power generation, water purification and communications equipment.
Education	**COLLEGE** - B.A., Business Administration - M.B.A., Economics - National University, La Jolla, California - United States Marine Corps – Journeyman Electrician & Electronics
Awards	- Navy Achievement Medal - Good Conduct Medal x 2 - Global War on Terrorism Expeditionary Medal - National Defense Medal

4.2.2.4 Resume – System Technologist – Peter Acord

System Technologist	Motorola Solutions, Inc.
Date of Hire	2010
Professional Summary	Peter Acord has been working for Motorola for the last 8 years as a System Technologist in Northern California. During that time he has worked on many projects both inside and outside the territory supporting all aspects of Motorola's P25 LMR Communications Systems, including integration and inter-vendor interoperability. Peter's experience with servers, networking, and network security are assets for implementing today's modern radio systems, as are his troubleshooting skills. He currently resides in the San Francisco bay area.
Motorola Professional Experience	System Technologist, 2010-2018 Territory 8/Northern California ST **Projects:** **1. San Francisco Radio Communications System Replacement Project** City-wide P25 Public Safety Communications System **Lead System Technologist** - Currently transitioning the City of San Francisco to a current-generation Motorola P25 system. - Responsible for all aspects of deployment including core, RF and dispatch sites. - Responsible for integrating radio system components via MPLS backhaul. - Responsible for integration of 3rd party products including CAD and IP logging. **2. East Bay Regional Communications System** Two-county P25 Public Safety Communications System System Technologist - System Install & Configuration **3. State of California (Multiple Agencies)** Statewide P25 Public Safety Communications Solutions

System Technologist	Motorola Solutions, Inc.
	Lead System Technologist - P25 radio system with RF coverage for multiple facilities across the state.
Other Professional Experience	**Alameda County GSA Communications** **2009-2010** 800MHz Rebanding Subscriber Support - Public Safety Radio System
Education	- Encinal High School, Alameda, CA - San Francisco State University, San Francisco, CA Courses in Computer Science
Awards/Certifications	- Motorola Digital Six Sigma Quality White Badge Certified - Motorola Tier 3 Network Specialist Certified - CompTIA Network+

4.2.2.5 Resume – Principal Staff Systems Engineer - Sergio Perez

Principal Staff Systems Engineer	Motorola Solutions, Inc.
Date of Hire	2002
Professional Summary	16 years of experience with Motorola in field engineering and product development. Sergio's office is located in San Bruno, Calif. **Skills include:** - VMware Design and Implementation, - Cisco Network Design, Cisco IP Telephony Design/Support, - Cisco Routers/Switches, - Firewall 1/VPN 1deploy and support, - Rational Clearcase, - Windows 2k/XP/Vista/7/10/Server 2k3/2k8/2012, - Unix support, HyperV, - Windows 95/98, Windows NT 3.51/4.0
Motorola Professional Experience	**03/2017 – Present** **Lead System Engineer – Butte County Joint Regional Interoperable Communication System (JRICS)** Lead System Engineer for (JRICS) which is a regional P25 system covering Butte Countiy in the northern California. JRICS has 2 simulcast cells a dispatch site and an ASR site as well as ~1000 subscribers. Worked with 3rd party vendor to design and implement MPLS Microwave backhaul. **11/2017 – Present** **Lead System Engineer – Sacramento County Regional Communication System (SRRCS**) SRRCS is a 2 simulcast cell, 4 repeater site and 19 Dispatch Site communications system that serves the greater Sacramento area. Added an upgrade logging recorder solution at 2 of the dispatch sites Added 7100 console operator positions for existing dispatch sites Added a simulcast cell and 2 dispatch sites to this system

Principal Staff Systems Engineer	Motorola Solutions, Inc.
	Lead engineer on the upgrade of this system from Astro 7.13 to Astro 7.17 **05/2017 – Present** **System Engineer – Marin County Communications (MERA)** Network System Engineer for MERA responsible for designing the backhaul communication between Motorola's radio system and the customer's cloud infrastructure. **07/2017 – Present** **Lead System Engineer – Kings County Communications System** Lead System Engineer responsible for design and implementation of this 6 site simulcast cell and a dispatch site with a point to point microwave link . **05/2017 – Present** **Lead System Engineer – Turlock PD** Lead System Engineer responsible for the design and implementation of this 2 site simulcast and 2 dispatch site solution. This system also includes a microwave link and MPLS backhaul.

Principal Staff Systems Engineer	Motorola Solutions, Inc.
Other Professional Experience	**Netmedic, Inc., 04/99 to 03/02** **Senior Network Specialist** - Designing, installing, and supporting Microsoft based solutions for corporate environments. - Designing security structure and installing customer specific rule base for Checkpoint Firewall/VPN products. - Supporting a wide range of customer specific apps such as Clearcase and Rational Rose. - Design, installation, and support of Cisco IP Telephony solutions. **Intel Corporation, 09/97 to 04/99** **Remote Technician** - Troubleshooting and repairing operating systems (Windows 95/98 and Windows NT 3.51 and 4.0) and application support for a wide range of products. **California Department of Corrections, 08/90 to 09/97** **Student Assistant/Office Assistant** - Desktop support, answering phones, writing macros, creating forms using Excel, Lotus, or Word. **Pacific Computer Design, 1991 to 1992** **Owner** - Selling, upgrading, repairing, and troubleshooting computers.
Education	Associate in Applied Science Degree in Electronics Technology Heald Institute of Technology, Sacramento, CA
Awards/Certifications	- VMware Certified Associate - Cisco Certified Design Associate - Cisco IP Telephony Design Specialist - Checkpoint Certified Security Administrator (Firewall1/VPN1) - Microsoft Certified Professional in Windows NT 4.0 Workstation/Server

4.2.3 Subcontractors-Partners

Motorola outsources highly specialized functions to industry-proven firms. We have been the prime contractor for the majority of our successful public safety communications systems. During this time, we have learned that our continued success is only achieved through the careful up-front selection of our subcontractors, the rigorous oversight of their work, and the integration of their team members as part of our core customer project team.

Motorola has options when it comes to microwave, site, and service partners. Yet, we specifically chose Nokia, Pyramid and Day for this project. Nokia is a microwave industry leader in state and local government and we have worked together on many countywide systems like Humboldt County in the past. We have an excellent working relationship with Nokia specifically in California and have partnered on projects including San Diego, San Francisco and Turlock.

4.2.3.1 Day Wireless Systems

Day Wireless Systems is a premier provider of wireless solutions for voice, data, and video. The company designs, installs, and supports systems for government, public safety, healthcare, commercial, and education customers. Founded in 1969, the company is based in the Portland, Oregon area and now operates from 26 locations in five States. Day Wireless Systems employs more than 320 employees, including 175 technical staff made up of engineers, senior technicians and skilled installers. The company is privately held and led by third generation family members. Day Wireless has been a long time Motorola two-way radio service provider and has an excellent reputation and 28 service locations throughout the West coast

Day Wireless Systems is one of the largest wireless integrators in the United States and a major provider of the leading brands in wireless system applications. They are the second largest Motorola channel partner in the nation. All of their regional service centers are certified as Service Elite Specialists, which is the highest technical service status awarded by Motorola. Achieving this certification requires the highest level of technical and customer service. Additionally, Day's service centers are certified by the Electronics Technical Association (ETA) for high standards of technical ability, business operations, ethics, safety and customer service.

Day Wireless has worked on and maintained many P25 systems just like Humboldt County including the P25 Rogue Valley Transit in Jackson County, Lane County P25 system and the P25 Linn/Benton Counties. In addition, Day Wireless currently services your Avtec consoles and is also the 2-way service provider for the cities of

Eureka, Arcata, Humboldt State University Police Department, Del Norte County, Curry County, Jackson County, Coos County, and many more.

Day Wireless – Darin DeMasters

As a member of the Day Wireless project team, Darin is assigned to various projects as needed and provides the capabilities for managing small and large projects.

Darin earned his PMP from the Project Management Institute. He also holds an Advanced Masters Certificate in Applied Project Management, and a Certificate in Advanced Strategic Project Management Practices. Darin also holds an FCC license.

His unique mix of wired, fiber, wireless and IT communications technical expertise adds extra value to his role as project manager. This allows him to be especially effective in leading advanced telecommunication system implementations.

Darin has led numerous projects involving sophisticated digital RF and IP integrated solutions. Examples include deployments for: Lawrence Livermore Labs, Golden Gate National Recreation Area, Santa Clara Valley Transit Agency, ECSO Dispatch Center, Klamath Falls Console System, Yakima Sheriff Simulcast, Lincoln PUD digital radio and others.

4.2.3.2 Resume – DAY Wireless Systems PM – Darin DeMasters, PMP, CET

PROJECT MANAGER	3669 Aviation Way, Medford, OR TEL: 541-772-5602
Date of Hire	1992
Professional Summary	As a member of the Day Wireless project team, Darin is assigned to various projects as needed and provides the capabilities for managing small and large projects. Darin earned his PMP from the Project Management Institute. He also holds an Advanced Masters Certificate in Applied Project Management, and a Certificate in Advanced Strategic Project Management Practices. Darin also holds an FCC license and is a Certified Electronics Technician (CET) per rigorous testing from the Electronic Technician Association, International (ETA). His unique mix of wired, fiber, wireless and IT communications technical expertise adds extra value to his role as project manager. This allows him to be especially effective in leading advanced telecommunication system implementations. Darin has led numerous projects involving sophisticated digital RF and IP integrated solutions. Examples include deployments for: Lawrence Livermore Labs, Golden Gate National Recreation Area, Santa Clara Valley Transit Agency, ECSO Dispatch Center, Klamath Falls Console System, Yakima Sheriff Simulcast, Lincoln PUD digital radio and others.
Other Professional Experience	- Program Management - Project Management - Strategic Business Planning - HR Management & Leadership - LAN/WLAN/Wireless Install & Upgrade - Fiber Engineering & Construction - Site Safety/OSHA Compliance

PROJECT MANAGER	3669 Aviation Way, Medford, OR TEL: 541-772-5602
Education	▪ Boston University – Project Management Professional ▪ Southern Illinois University - Vocational Education ▪ City College of Chicago – Business Administration ▪ Villanova University – Advanced Masters Certificate for Applied Project Management
Training, Certifications, and Memberships	▪ Project Management Professional (PMP)#:1262368 ▪ FCC License #:PGGB008924 ▪ Motorola Certified – Centracom, Best Practices, ASTRO Saber, R56 ▪ EIA Certified Electronics Technician WCMOR883 ▪ Certificate in Lean Six Sigma

4.2.3.3 Nokia – Subcontractor Profile

Motorola and Nokia have partnered for over two decades providing robust and secure communications solutions to meet the mission critical needs of first responders. Scaling from small networks to large statewide networks the Motorola and Nokia team provides a solution scaled for the service needs of today and ready to expand to support future needs as they arise. Nokia's backhaul solution is the perfect complement to the Motorola P25 radio network. Beyond the years of experience of working together and honing our interworking business processes to ensure the entire network implementation is painless to you the customer, the Nokia and Motorola solution is field tested for full product interoperability with a dedicated Nokia team for Motorola to help with response and escalation processes. Whether the solution requires a simpler Carrier Ethernet or a higher feature rich IP/MPLS service, Nokia has the product lines to support your P25 and legacy traffic requirements and are visible to the Motorola Unified Element Manager. Nokia and Motorola are familiar with the existing Humboldt County system, County is currently utilizing Nokia MDR 8000 Microwave today. As part of this solution, it will be upgraded to the next generation Nokia Wavence Microwave platform.

Nokia - Peter Crosbie & Chad Brening

Nokia's Microwave Deployment Project Manager (DPM) is responsible for all facets of the field installation. Their first responsibility is to coordinate site surveys which taken together with the microwave design allow the DPM to define the Bill of Materials for all the site specific material (antenna mounts, tie-back steel, waveguide lengths and supporting structure, etc.) Utilizing the Site Survey Report, Microwave Design and Bill of Materials, he then forms the work package required for Nokia's sub-contractors to plan their resources and material estimates. Based on the location and complexity the DPM works with Nokia's Procurement organization to select the field installation sub-contractor. The DPM ensures the sub-contractor's assigned resources meet Nokia technical certification requirements and follow Nokia's Environmental Health and Safety standards.

During installation the DPM is the liaison between the installation team and the Program Team. The DPM updates the PM for schedule tracking as well as any risks that occur. After installation the DPM ensures the Acceptance Test Plan is completed successfully, that all Phot Quality Audits are 100% conforming to Nokia standards and all Close-out Packages meet specifications and are correctly and consistently completed.

Chad Brening and Peter Crosbie have successfully partnered and completed a number of projects similar in scope to Humboldt County. Listed below are some of these projects primarily in California.

City of Los Angeles- 2 hop Radio System, Edison Supply-MPR9500 & installation Support Mandalay - Rincon Peak - Santa Barbara, Eastern Municipal Water District- Path Survey/Tower Analysis Phase 1, Rockwall County, TX- Harris Corporation - Rockwall County, TX, SFMTA, Trinidad & Tobago, Rensselaer County, California DWR- Tank1 to Lost Hills, State of California – CalOES- Tower Analysis 3 Phase Project, Fresno County- Public Safety Network Upgrade, Mendocino County- Fire Damage Site Replacement

4.2.3.4 Resume – Nokia – Peter Crosbie - Deployment Project Manager

TITLE	Deployment Project Manager
Date of Hire	January 2001
Professional Experience	**QUALIFICATION SUMMARY** A hard-working dedicated team player that meets deadlines and works well under pressure while managing scope, schedule, cost and quality. A goal-oriented manager who leads by example and works well at all levels of an organization. A proven problem-solver with excellent organizational, interpersonal and communications skills. **Nokia (formerly Alcatel-Lucent) Deployment Project Manager, X- Haul, Strategic Industries: Wireless Transmission Division** **September 2001- Present** **Nokia, Plano, TX** **Responsibilities** - Manage all aspects of Microwave Network implementation. - Initiate planning and interface with transmission and network engineers. - Work with customers internal and external to develop scope of work and project goals. - Estimating and quoting services and outside purchase equipment - Develop budget and schedule - Evaluate and approve vendors and contractors best suited for project. - Schedule resources to meet project priorities and milestones. - Monitor execution of project plan to assure quality standards. - Facilitate resolution of technical and process issues. - Reporting status and progress for upper management and customer. - Customer acceptance. - Project closure, record project history, lessons learned and archive.

TITLE	Deployment Project Manager
	Jan 2001 – 1999 **Kay Minihan Inc.** **Seminole, OK** **Project Manager (Alcatel Puerto Rico)** - Contracted project manager for the implementation of Newcomm, and SprintPCS programs in Puerto Rico. - Interface with Alcatel Program manager - Interface with customer. - Warehouse and Logistics management. - Scheduling of installation effort. - Supervision of installation personnel. **1999 - 1986 Farrow Manufacturing Inc.** **Grand Prairie, TX** **General/Production manager** - Estimating and quoting new and recurring projects for industry including Gov./defense, Aerospace, Automotive and Petroleum - Budgeting and Planning all aspects of manufacturing processes, from purchasing raw materials through the shipping of the finished products. - Programming of computer-controlled equipment used in manufacturing. - Scheduling. - Author of the company quality control manual and procedures to ISO9000 compliance. - Set up and maintenance of statistical control methods and procedures. - Purchase of new equipment essential to company growth. - Personnel Management, supervision and training.

TITLE	Deployment Project Manager
Education	- Project Management Professional (PMP), 2005 - 2012 - Gwent College University of Wales / British Steel corp. UK - Indentured four-year apprenticeship in mechanical engineering, manufacturing and maintenance.
Training, Certifications, and Memberships	HONORS AND ACTIVITIES * Member of the Dallas PMI Chapter

4.2.3.5 Resume – Nokia – Chad Brening, PMP - Deployment Project Manager

TITLE	Project Manager
Date of Hire	October, 1999
Professional Experience	QUALIFICATION SUMMARY Certified Project Manager with over 21 years of experience. Proven ability to manage complex, technical projects and lead diverse teams to successful project completion. Driven to learn new products and technologies and to document the process and training plans needed to deploy them worldwide. Demonstrated ability to design and document processes and technical procedures to adapt to operational evolution. Managed the deployment of the two largest microwave backhaul projects Alcatel-Lucent has been awarded. **Customer Program Manager, Strategic Industries: Wireless Transmission Division** **September 2012- Present** **Nokia, Plano, TX** **List of Responsibilities** **Type of Projects:** Customer facing PM on multiple highly complex projects providing various technology solutions; Microwave system integrations & upgrades, with engineered IP/MPLS router supported fiber networks, with services that include staging and customer witness test with planned customer network migrations, lab trial support, maintenance service agreements (SLA) and customer management for technical support, repair services, call out support, and SLA renewal services. **Pre-Sale Support:** RFP support, project schedule and SOW development, equipment and service evaluation. **Finance Support:** Quarterly revenue forecasting, project planning and cost containment. Average yearly revenue from $2 to $5 million **Engineering, & Product Support:** Internal cross-functional team development, TDM to MPLS migrations support from Product Level Management that include technical diverse team processes from initiation to project closure **Customer Support:** Maintain open communication with regular customer meetings.

TITLE	Project Manager
	Building a strong relationship of trust by identifying and documenting issues, discussing solutions and resolution timeframes, inviting internal resources to customer meetings to bring support directly to the issue. Develop webinars to help customer's fill in training gaps on product specific skills. **Technical Project Manager, Network Deployment, Integration & Operation,** **IPTV Deployment & Operation (Multimedia)** **September 2008 – August 2012,** **Alcatel-Lucent North America, Plano, TX** **Type of Projects:** Technical PM Support for CFPM, engineering coordinator between internal and customer teams while managing integration and migration schedules on multiple projects. Highly complex IPTV solutions including IP/MPLS, fixed networks, server and network management solutions. 3rd Party vendor evaluation, scope development and management of installation, engineering, and integration team. **Pre-Sale Support:** SOW development for proposals, creation of deployment schedules, and providing 3rd party vendor cost estimates. **Finance Support:** 3rd party vendor quote, scheduling and change management processes to maintain cost containment. Internal effort estimates and resource allocation management to maintain cost controls. Average yearly revenue up to $2 million. **Engineering, & Product Support:** Manage cross-organizational engineering teams to work directly with customer to provide network solutions. Acted as QC check of engineering drawings and documentation prior to customer submission. **Customer Support:** Invited customer to Alcatel campus to meet engineers working on their project. Prepared and hosted lab demonstrations. Maintained smaller attended engineer specific meetings with each customer to provide a more technical discussion platform to work through specific issues more effectively. Traveled to customer locations to evaluate and assist with specific technical issues and support ALU on site engineers.

TITLE	Project Manager
	Project Manager, Telecommunication Installation and Integration **April 2002 – May 2007** **Goodman Networks, Carrolton, TX** **Type of Projects:** 3rd party vendor support for Alcatel central office equipment's installations and DWDM network integrations. Full network deployments of DWDM fiber optic systems through the Sprint network and field engineering support for DWDM channel additions for various carriers throughout the US and Canada. **Pre-Sale Support:** RFQ response management, scope and schedule proposals. **Finance Support:** Project cost containment, revenue forecasting, cost change management and margin control. Average yearly revenue up to $800 thousand. **Project Support**: PMI processes including project planning, resources allocation, material supply management, engineering and installation team coordinator. **Engineering & Product Support:** Field installation and integrations working directly with lab engineers through product equipment planning and software version upgrades. Planning and assisting with the development of test plans used during customer Factory Acceptance Tests (FAT). Customer facing engineer during FAT witness testing. **Network Operations Project Manager, Submarine Networks Division** **May 2001 – October 2002** **Alcatel USA, San Diego, CA**

TITLE	Project Manager
	Type of Projects: Implementation and operation of DWDM submarine fiber optic network connecting San Diego to San Francisco. **Project Support:** Process development, training and mentoring of engineers, NOC staff, NOC staff, site techs and billing dept. 3rd party contract and vendor performance management included in projects yearly budget up to $1 million. **Lead Install Project Supervisor, Network Services Division** **November 1999- May 2001** **Alcatel USA, Plano, TX** **Type of Projects:** Central Office equipment installation manager with direct coordination with customer. **Project Support:** Managed project schedules and 3rd party vendor installation team. Technical Engineer to finalize equipment testing and perform system migrations. Project closure and customer acceptance responsibilities.
Education	EDUCATION AND CERTIFICATIONS **Project Management Professional (PMP), since Sept 9, 2008** Project Management Institute San Diego, CA **Master of Business Administration—International Business, 2003** DeVry University San Diego, CA **Bachelor of Science in Telecommunication Management, 1999** DeVry University Kansas City, MO

TITLE	Project Manager
Training, Certifications, and Memberships	HONORS AND ACTIVITIES * Member of the San Diego PMI Chapter * Member of the Institute of Certified Professional Managers

4.2.3.6 Site Development & Upgrade Services: Pyramid Network Services

Pyramid Network Services, LLC (Pyramid) is one of the premiere communication systems contractors in the USA. Pyramid designs, develops and deploys wireless communication networks for Federal, State, & Local public safety agencies as well as all of the major wireless carriers

Pyramid has completed work on over 66,000 sites nationwide. They maintain excellent working relationships with all wireless carriers and work closely with many governmental agencies. Pyramid's management has more than 40 years of real estate development & brokerage, and 18 years of direct experience in wireless communication site development.

Pyramid differentiates itself from other large system integration firms, by self-performing site acquisition, electrical, tower stacking, line & antenna installations and radio installation services. This offers optimal control of these most critical phases, which can stall any project even if 1 site is improperly handled.

Pyramid has been a long-standing partner of Motorola, providing site development and new site construction services throughout North America. Site development activities include the enhancement of existing facilities by improving or replacing primary and backup power, grounding and surge protection systems; structural remediation of towers; and adding new towers or shelters to existing sites. Pyramid is currently Motorola's partner for the Humboldt County implementation and is Motorola's exclusive nation-wide partner.

Utilizing Pyramid provide Humboldt County the following advantages:

1. Motorola's larger business relationship provides additional flexibility and additional services vs. a different integrator
2. A proven track record of partnership in deployment of P25 radio systems and integration

The high-level scope of work for Pyramid Network Services includes:

- Site development
- Civil improvements

A project manager will be assigned once the timing of the project is better defined. This is standard for how Pyramid Networks staffs their projects.

6. A detailed description of how each Project Team member's qualifications and experience will help meet the objectives of the Project.

MOTOROLA SOLUTIONS RESPONSE

The members of this Project Team were specifically selected for this Project for a couple of reasons. First, they are all very qualified and experienced in implementing and optimizing projects of similar scope and size. In addition, many of these team members have worked together before, so they are very familiar with one another. As a result, they are very efficient which means their projects are executed on time and on budget.

Project Manager (PM) – Brian White

Brian's qualifications and experience is with Motorola Project 25 IP systems such as that proposed for Humboldt County, including analog and IP-based dispatch systems, several microwave system deployments and FCC licensing. His skill set matches up with what is required for this project.

His familiarity with projects in Northern California also make him an excellent match for Humboldt County. Brian has been the Project Manager for Butte County's new P25 system and Sacramento County's P25 simulcast system and consoles, as well as managing dispatch expansions for San Francisco MTA, SAMTRANS, and Oakland.

Lead Systems Engineer (SE) – Sergio Perez

Sergio's experience having worked in development on the Network Transport Product Team, with expertise in networking which will be beneficial in integrating the Nokia microwave backhaul on Humboldt County's system.

A reoccurring them to the Motorola Humboldt County Project Team is Sergio is also based in NorCal and is working or has worked on Butte County's P25 system, city of Turlock's P25 system, Sacramento County P25 system and the County of Kings P25 system-these projects are similar in size and scope to the Humboldt County system.

Lead System Technologist (ST) – Peter Acord

Peter has been a leading System Technologist for Sacramento County and East Bay RCS. He has extensive experience with subscribers for multi-agency and mixed mode (analog and P25) technology, which is very relevant to the Humboldt County system. Peter is based in NorCal and was a key contributor working with the city of Ukiah and console integration which is also applicable here with the county's Avtec consoles.

Customer Service Manager (CSM) – John Carson

John Carson has 5 years experience working with counties of similar size including Mendocino County, Trinity County and the County of Kings. We deliberately align our customer service managers with customers of similar size and scope. This allows

our CSM's to better understand our customer's needs and provide customized solutions.

Day Wireless – Darin DeMasters

Day has worked on and maintained many P25 systems just like Humboldt County including the P25 Rogue Valley Transit in Jackson County, Lane County P25 system and the P25 Linn/Benton Counties. In addition, Darin has led numerous projects involving sophisticated digital RF and IP integrated solutions similar to what Humboldt Count is requiring in tis RFP. Day Wireless currently services your Avtec consoles as well.

Nokia – Peter Crosbie and Chad Brening

Both Peter and Chad are Project Managers and are experienced with projects with scope of work very similar to Humboldt County with very similar objectives. These are well qualified, experienced microwave project managers who have led and executed on numerous projects on time and on budget.

MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 5
QUALITY ASSURANCE CAPABILITIES

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM

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Section 5

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SECTION 5

QUALITY ASSURANCE CAPABILITIES

The following sections provide a detailed description of the proposed equipment and services, and have been organized to correspond with Section 7.6 of the RFP. In the detailed descriptions, the corresponding Section 7.6 item number has been cross referenced to aid in describing how the proposed solution aligns with Humboldt County's requirements.

5.1 DESCRIPTION OF PRODUCTS AND SERVICES – SYSTEM DESCRIPTION (RFP SECTION 7.6.A.1, 7.6.A.2, 7.6.A.3)

The following section includes an overview of how the Radio System Package and related services provided by the project team pursuant to the terms and conditions of a final Professional Services Agreement.

All proposed products are currently shipping and available.

The description of products and services includes:

1. (RFP 7.6.A.1) The system description in the subsequent section pertains to the radio communications equipment. Additional system information is found in the following sections:
    - Section 5, Appendix 7 - Block Diagrams.
    - Sections 5.13 to 5.19 (RFP Section 7.6.B.2) Coverage
    - Section 5.20 (RFP Section 7.6.B.3) Microwave Backhaul
    - Section 5.21 (RFP Section 7.6.B.4) Subscriber Equipment
    - Section 5, Appendix – Detailed Equipment List.
2. (RFP 7.6.A.2) The proposed equipment is as described in the system description. Equipment of note that is not included in the proposal is existing towers, existing shelters, existing generators, and existing Avtec consoles. Our understanding is that an upgrade to the Avtec console is separate from this project because there is not a section describing the desired technical operation of the console, nor a pricing section in RFP Attachment H. As a result, Motorola has provided an optional console upgrade based on assumptions, and welcomes the opportunity to further discuss the console operation.
3. (RFP 7.6.A.3) Technical features that are not set forth in the RFP but are included with the proposed solution include many features noted in the compliance matrix where Motorola exceeds the requirements. These areas are described in more detail in the following system description and include coverage and user radios.

5.1.1 System Overview

In accordance with the Humboldt County RFP's request Motorola Solutions is proposing an RF system deployment that strives to meet and exceed Humboldt County's communication needs. The proposed system will provide Humboldt County with a conventional RF system spanning across ten locations. The proposed solution includes conventional simulcast/voting sites, conventional repeater sites, Ethernet based microwave backhaul links, fault monitoring systems, and DC power systems.

5.1.2 Conventional RF Solution

Motorola Solutions is proposing a conventional VHF solution in accordance with Humboldt County's requested specification. The following two (2) systems are proposed in this design:

5.1.3 Digital P25 Conventional System for Sheriff's Department:

As requested by Humboldt County this system is centered on the deployment simulcast. The digital design consists of two (2) simulcast cells with three (3) sites each, and a single voted digital VHF receive frequency. This allows audio from either simulcast cell to be repeated across both simulcast systems.

In order to reduce the number of transmit frequencies required to support the proposed system, simulcast operation has been employed wherever possible. Motorola Solutions has included a ring-based microwave backhaul design to support Ethernet connectivity to each of these locations.

Additionally, four (4) locations have been proposed as standalone repeater sites in order to meet Humboldt County's coverage requirements. These four (4) sites will utilize independent transmit frequencies, and the same receive frequency with a different PL tone. The four (4) repeater sites could not be included as part of the multicast system as they could not support reliable microwave links to nearby sites. Below is a high level diagram.

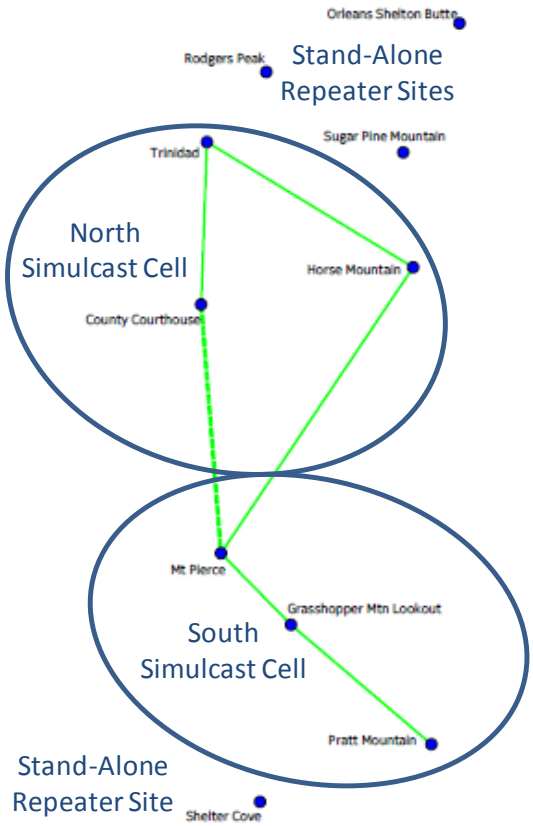


Figure 5-1: Public Safety P25 Digital System Overview.

5.1.4 Analog Conventional System for Public Works Department:

As requested by Humboldt County this solution is centered around the deployment of a simulcast system. The simulcast system consists of four (4) sites with one voted analog VHF receive frequency. In order to also reduce the number of transmit frequencies required to support the proposed system simulcast operation has also been employed wherever possible. Motorola Solutions' proposed ring-based microwave backhaul design will support Ethernet connectivity to each of these locations.

Two (2) additional locations have also been proposed as standalone repeater sites in order to meet Humboldt County's coverage requirements. These two (2) repeater sites could not be included as part of the multicast system as they lack existing Ethernet backhaul and could not support reliable microwave links to nearby sites.

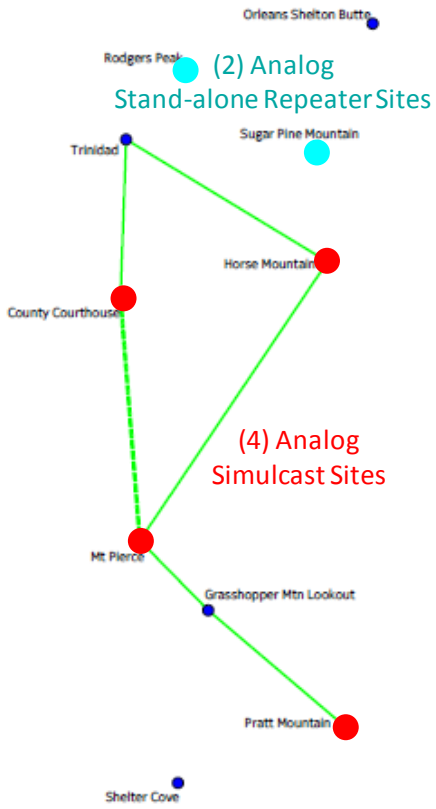


Figure 5-2: Analog System Overview.

5.1.5 Sites

Below is a summary of P25 digital and analog sites.

Table 5-1: Summary of Sites in the P25 and Analog System

Site	Analog Simulcast	P25 Digital Simulcast	Stand-alone Repeater
Trinidad		North Cell	
Horse Mountain	Analog Cell	North Cell	
County Courthouse	Analog Cell	North Cell	
Mount Pierce	Analog Cell	South Cell	
Grasshopper Mountain		South Cell	
Pratt Mountain	Analog Cell	South Cell	
Rodgers Peak			Digital and Analog
Sugar Pine			Digital and Analog
Shelter Cove			Digital
Shelton Butte			Digital

5.1.6 Dispatch Interface

Motorola has contacted Avtec and provided an optional upgrade to the existing Avtec console. The RFP did not have a section defining the console operational requirements, and did not have dispatch consoles in the price pages. As a result, we made assumptions based on other aspects of the RFP, and provided the Avtec console upgrade as an option with operational assumptions discussed below.

Motorola has flexibility to change the assumed operational approach, and can finalize the user radio operational approach as well as dispatch during the Detailed Design Review. Some key operational questions include your desire for repeated audio at stand-alone sites, the type and quantity of resources at the console (site resources or operational audio/talkgroups), and ability to get backhaul to stand-alone sites. As Addendum 3 only specifies a 10% transmit duty cycle at Rodgers Peak and Sugar Pine, while the rest of the system is specified to have 20% duty cycle, our assumption is that these sites are intended to operate as standalone repeaters. Additionally, the RFP specifies that votescan roaming is required, if backhaul is available, so Motorola assumes that a knob switch to the standalone sites is acceptable.

Based on these assumptions, Humboldt County's existing Avtec Dispatch system will achieve communications with the radio subsystems via over-the-air transmissions from a fixed consolette radio controlled by the Avtec console through a wireline interface.

5.1.7 Conventional RF Solution Operation

5.1.7.1 Conventional Simulcast Subsystem

RF communications will be achieved through a combination of simulcast and multicast operations. Simulcast operations are achieved by transmitting on the same frequency across multiple sites with specific transmission delays. Multicast operation differs in that it entails transmitting on different frequencies across multiple sites or simulcast cells at the same time. As the same frequency is not used across these separate simulcast cells or remote sites achieving specific timing of transmissions between them is unnecessary. Through the use of an extensive coverage design process, Motorola has determined the best permutation of RF sites to form simulcast cells that maximize RF coverage.

The proposed Sheriff P25/digital channel's design requires the development of two (2) simulcast cells; each of which will feature its own transmit frequency. Both the North and South simulcast cells will utilize the same receive frequency and will be supported by the same comparator performing receive voting for any audio received by either cell. Additionally, the comparator will initiate outbound transmissions from both the North and South cell at the same time ensuring that users in either region receive the transmission. In order to eliminate the need for the users to manually change channels when roaming between the P25/digital North and South Cells vote-scan can be employed by the subscribers.

The Public Works analog conventional subsystem features a single simulcast cell operating with the same transmit and receive frequency across all four (4) locations As such, the Public Works analog conventional simulcast channel does not utilize multicast operation.

This conventional radio network design is supported by geographically redundant prime sites featuring the system's RF voting comparators, as requested by Humboldt County, to increase the system's overall fault tolerance & reliability. The prime sites feature all of the conventional multicast system's control equipment. County Courthouse and Mount Pierce have currently been selected to house the two (2) geo-redundant prime sites. These locations were specifically chosen as both are provided with ring protection as part of the proposed microwave system offering a greater level of reliability.

The conventional prime sites are each comprised of the following primary components:

- One (1) Backhaul Switch
- One (1) Site Router
- One (1) Site Switch
- One (1) Analog Conventional GRV 8000 Comparator
- One (1) P25/Digital Conventional GRV 8000 Comparator
- One (1) TRAK 8835 GPS Time/Frequency Reference
- Two (2) Co-Located GTR 8000 Base Radios
- One (1) SDM 3000 Remote Terminal Unit (RTU)

The geographically redundant architecture is primarily supported by the deployment of GRV 8000 comparators at the primary prime site and redundant units, supporting the same channels, at the backup prime site. In the event that connectivity to the primary prime site is lost or the primary comparator fails the redundant backup comparator will automatically become active and resume comparator operation for its associated channel without user intervention.

Motorola's new GRV 8000 conventional comparators are proposed to support the analog and P25/digital multicast channels. This comparator establishes IP based connections to the system's proposed GTR 8000 base radios to acquire received audio from all base radios associated with each channel. Upon acquiring the received audio from each station the GRV 8000 compares and combines the signal before redistributing it for transmission by the base stations to ensure the best audio quality is constantly provided to the system's subscribers. The GRV 8000 comparators are also responsible for coordinating the timing and transmissions of the GTR 8000 base radios to achieve proper phasing for simulcast transmissions.

The proposed multicast RF sites have all been designed to include the following primary components:

- One (1) Backhaul Switch
- One (1) Site Router
- One (1) Site Switch

- One (1) SDM 3000 RTU
- One (1) TRAK 8835 GPS Time/Freq Reference
- GTR 8000 Base Radios (Per Site Table's Indicated Qtys)

Each of the multicast sites feature Motorola's versatile GTR 8000 radio configured for analog or P25/digital operation and equipped with the required conventional simulcast software. The analog or P25/digital GTR 8000s will be programmed to communicate with their respective analog or P25 GRV 8000 comparator which in turn provide receive audio voting and coordinate simulcast transmissions to ensure proper timing/phasing is achieved to avoid destructive interference. Sites featuring a single GTR 8000 will feature a single channel duplexer, while the two (2) channel sites will feature a two (2) channel duplexer. One (1) antenna with associated line and connectors has also been quoted to support each site's duplexer.

Please see the system overview drawing for details regarding each location's proposed multicast site equipment and its associated preliminary frequency plan.

5.1.7.2 Standalone Repeater Sites

In order to meet Humboldt County's coverage needs in the northern and southern portion of the county. As these sites lack IP based connectivity they are unable to communicate with the multicast system's comparators and must operate as independent repeater sites.

Table 5-2: Summary of Stand-alone Repeater Sites in the P25 and Analog System

Site	Analog Repeater CH	P25 Digital Repeater CH
Orleans Shelton Butte (Same Tx Frequency as Shelter Cove)		X
Rodgers Peak	X	X
Sugar Pine Mountain	X	X
Shelter Cove (Same Tx Frequency as Shelton Butte)		X

The four proposed repeater sites will require a total of five (5) VHF transmit frequencies to support their operations. Based upon review of the signals it is currently assumed that a frequency can be deployed at both the Shelton Butte and Shelter Cove sites as signal overlap is not expected due to the distance and terrain between the sites. All analog repeater sites are expected to utilize the same receive frequency as the voting sites in the simulcast system. Similarly, the P25 repeater sites will also utilize the same frequency which is also utilized by the P25 simulcast/voting sites. Unique CTCSS and PL tones will be employed at each repeater site in conjunction with this shared receive frequency to avoid duplicated inbound transmissions from users within overlapping inbound coverage areas. This will require each site to be programmed as an independent channel in the subscriber's configuration and users must manually switch to the site's associated 'channel' upon roaming into its covered area.

The proposed repeater sites will not feature any network or fault management related devices due to the lack of backhaul connectivity. The site will primarily be comprised of:

- GTR 8000 Base Radios (Per Site Table's Indicated Qtys)
- One (1) Duplexer System (1-2CH Depending on Qty of Proposed GTR 8000s)
- One New VHF Antenna with Associated Line & Connectors

Please see the system overview drawing for details regarding each location's proposed standalone site equipment and its associated preliminary frequency plan.

5.1.7.3 Repeated Audio

With the proposed solution for the Sheriff's P25 simulcast subsystem, user audio within either simulcast cell is repeated across all simulcast sites and multicast from the north and south cells. The P25 standalone sites, however, cannot support county-wide repeat as they lack network connectivity required for audio transport and control. Motorola has also determined that microwave links to these standalone sites are not feasible due to line of site or clutter constraints.

Similarly, Public Works user audio is repeated across the analog simulcast cell, but is not repeated between the stand-alone sites due to backhaul constraints at Rodgers Peak and Sugar Pine.

A benefit of not repeating across standalone sites is lower power draw at the solar sites, Rodgers Peak and Sugar Pine, which are designed for 10% transmit duty cycle solar power per Addendum 3. As the RFP also specified that audio is repeated to other sites if backhaul is available it is Motorola's understanding that the County does not expect county-wide repeat operation at these locations. Additionally, as Addendum 3 specified a 10% transmit duty cycle at the solar sites, while other sites have 20% transmit duty cycle it appears that these sites are not expected to function as part of the county-wide repeat operation.

If repeated audio between stand-alone sites that do not have backhaul available is desired, there are design options to accomplish this, such as patching the subsystems or a Digital Vehicular Repeater System in lieu of a GTR station at the stand-alone sites. If repeated audio between stand-alone sites is desired, the solar power at Rodgers Peak and Sugar Pine may need to increase the power to accommodate transmit duty cycle greater than 10%.

5.1.7.4 Talkgroup Operation

The proposed standalone conventional system is capable of talkgroup operation, if upgraded to include an optional core. The standalone conventional subsystem architecture does not support talkgroup operation referenced in the RFP's section 5.4.1. Motorola's ASTRO 25 L or M Cores featuring conventional sub-systems or sites are capable of providing conventional talkgroup functionality.

5.1.8 Project 25 and Analog Radio Site Equipment

The Humboldt Sheriff System design contains 10 digital ASTRO 25 sites. The system design consists of the different types of sites described below. ASTRO 25 RF sites provide communications for radio users both inside and outside the ASTRO 25 network. RF Sites may include ASTRO 25 conventional sites and simulcast cells.

The Humboldt Public Works system contains 6 analog sites. The system design consists of the different types of sites described below.

The RF Site types applicable to this system design are described briefly in this section.

Base Radio Site

As part of the design both systems utilize Base Radio Sites. In the Sheriff System Rodgers Peak, Shelter Cove, Shelton Butte and Sugar Pine are standalone Base Radio Sites. In the Public Works System Rodgers Peak and Sugar Pine are standalone Base Radio Sites. These sites do not have backhaul and can be accessed via control station. When a user is in the vicinity of these sites, they will need to switch a knob on their radio.

The basic conventional configuration is the Base Radio site. A Base Radio site contains base station(s) and/or repeater(s) and/or consolettes(s), and operates over the distance that the transmitter/receiver covers. When a mobile or portable radio is within range of the base radio or consolette, they are able to communicate to the dispatcher and/or other mobile/portable users.

Simulcast

The Sheriff System is comprised of two simulcast cells. Due to the geographical nature of the county and the terrain the system was split into a North and South Cell. The North Cell consists of the following sites:

- County Courthouse
- Trinidad
- Horse Mountain

The South Cell consists of the following sites:

- Mt Pierce
- Grasshopper
- Pratt Mountain

The Public Works system is comprised of a single simulcast cell. The sites contained in the Public Works simulcast cell consist of the following:

- Mt. Pierce
- Pratt Mountain
- Horse Mountain
- County Courthouse

When a wide geographical area requires communications throughout the system, simulcast provides a solution. Simulcast is the simultaneous broadcast of the same voice or message from multiple transmitter sites on the same frequency. Simulcast was developed by Motorola to meet the needs of users who were outgrowing their single-site radio systems. These systems provide consistent communications throughout a large city, metropolitan area, county, or even country.

Simulcast systems are a frequency efficient and user-friendly technique of providing wide-area coverage. Simulcast offers the following advantages:

- ***Larger Coverage Area*** **–** One radio site may not provide the coverage necessary for the application in question. Simulcast expands the coverage area by expanding the number of radio sites. A simulcast system delivers continuous coverage throughout a large geographic area.
- ***Efficient Use of Frequencies*** **–** Adding sites typically requires more frequencies. In a simulcast system, the same frequencies are reused at every site in the system. This makes very efficient use of the available spectrum.
- ***Simple Radio Operation*** **–** Field units must be easy to use. As the simulcast architecture operates like a single-site system, operations are simplified and radios are easy to use.

5.1.9 Component Descriptions

GTR 8000 Site Repeater/Base Radio

The GTR 8000 Base Radio consists of a transceiver module, power amplifier module, fan module, and power supply. The transceiver module includes the functionality for the exciter, receiver, and station control. The base radio software, configuration, and network management, as well as inbound/outbound traffic handling, are performed through this transceiver module. On-board serial and Ethernet ports are located on this module for local servicing via CSS. The power amplifier module amplifies the low-level modulated RF signal from the transceiver module and delivers the amplified signal on the path to the transmit antenna. The power supply module supports the transceiver and power amplifier modules.

GRV 8000 Comparator

The GRV 8000 Comparator ensures the broadcast of the best possible voice signal by combining the best parts of a single signal that has been received by multiple sites in a Multisite (simulcast) system. This comparator utilizes Motorola's standardized G-Series chassis to support the GRV 8000 Comparator modules. Each GRV 8000 chassis is capable of supporting up to two GRV 8000 Comparator modules. Both of the comparator modules must, however, be configured for analog or digital operation to co-exist in the same chassis.

The comparator features a digital or analog voting methodology: Frame Diversity Reception. The comparator selects the data frame or signals with the lowest Bit Error

Rate (BER) and forwards it. By using the best pieces of each input signal, the result is the best possible composite signal. This signal is then redistributed across the radio IP network to every connected base station for rebroadcasting.

Radio Frequency Distribution System

The Radio Frequency Distribution System (RFDS) provides interconnect between the base radios and antennas, allowing for a completely contained and more compact installation footprint. For the transmitters, this can include isolators, combiners, TX filters, diplexers, and power monitors. The proposed system primarily relies upon a compact single and dual channel VHF duplexers designed by Bird Technologies to meet Motorola's RF requirements. Duplexers allow transmitters and receivers to share a single antenna while also ensuring proper antenna isolation. The isolation provided by Bird Technologies' 26-36H series duplexers exceed the minimum isolation that is required for repeaters. This eliminates the need to achieve transmit to receive antenna isolation through horizontal or vertical separation of the system's antennas. The 26-36H series duplexers also feature active receiver amplifier to bolster system receive performance.

RF Site Gateway

The Site Gateway provides an interface that handles all of the IP Network Management traffic between the conventional hub site and the remote RF Sites. The Site Gateway provides the following:

- Media conversion – the gateway converts Ethernet to the selected transport medium.
- Traffic prioritization – the gateway applies a prioritization marking to the packets leaving the site.
- Fragmentation – the gateway fragments large IP packets per industry standards.

Site LAN Switch

The site LAN Switch provides a LAN interface for site equipment and a LAN port for the site gateway. Through the switch, the service technicians gain access to service the site, and also access the system's Graphical User Interface (GUI).

TRAK 8835 Simulcast Site Reference

The equipment used to synchronize a simulcast system is the TRAK 8835 which is a Global Positioning Satellite (GPS)-based frequency and time reference unit. This model incorporates a 12 channel GPS receiver, disciplined oscillator and time and frequency signal generation in a small form factor enclosure.

TRAK 8835 Site Reference (SSR) unit provides the following outputs/features to meet the network time and network transport synchronization requirement of the Analog system:

TRAK 8835

- 10 MHz time reference.
- Composite (1pps/5MHz) time reference.
- GPS Referenced Time and Frequency.
- Stratum 1 Accuracy.
- Small Form Factor.
- 10/100 base-T Ethernet Port.
- Network Timer Sever.
- SNMP.
- 24VDC and 48VDC Power Input Options.
- Optional AC Power.

5.1.10 Site Monitoring Solution

Motorola is proposing its standalone UEM Lite based network fault management (NFM) system to monitor the RF equipment at each of the networked multicast system's sites. This solution offers a standalone SNMP and relay based monitoring system independent of a full core/master site. The NFM system is primarily comprised of a server running the UEM Lite server application, a NFM workstation with the UEM Lite client, and six (6) SDM 3000 RTUs. One (1) SDM 3000 RTU will be deployed at each of the six (6) multicast system's sites and will be connected to the site switch to achieve network connectivity. It is currently assumed that the UEM Lite Server and NFM workstation will be located at the County Courthouse.

The UEM Lite applications provide users with a customizable graphical aggregation of the system's failures and provide the ability to "drill-down" to determine the details surrounding each fault. The standalone NFM system is capable of monitoring/reporting faults experienced by the site's network equipment and GTR 8000 base radios through SNMP management and is capable of monitoring additional site equipment through physical relays. Licensing to provide email based alarm notification has also been provided to support the NFM system.

Each SDM 3000 RTU is capable of capturing up to 48 relay based alarms in addition to 8 analog based inputs. 16 separate output control relays can also be configured for use at each location. All physical relay-based connections are achieved through the use of three (3) punchblocks supplied for each site.

Note: As independent repeater sites do not have backhaul connectivity back to the Courthouse no SDM 3000 RTUs have been provided for these locations. Inputs or

Alarms at these sites cannot be monitored by the UEM without the presence of IP based network connectivity.

5.1.11 DC Power Systems

Motorola is proposing the use of direct current (DC) at all of the RF site communications facilities, where applicable, to power radio and other critical site equipment. The power systems will be based on -48 Volt DC for power. The system will utilize LaMarche equipment at non-solar sites, which has proven successful in providing highly reliable power systems in mission-critical networks.

The RF remote site wireless communications facilities will remain fully operational in the event of a commercial power failure. This expectation is met by use of an emergency power design strategy that includes 4 hours total (2 hours plus an assumed 2 hours of travel time) of battery backup for the RF sites. The design also includes 20% additional capacity to account for future growth. Running a site on DC power with battery backup is the most efficient way to provide continuous power during the period of time between commercial power failure and when power can be restored, or when an alternative source of power can be supplied by a generator. It also reduces the power transients that potentially occur in other systems not "floated" on DC batteries during the small but critical milliseconds or seconds as standby power systems transfer and come on line.

Some of the sites have a combination of DC and AC (alternating current) power requirements. In this case N+1 inverters are included. The microwave radios will be powered with a -48VDC system as well as the RF Radio Equipment.

Solar is provided at Rodgers Peak and Sugar Pine. At these sites Motorola is proposing a new 48VDC solar array and battery system that will power the new radios. The assumptions were made for 4-hours of sunlight per day. The battery system was designed using a 90/10 duty cycle, with the stations transmitting 10% of the time. The proposed solar battery bank is 4,368Wh of usable energy. It is anticipated that there is up to 33.6 hours of battery autonomy with the required duty cycle.

5.2 DESCRIPTION OF PRODUCTS AND SERVICES - IMPLEMENTATION PROCESS SUMMARY (RFP SECTION 7.6.A.4, 7.6.A.5, 7.6.A.6, 7.6.A.7)

The following section is an implementation plan that includes:

4. (RFP 7.6.A.4) A summary of the development, installation, and training, services related to the implementation of the radio System package provided pursuant to the terms and conditions of a final Professional Services Agreement.

   – The subsequent section is an implementation overview.

- The detailed implementation plan is included in Section 5.5 - Project Management Plan – Statement of Work (RFP Section 7.6.B.1.A).
- The detailed Warranty and Maintenance services are described in Section 5.3 and Section 5.10. One year warranty is included. The warranty and maintenance services are the same during the warranty and post warranty, and Humboldt County can elect to customize the post-warranty services as desired based on your experience during warranty.
- The detailed training is described in Section 5.9.

5. (RFP 7.6.A.5) Services included are as described in the Statement of Work. Notable items that are not included and priced as an option are the Avtec console upgrade and site improvements. Our understanding is that an upgrade to the Avtec console is separate from this project because there is not a section describing the desired technical operation of the console, nor a pricing section in RFP Attachment H. As a result, Motorola has provided an optional console upgrade based on assumptions, and welcomes the opportunity to further discuss the console operation. The optional site improvements include an estimate for the construction work to upgrade the grounding, add entry ports, add waveguide bridges, an electrician to connect the AC power panel to the DC rectifier, and the solar panel construction/installation. More detail regarding the site improvements is included in Section 5, Appendix 2 Site Improvements Statement of Work. The existing sites are assumed to have adequate space, electrical service, and structural integrity. A tower analysis for the existing towers is included and assumes as-built information for the existing towers is available.
6. (RFP 7.6.A.6) Services not set forth in the RFP which are included in the proposal are areas where Motorola exceeds the specifications. Motorola exceeds the implementation services specification by providing a technical staff and references that far exceed the experience requirements in the RFP.
7. (RFP 7.6.A.7) Motorola complies with the requirements set forth in the RFP as described in the system description and Statement of Work. Site design services are included in the proposal to assess the sites and confirm the installation plan with the County, and optional site improvements are described in Section 5, Appendix 2.

5.2.1 Implementation Process Overview

The project will kick-off with a meeting where the project managers and team review the high level contract deliverables and discuss the communication plan.

Motorola has provided a design as a part of this proposal, which serves as a baseline for the Contract Design Review (CDR). The CDR encompasses the confirmation of the design of the major subsystems. During this review, we will work closely with Humboldt County to review the proposed migration plan to transition to the new communications system. At the end of the Contract Design Review phase, detailed design documents will be provided to Humboldt County.

Upon approval of the CDR by Humboldt County, infrastructure equipment will be ordered. Equipment manufacturing will be followed by factory staging of the radio

infrastructure at Motorola's Customer Center for Solutions Integration (CCSi) in Elgin, Illinois. Factory staging provides for initial assembly and testing of all radio system components. Factory staging will allow complete testing of the functional capabilities of the communications system.

Motorola's local implementation team will install, optimize, and test the system at the defined sites as staged at CCSi. Motorola's implementation includes the integration of all proposed subsystems to provide an end-to-end solution. To verify the delivered system's functionality, Motorola will execute Acceptance Testing according to an Acceptance Test Plan (ATP). The ATP includes staging and factory functional testing, field functional acceptance testing, and coverage verification.

Training is an important step in the success of the network and will occur prior to cutover.

Following the system acceptance milestone, the project team and the post-acceptance service team will work with Humboldt County during this phase to ensure a smooth transition to the post acceptance support period. The final steps to be completed post system acceptance are the delivery of system documentation, punchlist resolution, and final acceptance.

5.3 DESCRIPTION OF PRODUCTS AND SERVICES – WARRANTY AND MAINTENANCE (RFP SECTION 7.6.A.8, 7.6.A.9, 7.6.A.10)

The following is a description of the warranty services that includes:

8. (RFP Section 7.6.A.8) A detailed description of the warranty that will apply to the Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement.
9. (RFP Section 7.6.A.9) The warranty services provided are as described in the warranty plan. Items not included in the warranty are existing equipment or equipment provided by others.
10. (RFP Section 7.6.A.10) Warranty features not set forth in the RFP that are included are areas where Motorola exceeds the RFP. An area where Motorola's services exceed the specification is Motorola's Customer Support Manager, who oversees the contract requirements during warranty and maintenance. In addition, should Humboldt County elect to purchase on-site support for 10 years of maintenance, Day Wireless will have a technician located in Humboldt County. Furthermore, Motorola provides disaster response support which is above and beyond the requirements of the RFP.

5.3.1 Warranty and Maintenance Overview

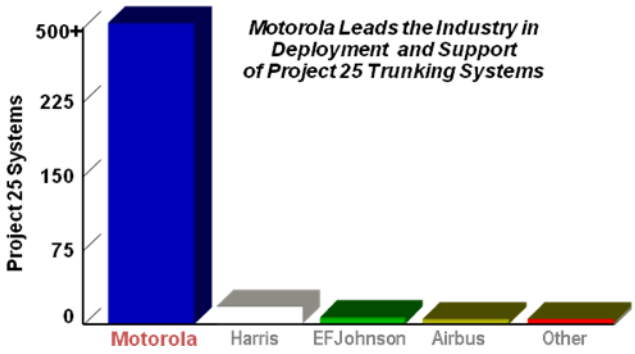
During the first year warranty, Motorola will provide Humboldt County with a suite of system support services designed to maximize the network's uptime. During this

period, Motorola will repair *without charge* to the County, any new component of the Communications System that becomes defective through normal use or that fails because of defective materials or workmanship.

You are purchasing a system that you need to rely upon for 10 years+, and Motorola wants to earn your trust and assist in managing your investment. Investing in quality equipment is a commitment to the community and those that protect it.

The value of Motorola's support is measured by system availability, which is optimized through the use of proactive processes, such as preventive maintenance, resilient design, and active response management. System availability is a function of having in place a support plan delivered by highly skilled support professionals, backed by proven processes, tools, and continuous training. Motorola has 90 years of experience supporting mission critical communications for public safety and public service agencies. Motorola's technical and service professionals use a structured approach to provide comprehensive maintenance and support throughout the life of the system.

Motorola has many support contract commitments with product availability and support for 10+ years.



The importance of a well-defined warranty/maintenance program for this system cannot be overstated. Successful system operation depends on consistent, comprehensive routine maintenance backed up by expedient remedial action in response to infrastructure equipment failures. Humboldt County expects that the utmost care and attention will be given to maximizing the system network availability, despite the failure of individual components – and the proposed system has no single point of failure.

Motorola's maintenance plan includes an initial recommended maintenance schedule to minimize likelihood the proposed system will revert to any of the fallback modes.

Maintenance and support of a Land Mobile Radio Communications System is a complex task that is critical in assuring high system availability. Motorola is uniquely qualified to provide the necessary support services with our depth of talent, experience, and resources. The Motorola warranty, service, and maintenance plan will provide Humboldt County with comprehensive services designed to maintain and support your P25 System. Motorola will combine the resources and support services provided by our Systems Support Center (SSC), our Factory Authorized Premier Service Partner, Day Wireless, and our California-based Motorola System Technologists to deliver ongoing warranty and maintenance throughout the life of the system. This proven methodology, duplicated in California, neighboring State and Countywide systems and throughout the country, will provide the optimal level of

local and remote support to maximize system performance and minimize system downtime.

Customers who purchase a new system from Motorola receive a complete system service solution while the equipment is in its warranty period. As required, Motorola has proposed the cost to extend System Maintenance, on an annual basis, following the expiration of the one-year System Warranty.

Table 5-3 is a summary of warranty and maintenance services.

Table 5-3: Summary of Warranty Services

Description	1 Year Warranty	Years 2-10 Maintenance
Dispatch Service and Case Management (24x7x365)	☑	☑
Day Wireless - On-Site Response (24x7x365)	☑	☑
Motorola Infrastructure Board Repair	☑	☑
Network Preventive Maintenance (Annual)	Optional	Optional
Technical Support (24x7x365)	☑	☑
Customer Support Manager	☑	☑
Customer Support Plan	☑	☑
Motorola On-Line	☑	☑
Disaster Recovery Plan	☑	☑
Microwave Parts	☑	☑
System Upgrade Agreement II	N/A	Optional

5.3.2 The Motorola Service Delivery Team

Motorola's local team is the heart of Motorola's support operations. Motorola continues to invest a significant amount of time and resources to develop new procedures and tools designed to enhance the service delivery process.

5.3.2.1 Customer Support Manager

The Customer Support Manager (CSM) has extensive support and technical experience working with Customers to ensure system availability. Your CSM provides coordination of support resources to enhance the quality of service delivery and to ensure your satisfaction. The Customer Support Manager is responsible for overseeing the execution of the Warranty and Service Agreement, and ensuring that Motorola meets its response and restoration cycle time commitments. The CSM will supervise and manage the Motorola Authorized Servicer's functions. Your CSM will have monthly review meetings with Humboldt County to ensure your satisfaction.

5.3.2.2 Motorola System Technologists

Motorola System Technologists (ST) are highly skilled, factory trained, technical individuals who optimize and configure networks. They are available to assist Motorola's Authorized Servicers with network health and operations when needed.

5.3.2.3 Local Service Partner–Day Wireless

Motorola's authorized service center, Day Wireless, is staffed with trained and qualified technicians. They provide rapid response, repair, restoration, installation,

removal, and programming. Motorola's authorized service centers are assessed annually for technical and administrative competency. Motorola places great emphasis on ensuring that communications systems, such as the one proposed for Humboldt County, meets high standards for design, manufacture, and performance. Should Humboldt County contract for maintenance years 2-10, Day wireless will provide a technician in Humboldt County, however, does not currently employ a technician within Humboldt County. Additional resources are located in Chico, CA, Grants Pass and Medford, OR.

5.3.3 Factory Organization

The service support proposed to Humboldt County includes the local customer support manager, local field service technicians, and Motorola's Technical Support Operations team based in Schaumburg, IL that includes the System Support Center, factory technologists, and factory engineering teams.

5.3.3.1 Motorola's System Support Center

The SSC is the heart of Motorola's central support operations. Motorola continues to invest a significant amount of time and resources to develop new procedures and tools designed to enhance the service delivery process. The toll free call center, located at the SSC, will handle your incoming service requests and manage each case from beginning to end, keeping you in formed every step of the way.

5.3.3.2 Ongoing Level of Factory Engineering and Service Support

Throughout the installation and maintenance of the system, the Motorola Technical Support Operations team provides centralized remote telephone support via the System Support Center for technical issues that require a high level of expertise or troubleshooting. The technical support operations team is staffed with experienced and degreed factory technologists who have attained industry-standard networking certifications and technology specialization. They have an average of 10 to 15 years of experience working with complex mission critical communications systems. The factory technologists work closely with the field service support team, Humboldt County, or both to ensure rapid resolution and closure of system issues. Technical Support is available 24 hours per day, 7 days per week, and 365 days per year. Using the Case Management system, a case is created and tracked for each issue, followed to resolution, and documented every step of the way. The Technical Support personnel are in close proximity to the Motorola factory engineers, who provide the highest level of technical support needed.

5.4 DESCRIPTION OF PRODUCTS AND SERVICES – SYSTEM CAPACITY AND QUALITY (RFP SECTION 7.6.A.11 AND 7.6.A.12)

The following section is a description of the capacity of the system and includes:

11. (RFP Section 7.6.A.11) A detailed description of the maximum number of radio subsystems, channels, sites, radios and talk groups.

12. (RFP Section 7.6.A.12) A detailed description of quality procedures and best practices.

5.4.1 Platform Capacity (RFP Section 7.6.A.11)

The following section is a description of the capacity of the system. The proposed system is based upon a standalone variation of Motorola's distributed conventional system architecture. This standalone conventional system is designed to support wide area conventional channel operation without requiring an interface to a master site or zone core. As such, the proposed system's capacity limitations are primarily driven by Motorola's standardized conventional system IP-based network topology, the limitations of the GRV 8000 voting comparators, and available RF channels/resources.

Subscriber Capacity

- No specific limitation exists beyond the quantity and availability of RF channels. Subscribers are not managed directly by the standalone conventional system.

GRV 8000 Comparator Capacity

- Each GRV 8000 comparator module is capable of supporting one (1) analog or digital conventional channel
- Each GRV 8000 comparator module is capable of supporting voting/comparator operation for up to 96 remote RF base stations
    - Up to 64 transmit and receive base stations can be supported. Once this limitation has been achieved the remaining 32 base stations must be Receive-only

Standalone Conventional System

The distributed conventional subsystem is comprised of two primary site configurations: conventional comparator hub sites and conventional base radio sites. Overall, the standalone conventional system can support a combination of up to 255 total conventional hub and conventional remote sites.

The limitations associated with each site configuration are as follows:

Conventional Hub Site Capacity:

- 1 to 2 site gateways

- 1 to 3 LAN switches (24 ports each)
- 0 to 30 IP conventional base radios and/or GRV 8000 IP comparators
- 0 to 40 analog (4-wire) conventional base radios and/or comparators, including up to 30 MLC 8000 Comparators per each distributed conventional system
- 0 to 20 v.24 conventional base radios and/or comparators
- 0 to 30 MLC 8000 Base Radio Link Converters co-located with the MLC Analog Comparators (used for 4-wire analog simulcast or voted mixed mode operation)
- MOSCAD Network Fault Management:
    - 0 to 5 SDM3000 Remote Terminal Units (RTUs) per each distributed conventional hub site

Conventional Base Radio Site Capacity:

- 1 or 2 site gateways
- 0 to 2 LAN switches with 24 ports
- 0 to 30 IP conventional base radios
- 0 to 12 conventional analog/digital/mixed mode base radios (4 wire and V.24)
- 0 to 20 MLC 8000 Base Radio Link Converters per remote conventional site
- MOSCAD Network Fault Management:
    - 0 to 5 SDM3000 Remote Terminal Units (RTUs) per remote distributed conventional base radio site

Note: The proposed system utilizes IP based links between the base radios and the GRV 8000 comparators and as such the 4-wire and v.24 capacity limitations regarding base radios and comparators do not apply to the system, as currently designed. These limitations have been provided for informational purposes.

5.4.2 Quality Procedures and Best Practices (RFP Section 7.6.A.12)

It is Motorola's policy to produce and provide products and services of the highest quality that meet or exceed the needs of our customers. Motorola has a well-established reputation for designing and developing high quality products and systems on schedule and within budget. Motorola will perform all work consistent with high quality commercial practices and in accordance with Motorola's quality standards for fixed equipment installations and all applicable manufacturer installation and maintenance manuals. Motorola will comply with all applicable standards such as Electronics Industries Association (EIA) and FCC standards and regulations in effect at the time of contract execution.

5.4.2.1 Quality Management System (QMS)

An effective Quality Assurance / Quality Control Plan are essential in order to deliver to Humboldt County a best-in-class radio system. Our comprehensive Quality

Management System (QMS), shown in Figure 5-3, outlines the policies, procedures and processes for dynamically improving business performance. Motorola has selected the ISO 9001 Quality Management System as the quality management system standard to control our business activities. We have developed a quality manual that includes the scope of the quality management system, documented procedures established for the quality management system, and a description of the interaction between the processes of the quality management system.

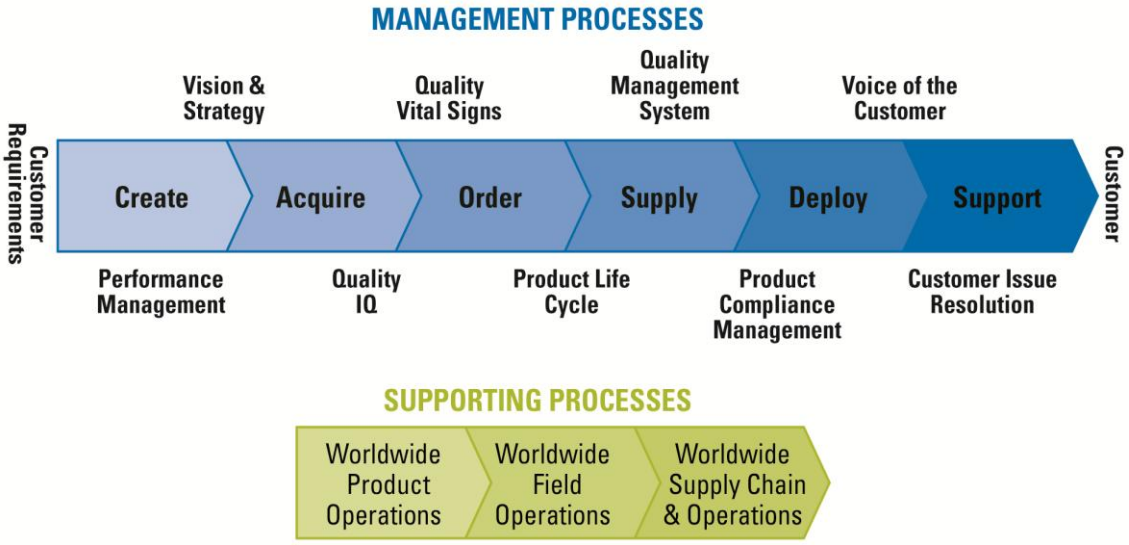


Figure 5-3: Motorola's Customer-Focused Quality Processes

The International Organization for Standardization's ISO 9000 series describes standards for a quality management system addressing the processes surrounding the design, development and delivery of a general product or service. Organizations can participate in a continuing certification process to demonstrate their continuous quality improvement, effectiveness with quality management and compliance with the standards.

In addition to our ISO 9001 Quality Management Certification, Motorola has a robust Environmental, Health, and Safety policy. Our Cities' vision for EHS is to be a globally recognized benchmark within our industry for successful integration of environmental, health, safety and corporate responsibility principles in company's day-to-day operations to ensure superior business performance. Motorola facilities are also certified to the ISO 14001:2008 and OSHAS: 2007 standards.

Another pillar of Motorola's focus on quality is our desire to improve our processes to drive costs out of our products and services through our Services Process Improvement program. This program is based upon the Six Sigma philosophy and strategy. It seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing, services and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization ("Black Belts", "Green Belts", etc.) who are experts in these methods.

More recently, Motorola has embraced the Lean Six Sigma—or simply Lean—strategy which even more rapidly addresses opportunities to drive costs out of our project implementations. Currently, our Services Process Improvement Program has nearly forty active improvement projects in our North America Services operation alone—all with the common goal of driving costs out of our business processes.

5.4.2.2 Quality Control Plan for Humboldt County

Since Motorola's QMS is an end to end quality management system, the entire span of the project is monitored continuously for adherence to quality deliverables. Quality is assured through vigilance in active management techniques. This section outlines the Quality Control Plan (QCP) steps and procedures that will be used by Motorola in the implementation of the project from proposal through final acceptance.

The QCP for Humboldt County identifies processes and activities that are monitored for quality metric compliance, represented below in Table 5-4.

Table 5-4: Processes in Place to Verify Quality in Specific Implementation and Deployment Activities

Deployment	System	Assurance
System Design	- System Requirements. - Design Review. - Site Design.	- Compliance to Requirements. - Joint approval.
Project Management	- SI-Gates. - Status Reports. - Status Meetings. - Project Schedule. - Issue Tracking Log. - Risk Analysis.	- Supervision. - Sample Inspection. - Audits. - Project Reviews. - PMO Governance. - Dedicated Master Schedule.
Grounding/Electrical/Power Installation	- Drawings/Electrical Plan. - National and Local Codes. - Motorola R56 Standards.	- Supervision. - Sample Inspection.
Network Equipment Installation	- Motorola R56 Standards. - System Design Diagrams/Documentation. - Optimization Procedures.	- Supervision. - Sample Inspection.
System Acceptance	- Equipment Verification. - Feature/Functionality Testing. - Coverage Testing.	- Sample Inspection. - Contract Review.

5.4.2.3 Design Analysis and Verification

Design Review meetings will be held between Motorola and Humboldt County to review the system design and project plan. The design and plan will be agreed upon and approved before the project proceeds.

The Design Review is structured for alignment with the schedule for deployment of the P25 system. Design agreement and approval by Humboldt County and Motorola will ensure a common understanding of system parameters and expected performance.

5.4.2.4 Design Changes and Document Control

Any change in system design/project scope will be managed through a Change Order. The Change Order will be approved and signed by both Motorola and Humboldt County. Key project documents will be controlled through a centralized file repository and these documents will have version control fields.

5.4.2.5 Factory Staging

A critical quality assurance step is the factory staging of Humboldt County's system equipment at Motorola's Customer Center for Solutions Integration (CCSi), an ISO 9000 certified process. Staging equipment at CCSi will provide a central point, in a controlled environment, to test the functionality of the system and the proper operation of all critical components. Access to development engineering and Motorola's lab resources further enhance the benefits of staging. Since equipment cabling is factory made and tested field installation and optimization cycle time will be significantly reduced while the possibility of introducing cabling errors during installation is virtually eliminated. Equipment is also labeled and inventoried at CCSi in an efficient and consistent manner in compliance with Humboldt County's requirements.

5.4.2.6 Material Receiving, Storage, and Shipping / Equipment Inventory and Tracking

Equipment packing and inventory lists will be used to manage equipment logistics and warehousing. CCSi's bar coding system will be used to label all equipment shipped from CCSi. Shock sensors will be applied to sensitive equipment to determine if damage may have occurred during transit. An inventory and maintenance tracking system will be used to track inventory as it moves from shipment through installation to reduce lost or missing equipment.

5.4.2.7 Installation Personnel Training and Certification

All Motorola installation personnel are trained on Motorola R56 installation guidelines.

5.4.2.8 Field Installation and Inspection

Motorola local installation teams will install per our quality standards and Motorola's team will inspect the equipment at Humboldt County sites as they are installed and commissioned.

5.4.2.9 Non-Conforming Products/Modules/Components

Equipment that is found not to be in conformance with published specifications will be tagged, repaired, and/or replaced. Each non-conformance shall have a non-conformance record that will be included in the corrective action report.

5.4.2.10 System Testing and Validation

The core site equipment will be staged at Motorola's facility in Schaumburg, IL. Before the equipment leaves the staging facility, a number of pre-installation performance and functionality tests will be executed to verify that the system is operating properly. After the equipment has been installed in the field, acceptance tests will be executed to verify that the system has been installed correctly and is ready for use. Through the use of a Requirements Traceability Matrix (RTM), the Project Team will be able to correlate system design and performance parameters from design through testing and delivery for traceable requirements management.

5.4.2.11 Training of Humboldt County Personnel

Motorola will conduct customized training courses to thoroughly train agency personnel on the use of the system, and Humboldt County's technical personnel on the operation and support of the system.

5.4.2.12 Implementation/Migration

A detailed project schedule and migration plan has been created to document system installation and commissioning steps and milestones. The project schedule describes how and when the site/equipment installations will occur. The migration plan describes how and when users will transition to the new system and when it will be put into service. These documents will be reviewed during the detail design review process in conjunction with input from Humboldt County once all the existing users have been identified.

5.4.2.13 Project Documentation

Various documents will be used throughout the project lifecycle. The actual project templates and documentation used to verify the adequacy of the actual processes and procedures used to develop and/or deliver products/services will vary based on specific project needs.

5.5 PROJECT MANAGEMENT PLAN – STATEMENT OF WORK (RFP SECTION 7.6.B.1.A)

This section is Motorola's understanding of the Radio System Package and related services that will be required pursuant to the terms and conditions of a final Professional Services Agreement. This includes:

1. (RFP Section 7.6.B.1) Detailed Project Management Plan which describes the management strategies that will be utilized to achieve the goals and objectives of the project in a timely and efficient manner.

    a. Statement of Work - A detailed description of the Motorola's plan for implementing the Radio System Package, and providing the related services, the goals, activities, outcomes, deliverables and assumptions regarding system design, frequency acquisition and licensing, system manufacturing, site preparation for each site, system staging, system installation, system configuration, system optimization, system testing, cutover preparation, training, cutover implementation, conditional acceptance, final acceptance, system maintenance, technical support and any other relevant activities. The Statement of Work describes the roles and responsibilities of each member of the project team, and other relevant third parties for each activity and sub-activity set forth therein. The proposed system includes equipment currently shipping.

5.5.1 Statement of Work Introduction

This Statement of Work (SOW) provides the most current understanding of the work required by both parties to ensure a successful project implementation. It is understood that this SOW is a working document, and that it will be revised as needed to incorporate any changes associated with contract negotiations, Contract Design Review (CDR), and any other changes that may occur during the execution of the project. The scope of work and deliverables described in this SOW are designed to lead to the successful implementation, testing and cutover of a new conventional radio system. The work to be performed is as specified herein and other work is excluded, and Customer responsibilities will occur within the mutually agreeable schedule.

5.5.2 Project Management Responsibilities

Motorola has designated a Project Manager who will direct Motorola's efforts and serve as the primary point of contact for Humboldt County. The Motorola Project Manager will have significant authority to make certain decisions relative to the project on behalf of Motorola, and will have direct access to Motorola's executive management for resolving problems beyond his immediate authority. The responsibilities of the Motorola Project Manager include:

- Starting at contract award, participate with Humboldt County in mutually agreed upon meetings and submitting status reports that identify the action items, as well as activities planned.
- Maintaining project communications with Humboldt County Project Manager and project team members. Motorola will provide a record of correspondence as part of the progress reports provided prior to each progress meeting.
- Managing the efforts of Motorola staff and coordinate Motorola activities with Humboldt County project team members.
- Issuing status reports that include the project status and milestones achieved.
- Measuring, evaluating, and reporting the progress against the Project Schedule.
- Resolving deviations from the Project Schedule.
- Monitoring and managing risks via a Risk Management Plan.
- Maintaining a documentation schedule that identifies and shows the status of documents to be transmitted for review during the next two reporting periods.
- Monitoring the project to ensure that support resources are available as scheduled and as identified in the contract.
- Assuming accountability for all Motorola contractor and subcontractor supplied tasks within the Project Schedule.
- Reviewing and administering change control procedures through Humboldt County Project Manager, commonly referenced as a "Project Change Request" (PCR), issued by the Motorola Project Manager.
- Providing timely responses to issues related to project progress raised by Humboldt County Project Manager.
- Working with Humboldt County Project Manager in designing and approving the format of an action item log to be used in conjunction with the Project Schedule. The purpose of the log is to identify outstanding issues, provide continual status updates on specific tasks and to identify responsibilities of the parties.
- In the event that Motorola must replace or substitute a Project Manager, Motorola will immediately notify Humboldt County of such a change and will provide Humboldt County with a résumé of the person Motorola intends to substitute or change.

Humboldt County will designate a Project Manager who will direct Humboldt County's efforts and serve as the primary point of contact for Humboldt County. Humboldt County's Project Manager will have significant authority to make certain decisions relative to the project, on behalf of Humboldt County, and will have direct access to Humboldt County executive management for resolving problems beyond the Project Manager's immediate authority. The responsibilities of Humboldt County Project Manager include:

- Reviewing the preliminary Project Schedule with Motorola's Project Manager and assisting Motorola in developing a Project Schedule to defining the detailed tasks and timeline for the completion of Motorola and Humboldt County responsibilities.
- Interfacing with members of Humboldt County team and the Executive Committee to ensure appropriate participation in meetings and timely decisions.

- Providing timely responses to issues related to project progress raised by Motorola's Project Manager.
- Acting as liaison for and coordinating with other Humboldt County agencies, other governmental agencies and Humboldt County vendors, contractors, and common carriers.
- Approving and releasing payments in a timely manner predicated on project deliverables.
- Assigning one or more personnel who will work with Motorola staff as needed for the duration of the project, including at least one system administrator.
- Ensuring acceptable Standard Change Requests and Approval Letters are approved by authorized signatures.
- Providing building access to Motorola personnel to all facilities where the system is to be installed during the project. Access must be available as necessary to meet the project schedule.
- Reviewing and approving or revising delivered design documents within 7 days of submission.

5.5.3 Summary of Work Breakdown Structure

Humboldt County wants to develop and implement the new system as soon as possible. Motorola has provided a tentative project schedule including the below listed tasks.

- Contract Initiation and Kick-off.
- Radio Deployment Plan.
- Design Review.
- Order Processing, Manufacturing, and Staging.
- Site Improvements.
- Microwave.
- Develop Fleetmap and Operational Configuration.
- Mobile and control station Installation
- Infrastructure Installation.
- Systems Integration and Optimization.
- Acceptance Testing.
- Documentation.
- Training.
- Acceptance Testing.
- Warranty Begins.
- Project Completion.

5.5.4 Contract Initiation and Project Kickoff

Upon contract award, Humboldt County and Motorola execute the contract, both parties receive all the necessary documentation, and schedule a project kick-off meeting. Contract initiation and project kickoff responsibilities are summarized in Table 5-5.

Table 5-5: Contract Initiation and Project Kickoff.

Tasks	Motorola	Humboldt County	Comments
Assign a Project Manager as Single Point of Contact.	X	X	
Assign Resources as necessary.	X	X	
Introduce Team, Review Roles, and Decision Authority.	X	X	
Present Overview of Project Scope and Objectives.	X		
Provide Communication Plan, Risk Management Plan, Change Control Procedures, Preliminary Schedule.	X		
Action Item Log.	X		
Provide Site Access, Necessary Site Permissions, and Resource for Site Walks.		X	
Begin Detailed Site Walks for Civil Work, Design Review, and Transition Planning.	X		

5.5.5 Design Review

The purpose of the Design Review is to review and finalize detailed aspects of the project, including the final System Design, Statement of Work, and Schedule. Any changes determined in Design Review will documented through a Change Order. The Design Review responsibilities are summarized in Table 5-6.

Table 5-6: Design Review.

Tasks	Motorola	Humboldt County	Comments
Present requirements and impact on equipment.	X		
Present overall project goals and requirements.		X	
Provide existing fleetmap and codeplugs to be used to aid configuration of new system		X	
Present System and Coverage Design.	X		
Provide all rights and agreements necessary for Motorola Solutions to operationally configure, access and deploy the system equipment, including sites and equipment owned by third parties. Any delays in providing such agreements will cause the schedule to be extended one day for each day of delay.		X	
Provide existing system information.		X	

Tasks	Motorola	Humboldt County	Comments
Present preliminary Transition and Cutover plan and methods to document a detailed procedure. Final cut over details may be completed nearer cut over in consultation with the participating user agencies.	X		
Present Equipment Layout Plans and System Design Drawings.	X		
Review Shelter and Compound Configurations.	X		
Review Power Requirements.	X		
Review demarcation between Motorola-supplied equipment and Customer interfaces.	X		
Present Acceptance Test Procedures. Deviations from the proposed ATP will be mutually agreed upon and may represent a change in scope.	X		
Review Preliminary Work Breakdown, Project Tasks and Responsibilities.	X	X	
Review Project Communications Plan.	X	X	
Present Quality Assurance Plan.	X		
Review Detailed Schedule.	X		
Review Training Plan.	X		
Provide Existing Frequency and Site Data for an Intermodulation Study		X	
Perform Intermodulation Study	X		
Interference caused or received by the Non-Motorola-provided equipment.		X	
Provide Existing Frequency and Radio Information for Sites.		X	
Identify and license frequencies.		X	
As mandated by the FCC, Humboldt County, as the licensee, has the ultimate responsibility for providing all required radio licensing or licensing modifications for the system prior to system staging. This responsibility includes paying for FCC licensing and frequency coordination fees. Provide the FCC “call sign” station identifier for each site prior to system staging.		X	

Tasks	Motorola	Humboldt County	Comments
Complete Design Documentation, which may include updated System Description, Equipment List, system drawings, or other documents applicable to the project. Incorporate any deviations from the proposed system into the contract documents accordingly.	X		
Prepare Change Order to Reflect Updated System Design and Documentation.	X		
System design is “frozen” in preparation for subsequent project phases such as Order Processing and Manufacturing.	X	X	
Approve Design Review within 10 days of submission.		X	

5.5.6 Order Processing, Manufacturing, and Staging

The order processing, manufacturing, and staging responsibilities are summarized in Table 5-7.

Table 5-7: Order Processing, Manufacturing, and Staging

Tasks	Motorola	Humboldt County	Comments
Place and track equipment orders.	X		
Provide warehouse for infrastructure equipment.	X		
Determine equipment shipping locations.	X		
Approve shipping locations.		X	
Ship equipment to either staging or the field.	X		
Setup and rack equipment on a site basis per site plans.	X		
Cut and label cables according to site plans and with to/from information to specify interconnection for field installation and future servicing needs.	X		
Complete the cabling/connecting of the subsystems to each other (“connectorization” of the subsystems).	X		
Assemble required subsystems to assure system functionality.	X		
Load application parameters on all equipment according to input from Systems Engineering.	X		
Complete programming of the Fixed Network Equipment.	X		
Program sample radios for the Factory Acceptance Test.	X		
Inventory the equipment with serial numbers and installation references.	X		
Update system documentation.	X		
Perform Factory Acceptance Test in Elgin, IL.	X		
Witness and Approve Factory Acceptance Test.		X	
Pack System and Ship Equipment to Field.	X		

5.5.7 Site Improvements

Existing sites will be utilized with existing towers, existing buildings, and existing generators. Site improvement work is limited to antenna installation and tower analysis. The County provided site walks and requested a quote for anticipated site upgrades. Optional site improvements are included in the price pages, and a detailed site by site description of optional site improvements is located in Appendix 2 – Site Improvements Statement of Work. In general, optional site improvements as described in Appendix 2 include grounding upgrades, entry ports, waveguide bridge, AC connection from the power panel to the DC rectifier, and construction of the solar power.

Table 5-8: Civil Work- Site Development and Construction.

Tasks	Motorola	Humboldt County	Comments
Existing sites will be utilized. Provide sites with permissions, lease agreements, zoning variances, right of entry, space, power to the top of the rack, cable raceways, and antenna mounting locations as necessary. There will be a day for day schedule extension until all necessary permissions and agreements are complete. It is assumed existing electrical panels have capacity and breakers for DC power.		X	
Provide Existing NEPA studies, Tower Mapping, Foundation/Tower Design, Tower Analysis, and Geotechnical studies.		X	
Perform tower structural analysis. Antenna inventory, tower mapping, foundation mapping and geotech, if needed, to further evaluate existing towers, are not included.	X		
Permitting and permitting fees.		X	
Install antenna systems.	X		
Provide alarm monitoring of proposed equipment.	X		
Provide existing alarms to building punchblock (e.g. existing tower lights, high temp, etc.).		X	

5.5.8 Microwave

The microwave backhaul responsibilities are summarized Table 5-9 below.

Table 5-9: Microwave.

Tasks	Motorola	Humboldt County	Comments
Preliminary feasibility studies which are subject to change after physical path surveys. The feasibility study includes (i) a system map, (ii) a path profile, (iii) path performance calculations, and (iv) a technical report.	X		
Site Surveys for installation	X	X	
Physical path surveys to determine or verify site coordinates, ground elevation, on-path obstructions (location and height), tower information, and other parameters required to develop the final design of a radio link. The present and anticipated future effect of on-path obstructions, such as tree growth, is evaluated and incorporated into the path design where applicable. Provide Path Survey Report. The report based on final design and observed conditions observed in the field.	X		
Final path design. The project can move to the implementation stage based on the recommendations within the final design report.	X		
Approve and pay for changes, if any, that are recommended in the final path design.		X	
Frequency Planning, Coordination, Licensing and Engineering - includes frequency selection, prior coordination, interference case resolution, and FCC license application documentation preparation. Interference studies will be conducted utilizing industry accepted methods, hardware, and software to build a database that is as accurate as possible at the time of the study. The deliverable is frequency coordination data sheets (PCN).	X		
Resolution to the frequency plan (Interference Resolution) may require antenna upgrades or other charges in system design.		X	

Tasks	Motorola	Humboldt County	Comments
In the event, that frequency interference is detected during the Acceptance Testing of a radio system and Nokia provided the frequency planning services, Motorola's total responsibility for correcting the problem is limited to selecting new frequencies.	X	X	
Ice shields are not included at this time and the need to utilize ice shields will be reviewed with Humboldt County prior to installation to determine if Humboldt County would like to purchase them.	X	X	
Installation includes performing the assembly, wiring, turn-up, and testing for the proposed radio system traffic only. Configuration of orderwire, DSI, and fiber interconnect are not included.	X		
Provide Turn-up and Test Documentation Measure and record transmit power Measure and record RSL at 9500MPR radio Record receiver fade margin RFC2544 Ethernet test results LLD for MW Radio	X		
Acceptance tests will be performed in accordance with the standard procedures listed in the applicable Instruction Manuals for the proposed equipment.	X		
Approve acceptance tests	X		

5.5.9 Develop Fleetmap and Operational Configuration

The fleetmap process defines the talkgroups and operational configuration of the infrastructure and subscriber radios. The fleetmap development and operational configuration responsibilities are summarized in Table 5-10.

Table 5-10: Develop Fleetmap and Operational Configuration.

Tasks	Motorola	Humboldt	Comments
Provide radio programming point of contact.	X		
Provide existing radio template and designate a representative for Humboldt user groups, to make timely decisions on their behalf related to radio programming.		X	
Develop an electronic version of a Master radio programming containing the Humboldt conventional features	X		
Approve the electronic version of the Master radio programming.		X	

Tasks	Motorola	Humboldt	Comments
Provide up to 20 codeplugs for user radio programming.	X		
Program sample radios with approved templates and deliver for Humboldt evaluation.	X		
Approve radio programming.		X	
Console configuration is not included.	X		

5.5.10 Mobile and control station Installation

Tasks	Motorola	Humboldt	Comments
Provide mobile installation point of contact to manage installations.	X	X	
Motorola has provided a trade-in, and Motorola will assume ownership of mobile and portable radios as they are removed.	X		
Prototype installation in several vehicles. Installation is based upon removal of existing mobiles without equipment relocation. During installation, reasonable modifications to the prototype installations may occur if a Humboldt representative is onsite during the installation process and able to approve a modification.	X		
Approve Prototype Vehicle Installation.		X	
Provide vehicles and control station locations per the mutually agreed schedule.		X	
Control stations will be installed as outlined in the pricing and design review for indoor, outdoor, or consolidated locations.	X		

5.5.11 System Installation and Optimization–Fixed Network Equipment

Installation of equipment will occur in existing shelters. The system installation and optimization- fixed network equipment responsibilities are summarized in Table 5-11.

Table 5-11: System Installation and Optimization- Fixed Network Equipment.

Tasks	Motorola	Humboldt County	Comments
Install infrastructure equipment per floor plans, rack drawings, and system description.	X		
Install equipment per R56 installation guidelines, NEC, EIA, FAA, and FCC.	X		

Tasks	Motorola	Humboldt County	Comments
Provide backhaul demarcation within 25ft of site routers per network requirements provided by Motorola.		X	
Provide as-built documentation.	X		
Configure, optimize, program and integrate all Motorola provided equipment.	X		
Verify that all equipment is operating properly and that all signal levels are set accurately and measured values are within the design parameters.	X		
Record site optimization data for the as-built.	X		
System Ready for Acceptance Testing.	X		
R56 Site Audits.	X		

5.5.12 Acceptance Testing

Acceptance testing will be performed per the Acceptance Test Plan requirements of the RFCSP. Acceptance testing responsibilities are summarized in Table 5-12.

Table 5-12: Acceptance Testing.

Tasks	Motorola	Humboldt County	Comments
Perform Factory Functional Acceptance Test.	X		
Witness and Approve Factory Functional Acceptance Test.		X	
Perform Field Functional Acceptance Test.	X		
Witness and Approve Field Functional Acceptance Test.		X	
Perform Coverage Acceptance Test.	X		
Provide Dispatch personnel and vehicles as required per the Acceptance Test Plan and schedule.	X	X	
Provide Coverage Acceptance Test Report.	X		
Approve Coverage Acceptance Test report within 7 days of submittal.		X	
Provide Customer Support Plan detailing the warranty and post-warranty support.	X		
Transition to Warranty/Service.	X	X	

5.5.13 Transition

Training is important to the success of the radio project and end user experience. Training needs to occur prior to transition of new equipment or the Project 25 radio network. After training is complete, there will be a readiness review to confirm the network, users, and support team are ready to transition. Transition responsibilities are summarized in Table 5-13.

Table 5-13: Transition.

Tasks	Motorola	Humboldt County	Comments
Finalize training schedules.	X		
Conduct the training classes outlined in the Training Plan based on Design Review.	X		
Attend Training Classes and comply with prerequisites.		X	
Review and Update Transition Plan as needed	X	X	
Readiness Review for Cutover.	X	X	
Cutover System.	X		

5.5.14 Equipment Removal

Equipment removal is not included.

5.5.15 Finalize Project

The finalization of project responsibilities is summarized in Table 5-14.

Table 5-14: Finalize Project.

Tasks	Motorola	Humboldt County	Comments
Resolve punchlists documented in order to meet all the criteria for final system acceptance.	X		
Provide support, such as access to the sites, equipment and system.		X	
Approve punchlist resolution.		X	
Provide as-built documentation in .PDF System Manual with native documents on the System Manual CD/DVD.	X		

Tasks	Motorola	Humboldt County	Comments
As-builts to include: - System-Level Diagram. - Site Equipment Rack Configurations from staging. - ATP Test Checklists. - Functional Acceptance Test Plan Test Sheets and Results. - Equipment Inventory List from staging. - Maintenance Manuals. - Technical Service Manuals. - Schedule of antenna heights and positions.	X		
Review and Approve as-built documentation.		X	

5.5.15.1 General Assumptions

Unless otherwise noted above, the Motorola proposal is based on the following assumptions:

- The Work Breakdown Structure and Project schedule with Humboldt County site and resource availability assume all work is to be performed during normal work hours, Monday through Friday 7:30 AM to 5:30 PM, except site development and construction work which is daylight hours. The impact due to Humboldt County (including other contractors) delays in the agreed-upon project schedule has not been included in this scope of work. Changes to this scope of work will be documented through the change order process.
- Motorola cannot be responsible for issues outside of our immediate control such as, improper frequency coordination by others and non-compliant operation of other radios.
- Although Motorola cannot be responsible for any cost impacts occurring from co-channel interference due to errors in frequency coordination by APCO or any other unlisted frequencies, or the improper design, installation, or operation of systems installed or operated by others; Motorola will support Humboldt County in identifying potential mitigation approaches and recommended course of action to resolve.
- If any of the proposed sites cannot be utilized due to reasons beyond Motorola's control, any changes in costs associated with required site changes or delays will be identified by Motorola for presentation and approval by Humboldt County for the change order process.
- Maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required to obtain zoning/SUP and NEPA approvals from time of submittal.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- AM detuning or electromagnetic emission studies will not be required.

- Humboldt County has FCC-licensed frequencies for the new system and subsystem equipment that will be installed at the site.
- No hazardous material will be found at sites.
- The cost of non-standard delivery, while not expected, is not included. Examples of non-standard delivery methods include air-lifts, deployment of swamp mats, barge delivery, or the improvements or installation of temporary roads, bridges, or access-ways.
- Existing Humboldt County facilities have adequate space, electrical service, breakers at power panel, HVAC and generator.
- Towers, Cable ladders, and Cable Raceways/Trays at all existing installation locations will have adequate space at time of installation.
- Physical improvements to walls, roofing, flooring, painting, etc. in existing facilities has not been included.
- Existing towers are sufficient to support any new antenna. Tower remediation is not included.
- Sites in conceptual design will be approved for permitting, zoning, FAA, FCC, NEPA.
- Foundations are based on normal soil TIA/EIA-222F, and no underground water, boulders, caverns, or anomalies that prevent the drilling or pouring of foundations.
- Lead paint testing of existing painted towers has not been included.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- Unless otherwise noted, existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- Plenum cable and routing is not required.
- As applicable at existing sites, Humboldt County will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708.

5.6 DETAILED PROJECT SCHEDULE (RFP SECTION 7.6.B.1.B)

The following is a detailed description of the schedule that Motorola will follow to ensure timely completion of the Project. A Gantt chart that graphically depicts the start date, end date, duration and precedence-relationship of the activities and sub-activities is included in Section 5, Appendix 4 – Project Schedule.

Motorola will work with Humboldt County to understand your priorities to finalize the schedule during the Design Review. Below is a preliminary snapshot of the project schedule. Humboldt County will benefit with a project schedule that is 15 months from contract to cutover.

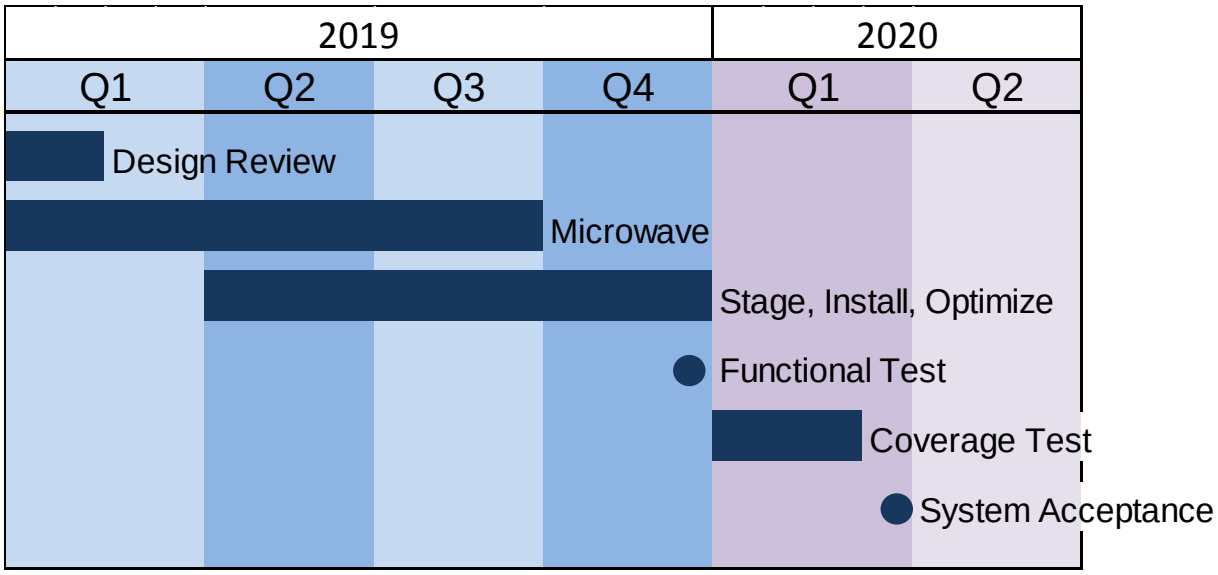


Figure 5-4: High-Level Project Timeline

Motorola has experience to deliver, and has implemented larger systems in the time frame proposed. Below are some example time frames for projects larger than the proposed Humboldt County system.

Las Vegas Metropolitan Police Department (LVMPD)
31 sites - Contract to Cutover - 14 months

State of Louisiana Wireless Information Network (LWIN)
First Phase 18 sites - Contract to Cutover- 6 months

5.6.1 Project Schedule Narrative

5.6.1.1 Contract Award and Project Initiations

Upon contract award, the project will kick-off with a meeting, in which the project managers and team review the high level contract deliverables and discuss the communication plan. This meeting may be concurrent with a schedule review and early subscriber deployment.

5.6.1.2 Contract Design Review

During the infrastructure design review, Motorola will review the proposed design and transition plan. The design and implementation documents will be updated for Humboldt County approval.

5.6.1.3 Order, Manufacture, and Stage System

At this milestone event, Motorola will have completed staging the infrastructure equipment at our state-of-the-art facility in Elgin, Illinois, and Humboldt County will

be invited to view the factory acceptance testing phase and sign off on the acceptance tests. Factory staging will allow complete testing of the functional capabilities of the communications system.

5.6.1.4 Site Improvements

Eight of the proposed sites are currently in use by Humboldt County, and 2 additional sites exist and are owned by the State of California.

5.6.1.5 Microwave

The microwave deployment is on the critical path of the schedule. Upon County approval, physical path surveys can begin, and there is an opportunity to expedite the schedule by approving use of the sites earlier in the project to begin physical path surveys.

5.6.1.6 Operational Fleetmap and Template Configurations

The fleetmap defines the operational parameters of the infrastructure and end-user equipment. Motorola will work with Humboldt County to develop the subscriber configuration templates. Motorola will program test radios with the approved paper template configuration for Humboldt County to test. Upon approval by Humboldt County, Motorola will program the user radios with the Humboldt County approved templates

5.6.1.7 System Installation and Optimization

Installation of the proposed infrastructure equipment will be performed in accordance with the Project Schedule and design documents as reviewed during Contract Design Review. During system optimization, Motorola will configure, optimize, and program all system equipment. Motorola will integrate all of the Motorola provided subsystems.

The County has specified use of the existing analog transmit frequency in the new system. Motorola will work with the County to finalize the cutover approach and use of the existing frequency during installation, optimization, and cutover. There are several options for consideration which include (a) the existing public works users could share the public safety system, (b) the analog channel could be used on one of the stand-alone analog sites, and tested/cutover after users cutover, and (c) an additional channel is identified.

5.6.1.8 Training

Motorola has provided several training options. Training is important to the success of the radio project and end-user experience. It will occur prior to transition of new equipment or the Project 25 radio network.

5.6.1.9 Acceptance Testing

Acceptance testing will be performed in accordance with Section 5.7: Acceptance Test Plan. Once all the infrastructure installation and optimization has been completed, a Field Functional Acceptance will be performed. After the successful completion of the Field FAT, Motorola will conduct a readiness review with Humboldt County to prepare for the cutover.

Upon successful completion of the Acceptance Tests, the system will be accepted and transition into warranty. A one year warranty has been included.

5.6.1.10 User Transition

Prior to transitioning a department or user agency to the new system, Motorola will conduct a readiness review to ensure the users and the network are ready for a department to go live. Table 5-15 is the readiness review checklist that confirms best practices have been followed prior to the transition.

Table 5-15: Readiness Review Checklist

System Staging
Staging completed & punchlist items addressed
Equipment labeled
Any Upgrades needed after equipment ship identified and funded
Unresolved issues documented and funded
Site Installation
R56 Audits completed & Reports submitted for all sites
Equipment installed at all RF sites
FCC Licenses posted at all sites
Warm start of all sites (Equipment powered, no alarm conditions)
Subcontractor work remaining is punchlisted
System/Site upgrades completed
Antenna & lines installed
Site quality audited
Site Acceptance from Customer for all sites
Equipment, Installation, Quality Punchlists resolved
Subscriber Programming and Installation
Subscriber Programming Templates developed
Subscriber Programming Template technical review
Subscriber Programming Template Customer Approval
Verify that local shop / contractor has proper software / hardware for subscriber programming
Subscriber Programming plan developed
Subscriber Installation plan developed

Field Acceptance Tests
RF Site Performance Verification
Site Link Verification
RF Site Antenna System Analysis & Documentation completed
System Configuration Review & Customer sign-off
Field Functional ATP executed & results documented
Field Coverage ATP executed & results documented
All Field Acceptance Test Punchlists resolved
Customer Training Approval
Users defined & trained
Technical Training Completed
Training Surveys obtained & reviewed
Training Punchlists developed & resolved
Follow-up training or tools needed by customer discussed & documented
Drawings and System Documentation Manual Review
Final Design Document (Customer Accepted)
System Staging Documentation provided to Field PM
Final equipment inventory reports
Site Layouts/Documents completed
Operator, User & Service Manuals / CDs Delivered to customer
RSS software & system key provided to System Manager
System Software documented, assembled, & delivered
Proposed Final System Documentation submitted to the Customer for first pass redline mark-up
Customer Quality Review
Ensure all critical technical or quality cases resolved
Identify future upgrades to the system (if any)
Safety and Contract Approval
Ensure SOW/WBS requirements are completed
Change order obligations complete
R56 Report reviewed for any potential issues
Review any risks outstanding
Customer Service and System Support Center
Service provider identified, qualified, and provided SOW for Maintenance (Proper Training and Test Equipment)
Provide third party/subcontractor contact list & warranty terms
Preliminary Customer Support Plan has been reviewed with the customer
Final Customer Support Plan is agreed upon or will be before Final Acceptance.
SSC Monitoring Line installed and tested
SSC notified of cutover date and time

Help line maintained
Customer transition meeting taken place with all Service/Warranty events reviewed
System Spares
Are there Spares? Are there enough?
Spares identified and located
Spares tested
Upgraded to match current system software release
General
No other issues exist that cause one or more core team members significant concern in cutting over.

5.7 ACCEPTANCE TEST PLAN (RFP SECTION 7.6.B.1.C)

The following is a preliminary Functional Acceptance Test plan which identifies the individual procedures, including the goals, methods, and acceptance criteria. The Coverage Acceptance Test Plan is included in Section 5, Appendix 3 and complies with the guidelines set forth in TSB88.3-C.

Conventional Radio Resource Call - Clear Mode

1. DESCRIPTION

Subscribers can communicate to each other through a repeater that is selected via the channel selector on the individual radio.

The signals that are received from the subscriber radio are repeated so that other radios on that channel will be able to hear and participate in the conversation.

SETUP

RADIO-1 - CONVENTIONAL CHANNEL 1
RADIO-1 - CONVSITE 1
RADIO-2 - CONVENTIONAL CHANNEL 1
RADIO-2 - CONVSITE 1

VERSION #1.050

Radio to Radio Features

2. TEST

Step 1. Initiate a CONVENTIONAL CHANNEL 1 call on RADIO-1.

Step 2. Verify RADIO-2 can monitor and respond to the call on CONVENTIONAL CHANNEL 1.

Step 3. Initiate a CONVENTIONAL CHANNEL 1 call on RADIO-2.

Step 4. Verify RADIO-1 can monitor and respond to the call on CONVENTIONAL CHANNEL 1.

Step 5. Repeat above tests for each repeater channel.

Pass____ Fail____

Radio to Radio Features

Multicast Scan

1. DESCRIPTION

Multicast scan is used in systems to give the subscriber the ability to roam from site to site even though their transmit frequencies may differ.

NOTE : Exact steps and functionality of the multicast scan are not yet available.

SETUP

RADIO-1 - SITE 1
RADIO-2 - SITE 2

Verify that SITE 1 and SITE 2 are in the multicast scan list of RADIO-1 and RADIO-2.

VERSION #1.020

2. TEST

Step 1. Disable all but SITE 1 on the comparator.

Step 2. Verify communications between RADIO-1 and RADIO-2 on the enabled site.

Step 3. Disable SITE 1 and enable the next site on the comparator.

Step 4. Verify that RADIO-1 and RADIO-2 will automatically switch to the enabled site.

Step 5. Verify communications between RADIO-1 and RADIO-2 on the enabled site.

Step 6. Repeat steps 3-5 for the remaining sites in the multicast scan list.

Pass____ Fail____

Radio to Radio Features

Conventional Radio Resource Via Comparator

1. DESCRIPTION

A comparator will vote all receive capable sites and transmit on specified transmit capable sites. As a comparator will construct a signal from multiple sites, it is necessary to test each site individually.

SETUP

RADIO-1 - SITE 1
RADIO-2 - SITE 1

VERSION #1.040

2. TEST

Step 1. Disable all sites on the comparator except SITE 1.

Step 2. Verify communications between RADIO-1 and RADIO-2.

Step 3. Disable SITE 1 and enable the next site. Change the channel on the subscriber if necessary.

Step 4. Verify communications between RADIO-1 and RADIO-2.

Step 5. Repeat steps 3 & 4 until all sites on the comparator have been individually tested.

Step 6. Enable all sites on the comparator.

Step 7. Verify communications between RADIO-1 and RADIO-2 with all sites enabled.

Pass____ Fail____

System Reliability Features

Redundant Comparator Switching – Comparator Failure

1. DESCRIPTION

IP Simulcast Trunking subsystem can use two comparators for each channel in a redundant configuration at the Prime Site. The standby comparator is made active upon the loss of the active comparator.

SETUP

RADIO-1 - TALKGROUP 1
RADIO-1 - SITE - SITE 1
RADIO-2 - TALKGROUP 1
RADIO-2 - SITE - SITE 1

Channel-1 – Control Channel
CSS Status Panel or UNC command can be used to verify the current redundancy state of the comparator (Active or Standby).

VERSION #1.030

2. TEST

Step 1. Verify the system is in Wide Trunking Mode with Channel-1 as the control channel and Channel-2 in service.

Step 2. Key RADIO-1 and verify that RADIO-2 hears the audio. Verify Channel-2 is used.

Step 3. Power off or Disable the Active comparator (i.e. Comparator 2) for Channel-2. Verify Channel-2 is out of service and RADIO-1's call ended.

Step 4. DeKey RADIO-1

Step 5. Verify the Standby comparator (i.e. CM2b) for Channel-2 becomes Active and Channel-2 is back in service (note the event in UEM event viewer).

Step 6. Re-key RADIO-1 and verify that RADIO-2 hears the audio. Verify Channel-2 is used.

Step 7. Power on or restore Comparator-2. Verify Comparator-2 is in the Enabled state.

Pass____ Fail____

UEM Tests

UEM Enhanced Navigation functionality – Views

1. DESCRIPTION

The Enhanced Navigation feature extends Unified Event Manager (UEM) Client presentation capabilities with additional views and operations to improve visualization of fault management information.

Note System Map functionality is useful in case of systems with multiple zones or using DSR feature.

SETUP

UEM Enhanced Navigation licenses installed.

VERSION #1.050

2. TEST

Step 1. Login to UEM Client application with appropriate user and password.

Step 2. Verify the navigation tree is displaying System Map under System Views and Site Views under Zone Views.

Step 3. Select System Map from navigation tree. An internal window will be opened displaying overall status of current zone.
In the right corner of the map click Zones Visibility button (icon) to open window where other zones visibility can be configured. Select zones and zone cores that shall be visible. Save change and verify that configured zone symbols are added on the map.

Step 4. Site Views on the navigation tree
Expand Site Views in the navigation tree to see all site types that can be displayed. Expand site type to see what sites of that type are discovered. Select specific site and verify that Site View window is displayed.

Step 5. On Site view (opened from navigation tree or from Zone Map) expand and review all elements displayed in the Objects section. Verify the quantity and overall state of managed devices displayed on the view.

Step 6. Network element view can be opened from Network Database for selected resource, which is not representing a site or network, or from Site View. Verify that network element view has been loaded and review Objects section for details on list of directly related managed resources representing given device, type and quantity of objects for a given resource as well as current state of each object.

Pass____ Fail____

UEM Enhanced Navigation Functionality - Unacknowledged / Acknowledged Alarm

1. DESCRIPTION

The Enhanced Navigation feature extends Unified Event Manager (UEM) Client presentation capabilities with additional views and operations to improve visualization of fault management information. The UEM Client uses three navigation concepts: Direct – Navigation tree, Context – Right-Click navigation from selected fault information context, Drill-down – Double-click on given objects. The UEM Client visualizes raising new alarm and unacknowledged alarm status on selected view and propagates that from detail to high level fault information hierarchy (e.g. from alarms and objects to sites and zones).

SETUP

UEM Enhanced Navigation licenses installed.

VERSION #1.040

2. TEST

Step 1. Login to UEM Client application with appropriate user and password.

Step 2. Close all views in the UEM Client.

Step 3. From navigation tree select System Map. Right click on the home zone and perform Acknowledge All Alarms.

Step 4. Generate single alarms for selected device in the home zone. Verify that Zone icon on the map is blinking with a violet outline. The blinking indicates new alarm and stops after 100s (default) leaving solid violet outline indicating unacknowledged alarm on the object or one of the lower level objects in the fault management hierarchy.

Step 5. Double-click on the zone icon and verify that zone map was opened. Verify the site containing device with alarm is marked with solid or blinking violet outline if blinking time passed.

Step 6. Double-click site icon and verify that Site View for selected site was opened showing tree-list of all devices managed in the site including device for which alarm has been generated. Verify that Device block is displayed with blinking violet box or solid violet outline if blinking time passed.

Step 7. Double-click on the device box and verify that Network Element view for selected device was opened showing details of the device managed resources and underlying objects. Verify that the object for which the alarm has been generated is displayed with blinking violet box or solid violet outline if blinking time passed.

Step 8. Double-click on the object (represented by box) and verify that an alarm detail for the alarm that has been generated has been displayed.

Step 9. Acknowledge alarm. Verify the new alarm indication / unacknowledged alarm status has been removed from all the previous views (given that this was the only alarm under given hierarchy level).

Pass____ Fail____

Signoff Certificate

By their signatures below, the following witnesses certify they have observed the system Acceptance Test Procedures.

Signatures

WITNESS: _____Date: _____

Please Print Name: _____ _____

Initials:

Please Print Title: _____

WITNESS: _____Date: _____

Please Print Name: _____ _____

Initials:

Please Print Title: _____

WITNESS: _____Date: _____

Please Print Name: _____ _____

Initials:

Please Print Title: _____

5.8 PROJECT UNDERSTANDING AND QUALITY CONTROL - FREQUENCY PLAN, ANTENNA SYSTEMS, GPS, AND SIMULCAST RELIABILITY (RFP SECTION 7.6.B.1.D, 7.6.1.B.1.E, 7.6.1.B.1.F, 7.6.B.2.B)

5.8.1 Frequency Plan and Antenna Systems (RFP Section 7.6.B.1.D)

The following is a detailed description of the radio frequencies, on a per-site basis, that will be utilized by the Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement. The frequency plan identifies the channels that will be used throughout the County's radio system.

In addition, a description of the proposed antenna systems follow. Specification sheets for the antenna system is included in Section 7 – Additional Items.

5.8.1.1 Frequency Plan

The frequency plan selected includes frequencies provided from the County in Addendum 2 as well as candidate frequencies that Motorola has identified for Humboldt County to license for use in the proposed solution.

Table 5-16: Proposed Sheriff Frequency plan.

Site Names	Channel #	Transmit	Receive
County Courthouse	1	155.6425	159.225
Horse Mountain	1	155.6425	159.225
Trinidad	1	155.6425	159.225
Mt. Pierce	2	155.5425	159.225
Grasshopper Mountain	2	155.5425	159.225
Pratt Mountain	2	155.5425	159.225
Rodgers Peak	3	Motorola Identified Candidate	159.225
Sugar Pine	4	155.5575	159.225
Shelter Cove	5	155.5575	159.225
Shelton Butte	6	Motorola Identified Candidate	159.225

Table 5-17: Proposed Public Works Frequency plan.

Site Names	Channel #	Transmit	Receive
County Courthouse	7	155.3175	158.985
Mt. Pierce	7	155.3175	158.985
Horse Mountain	7	155.3175	158.985

Site Names	Channel #	Transmit	Receive
Pratt Mountain	7		158.985
Rodgers Peak	8	153.9050	158.985
Sugar Pine	9	Motorola Identified Candidate	158.985

5.8.1.2 VHF Spectrum Fingerprinting

Spectrum fingerprinting is included in the proposed solution to mitigate the risk associated with VHF. As the VHF band is unstructured, prone to interference, and highly populated, the final coverage maps, based on site measurements, may vary. In an attempt to account for some of these characteristics all preliminary maps have an additional 12.6 dB of external noise above kToB applied to each site's receiver as well as mobile subscriber receivers. Portable subscribers have 1 dB of desense applied to account for this noise per Motorola Solutions' best practices for VHF system designs.

In order to both better characterize the noise levels at each site as well as to aid in discovery of 'clean' VHF frequencies Motorola Solutions has included Bird Technologies' Spectrum Fingerprinting service at each site. This test typically entails placement of a receiver at each site for a 24 hr duration while all in-band transmissions are captured. Not only can the noise floor be better characterized, but strong high level carrier signals recorded at each site can be built into intermodulation studies to help ensure that frequencies selected during coordination are not expected to produce harmful 3rd and 5th order intermodulation hits on or near the County's intended receive frequencies. Additionally, this information is also useful in the development of proper custom filtering in combiner multicoupler system designs.

5.8.1.3 Antenna Systems

Motorola has proposed an alternative approach with a single new antenna per site using a duplexer, and reusing the existing antenna systems for the existing equipment.

The reason for using a duplexer for new channels in lieu of combining the existing channels into the proposed antenna system is to improve performance of the proposed system and mitigate risk associated with the existing. The more channels that are combined, the more loss is introduced. The existing channels and new would both experience more loss combining them together. Only one new antenna is proposed per site, mitigating tower loading that would be associated with more antennas. The new antenna is assumed to be mounted at the top of the tower. If the top of the tower is not available, Motorola will work with Humboldt County to determine an optimal solution.

The proposed design includes a new antenna system to support each proposed conventional RF site. This antenna system and associated RF distribution systems (RFDS) have all been designed to support only the new base stations and are not

designed to support existing RF equipment. The existing base stations will continue to be supported by their existing RF distribution and antenna systems.

RF Antennas

Motorola is proposing one (1) new VHF antenna to support each new conventional RF site. RFI antennas featuring low passive intermodulation (PIM) characteristics have been selected to support each site. The antennas selected to support each site have been chosen with great care in order to achieve or exceed the desired level of RF coverage as specified in the RFP. The duplexed antennas are currently assumed to be placed at the top of each tower. However, in the event that this cannot be achieved Motorola will work with Humboldt County to determine a suitable alternative location on the tower. A summary of the proposed RFI antenna models and their intended distribution is provided in the table, below:

RFI Antenna Model	Deployed Location(s)
OA40-41-DIN, 9 dBd Gain	County Courthouse, Mt Pierce, Rodgers Peak, & Trinidad
OA40-41-DIN-T3, 9 dBd Gain, 3° Downtilt	Pratt Mountain
BA80-41-DIN, 6 dBd Gain	Grasshopper & Shelton Butte
EA80-41-DIN-T3, 8 dBd Gain, 3° Downtilt	Horse Mountain & Sugar Pine Mountain
EA40-41-DIN, 5 dBd Gain	Shelter Cove

Antenna Feedline

Every proposed RF site will be provided with one (1) antenna feedline to support each conventional RF site's proposed VHF antenna. The antenna feedline is primarily comprised of an upper jumper, mainline, lower jumper, lightning arrestor, and finally equipment jumpers. CommScope ½" LDF4-50A coax has been specified to support the upper and lower jumpers at each location. The mainline featured at all conventional RF sites will be comprised of Commscope 7/8" AVA5-50 coax. Equipment jumpers between the base radio transmitters and the duplexer utilize CommScope's ½" FSJ4-50B Superflexible coax. Meanwhile, CommScope's ¼" FSJ1-50A coax has been proposed to support the base radio receiver to duplexer jumpers. In addition to the cables appropriate connectors for each cable type have also been included. Finally, a PolyPhaser brand VHF50D-MA-PGR-C VHF lighting arrestor is included to protect each antenna system.

RF Distribution System

Bird Technologies 26-36H series one (1) and two (2) channel VHF duplexers have been selected to support the RFDS at each site in conjunction with its one (1) or two (2) base station configurations. The proposed duplexers were chosen as they offer less insertion loss for new single channel sites, compared to a comprehensive site combiner and multicoupler system. Similarly, the two (2) channel duplexer offers a similar level of insertion loss often seen in custom combiner and multicoupler systems. The use of a duplexer also allows both the new transmitters and receivers the

ability to function at the highest point possible on the tower. A combiner multicoupler system would, instead, require 20 feet of vertical tip-to-base separation between independent transmit and receive antennas to achieve a sufficient level of isolation between the transmit and receive antenna. This would inherently force a 20 foot long transmit antenna's base to be located over 40 feet below the receive antenna greatly reducing its outbound coverage capabilities. At locations in which the site clutter is approaching or exceeding the tower this extra height may be critical for achieving the desired level of system performance. Finally, the proposed duplexer features a receive amplifier providing a level of net gain equivalent to a comprehensive VHF site multicoupler system.

Consolette Antenna Systems

A complement of eight (8) new antenna systems have also been included as part of this solution in order to support the eight (8) proposed consolettes utilized for dispatching operations. As the placement of each consolette is to be determined, in conjunction with Humboldt County, a standardized antenna system has been provided to support each radio. Each antenna system currently features a Telewave ANT150Y10H 10 dBd gain yagi antenna. The use of a high gain yagi antenna is suggested as they feature a narrow beamwidth in order to mitigate desense at surrounding sites as all locations are dependent upon the same receive frequency. Additionally, Motorola suggests that each antenna is placed as low on the tower as feasible to further mitigate desense of the collocated conventional system's receive antenna. The antenna feedlines match the overall configuration described in the antenna feedline section, above, with the exception of the proposed mainline. In order to provide flexibility for the final consolette installations a total of 1600' of ½" LDF4-50A coax is currently included to support the mainline runs for eight (8) consolettes allowing for up to 200' runs to support each unit.

5.8.2 Optional Global Positioning System (GPS) (RFP Section 7.6.B.1.E) and Over-The-Air-Programming (OTAP)

The proposed solution is capable of GPS location based tracking and presence through the inclusion of a Motorola ASTRO 25 system core. Additionally, due to backhaul constraints, standalone sites would not be capable of supporting this operation. Humboldt County has requested an update cadence of (1) update every five (5) minutes for all subscribers. With a single frequency per site, per layer, GPS is not recommended with the proposed design due to loading constraints.

The optional location services solution requires the addition of an ASTRO 25 system core and integrated data equipment. The core equipment provides a central routing point for both voice and data calls and coordinates GPS tracking through the employment of an intelligent middleware (IMW) server. If desired, Motorola would be glad to explore the inclusion of an ASTRO 25 system core with Humboldt County in order to support the various desired IV&D, presence, and location tracking services operations.

5.8.2.1 Optional Integrated Voice and Data

The Project 25–compliant Integrated Voice and Data (IV&D) operation allows data traffic to seamlessly utilize your existing ASTRO 25 stations, improving in-field efficiency. The IV&D service creates a data transport layer capable of supporting both industry-standard IP and customer-developed applications, including:

- Outdoor Location (GPS)
- Over the Air Programming (POP25)

Packet Data Gateway

The Packet Data Gateway (PDG) is a modular platform designed to link the wireline IP Data Network to Motorola's ASTRO 25 network.

The PDG supports SNMP-based network management by providing detailed statistics and alarm information to monitor system activity and performance. These statistics and alarms allow you to monitor system operation and loading to support audit, diagnostic, and optimization activities using the SNMP-based standard. The information can be viewed directly via the PDG local console or through the Network Management System.

Motorola General Packet Radio Service Gateway Service Node Router

Motorola's General Packet Radio Service (GPRS) Gateway Service Node (GGSN) router provides for the internetworking between the customer's network and the ASTRO 25 data system, allowing for independent management of IP addresses across networks.

The GGSN router handles the IP routing services in support of end-to-end IP data messaging. These services include Static and Dynamic IP addressing, IP fragmentation, and ICMP error reporting messaging for diagnostics and troubleshooting.

5.8.2.2 Optional Outdoor Location Solution (GPS)

Motorola's ASTRO 25 Outdoor Location Solution is offered on the ASTRO 25 IV&D system using the VHF band, UHF Range 1, UHF Range 2, 700 MHz, and/or 800 MHz. It uses Global Positioning System (GPS) satellites to provide the location of personnel and vehicles; these locations can be fed to a map-based location application, providing dispatch operators with an invaluable tool for managing and tracking personnel and resources. The ability to locate users in a Mission-Critical situation dramatically increases user safety, while improving resource allocation and responsiveness.

Figure 5-5 shows an example of the main components for the Outdoor Location Solution.

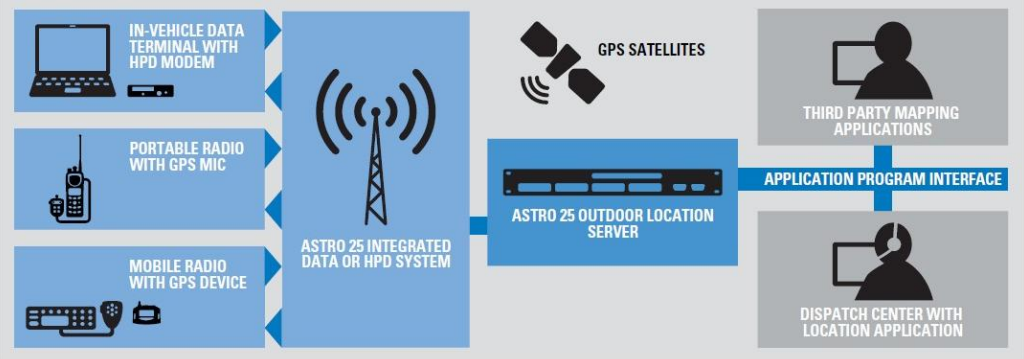


Figure 5-5: ASTRO 15 Outdoor Location Solution

5.8.2.3 Optional Over-the-Air Programming (OTAP)

Motorola can provide a powerful Over-the-Air Programming (OTAP) tool called Programming over P25 (POP25), which allows simple, wireless updates of LMR radios. This is an alternative to the standard method of programming, which is to connect a PC with a cable to the radio in order to read/write the programming changes. POP25 allows end-users and radio users to stay in the field during the reconfiguration process, thus saving valuable time and resources. An overview of the OTAP process is shown in Figure 5-6.

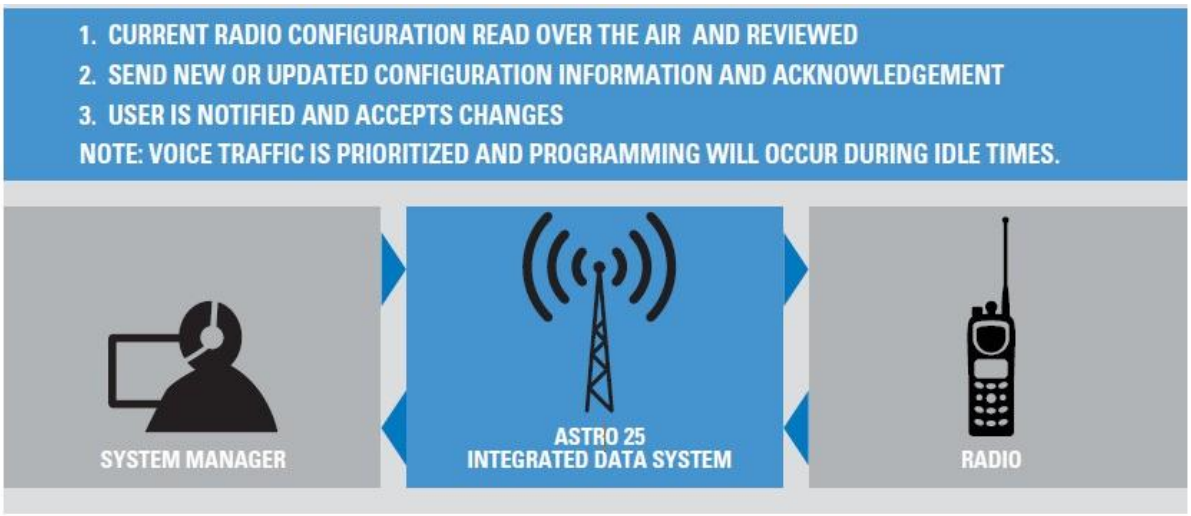


Figure 5-6: Over-the-Air Programming Steps

5.8.3 Detailed Description of the Reliability of Simulcast (RFP Section 7.6.B.1.F and 7.6.B.2.B)

Motorola has developed the proposed solution to offer Humboldt County with the best possible redundancy to meet their system reliability objectives. The proposed

simulcast system does not have any single point of failure that would cause either of the following to occur:

1. The loss of any of the P25 conventional features set forth herein across one (1) or more radio subsystems.
2. The loss of interconnection and processing of user audio between the Simulcast Control Subsystem and the RF Subsystem which results in the loss of two (2) or more radio sites across one (1) or more Simulcast subsystems.

Key redundancy features offered by the proposed solution that protect from the above single point of failure are:

1. Geographic Redundancy of the comparators: Motorola's design has two geographically separated comparators for each RF receive channel. Motorola has identified Courthouse Site and Pierce Mountain sites as potential candidate sites for hosting primary and backup comparators respectively. Furthermore, independent comparator chassis are proposed for sheriff's channel and public works channel to offer additional redundancy to protect from a backplane or a power supply failure.

2. High Availability Microwave Backbone: Motorola's proposed backhaul is developed based on the most viable Ring topology. Four of the simulcast sites are part of a Ring. Additionally, all spur links are designed to offer 1+1 (Hot-standby) protection. Motorola has proposed Spatial Diversity (SD) on one of the links to offer best protection to link fading. Furthermore, Motorola's design guarantees 99.999% or higher annual link availability.

Motorola's solution offers protection from the following failure scenarios:

- Comparator failure: Primary and backup GRV comparators are connected to all the Rx sites. In the event of failure of one of the comparators the corresponding backup comparator assumes the responsibility for voting for best audio. Motorola's solution offers near seamless switch over between primary and backup comparators. Users on the system won't notice the impact of this failure. The system administrator will be alerted by the Unified Event Manager (UEM).
- Microwave link fade: Motorola's solution is based on a fade margin of at least 34dBm at 64 QAM. This offers Humboldt County with 139 Mbps of throughput when links are operating with the predicted fade margin. In case of unexpected link fading, the radios, since configured with Adaptive Modulation, will switch to a lower modulation scheme there by still sustaining the connectivity between sites but at a lower throughput. Microwave system management application will report this failure to the system administrator.
- Microwave link equipment failure on Spur links: All spur links are designed with Hot Standby radios connected using equal split couplers to the primary radios. So, equipment failure on spur links will not have any impact to the Radio system. No user intervention is necessary to enable the hot standby radio in the event of a failure. Microwave system management application will report this failure to the system administrator.

- Microwave link equipment failure on Ring links: Even though the Ring links are designed as non Hot Standby they still offer East-West redundancy. So, equipment failure on ring links will not have any impact to the Radio system since the traffic from one direction will be routed to the other direction, thereby still maintaining the connectivity between site RF sites. No user intervention is necessary to offer traffic rerouting in the event of a failure. Microwave system management application will report this failure to the system administrator.

RF or network equipment failure at a single site: Motorola's solution includes simulcast and multicast sites with Rx Voting. RF/Network equipment failure at any site will only impact the RF coverage offered by that site. Since Motorola picked sites to offer best possible coverage overlap between sites, the impact of such failure to end users is minimum. However, users on the system will still notice the impact of this failure. The system administrator will be alerted by the Unified Event Manager (UEM). Motorola has included all necessary spares/FRUs in this proposal to help system administrator to replace the faulty equipment as soon as possible.

5.9 DETAILED DESCRIPTION OF THE TRAINING COURSES (7.6.B.1.G)

The following is a description of the training courses that will be offered to County employees regarding the usage, operation and administration of the Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement. The optional microwave training course description is included in Section 5, Appendix 6 – Optional Microwave Training.

5.9.1 Training Overview

Partnering with Motorola Solutions will enable Humboldt County to build personnel competency and maximize return on investment.

Effective training ensures successful implementation and use of your communications system by all personnel for the life of the system. The training plan furnished to Humboldt County is comprised of targeted coursework developed and delivered by our expert instructors. This plan, included below, will effectively provide Humboldt County's personnel with a comprehensive understanding of the proposed system and user equipment.

We will collaborate with Humboldt County to tailor a final training plan to enable Humboldt County's organization to operate, configure, and manage the proposed solution effectively and efficiently.

Motorola Solutions provides an expanding portfolio of training delivery methods, tools, and courses to support the training needs of our customers. The figure below shows the elements of our training methodology that qualify us as the leader in the communications training industry.

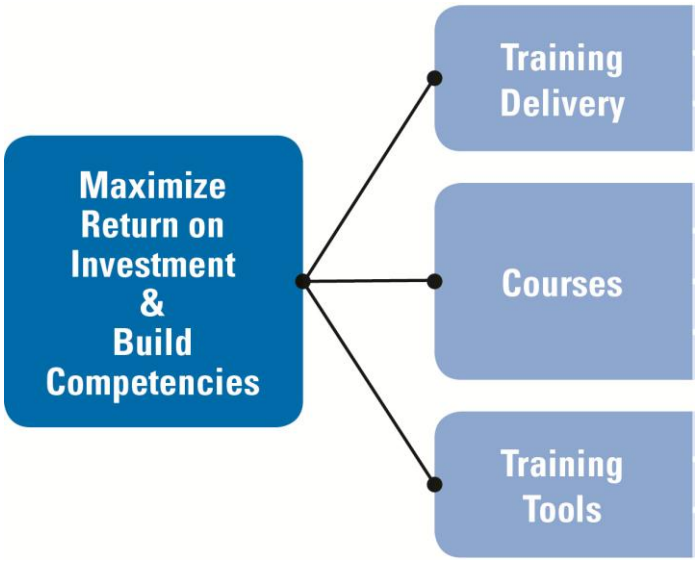


Figure 5-7: Build the competencies of Humboldt County's personnel and maximize your return on investment with Motorola Solutions' expanding portfolio of training delivery methods, tools, and courses.

Training Methods

Motorola Solutions' training experience and expertise enables our customers to gain the training they need to use during critical times in a variety of methods. As shown in the figure below, we offer four interactive methods of training: Online Self-Paced, Virtual Instructor-Led, Instructor-Led, and our new Integrated Training Environment.

Figure 5-8: Motorola Solutions offers a variety of interactive training methods that cater to different learning techniques, allowing more effective ways to give personnel the skills they need.

These training approaches ensure our customers receive the understanding they need for the practical aspects of their jobs.

Motorola Solutions Instructors

We have approximately 40 instructor resources distributed across North America. These instructors are available to train customers in our Technical Training Center located in Schaumburg, Illinois, while specific training courses are available at our facility in Plantation, Florida. Training can also be delivered directly on-site at customer locations. All instructors undergo an Instructional Skills and Technical Knowledge Program, which is a globally-recognized training and instructor assessment program.

Consultative Services

Motorola Solutions provides consultative services for our customers, which includes personalized training plans and other training-related services. Our dedicated training consultant team works with our customers and Motorola Solutions account teams to identify and meet the training needs of technical, administrative end users, and other audiences.

5.9.2 Proposed Training Overview for Humboldt County

In order to achieve the training goals identified by Humboldt County we propose the following courses.

It is necessary that participants bring their laptop computers for all system administrator and technician classes. Materials will be delivered electronically via USB drives.

Resident Classes – Motorola Training Facility

Resident classes are open to all Motorola customers, seating is based on availability, and participant guides and required pre-work when applicable are included in the tuition. These courses are comprehensive and are not tailored to any one customer's system. Students benefit from other students' experiences and are allowed to take systems out of service. These courses provide optimal "hands-on" training.

Training Plan – Motorola Facility

Course Title	Target Audience	Sessions	Duration	Location	Date	Participants
ASTRO 25 IV&D System Overview Course#: AST1038 (Self-paced; On-Line) Prerequisite	System Technicians	1	2.5 hours	Online; Self-paced	Prior to Workshops	3
ASTRO 25 Systems Fleetmapping Course#: RDS1017 (Instructor-led)	System Managers & Technicians	1	4.5 days	Schaumburg, IL	Prior to managing	3
ASTRO 25 IV&D Conventional K Core with Configuration Manager Course#: ACS717410 (Instructor-led)	System Technicians	1	3 days	Schaumburg, IL	Prior to Managing	3
ASTRO 25 IV&D Conventional RF Site Workshop Course #: ACS717440 (Instructor-led)	System Technicians	1	3 days	Schaumburg, IL	Prior to maintaining	3

Course Title	Target Audience	Sessions	Duration	Location	Date	Participants
Standalone GTR8000 Conventional Based Radio Course#: AST2006 (Instructor-led)	System Technicians	1	2 days	Schaumburg, IL	Prior to maintaining	3

Training Plan – Field Class

Course Title	Target Audience	Sessions	Duration	Location	Date	Participants
APX6000 Li Portable and APX4500 Mobile (1 model of each) **User Train-the-Trainer Training** **Utilizing the Interactive End User Tool Kits** Course#: AST1059 (Instructor-led)	Trainers	1	1 day	Humboldt County, CA	Prior to training users	10

5.9.2.1 Course Descriptions for Humboldt County

The following pages contain the course descriptions for the proposed training that is included in the proposal.

ASTRO® 25 IV&D SYSTEM OVERVIEW - AST1038

Course Synopsis and Objectives:	The ASTRO®25 IV&D System Overview course will provide participants with knowledge and understanding of the ASTRO®25 IV&D system. This course will address M, L and K Core systems. System architecture, components and features will be explained. In addition, RF and console sites and their architecture, features and components will be discussed. Finally, call processing for voice and mobile data applications will be covered, and an introduction to applications available in the ASTRO®25 system will be provided. At the end of this course, the participant should: - Understand the general architecture of an ASTRO®25 IV&D Radio System. - Understand key features of available in the ASTRO®25 IV&D Radio System. - Understand the components of the ASTRO®25 Zone Core. - Understand site components in the ASTRO®25 system. - Understand the features, capabilities and components of the MCC 7000 series dispatch consoles. - Understand concepts of Mobility and Call Processing in the ASTRO®25. - Understand the applications for managing the ASTRO®25 system.
Delivery Method:	- OLT = Online Training.
Duration:	2.5 hours
Participants:	- Core Technicians. - Site Technicians. - Console Technicians. - Core Managers.
Class Size:	Class Size varies by region
Prerequisite:	None

Curriculum:	M Core/L Core: - System Architecture. - System Features and Options. - Zone Core Components. - Repeater Sites. - Simulcast Sites. - Console Sites. - Conventional Sites. - Site Status. - Information Types and Paths. - Voice and Data Processing. - Mobility Management. - Applications Overview. K Core: - System Architecture. - System Features and Options. - Zone Core Components. - Console Sites. - Conventional Sites. - Information Types and Paths. - Voice and Data Processing. - Mobility Management. - Applications Overview.

ASTRO® 25 SYSTEMS FLEETMAPPING WORKSHOP - RDS1017

Course Synopsis and Objectives:	This workshop addresses topics necessary for the effective planning and mapping of an ASTRO 25 IV&D radio system. During this course, the participants will learn about ASTRO 25 features, capabilities, and restrictions in order to effectively plan for a new or upgraded ASTRO 25 system. After completing the course, the participant will be able to: - Understand the methodologies used to configure radio users and groups with the goal of optimizing system resources. - Enable participants to knowledgably assist with fleetmapping decisions. - Perform the basic planning requirements and complete a simple fleetmap information template. - Create a sample fleetmap based on sample operational requirement information.
Delivery Method:	ILT – Instructor-led training
Duration:	4.5 days
Participants:	Pre-Sale System Owners, Planners, Administrators, and Technicians
Class Size:	Up to 12
Prerequisite:	None
Curriculum:	N/A

ASTRO® 25 IV&D CONVENTIONAL K CORE WITH CONFIGURATION MANAGER - ACS717410

Course Synopsis and Objectives:	The ASTRO25 IV&D Conventional K Core with Configuration Manager course teaches advanced troubleshooting skills and best practices for the ASTRO25 IV&D Conventional K Core. It also focuses on administrator functions and how to use the ASTRO25 IV&D Configuration Manager applications. A technical introduction to the MCC7500 as used within the ASTRO25 IV&D Conventional K Core, including some administrator functions, is also provided. Learning activities focus on gathering and analyzing system information to implement the appropriate actions that return a system to full operational status. After completing the course the participant will be able to: - Understand key physical and functional characteristics of K Core conventional system. - Perform tasks necessary to install K Core conventional system components. - Perform configuration steps for K Core conventional system components. - Understand available maintenance tools and indicators in K Core conventional system.
Delivery Method:	ILT = Instructor Led Training
Duration:	3 days
Participants:	Master Site Technicians, System Administrators, Technical System Administrators, System Technicians, and other Application Users
Class Size:	Up to 12
Prerequisite:	Completion of the following courses or equivalent knowledge: - Bridging the Knowledge Gap – System Administrators (ACT101) - Networking Essentials in Communication Equipment (NST762) - ASTRO® 25 Applied Networking (NWT003) - ASTRO® 25 IV&D System Overview (AST1038)
Curriculum:	Intro Module Module 1: Conventional K Core Overview Module 2: GCP 8000 Conventional Site Controller Installation Module 3: GTR 8000 Conventional Base Radio Installation Module 4: Conventional Comparator Installation Module 5: Conventional Site Reference Installation Module 6: Conventional Network Transport Installation Module 7: K Core Configuration Manager Module 8: Configuration Service Software (CSS) Module 9: Software Download Manager (SWDL) Module 10: Configuration Manager Diagnostics Module 11: GCP 8000 Conventional Site Controller Diagnostics Module 12: GTR 8000 Conventional Base Radio Diagnostics Module 13: Conventional Comparator Diagnostics Module 14: Conventional Network Transport Diagnostics

ASTRO® 25 IV&D CONVENTIONAL RF SITE WORKSHOP - ACS717440

Course Synopsis and Objectives:	The ASTRO® 25 IV&D Conventional RF Site workshop describes the components in the different ASTRO® 25 IV&D Conventional RF Sites topologies. This course also presents how the different ASTRO® 25 IV&D Conventional RF Sites topologies operate and explains the tools and methods available for troubleshooting components within the different ASTRO® 25 IV&D Conventional RF Sites topologies. By the end of the course, you will be able to*:* - Describe the ASTRO® 25 Conventional RF Site components and site configurations. - Configure and optimize the GTR 8000 Base Radio, GPW 8000 Receiver, GCM 8000 Comparator, and MLC 8000 Site Link Converter/Analog Comparator. - Diagnose and troubleshoot the GTR 8000 Base Radio, GPW 8000 Receiver, GCM 8000 Comparator, and MLC 8000 Site Link Converter/Analog Comparator. - Configure, diagnose and troubleshoot the components of the Conventional RF Site Network Transport subsystem.
Delivery Method:	ILT = Instructor Led Training
Duration:	3 days
Participants:	Site Technicians
Class Size:	Up to 12
Prerequisite:	- AST1038–ASTRO® 25 with IV&D System Overview. - ACT100-E–Bridging the Knowledge Gap–Technicians. - NST762–Networking Essentials in Communication Equipment. - NWT003–ASTRO® Systems Applied Networking.
Curriculum:	Module 1: Course Introduction Module 2: Conventional Topologies: - Topic 2-1: Conventional Subsystems Overview (Distributed/Centralized). - Topic 2-2: Conventional Site Architecture. - Topic 2-3: Conventional Call Processing Concepts. Module 3: Component Descriptions: - Topic 3-1: GTR 8000 Conventional Base Radio. - Topic 3-2: GGM 8000 Gateway. - Topic 3-3: GPW 8000 Receiver. - Topic 3-4: GCM 8000 Comparator. - Topic 3-5: MLC 8000 Analog Comparator/Site Link Converter. - Topic 3-6: Site Timing Preferences. - Topic 3-7: HP 2610/2620 Ethernet Switch. - Topic 3-8: Legacy Site Components.

Module 4: Configuration:

- Topic 4-1: Configuration Software/Tools.
- Topic 4-2: GTR 8000 Base Radio Configuration.
- Topic 4-3: GCM 8000 Comparator Configuration.

Module 5: Site Links and Network Transport Subsystem:

- Topic 5-1: Supported Link Types.
- Topic 5-2: Site Gateway.
- Topic 5-3: Ethernet Switch.
- Topic 5-4: Configuration of Network Transport Components.
- Topic 5-5: MLC 8000 Site Link Converter.

Module 6: Conventional Site Maintenance and Troubleshooting:

- Topic 6-1: GTR 8000 Optimization, Alignments and Verification.
- Topic 6-2: GCM 8000 Optimization.
- Topic 6-3: MLC 8000 Optimization.
- Topic 6-4: Troubleshooting Tools.
- Topic 6-5: Unified Event Manager.
- Topic 6-6: GTR 8000 Diagnostics and Troubleshooting.
- Topic 6-7: G-Series FRU Procedures.
- Topic 6-8: Troubleshooting RF Site Links.
- Topic 6-9: Gateway Diagnostics and Troubleshooting.
- Topic 6-10: MLC 8000 Diagnostics and Troubleshooting.

STANDALONE GTR8000 CONVENTIONAL BASE RADIO - AST2006

Course Synopsis and Objectives:	This course is designed to give the participants the ability to align, troubleshoot and repair the Standalone GTR8000 Base Station/Repeater to Motorola Solutions recommended service levels. Emphasis is placed on the use of Configuration Service Software (CSS) and its role in configuration, maintenance, diagnostics, alignments, and optimization of the Standalone GTR8000 Base Radio/Repeater Upon completing this course, the participant will be able to: - Understand basic concepts of the various radio systems supported by the GTR8000 Conventional Base Radio. - Identify the equipment modules of the GTR8000 Conventional Base Radio. - Operate and perform routine maintenance on the GTR8000 Conventional Base Radio. - Understand basic operational theory of GTR8000 Conventional Base Radio components. - Configure the GTR8000 Conventional Base Radio using Configuration Service Software (CSS). - Identify the different backplane connections on the GTR8000 Conventional Base Radio. - Perform calibration and alignment adjustments for the GTR8000 Conventional Base Radio. - Troubleshoot problems and identify/replace faulty modules in the GTR8000 Conventional Base Radio.
Delivery Method:	ILT = Instructor Led Training (Field Delivery Only)
Duration:	2 days
Participants:	Maintenance Technicians
Class Size:	Up to 12
Prerequisite:	**Prerequisites:** • General RF Knowledge and Skills • Basic Knowledge of Two-Way Radio systems
Curriculum:	CONVENTIONAL GTR COURSE OUTLINE 1.GTR8000 Base Radio Topologies In A Conventional System Description Configurations Capabilities Clear and Encrypted CAI Digital Voice Clear and Encrypted Packet Data GTR8000 Modules Transceiver LED's Reset Button Intercom Button Front Connections Rear Connections Transceiver Option Board

	Power Amplifier LED’s Modules Input/Output Fan LED’s Power Supply LED’s Backplane Connections AC Power Distribution in the Base Radio Base Radio Connections to System Software Applications CSS Accessing CSS GTR Configuration Site Configuration Channel Configuration Subsite Configuration Hardware Configuration Station Configuration Repeater Configuration Infrastructure Configuration Status Report Screen Status Panel Screen Hardware/Software Screen CSS Tools Menu GTR8000 Alignments ASTRO Simulcast Frequency Reference ASTRO Test Pattern ASTRO BER and RSSI SWDL Performing A SWDL on a GTR8000 Base Radio Upgrading Software Converting Software Conventional Site Maintenance and Troubleshooting Optimization, Alignment, and Verification Troubleshooting Tools Troubleshooting Methodology GTR8000 Diagnostics and Troubleshooting FRU Procedures

APX PORTABLE AND APX MOBILE OPERATOR - TRAIN-THE-TRAINER

Course Synopsis and Objectives:	This course provides APX radio trainers with an introduction to their radio, its basic operation and tailored job aids available for assistance in operation. The learning experience is a mix of facilitation and hands-on activities to help users perform common tasks associated with their radio operation. Segmentation between user groups (i.e. Police, Fire/EMS, and Public Service) is encouraged to help focus instruction on the specific operational issues of the individual user group. This course is geared for customers who have an experienced dedicated training staff in their organization. It provides the customer's identified training personnel with the knowledge and practice applying training techniques that will enable them to successfully train their students. Trainers will use audio visual (Interactive End User Toolkits–iEUTK), facilitation and "hands-on" activities to facilitate learning events supported by tailored or customized training materials and job aides. They will become proficient in discussing common tasks associated with the operation of the customer's radios. After completing the course the participant will be able to: - Understand a high-level overview of the customer system configuration. - Understand the general radio operation. - Understand proper operating procedures for specific customer features. - Perform basic operational tasks of the radio. Utilize the provided job aids to perform specific tasks associated with the radio.
Delivery Method:	ILT - Instructor-led training
Duration:	8 hours
Participants:	APX Trainers, Supervisors and Support Personnel
Class Size:	Up to 15
Prerequisite:	Previous two-way radio and training experience
Curriculum:	Basics: - Controls. - Top and Side Buttons. - Switches. - 3 Position toggle. - 2 Position Concentric. - Home key. - Data Key. - Display. - Front Display. - Top Display. - Display light. - Intelligent Lighting.

	- Push to Talk or Accessory PTT found on the microphone. - Hub, hang up box (Mobile). Menu: - Menu Screen Anatomy. - Navigating Menu Screen. - Recent Call List (Model 3.5). - Unified Call List - Contacts (Model 3.5). - Dual Sided Radio (Model 3.5). - Dual Mics. - Dual Speakers. - Accessory Connector. Specific Features: - Changing Talkgroups/Channels. - Changing Zones. - Mute tones of keypad. - Talkgroup Call. - Private Call. - Accessing Private Call Feature. - Initiating Private Call. - Call List Programming. - Announcement/All Call (Calls involving Multiple Talkgroups). - Initiating Announcement/All Call. - Direct/Talkaround. - Failsoft. - Radio Profiles. - Accessing and changing Radio Profile. Optional Features: - Scan. - Scan program. - Priority Scan. - Dynamic Priority. - Telephone Interconnect. - Accessing Telephone Interconnect Feature. - Initiating a Phone Call. - Phone List Programming. Data Services: - Text Messaging.

	- Accessing the Text Messaging Feature. - Creating a Free Form Text Message. - Sending a “Canned “ Text Message - GPS. - OTAP. - Encryption. - Emergency.

THE INTERACTIVE END USER TOOL KIT

The Interactive End User Tool Kit (iEUTK) is a revolutionary knowledge transfer tool designed to accelerate learning. Using the iEUTK allows trainers to customize operator training to match unique button, feature programming, and displays provided in the system. Each iEUTK is user friendly and menu driven. The home page in every iEUTK provides excellent navigation to the multiple areas of interest for the specific communication device. Operators select "Getting Started" to view a highly informative video overview that helps build solid foundational knowledge and quickly brings users up to speed on the operational theory of their specific device. The tailored materials are developed on-site using tool kits that allow users to modify training materials when radio or console features change. Personnel are taught how to maneuver through and tailor the iEUTK screens. The tailored selections are saved to an electronic file that the Motorola Solutions training team sends to the printer to develop the training materials. The trainers use the iEUTK to generate their instructor guides, incorporating standard operating procedures, notes, and reminders. This dynamic tool allows the customer to generate training materials on an as-needed basis depicting current features and functionality.

Figure 5-9: Motorola Solutions uses the iEUTK to produce PowerPoint™ presentations, so that students can have self-paced training on any PC with Microsoft Office™.

5.10 DETAILED DESCRIPTION OF THE SYSTEM SUPPORT AND MAINTENANCE SERVICES (RFP SECTION 7.6.B.1.H)

The detailed description of the system support and maintenance services included in Section 5.3 for warranty are the same services available post warranty and maintenance. During the design review, Motorola will customize a Customer Support Plan (CSP) which dictates system support and maintenance plan and escalation process with Humboldt County's input. includes the procedures and schedules applicable to each support and maintenance service including software and/or hardware upgrades that will be made for each component of the Radio System Package provided pursuant to the terms and conditions of a final Professional

Services Agreement, and additional support and/or maintenance services that the County may feel is beneficial.

Table 5-3 is a summary of warranty and maintenance services.

Table 5-18: Summary of Warranty Services

Description	1 Year Warranty	Years 2-10 Maintenance
Dispatch Service and Case Management (24x7x365)	☑	☑
Day Wireless - On-Site Response (24x7x365)	☑	☑
Motorola Infrastructure Board Repair	☑	☑
Network Preventive Maintenance (Annual)	Optional	Optional
Technical Support (24x7x365)	☑	☑
Customer Support Manager	☑	☑
Customer Support Plan	☑	☑
Motorola On-Line	☑	☑
Disaster Recovery Plan	☑	☑
Microwave Parts	☑	☑
System Upgrade Agreement II	N/A	Optional

5.11 DETAILED DESCRIPTION OF RISK MITIGATION (RFP SECTION 7.6.B.1.I)

The following is a detailed description of the Motorola's understanding of the requirements, challenges, logistical issues and risks associated with the project.

In addition, Motorola has included the primary point of contact name, physical address, email address and telephone number, and our secondary point of contact with the County, in the event the project team is unable to adequately address a particular issue or dispute, and the contents and frequencies of regular report and status meetings that will be held throughout the Project. We have also included a description of our escalation process.

5.11.1 Risk Mitigation Plan

The success of Humboldt County's radio network will be measured by the ability to meet user expectations and deliver a system that meets the operability and interoperability needs of the first responders in Humboldt County. This section is a discussion of the risks associated with this project, as well as the mitigation of those risks. In this section, risks associated with the following critical items are discussed:

- Coverage that Meets Expectations, Not Just Passes a Test
- Simulcast Coverage and Technology.
- Coverage Amongst Mighty Redwoods – Environmental Coverage Impact

- Feasible Design with Frequency Availability.
- Radio System Reliability.
- Site Selection and Antennas.
- Implementation and transition.

Motorola has completed a thorough risk analysis. By gathering this data, Motorola is able to provide an offer that is highly accurate in terms of coverage design, project costs, and risk mitigation. This will ensure a successful implementation.

5.11.1.1 Coverage that Meets Expectations, Not Just Passes a Test

Motorola's highest priority in the proposed solution is Humboldt County's highest priority and only critical requirement: coverage. Coverage risk relates to the accuracy of the tool used to predict and guarantee coverage, and selecting sites that will meet the expectations of the users, not just pass a coverage test.

Regarding the reliability of Motorola's prediction tool: Motorola uses a proprietary tool called Hydra, which has been tested and proven in thousands of implemented systems.

The RFP required 86% of the Humboldt County service area have digital mobile coverage, 56% of the County have digital portable coverage, and 70% of the County have analog mobile coverage. Conversely, 14-44% of the County will not have the required coverage. In evaluation of candidate sites, including all sites in the FCC database, Motorola found that we can comply with less than the 10 proposed sites. However, the coverage will be different with significant holes in populated areas that have coverage today. ***As a result, Motorola mitigated the risk associated with coverage expectations by utilizing the existing sites and adding two (2) sites that are owned by the State of California.***

5.11.1.2 Simulcast Coverage and Technology

Humboldt County's RFP has only one critical requirement: coverage. Simulcast is the simultaneous transmission of identical audio information over the same radio frequency at different sites. Simulcast is analogous to dropping two pebbles in a pond. The waves can be synchronized to create bigger waves, or smaller out-of-synch waves. Simulcast risk is associated with the ability to effectively synchronize radio waves. Not all simulcast technology is the same.

Motorola mitigates risk associated with simulcast technology by utilizing Linear Simulcast Modulation in our 3rd generation LSM station. TIA-102 Project 25 conventional simulcast can be deployed with linear or non-linear modulation equipment. Project 25 C4FM modulation is non-linear and does not perform as well as Motorola's Project 25 Linear Simulcast Modulation (LSM). Simulcast is a technology where more than one tower transmits the same frequency. As such, wide signal "eye openings" are particularly important because it impacts the "Receiver Delay Spread" presence in a simulcast system. Receiver Delay Spread is a figure of merit for subscriber simulcast receiver capability. With receiver delay spread, the bigger the number, the better, because it equates to how much delay from multiple

towers a receiver can tolerate. A wider or bigger eye opening provides better simulcast coverage and better in-building coverage. Below are the Receiver Delay Spread characteristics in TIA-102.CAAB. Motorola utilizes LSM which has very good receiver delay spread performance.

Project 25 Receiver Delay Spread Performance Standards per TIA-102.CAAB:

- C4FM = 50 usec (FDMA).
- LSM = 80 usec (FDMA) – More Delayed Allowed = Best Performance.
- HDQPSK = 65 usec (TDMA voice).

This is shown in Figure 5-6 below captured from two different live Project 25 simulcast systems.

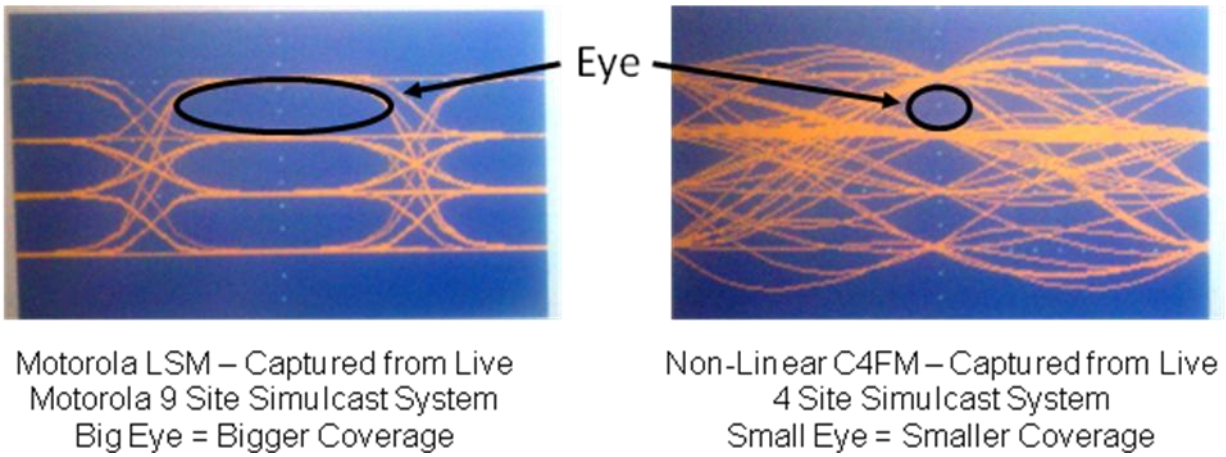


Figure 5-10: Linear versus Non-linear Simulcast Eye Pattern.

5.11.1.3 Coverage Amongst Mighty Redwoods – Environmental Clutter Impact

Humboldt County is home to majestic redwood trees, which introduces a coverage risk because the redwood trees are taller than the Rodgers Peak tower. As required, coverage is predicted utilizing TSB-88 recommendations and Okumura. Okumura-based coverage predictions are valid only when tower site antennas are installed above the local clutter heights. Motorola has included additional clutter loss in the coverage for Rodgers Peak to account for the redwood trees. ***The proposed solution mitigates local environmental clutter risk at Rodgers Peak with additional coverage loss associated with the redwood trees around Rodgers Peak.***

5.11.1.4 Feasible Design with Frequency Availability.

Risk associated with a feasible design includes the proposed architecture and availability of frequencies.

Proposed Architecture

The proposed digital system architecture includes 6 sites that are simulcast, and 4 sites that are stand-alone. Stand-alone sites are proposed to mitigate backhaul risk. Addendum 2 included a frequency plan with Rodgers Peak and Sugar Pine in a simulcast cell with the Courthouse site and Horse Mountain. We found that those sites can be simulcast together, however, simulcast requires microwave backhaul. Additionally, it appears that the Rodgers Peak tower is shorter than surrounding redwood trees, and microwave backhaul is not feasible – thus making simulcast not possible. Microwave backhaul connectivity to the Shelter Cove site was also found to be infeasible provided the existing tower height. In addition, Addendum 3 required a new solar system for proposed equipment at Rodgers Peak and Sugar Pine with a 10% transmit duty cycle, while other sites are a 20% transmit duty cycle, and the different transmit duty cycle lead us to believe that it is desired to make the solar sites stand alone. With Rodgers Peak and Sugar Pine stand-alone, Shelton Butte is also stand alone because it is isolated from backhaul. ***To mitigate risk associated with backhaul feasibility risk, Shelton Butte, Shelter Cove, Rodgers Peak, and Sugar Pine are P25 digital stand-alone repeater sites, and Rodgers Peak and Sugar Pine are stand-alone analog sites.***

Frequency Availability

The stand-alone sites introduce an additional risk, frequency availability. The proposed P25 digital solution requires 5 transmit frequencies, and the RFP stated that the County is licensing 3 new transmit frequencies. The proposed analog solution requires 3 transmit frequencies, and the RFP stated that the County is licensing 2 new transmit frequencies. ***Motorola performed a frequency search and identified 3 candidate frequencies for potential licensing to mitigate the risk associated with frequency availability for both the analog and digital P25 systems.***

5.11.1.5 Radio System Reliability

Radio system reliability risk is associated with system operation in the event of a failure. In a voting/simulcast system, all the audio from a user radio comes into a comparator to be voted and repeated out all simulcast. If the comparator fails, all audio is lost in a voting system. ***Motorola has mitigated the reliability risk by including redundant comparators for both P25 digital and analog.***

5.11.1.6 Site Selection and Antennas

Site selection and upgrade risk is associated with the ability to acquire a site and upgrade the site as needed.

The primary reason for utilizing the existing 8 sites is to mitigate risk associated with user coverage expectations, and the additional benefit is mitigation of risk associated with site acquisition because the County already utilizes these sites. The County is currently a partner with the State of California at sites. The two additional sites were selected because they are owned by the State of California. The State has indicated that they are interested in potentially partnering with Humboldt County at those sites.

Motorola has mitigated site acquisition sites by proposing locations with existing site partners.

To mitigate site upgrade risk and risk associated with combining the existing frequencies into the proposed antenna system, Motorola has proposed an alternative approach with a single new antenna per site using a duplexer, and reusing the existing antenna systems for the existing equipment. The reason for using a duplexer for new channels in lieu of combining the existing channels into the proposed antenna system is to improve performance of the proposed system and mitigate risk associated with the existing. The more channels that are combined, the more loss is introduced. The existing channels and new would both experience more loss combining them together. Only one new antenna is proposed per site, mitigating tower loading that would be associated with more antennas. The new antenna is assumed to be mounted at the top of the tower. If the top of the tower is not available, Motorola will work with Humboldt County to determine an optimal solution. ***A new single antenna in lieu of combining with the existing frequencies and stations mitigates risk associated with additional coverage loss, while only adding a single antenna.***

As required, Motorola has included a tower analysis and R56 audit to determine if upgrades, if any, are needed for microwave and additional land mobile radio equipment at the sites. Motorola has included grounding that is able to be identified from visual inspection during the site walks. An R56 audit includes measurement of the grounding system and a more detailed audit to determine if addition upgrades are necessary to protect the equipment. ***The site analysis included in the deployment mitigates risk associated with confirming tower loading and site upgrades.***

5.11.1.7 Implementation and Transition.

Motorola's experience with Project 25 linear simulcast modulation is an important consideration to deliver high-quality, stable audio throughout Humboldt County's service area. Motorola is shipping our third generation of Project 25 Linear Simulcast Modulation (LSM). Motorola's simulcast experience over the past 30 years has driven improvements in our equipment design over the decades, providing Humboldt County the best coverage available. ***Motorola has mitigated deployment risk with technology and experienced staff that have been proven in thousands of implemented systems.***

5.11.1.8 Motorola's Approach to Continual Risk Management

During Humboldt County' project, Motorola will have review meetings that track the status of each risk item. These reviews will analyze each risk, identify any new risks that may impact the project, assess the impact of those risks, and assign action items to develop risk mitigation plans. This review will also determine the effectiveness of any mitigation plans that have been triggered by a risk event occurring.

The risk identification and mitigation process provides early development of mitigation approaches, monitoring of potential risks and initiation of mitigation plans should they occur. Motorola's risk approach ensures that the Humboldt County

project team understands and anticipates risk. This will allow both Humboldt County and Motorola to act in a timely manner to mitigate risks that could otherwise lead to cost increases and schedule delays.

5.11.2 Issue Reporting, Corrective Action, and Point of Contact

Issues identified during the project shall be recorded and tracked. Tracking information typically includes:

- Description.
- Priority level.
- Date identified.
- Owner.
- Due date.
- Status.

Issues should be resolved by the direct producer whenever possible. Any that cannot be resolved with the help of the Motorola technical team are elevated to the Motorola Project Manager. The Motorola Project Manager is responsible for deficiency escalation when required.

Issues that have been referred to the Motorola Project Manager are reviewed periodically until they are resolved. Items that are unable to be resolved by the Motorola Project Team may be escalated to higher levels of management.

Primary Point of Contact: Brian White
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brian.white@motorolasolutions.com
(847) 980-4478

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(858) 368-3241

5.12 TYPES OF SITUATIONS THAT REQUIRE A CHANGE ORDER (RFP SECTION 7.6.B.1.J)

Motorola's approach to project design is to develop a "true project cost" for a specific solution, by accurately assessing the project scope and risks in order to successfully complete the implementation. Motorola's Change Control Process includes elements of scope, cost, schedule, risk, quality, communications, and subcontract management to minimize the need for changes.

Motorola has proposed equipment and services to the best of our ability within the RFP process where discussion with the County and approval by the County of the

approach is not possible due to the limitation of communication and time during the RFP process. An example of a situation where a change order would occur would be if Humboldt County would like a user radio accessory such as a Si500 video speaker microphone. Another potential change order would be the result of a detailed engineering analysis that occurs post contract such as microwave physical path surveys or tower remediation identified after a tower analysis.

At a high level, Motorola's approach to change management is focused on the consistent application of the elements that make up Motorola's Project Management Methodology:

- **Quality Management**: The project and its deliverables meet Motorola's exacting standards and Humboldt's requirements for quality and performance.
- **Scope Management**: The scope of the project will be managed through the change management process to ensure that any changes in scope are identified and the impact of those changes are communicated and approved prior to implementation. Motorola's integrated team, consisting of Motorola and its subcontractors/suppliers will manage the scope of the project following the same rigorous scope and change management processes to ensure the project is completed on time and on budget.
- **Risk Management**: Motorola's risk management process keeps the potential risks highlighted during the project. As a risk item is eliminated, it is removed from the list, any new risks are added and mitigation plans are developed to minimize the impact of an event to the project.
- **Schedule Management**: Schedules are utilized to manage resources, equipment, subcontractors, and tasks on the project. The schedule management process shows the status of each task and allows the project manager to allocate resources as needed to ensure timely completion of all tasks. This allows optimal use of project resources and reduces the possibility of delays.
- **Communications Management**: Keeps all project stakeholders informed of the status of the project and enables them to get timely information regarding the project progress. Communications Management ensures all team members are kept informed of the upcoming tasks and assignments so they can provide feedback to improve the project performance.
- **Subcontractor Management**: Motorola's subcontractors are critical to the success of Humboldt project and are managed as team members and key contributors. Their experience and expertise enables Motorola to provide Humboldt with world-class technologies and a world class implementation while keeping the project cost effective and predictable.

This proven cost-management methodology has been used successfully to deliver hundreds of statewide, countywide, and citywide projects within their anticipated timelines and projected budgets.

Motorola will strive to understand the requirements and needs of Humboldt and its agency users up front, so that a system solution is designed to meet those needs and requirements with as little need for change as possible. For Humboldt this process has already begun with this proposal, and will continue with regular meetings and

dialogue through all of the system's lifecycle phases to include; design, design review, and design approval phases, implementation, testing, acceptance, initiation into service, and the Maintenance phase. With even the most rigorous process, some changes are inevitable, and Motorola has a comprehensive Change Control Process in place to streamline the change management process.

5.13 RADIO COVERAGE PLAN (RFP SECTION 7.6.B.2)

This section describes Motorola's approach to provide radio coverage that not only meets, but exceeds Humboldt County's coverage requirements.

5.13.1 Coverage Design Overview

The following design criteria were identified by Motorola based on the information provided in the RFP:

1. Project 25 Conventional Digital Portable Coverage for 56% of the Overall County Service Area at 95% Reliability.
2. Project 25 Conventional Digital Mobile Coverage for 86% of the Overall County Service Area at 95% Reliability.
3. Analog Mobile Coverage for 70% of the Overall County Service Area at 95% Reliability.

In every radio configuration, Motorola exceeds the Bounded Area Percent Coverage (BAPC). Below is a summary of Motorola's solution.

Table 5-19: Motorola Exceeds the Required Bounded Area Percent Coverage.

	Required Bounded Area	Proposed Bounded Area
P25 Portable Inbound DAQ 3.4	56%	59.6% - Exceeds
P25 Portable Outbound DAQ 3.4	56%	70.5% - Exceeds
P25 Mobile Inbound DAQ 3.4	86%	92.8% - Exceeds
P25 Mobile Outbound DAQ 3.4	86%	86.3% - Exceeds
Analog Mobile Inbound DAQ 3.0	70%	83.0% - Exceeds
Analog Mobile Outbound DAQ 3.0	70%	74.4% - Exceeds

To provide the best Project 25 simulcast performance, and Motorola's technology utilizes Linear Simulcast Modulation (LSM) to offer Humboldt County with great receiver delay spread performance and better coverage.

In evaluation of candidate sites, including sites in FCC database, we found that we can comply to County's requirements with less number of sites than the number of sites in this proposal. However, the coverage footprint will not only be different from the existing system's footprint but also have significant holes in populated areas of Humboldt County. So, to reduce the risk associated with coverage expectations, Motorola opted to utilize the existing sites and adding two (2) additional sites, which are owned by the State of California, to arrive at a final design.

Motorola has worked extensively to design a system that will meet and exceed Humboldt County's daily needs, while remaining highly cost effective.

As specified by the RFP, coverage was evaluated for a portable worn on the hip (3 ft. height) in a swivel holster for the portable coverage, and a mobile with the antenna mounted in the center roof (5 ft. height) for the mobile coverage. Motorola Solutions guarantees 95% reliability in the covered area shown on the included maps. In order to demonstrate this guarantee, Motorola Solutions will perform a coverage test for the proposed design.

Motorola's design takes into account the County's preference to use existing sites and uses eight (8) current sites and two (2) state owned sites, Motorola's proposed sites are as follows:

- County Courthouse (Current).
- Pratt Mountain (Current).
- Mt. Pierce (Current).
- Shelter Cove (Current).
- Horse Mountain (Current).
- Trinidad (Current).
- Rodgers Peak (Current).
- Sugar Pine (Current).
- Orleans Shelton Butte (Existing State Owned).
- Grasshopper Mountain (Existing State Owned).

5.14 COVERAGE PREDICTION METHODOLOGY (RFP SECTION 7.6.B.2.C)

Motorola would like to explain its coverage prediction methodology, coverage reliability, system configuration used for modeling and predicted link budget in this section. In Section 5, Appendix 3 – Coverage Acceptance Test, we provide a preliminary coverage acceptance test plan which complements our coverage modeling process described in this section.

Radio coverage is affected by many factors. Some of these elements, called system factors, are related to the system design parameters. These factors uniformly affect coverage performance and include frequency, distance, transmitter power, receiver sensitivity, antenna height and gain. The other factors, called environmental factors, vary according to the path taken by the radio signal and the environment surrounding the signal. Environmental factors include terrain variations, atmospheric conditions, obstructions, vegetation, buildings, noise, and interference.

All propagation prediction methods try to account for both types of factors and incorporate them into a computational model. In general, the currently accepted propagation models, such as Bullington, Lopez and Okumura provide good macro level indications of coverage performance. In the past this level of analysis was adequate for the type of basic systems that were available. However, today's complex

technologies, such as digital radios or simulcast, require a much more in-depth analysis of the expected coverage performance to create a cost-effective design. This makes it necessary to select the appropriate coverage model, provide accurate representation of the environmental factors throughout the service area, and apply the coverage analysis method to every location within the service area.

Recognizing these facts, Motorola has developed Hydra, a coverage analysis program. Employing the knowledge gained from Motorola's many years of practical experience and coverage testing, Hydra provides a superior means for analyzing system coverage. This program, which is unique to Motorola, is named for its technique of computing coverage on every tile in a service area rather than along a finite number of radials. Solution "layers" can be computed and observed separately or in any combination.

Hydra uses both topographical and environmental databases. These databases generally originate from official government agencies such as the U. S. Geological Survey in the United States and equivalent governmental organizations worldwide. In some situations, when this database does not exist, Motorola has worked with other suppliers to produce high quality Hydra databases.

Hydra uniformly divides the entire geographical service area to be analyzed into small, distinct areas called tiles. The resolution (size) of the tiles can be as fine as three arc-seconds (approximately 300 feet at U.S. latitudes). At each tile, Hydra models the propagation from each site in the system.

The tile method is of significant importance in the calculation of simulcast performance, co-channel interference and adjacent channel interference. The radial method determines simulcast and interference performance only at the locations where radials from all sites cross. This can leave many areas where coverage performance is not calculated. The advantage of the tile method is that information from every site and all databases are available in every 3 arc second tile. This method provides the most accurate results for simulcast, interference and voting analysis.

5.14.1.1 Database Accuracy and limitations of Coverage Guarantee

Since its introduction, Hydra has proven to be a very valuable coverage analysis tool. With the proper databases, Hydra produces highly accurate results. As the accuracy is directly dependent on the quality of the digitized data, Motorola uses the best quality data available for its analyses. Whenever possible, Motorola obtains data from official governments sources. When data is not available from these sources, Motorola purchases the data from an approved vendor and then performs its own quality check. These quality tests are based on the standards published by the United States Geological Survey.

Unfortunately, even the best database can contain a certain amount of errors. These errors can be caused by a number of factors. Some examples are:

Source Information - Terrain and environmental databases are primarily derived from existing map information. Errors can creep into the maps anywhere within the

map making cycle. Consequently, any errors in the maps will be carried over to the database.

Database Development Process - The process of creating digitized map information involves both sophisticated computer technology and human participation. Each has the potential for introducing errors into the databases. Limitations in the digitizing algorithms and computer hardware problems are just two examples of potential error sources. Also, as part of the process, the database developer is required to make a certain amount of judgment calls, which could lead to errors if they are not correct. Fortunately, most process errors are caught during the data verification phase. However, certain errors may not be detected and can be incorporated in the database.

Age - The physical world is constantly changing. Natural phenomena such as earthquakes, volcanoes, fires, storms, etc., change the topography and environmental factors. Over time landfills are created; hills are leveled; roads are built; communities are developed; and large buildings are constructed. Not all of these changes may be captured in the database.

Consequently, any coverage guarantee offered by Motorola is limited to the locations where the database accurately depicts the terrain and environmental conditions along the path between the transmitter and receiver.

Additionally, proposed coverage is predicted utilizing TSB-88 recommendations and Okumura. Okumura-based coverage predictions are valid only when site antennas are installed above the local clutter heights. Motorola has included additional loss to account for Rodgers Peak being below the local clutter, and other sites are above clutter. If a site is determined to be below local clutter, the site will be excluded from the coverage test calculations and relevant portions of the service area will be excluded from the testing process.

5.14.1.2 Reliability of predicted coverage

Hydra coverage maps indicate the probability (usually referred to as the reliability) of the radio system providing a minimum criterion, such as a Delivered Audio Quality or BER. Since system coverage can never be 100% reliable, there will always be particular times and locations where the signal strength or BER is below that needed for satisfactory performance. These locations of unsatisfactory performance are often predicted in a coverage study. However, there are also areas of unsatisfactory coverage that cannot be predicted due to unknown circumstances such as shadowing of buildings, greater than average tree density, noise, atmospheric conditions, or terrain variations not accounted for in the coverage prediction.

Because these conditions exist and signals fade due to these environmental and terrain factors, coverage must be described statistically in the terms of a percentage of locations that exhibit reliable communications. Reliability of the signal strength is given in percentage within the defined coverage area. A system predicted to have 95% area coverage reliability will achieve the specified signal quality in 95% of the area indicated by the coverage shading. For example, if the area is divided uniformly

into 100 locations then 95 of these locations will provide satisfactory coverage and 5 of these locations will provide unsatisfactory coverage reliability.

The coverage maps provided in Section 7 – Additional information indicate areas of 95% or greater area reliability within the painted area on the map. The coverage map predictions are based on accepted engineering methods and considerations. However, unusual natural phenomena may be present which can either hinder or improve actual RF propagation. The actual signal strength at the various locations of the desired coverage area can only be determined by conducting field measurements.

5.14.1.3 Interference, Noise Floor, and Clutter

The system's coverage was designed with the premise that possible outside interference is negligible. Motorola has configured the antenna systems at all of the sites, to try to minimize on site RF Interference. Additionally, Motorola has accounted for 12.6 dB of additional VHF noise at each receiver site to visualize most typical RF landscape. Moreover, due to other RF users at these locations and surrounding areas, the potential exists for intermodulation caused by the many transmitters at this site and transmitter noise/receiver de-sense caused by closely spaced transmitters and antennas. Further, co-channel interference from other radio systems can effectively reduce the coverage footprint of proposed radio system. Once awarded, Motorola will perform spectrum fingerprinting and noise floor measurements at each RF sites to confirm assumed external noise and identify any potential IM issues.

It is extremely important to understand that there is nothing that can feasibly be done to eliminate co-channel interference (short of building a RF barrier around your service area or the changing out of frequencies). All the filtering in the world cannot notch out an interfering signal that is on frequency. There are in some cases however, methods of reducing its effects.

1. The effective radiated power of the interfering transmitter can be lowered in the direction of county's service area, thus reducing the interfering signal in the desired service area. This requires the cooperation of the interfering municipality or user and can potentially reduce their coverage within their service area.
2. If the interfering site is not co-channel, additional filtering may reduce interference. This requires the cooperation of the interfering user and may not necessarily be required by the FCC rules as the out of band emissions may be within allowed levels.
3. If the offender can be determined, County may be able to swap some of existing channels to gain geographic separation. Channels that are being interfered with can be swapped with channels that are geographically further away.

As required, coverage is predicted utilizing TSB-88 recommendations. Okumura-based coverage predictions are valid only when tower site antennas are installed above the local clutter heights. Motorola has included additional clutter loss in the coverage for Rodgers Peak to account for the redwood trees, and other sites are assumed to have antenna installation locations above local clutter.

Motorola cannot guarantee an interference and local clutter free system. However, Motorola can assist County with Engineering support on time and materials basis should interference or local clutter issues arise. If there is any additional protective equipment and/or labor that will be required, the additional cost will be the responsibility of the Customer. This may include antenna relocation and/or additional filtering.

At the time of drafting this proposal, Motorola does not have information about all the required RF Tx and Rx Frequencies. Customer is responsible to acquire frequencies necessary for the proposed system. Motorola can provide recommendations and perform paper studies to confirm that whether or not the frequencies suggested by customer are usable.

5.14.1.4 Channel Performance Criteria

Per TSB-88, the Channel Performance Criteria (CPC) is the CPC is the specified design performance level in a faded channel. Its value is dependent upon ratios of the desired signal to that of the other noise and interference mechanisms that exist within the service area.

Motorola is proposing a CPC Delivered Audio Quality (DAQ) 3.0 for analog channels and DAQ 3.4 for Project 25 digital channels. Testing of analog conventional channels is typically limited to subjective DAQ 3.0 voice tests to verify performance. Due to the nature of analog communications DAQs levels of 3.4 or higher do not apply. Analog channels, particularly in the VHF band, present a much higher degree of background noise compared to channels utilizing digital modulation. Digital modulation, however, removes the majority of the background static noise experienced with digital modulations and thus is more readily capable of performing at DAQ 3.4.

Table 5-20: Channel Performance Criteria (CPC) Delivered Audio Quality Chart (DAQ).

AUDIO QUALITY CHART DAQ (Delivered Audio Quality)	
DAQ	**Grade of Circuit Performance**
1	Unusable, Speech present but unreadable
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion
3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion
4	Speech easily understood. Occasional Noise/Distortion
4.5	Speech easily understood. Infrequent Noise/Distortion
5	Speech easily understood.

The ASTRO digital system provides consistent, high quality audio with little background noise throughout the coverage area through the use of error correction

techniques. In fact, the ASTRO system can provide usable audio, with no “analog” noise component, from the received digital information, even when some Bit Errors are experienced. In areas or situations where the received signal experiences a high Bit Error Rate, the user may notice low level background Vocoder “artifact”; however “analog noise” or static as traditionally thought of in an analog system is not heard.

5.14.1.5 Motorola’s Simulcast

Motorola predicts simulcast performance analysis using the Hydra program, which simulates aggregate signal strength and phase angle (delay) throughout the complete predicted coverage area. All locations within the predicted coverage area are analyzed for the combined effect of signal strengths and differential delays from all simulcast transmitters in the system. Any area that exhibits an aggregate of signal strength and differential delay that falls below Receive Signal Level / Bit Error Rate (BER) design goals is either designed to occur outside the predicted coverage area, or is noted as a separate area of less than acceptable performance.

5.14.2 System parameters

The predicted coverage on the maps is based on the availability of the sites located at the coordinates specified in the below site locations with the antenna site equipment parameters shown below. The transmit site coordinates and antenna heights were verified against the information provided in the RFP and its addendums.

5.14.2.1 Site parameters:

The table below provides parameters for all sites.

Table 5-21: Sheriff Digital P25 Site Parameters.

Site Name	Group Name	Latitude	Longitude	Database Elevation (feet)	Mounting Height (feet)
County Courthouse	North Cell	40°48’11.18” N	124°9’43.7” W	39.3700788	120
Horse Mountain	North Cell	40°52’27.09” N	123°44’0.84” W	4911.41733	100
Trinidad	North Cell	41°3’15.8” N	124°9’2.7” W	344.4881895	60
Mt Pierce	South Cell	40°25’2.3” N	124°7’13” W	3162.729664	100
Pratt Mountain	South Cell	40°7’13.5” N	123°41’35.76” W	3868.110242	100
Grasshopper	South Cell	40°18’23.9” N	123°58’40.4” W	3356.299218	90
Rodgers Peak	Stand-alone	41°9’28.05” N	124°1’23.49” W	2732.939637	100
Shelter Cove	Stand-alone	40°2’1.83” N	124°2’25.63” W	2014.435699	112

Site Name	Group Name	Latitude	Longitude	Database Elevation (feet)	Mounting Height (feet)
Shelton Butte	Stand-alone	41°14’17.49” N	123°37’58.19” W	3553.149612	70
Sugar Pine Mountain	Stand-alone	41°2’18.7” N	123°44’54.89” W	3815.616804	80

Table 5-22: Public Works Analog Site Parameters.

Site Name	Group Name	Latitude	Longitude	Database Elevation (feet)	Mounting Height (feet)
County Courthouse	Cell1	40°48’11.18” N	124°9’43.7” W	39.3700788	120
Horse Mountain	Cell1	40°52’27.09” N	123°44’0.84” W	4911.41733	100
Mt Pierce	Cell1	40°25’2.3” N	124°7’13” W	3162.729664	100
Pratt Mountain	Cell1	40°7’13.5” N	123°41’35.76” W	3868.110242	100
Rodgers Peak	Stand-alone	41°9’28.05” N	124°1’23.49” W	2732.939637	100
Sugar Pine Mountain	Stand-alone	41°2’18.7” N	123°44’54.89” W	3815.616804	80

5.14.2.2 Subscriber Parameters

Portable antenna performance can vary widely depending on the type of antenna used and the location of the portable antenna on the user's body. Similarly, Mobile antenna performance can vary based the location of the antenna on the car or truck. The coverage maps included for portable and radios show the coverage predicted for portable and mobiles operation with the following configuration:

- The 6 Watt Motorola APX 6000 portable with a half wave flexible whip antenna located on the portable. The RF Subsystem was designed to utilize portable radios that are worn in a swivel holster at a height of three (3) feet for coverage and testing purposes. Both transmission and reception shall occur from this position using a remote speaker microphone.
- The 35 Watt Motorola APX 4500 mobile. The RF Subsystem was designed to utilize mobile transceivers mounted in the trunk of a typical sedan with a unity gain antenna mounted in the center of the roof at a height of five (5) feet for coverage and testing purposes.

Deviation from the specified portable/mobile antenna and/or configuration will result in a change of the coverage performance of the portable radio and may can the coverage maps substantially. If the configuration of the portable/mobile and/or its antenna changes, Motorola will have to run coverage maps to determine the change in coverage performance.

5.15 RF LINK BUDGET (RFP SECTION 7.6.B.2.A)

It is critical to understand the gains and losses within the links, commonly referred to as the link budget. The following sections include the link budget for each Project 25 digital site and analog site. Humboldt County requested a 1dB difference in link budget between inbound/talk-in and outbound/talk-out. We have provided the raw link budgets because we recommend optimization of the link budgets after installation and measurement of the sites and noise.

5.15.1 Sheriff System Project 25 Digital Link Budget

The link budget data for each site in the proposed system Project 25 digital system is shown in following tables.

Table 5-23: County Courthouse Mobile Link Budget

County Courthouse **Latitude** 40°48'11.18" N **Longitude** 124°9'43.7" W		**Base TX Antenna Height (ft) / Az (deg)** 120 / 120 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 120 / 120 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.06
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		2
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-114.96**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.25		0.8	
TRANSMITTED POWER	**dBm**	**48.73**		**38.2**	
ERP	**W**	**74.66**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**151.3**		**153.16**	

Table 5-24: Horse Mountain Mobile Link Budget

Horse Mountain **Latitude** 40°52'27.09" N **Longitude** 123°44'0.84" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-116.28**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	8		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**47.63**		**38.2**	
ERP	**W**	**57.96**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**150.2**		**154.48**	

Table 5-25: Mt. Pierce Mobile Link Budget

Mt Pierce **Latitude** 40°25'2.3" N **Longitude** 124°7'13" W		Base TX Antenna Height (ft) / Az (deg) 100 / 60 Antenna Model RFI OA40-41-DIN		Base RX Antenna Height (ft) / Az (deg) 100 / 60 Antenna Model RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-117.28**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**48.63**		**38.2**	
ERP	**W**	**72.96**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**151.2**		**155.48**	

Table 5-26: Pratt Mountain Mobile Link Budget

Pratt Mountain **Latitude** 40°7'13.5" N **Longitude** 123°41'35.76" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 315 **Antenna Model** RFI OA40-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 100 / 315 **Antenna Model** RFI OA40-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-117.28**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**48.63**		**38.2**	
ERP	**W**	**72.96**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**151.2**		**155.48**	

Table 5-27: Rodgers Peak Mobile Link Budget

Rodgers Peak **Latitude** 41°9'28.05" N **Longitude** 124°1'23.49" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 105 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 100 / 105 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-117.28**
OUTPUT POWER	W	8		10	
OUTPUT POWER	dBm	39.03		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**40.68**		**38.2**	
ERP	**W**	**11.7**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**143.25**		**155.48**	

Table 5-28: Shelter Cove Mobile Link Budget

Shelter Cove **Latitude** 40°2'1.83" N **Longitude** 124°2'25.63" W		**Base TX Antenna Height (ft) / Az (deg)** 112 / 0 **Antenna Model** RFI EA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 112 / 0 **Antenna Model** RFI EA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.04
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		5
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		2
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-110.96**
OUTPUT POWER	W	28.84		10	
OUTPUT POWER	dBm	44.6		40	
TX ANTENNA GAIN	dBd	5		-1	
COMBINED LOSSES	dB	4.38		0.8	
TRANSMITTED POWER	**dBm**	**45.22**		**38.2**	
ERP	**W**	**33.27**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**147.79**		**149.16**	

Table 5-29: Sugar Pine Mountain Mobile Link Budget

Sugar Pine Mountain **Latitude** 41°2'18.7" N **Longitude** 123°44'54.89" W		**Base TX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.39
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-116.28**
OUTPUT POWER	W	8		10	
OUTPUT POWER	dBm	39.03		40	
TX ANTENNA GAIN	dBd	8		-1	
COMBINED LOSSES	dB	7.3		0.8	
TRANSMITTED POWER	**dBm**	**39.73**		**38.2**	
ERP	**W**	**9.4**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**142.3**		**154.48**	

Table 5-30: Trinidad Mobile Link Budget

Trinidad **Latitude** 41°3'15.8" N **Longitude** 124°9'2.7" W		**Base TX Antenna Height (ft) / Az (deg)** 60 / 90 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 60 / 90 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.06
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		2
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-114.96**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	4.25		0.8	
TRANSMITTED POWER	**dBm**	**51.73**		**38.2**	
ERP	**W**	**148.97**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**154.3**		**153.16**	

Table 5-31: Shelton Butte Mobile Link Budget

Shelton Butte **Latitude** 41°14'17.49" N **Longitude** 123°37'58.19" W		**Base TX Antenna Height (ft) / Az (deg)** 70 / omni **Antenna Model** RFI BA80-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 70 / omni **Antenna Model** RFI BA80-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.39
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		6
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-114.28**
OUTPUT POWER	W	33.51		10	
OUTPUT POWER	dBm	45.25		40	
TX ANTENNA GAIN	dBd	6		-1	
COMBINED LOSSES	dB	4.27		0.8	
TRANSMITTED POWER	**dBm**	**46.98**		**38.2**	
ERP	**W**	**49.91**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**149.55**		**152.48**	

Table 5-32: Grasshopper Mobile Link Budget

Grasshopper **Latitude** 40°18'23.9" N **Longitude** 123°58'40.4" W		**Base TX Antenna Height (ft) / Az (deg)** 90 / omni **Antenna Model** RFI BA80-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 90 / omni **Antenna Model** RFI BA80-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.83		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-104.37		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		6
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-102.57**		**-114.28**
OUTPUT POWER	W	49.9		10	
OUTPUT POWER	dBm	46.98		40	
TX ANTENNA GAIN	dBd	6		-1	
COMBINED LOSSES	dB	4.32		0.8	
TRANSMITTED POWER	**dBm**	**48.66**		**38.2**	
ERP	**W**	**73.47**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**151.23**		**152.48**	

Table 5-33: County Courthouse Portable Link Budget

County Courthouse **Latitude** 40°48'11.18" N **Longitude** 124°9'43.7" W		**Base TX Antenna Height (ft) / Az (deg)** 120 / 120 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 120 / 120 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.06
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		2
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-114.96**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	9		-16.6	
COMBINED LOSSES	dB	7.25		0	
TRANSMITTED POWER	**dBm**	**48.73**		**21.18**	
ERP	**W**	**74.66**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**142.18**		**136.14**	

Table 5-34: Grasshopper Portable Link Budget

Grasshopper **Latitude** 40°18'23.9" N **Longitude** 123°58'40.4" W		**Base TX Antenna Height (ft) / Az (deg)** 90 / omni **Antenna Model** RFI BA80-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 90 / omni **Antenna Model** RFI BA80-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		6
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-114.28**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	6		-16.6	
COMBINED LOSSES	dB	4.32		0	
TRANSMITTED POWER	**dBm**	**48.66**		**21.18**	
ERP	**W**	**73.47**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**142.11**		**135.46**	

Table 5-35: Horse Mountain Portable Link Budget

Horse Mountain **Latitude** 40°52'27.09" N **Longitude** 123°44'0.84" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-116.28**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	8		-16.6	
COMBINED LOSSES	dB	7.35		0	
TRANSMITTED POWER	**dBm**	**47.63**		**21.18**	
ERP	**W**	**57.96**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**141.08**		**137.46**	

Table 5-36: Mt. Pierce Portable Link Budget

Mt Pierce **Latitude** 40°25'2.3" N **Longitude** 124°7'13" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 60 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 100 / 60 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-117.28**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	9		-16.6	
COMBINED LOSSES	dB	7.35		0	
TRANSMITTED POWER	**dBm**	**48.63**		**21.18**	
ERP	**W**	**72.96**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**142.08**		**138.46**	

Table 5-37: Pratt Mountain Portable Link Budget

Pratt Mountain		Base TX Antenna Height (ft) / Az (deg)		Base RX Antenna Height (ft) / Az (deg)	
Latitude 40°7'13.5" N		100 / 315		100 / 315	
Longitude 123°41'35.76" W		**Antenna Model** RFI	OA40-41-DIN-T3	**Antenna Model** RFI	OA40-41-DIN-T3
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-117.28**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	9		-16.6	
COMBINED LOSSES	dB	7.35		0	
TRANSMITTED POWER	**dBm**	**48.63**		**21.18**	
ERP	**W**	**72.96**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**142.08**		**138.46**	

Table 5-38: Rodgers Peak Portable Link Budget

Rodgers Peak **Latitude** 41°9'28.05" N **Longitude** 124°1'23.49" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 105 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 100 / 105 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.38
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-117.28**
OUTPUT POWER	W	8		6	
OUTPUT POWER	dBm	39.03		37.78	
TX ANTENNA GAIN	dBd	9		-16.6	
COMBINED LOSSES	dB	7.35		0	
TRANSMITTED POWER	**dBm**	**40.68**		**21.18**	
ERP	**W**	**11.7**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**134.13**		**138.46**	

Table 5-39: Shelter Cove Portable Link Budget

Shelter Cove **Latitude** 40°2'1.83" N **Longitude** 124°2'25.63" W		**Base TX Antenna Height (ft) / Az (deg)** 112 / 0 **Antenna Model** RFI EA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 112 / 0 **Antenna Model** RFI EA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.04
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		5
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		2
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-110.96**
OUTPUT POWER	W	28.84		6	
OUTPUT POWER	dBm	44.6		37.78	
TX ANTENNA GAIN	dBd	5		-16.6	
COMBINED LOSSES	dB	4.38		0	
TRANSMITTED POWER	**dBm**	**45.22**		**21.18**	
ERP	**W**	**33.27**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**138.67**		**132.14**	

Table 5-40: Sugar Pine Mountain Portable Link Budget

Sugar Pine Mountain **Latitude** 41°2'18.7" N **Longitude** 123°44'54.89" W		**Base TX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.39
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-116.28**
OUTPUT POWER	W	8		6	
OUTPUT POWER	dBm	39.03		37.78	
TX ANTENNA GAIN	dBd	8		-16.6	
COMBINED LOSSES	dB	7.3		0	
TRANSMITTED POWER	**dBm**	**39.73**		**21.18**	
ERP	**W**	**9.4**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**133.18**		**137.46**	

Table 5-41: Trinidad Portable Link Budget

Trinidad **Latitude** 41°3'15.8" N **Longitude** 124°9'2.7" W		**Base TX Antenna Height (ft) / Az (deg)** 60 / 90 **Antenna Model** RFI OA40-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 60 / 90 **Antenna Model** RFI OA40-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.06
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-103.96
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		2
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-114.96**
OUTPUT POWER	W	49.9		6	
OUTPUT POWER	dBm	46.98		37.78	
TX ANTENNA GAIN	dBd	9		-16.6	
COMBINED LOSSES	dB	4.25		0	
TRANSMITTED POWER	**dBm**	**51.73**		**21.18**	
ERP	**W**	**148.97**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**145.18**		**136.14**	

Table 5-42: Shelton Butte Portable Link Budget

Shelton Butte **Latitude** 41°14'17.49" N **Longitude** 123°37'58.19" W		**Base TX Antenna Height (ft) / Az (deg)** 70 / omni **Antenna Model** RFI BA80-41-DIN		**Base RX Antenna Height (ft) / Az (deg)** 70 / omni **Antenna Model** RFI BA80-41-DIN	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-120.51		-114.39
RX SYSTEM FADED (DAQ 3.4 CPC) SENSITIVITY W NOISE	dBm		-111.05		-104.28
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-16.6		6
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-1		4
REQUIRED MINIMUM POWER	**dBm**		**-93.45**		**-114.28**
OUTPUT POWER	W	33.51		6	
OUTPUT POWER	dBm	45.25		37.78	
TX ANTENNA GAIN	dBd	6		-16.6	
COMBINED LOSSES	dB	4.27		0	
TRANSMITTED POWER	**dBm**	**46.98**		**21.18**	
ERP	**W**	**49.91**		**0.13**	
MAXIMUM PATH LOSS	**dB**	**140.43**		**135.46**	

5.15.2 Public Works System Link Budget

It is critical to understand the gains and losses within the links, commonly referred to as the Link Budget. The link budget data for each site in the proposed analog system is shown in following tables.

Table 5-43: Mt. Pierce Link Budget

Mt Pierce		**Base TX Antenna Height (ft) / Az (deg)**		**Base RX Antenna Height (ft) / Az (deg)**	
Latitude		100 / 60		100 / 60	
40°25'2.3" N		**Antenna Model**		**Antenna Model**	
Longitude		RFI	OA40-41-DIN	RFI	OA40-41-DIN
124°7'13" W					
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-114.04
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-98.04
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-111.04**
OUTPUT POWER	W	60.9		10	
OUTPUT POWER	dBm	47.85		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**49.5**		**38.2**	
ERP	**W**	**89.05**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**148.88**		**149.24**	

Table 5-44: Pratt Mountain Link Budget

Pratt Mountain		**Base TX Antenna Height (ft) / Az (deg)**		**Base RX Antenna Height (ft) / Az (deg)**	
Latitude		100 / 315		100 / 315	
40°7'13.5" N		**Antenna Model**		**Antenna Model**	
Longitude		RFI	OA40-41-DIN-T3	RFI	OA40-41-DIN-T3
123°41'35.76" W					
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-114.04
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-98.04
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-111.04**
OUTPUT POWER	W	60.9		10	
OUTPUT POWER	dBm	47.85		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**49.5**		**38.2**	
ERP	**W**	**89.05**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**148.88**		**149.24**	

Table 5-45: Horse Mountain Link Budget

Horse Mountain **Latitude** 40°52'27.09" N **Longitude** 123°44'0.84" W		**Base TX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 100 / 0 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-114.04
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-98.04
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-110.04**
OUTPUT POWER	W	60.9		10	
OUTPUT POWER	dBm	47.85		40	
TX ANTENNA GAIN	dBd	8		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**48.5**		**38.2**	
ERP	**W**	**70.73**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**147.88**		**148.24**	

Table 5-46: County Courthouse

County Courthouse		**Base TX Antenna Height (ft) / Az (deg)**		**Base RX Antenna Height (ft) / Az (deg)**	
Latitude		120 / 120		120 / 120	
40°48'11.18" N		**Antenna Model**		**Antenna Model**	
Longitude		RFI	OA40-41-DIN	RFI	OA40-41-DIN
124°9'43.7" W					
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-113.74
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-97.74
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		2
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-108.74**
OUTPUT POWER	W	55.58		10	
OUTPUT POWER	dBm	47.45		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.25		0.8	
TRANSMITTED POWER	**dBm**	**49.2**		**38.2**	
ERP	**W**	**83.16**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**148.58**		**146.94**	

Table 5-47: Rodgers Peak

Rodgers Peak		Base TX Antenna Height (ft) / Az (deg)		Base RX Antenna Height (ft) / Az (deg)	
Latitude		100 / 105		100 / 105	
41°9'28.05" N		**Antenna Model**		**Antenna Model**	
Longitude		RFI	OA40-41-DIN	RFI	OA40-41-DIN
124°1'23.49" W					
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-114.04
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-98.04
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		9
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-111.04**
OUTPUT POWER	W	8		10	
OUTPUT POWER	dBm	39.03		40	
TX ANTENNA GAIN	dBd	9		-1	
COMBINED LOSSES	dB	7.35		0.8	
TRANSMITTED POWER	**dBm**	**40.68**		**38.2**	
ERP	**W**	**11.7**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**140.06**		**149.24**	

Table 5-48: Sugar Pine

Sugar Pine Mountain **Latitude** 41°2'18.7" N **Longitude** 123°44'54.89" W		**Base TX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3		**Base RX Antenna Height (ft) / Az (deg)** 80 / 30 **Antenna Model** RFI EA80-41-DIN-T3	
Link Budget	**Units**	**Outbound**		**Inbound**	
		Base StationTX	SubscriberRX	SubscriberTX	Base StationRX
RX SYSTEM STATIC SENSITIVITY W NOISE	dBm		-114.18		-114.04
RX SYSTEM FADED (DAQ 3.0 CPC) SENSITIVITY W NOISE	dBm		-101.18		-98.04
DIVERSITY GAIN (if applicable)	dB		n/a		n/a
RX ANTENNA GAIN	dBd		-1		8
COMBINED GAINS/LOSSES OR NOISEDEG	dB		-0.8		4
REQUIRED MINIMUM POWER	**dBm**		**-99.38**		**-110.04**
OUTPUT POWER	W	8		10	
OUTPUT POWER	dBm	39.03		40	
TX ANTENNA GAIN	dBd	8		-1	
COMBINED LOSSES	dB	7.3		0.8	
TRANSMITTED POWER	**dBm**	**39.73**		**38.2**	
ERP	**W**	**9.4**		**6.61**	
MAXIMUM PATH LOSS	**dB**	**139.11**		**148.24**	

5.16 NEW SITES (RFP SECTION 7.6.B.2.D)

The following includes a detailed description of any and all different and/or additional radio sites not currently used by the County's radio system that will be utilized by the Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement.

Motorola investigated all sites in the FCC database for the Humboldt County design, and found that less sites than proposed could be utilized and comply, however, the coverage would be different than today with areas of less coverage in populated areas. As a result, Motorola elected to utilize the existing 8 sites and add 2 State sites to comply with the required Bounded Area Percent Coverage (BAPC) requirements.

For the new sites not currently in use by Humboldt County, Motorola is proposing using two State of California sites. These sites are Grasshopper Mountain and Orleans Shelton Butte. These sites were chosen due to the coverage they provided over Humboldt County's service area. The 8 current sites were not sufficient in reaching the coverage requirements therefore these two sites were added to the design. Motorola has obtained a statement of good faith from the State of California to allow the use of these two sites.

The coordinates of the two sites are as follows:

Orleans Shelton Butte 41° 14' 17.5"N 123° 37' 58.2"W

Grasshopper Mountain 40° 18' 23.9" N 123° 58' 40.4"W

5.17 SIGNAL STRENGTH MAPS (RFP SECTION 7.6.B.2.E)

In Section 7 – Additional Items, Motorola has included signal strength that graphically depict the boundaries of the overall Service Area and individual coverage areas within the County's political boundaries, major roads, bodies of water and any other relevant landmarks. Signal strength maps do not include losses for land use and land cover and are de-rated by 9 dB as recommended by Section 6.4.2 of TSB-88.2-D. The signal strength maps are provided in the printed binders and electronically. The signal strength maps include:

i. Adjacent channel signal strength maps which depict the digital and analog talk-out coverage predictions for each area over which the radio sites utilized produce a signal strength of 44 dBµ.

ii. Service Area signal strength maps which depict the digital and analog talk-out coverage predictions for each area over which the radio sites utilized produce a signal strength of 37 dBµ.

iii. Co-channel signal strength maps which depict the digital and analog talk-out coverage predictions for each area over which the radio sites produce a signal strength of 19 dBµ.

5.18 PREDICTED COVERAGE RELIABILITY (RFP SECTION 7.6.B.2.F)

Humboldt County has requested coverage reliability maps that graphically depict coverage areas that meet or exceed 95% coverage reliability. Motorola has included coverage maps in Section 7 – Additional Items.

Motorola guarantees the coverage per TSB-88.1-D, where the painted area on the coverage map represents a tile-based area reliability that is calculated by averaging the individual tile reliabilities only for those tiles that meet or exceed the minimum desired tile reliability. It can be used as a system acceptance criterion. Motorola will perform coverage tests and guarantee the painted area on the coverage maps has 95% or better reliability. The painted area may have individual tiles that are less than 95%, but not less than 90%. ***Motorola's resultant coverage design for all configurations has a 98% or better average tile reliability across all the painted tiles.***

Motorola's coverage maps integrate bit error rate, time domain interference, and other coverage factors into a single ninety-five percent (95%) reliability as defined by TSB-88.1D for P25 Phase 1 operation.

Humboldt County has requested a Channel Performance Criteria (CPC) with Delivered Audio Quality (DAQ) 3.4 for both analog and digital channels. The testing of an analog conventional channel is, however, typically limited to subjective DAQ 3.0 voice tests to verify performance. Due to the nature of analog communications DAQs levels of 3.4 or higher do not apply. Analog channels, particularly in the VHF band, present a much higher degree of background noise compared to channels utilizing digital modulation. Therefore, Motorola proposes a DAQ 3.4 test for the digital P25 channel and a DAQ 3.0 level test for the analog channel.

The maps are printed in Section 7 – Additional Items, and they are provided electronically. The coverage reliability maps provided include:

- Project 25 Conventional Digital DAQ 3.4
  - Portable on-street Talk-In
  - Portable on-street Talk-Out
  - Mobile Talk-In
  - Mobile Talk-Out
- Analog Conventional DAQ 3.0
  - Mobile Talk-In
  - Mobile Talk-Out

5.19 COVERAGE SERVICE AREA (RFP SECTION 7.6.B.2.G)

The RFP required a percentage of the county have 95% reliability. The percentage of the County that is predicted to have 95% reliability is the Bounded Area Percent Coverage (BPAC). Per TSB-88.1-D, Bounded Area Percentage Coverage (BAPC) is a statistical representation of the geography painted on a coverage map, and ought not

be confused with a system acceptance criterion. ***Motorola exceeds the BAPC for each service area and user radio configuration.***

Table 5-49: Motorola Exceeds the Required Bounded Area Percent Coverage.

	Required Bounded Area	Proposed Bounded Area
P25 Portable Inbound DAQ 3.4	56%	59.6% - Exceeds
P25 Portable Outbound DAQ 3.4	56%	70.5% - Exceeds
P25 Mobile Inbound DAQ 3.4	86%	92.8% - Exceeds
P25 Mobile Outbound DAQ 3.4	86%	86.3% - Exceeds
Analog Mobile Inbound DAQ 3.0	70%	83.0% - Exceeds
Analog Mobile Outbound DAQ 3.0	70%	74.4% - Exceeds

5.20 MICROWAVE NETWORK PLAN (RFP SECTION 7.6.B.3)

5.20.1 Microwave Overview

Motorola is pleased to offer a Nokia solution for microwave backhaul. Nokia has maintained the number one microwave market position in North America for over seven years.

Motorola and Nokia's combined experience provides Humboldt County assurance that the microwave network will be deployed with best practices and processes to effectively and efficiently implement the network.

Motorola is proposing for Humboldt County:

- 6 Hops – Backhaul Microwave Network – Wavence split-mount configuration
- Carrier-class reliability to support mission critical and reliable wireless data communications
- High spectral efficiency
- Modular scalability, all equipment proposed are modular and can be scaled
- Design that guarantees advanced queuing, QoS and low latency

Following is a diagram of the microwave network layout.

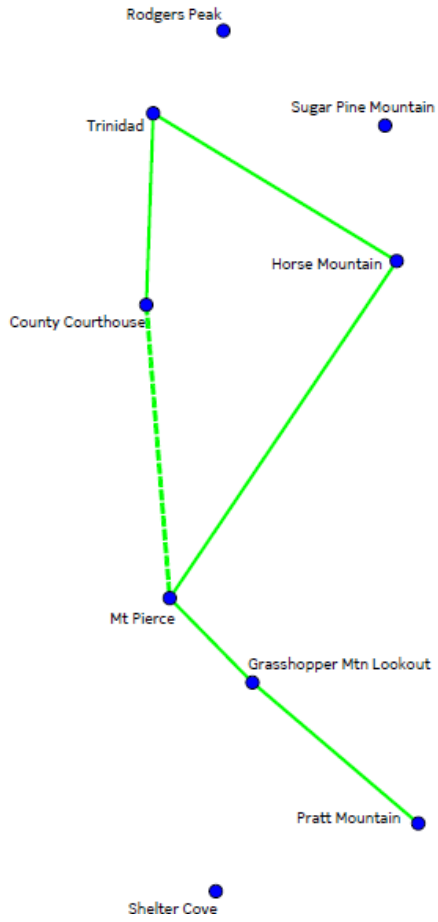


Figure 5-11: Microwave Network Layout.

The proposed Nokia Wavence, new antennas, waveguide lengths, frequencies and RF bandwidth were used in the feasibility study as required. The feasibility study document provides a preliminary assessment to show, based on the information provided, that all links will meet the required availability as requested. The microwave feasibility study can be found in Section 5, Appendix 5 – Microwave Feasibility Study.

The proposed network will utilize the Nokia Wavence with a layer-2 Microwave Service Switch (MSS). The solution utilizes the high capacity and high system gain of the split-mount (MPT-XP-HQAM) and the Microwave Service Switch (MSS-8) providing a MEF 2 and MEF 8 Carrier Ethernet compliant solution. The Wavence radios are designed utilizing seven 6 GHz paths with one RF channel each at 64 to 2048 QAM providing up to 257 Mbps of traffic capacity utilizing adaptive modulation technology. Four of the paths are designed using 8032v2 ring switching to provide route protection for the core of the network. The hot-standby spurs off the ring provide equipment redundancy where route protection is not available. The Wavence MPT-XP-HQAM radio transceivers will interface directly with the MSS-8 in the case of a desired Layer 2 solution. The system capacity is scaled to the direction of 32 DS1's per site and Ethernet packet size of 1518-bytes IPv4 frame.

The Wavence system quoted installs all indoor equipment in one seven-foot standard aluminum rack providing solutions for congested sites. When indoor equipment is used the Wavence offers the highest rack density permitting sixteen all in-door RF direction within one rack.

The Wavence solution consists of a combination of a radio unit — the Microwave Packet Transceiver (MPT) — and a networking unit — the Microwave Service Switch (MSS), both shown in the figure. Three segments are served: small cell backhaul, short-haul and long-haul. Several types of wireless cell site connection options are required to support mobile network capacity and coverage expansions. Nokia's Wavence solutions support a full suite of wireless frequency options including unlicensed 5.8GHz, for macro cell backhaul, 80 GHz millimeter wave (e-band) solutions for both macro and small cells, unlicensed 60 GHz millimeter wave (v-band) and sub-6 GHz solutions that are typically used to support the backhaul of small cells.

Figure 5-12: Nokia Wavence Solution.

The Nokia Wavence product portfolio offers a comprehensive set of microwave solutions for short-haul, long-haul and small cell backhaul applications for telecom operators, public sectors and large enterprises. Based on a full packet architecture, it offers superior performance with its high radio density and unique multiservice link aggregation capability. This common transport of legacy TDM and Ethernet traffic positions the Wavence as the ideal product family to seamlessly support backhaul transformation to full packet and provide your network the capacity to evolve.

5.20.2 Microwave Links (RFP Section 7.6.B.3.A)

The Nokia Wavence microwave network provides the communication links between the County Court House, Trinidad, Horse Mountain, Mt Pierce, Grasshopper Mountain Lookout, and Pratt Mountain sites. Nokia Wavence microwave radio will be co-located at each site with the Motorola P25 simulcast radio. The Wavence microwave radio will be connected to the Motorola P25 base station via a Cat5e cable providing Ethernet connectivity. The Nokia Wavence network is organized into a 4

node ring with a two hop linear spur. The Wavence EAS v2 cards supporting Ethernet and radio connection located in the Microwave Service Switch (MSS-8) are used to offer two radio directions in the ring and hot standby radio connections for the linear spur. Ring sites are designed with G.8032 V2 Ethernet Ring Protection Switching protocol native to the radio which handles the switching to the opposite direction around the ring in the event of an equipment failure of the radio. All Wavence links proposed operate in the Lower 6 GHz band (5924-6425 MHz).

5.20.3 Microwave Link Protection (RFP Section 7.6.B.3.B)

The Nokia Wavence microwave radio system offers redundancy at several levels. In this proposal, the main CPU/switch cards (Cor-Evo) located in the Microwave Service Switch (MSS-8) shelf are redundant at every site. The Cor-Evo protects one for one all features including the data plan and network management channel. Ethernet cards (EAS v2) are used for the incoming Ethernet interface as well as the connections to the outdoor radios (MPT-HQAM). In the case of the ring, two cards are provided to support the two directions around the ring. In the case of a radio failure, the G.8032v2 protocol automatically switches traffic to the opposite direction around the ring. The ring switching is sub 50 ms. In the case of the hot standby and space diversity hot standby links, receivers in switch automatically and errorlessly. Transmitters will automatically switch upon a failure detection in less than 50 msec. Also included in each MSS are redundant 32 DS1 interface cards. DS1 circuits from each DS1 card are connected to a protection panel. Decisions on which DS1 signal to take are based on decisions made by the Cor-Evo.

5.20.4 Microwave Functional Capabilities (RFP Section 7.6.B.3.C)

The Wavence MPT-HQAM radios complies with the required operation range of -27 F to 131 F continuously without direct solar loading and up to 149 F for extended periods without solar loading. The indoor Microwave Service Switch (MSS-8) complies with the required operation from 23 F to 131 F in up to 93% humidity non-condensing. The MSS-8 operates from -40 F to 149 F in 95% relative humidity non-condensing.

5.21 SUBSCRIBER RADIO NETWORK PLAN (RFP SECTION 7.6.4)

The following is a detailed subscriber radio network plan which describes how the portable and mobile subscriber radios that will be utilized by the Radio System Package provided pursuant to the terms and conditions of a final Professional Services Agreement.

5.21.1 Proposed Radios (RFP Section 7.6.4.A)

The proposed radios include:

- APX6000 Model 1.5 Portable Radio
- APX4500 Mobile Radio
- APX Consolette

5.21.2 APX™ 6000 Project 25 Portable Radio

Motorola is proposing the APX 6000 Portable radio. This radio meets and exceeds the requirements listed in the RFP. Motorola designed the APX 6000 fourth generation P25 portable with direct input from first responders. Engineered with high performance technology and utilizing innovative designs, the APX 6000 provides users with an ergonomic and rugged device that delivers superior audio performance with real-time information in a smaller package. The APX 6000 is easy to use, allowing personnel to focus on their job at hand, rather than the technology. In addition, the APX 6000 equips first responders with the clearest audio of any Motorola portable on the market.

APX 6000, Model 1.5

The APX 6000 is Motorola's fourth-generation, P25 Phase 2 capable portable radio, created specifically for public safety first responders who need to communicate on Project 25 Phase 2 systems. It offers outstanding performance in a compact, ruggedly reliable design, with the clearest audio of any Motorola portable on the market. Wi-Fi access enables the APX 8000 to quickly receive new codeplugs, firmware, and software features, redeploying the radio fleet with ease as users continue talking without interruption. The APX 6000 improves public safety and emergency response times by incorporating innovative technology and design features developed based on direct input from first responder radio users. Some of its standard features and benefits are identified below:

- **Improved Efficiency and Safety** – Supports Integrated Voice and Data (IV&D) capabilities to enhance the efficiency and safety of Humboldt County's users through various data applications (Over-the-Air Programming (POP25), Text Messaging).
- **Advanced Audio Features Ensure Intelligibility in High-Noise Environments** –An adaptive audio engine and ultra-loud 3-Watt speaker enable the radio to automatically adjust to consistently produce the loudest and clearest audio in any environment. Dual-sided two-microphone noise-canceling technology ensures clear audio through noise suppression technology that locates the talker and cancels out any background noise in their environment. An AMBE digital voice vocoder provides unmatched speed and voice quality, while reducing costs by requiring less data, memory, and power consumption.

- **Discreet Communication between Radio Users** - Cutting-edge design features in a small size enable public safety radio users, such as police officers, with the ability to communicate with team members without being detected in dangerous situations. The T-Grip design offers a secure grip and easy handling. The full bitmap monochromatic LCD Top Displays allow users to quickly read messages at a glance, and a high-contrast color display screen ensures easy viewing in difficult lighting conditions or when viewing at an angle. The enhanced grooves of the Push-to-Talk (PTT) button allow users to easily locate by "touch."
- **Rugged Design Features** – Heavy-duty design features provide additional durability. The APX 6000 meets Submersible IP67 standards with the option to upgrade to a rugged housing (2 meters, 2 hours). Additionally, the APX 6000 will function even when immersed in water. Meets all applicable MIL-STD-810C, D, E, F and G standards for withstanding dust, heat, shock, and drops, making it the most reliable portable radio in any situation.

The APX 6000 comes in three different base configurations, and can be further customized to meet the needs of Humboldt County. These models include:

- Model 1.5 (Dual Display display and no keypad)
- Model 2.5 (Dual-display with limited keypad)
- Model 3.5 (Dual-display with full keypad)
- Motorola is proposing the APX 6000 Model 1.5 in response to this RFP.

5.21.3 APX™4500 Project 25 Mobile Radio

Motorola is proposing the APX 4500 Mobile Radio. This radio meets and exceeds the requirements listed in the RFP for Mobile Radios as well as Control Stations. The APX 4500 brings together powerful technology in a compact, rugged, budget-friendly mobile radio, providing seamless, secure interoperability to a wide variety of agencies and users. By providing a wide range of budget-friendly configuration options, the APX 4500 offers the functionality and security required by public works, public safety, and mission critical first responders. Its compatible APX O2 Control Head, easy installation, durability, and AES encryption ensure that users can safely and effectively complete the mission at hand.

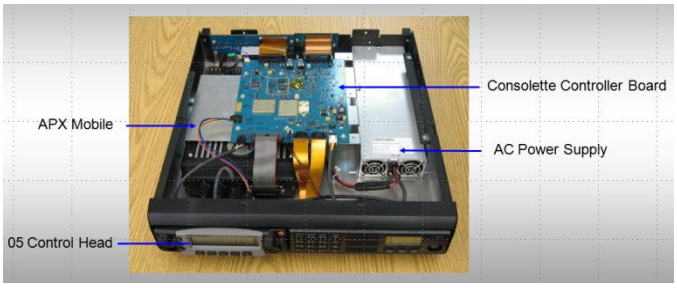
APX 4500 Mobile Radio

Motorola's APX 4500 offers a sophisticated feature set that meets the needs of public servants, including utilities and public works personnel, public safety, and first responders, while being easy on agency budgets. Some of its standard features and benefits are identified below:

- **P25 and Legacy Interoperability** - Available in 700/800 MHz, VHF, UHF R1 and UHF R2 frequency bands, and compatible with both P25 Phase 1 and Phase 2 infrastructure, the APX 4500 seamlessly unifies public works and public safety personnel so they can interoperate effectively in the moments that matter.
- **Ergonomic Controls** - The compatible O2 Control Head with color display is easy to read and operate in all lighting conditions, from bright sunlight to dark streets. Intelligent lighting notifies users when the radio receives a call, an emergency arises, or when they are out of range. Enlarged multifunctional knobs allow radio users to easily adjust talkgroup and volume settings while wearing bulky gloves.
- **Easy to Install** -The APX 4500's simplified dash mount design makes installation quick and easy, fitting into the existing XTL™ footprint so you can reuse mounting holes and cables. This design also allows the reuse of mounting holes and cables, making installation easy and reducing costs.
- **Ruggedized Construction –** Uncompromising durability and world-class quality enables the APX 4500 to withstand wet, dusty, and hazardous conditions. Its IP56 durability rating is the highest level of certification for mobile radios, and it meets applicable MIL-STD 810C, D, E, F, G standards.
- **Options to Meet Radio Users' Needs** – The APX 4500 is compatible with the following optional advanced features and data applications: AES Encryption, Over-the-Air Programming (POP25), Text Messaging, Tactical Over the Air Rekeying (OTAR), 12 character RF ID asset tracking.

5.21.4 APX™ 7500 Project 25 Consolette

Motorola is proposing the APX 7500 Consolette for the Console Backup Control Stations listed in the RFP. The APX 7500 Consolette meets and exceeds the requirements listed in the RFP. The APX 7500 Consolette provides a low-cost, mid-power wireless dispatch solution as an ideal complement to a modern P25 dispatch center. Equipped with leading edge P25 Phase 1 & Phase 2 TDMA technology and multiband interoperability, the APX 7500 Consolette can also be used as an emergency backup station when infrastructure is offline, or for wireless access to different system types for increased interoperability between agencies.



Internal Configurations - APX 7500 Consolette

The APX 7500 Consolette's dual-band P25 operation and compatibility with legacy systems ensures that communications are clear, continuous, and coordinated across multiple users, agencies, and systems. Some of its standard features and benefits are identified below:

- **Multiband Operation in One Radio** –The APX 7500 Consolette delivers the convenience of two radios in one while maintaining APCO TIA receiver specifications. With the APX 7500, personnel can use one consolette to communicate and provide dispatch operations across multiple digital and analog networks that operate in any two of the following frequency bands: 700/800 MHz, VHF, UHF R1 and UHF R2.
- **Options to Meet Radio Users' Needs** – The APX 7500 is compatible with the following optional advanced features and data applications: Programming over Project 25 (POP25), Text Messaging, Over the Air Rekeying (OTAR), 12 character RF ID asset tracking, and Enhanced Encryption Software Options. It is also capable of Extended Dispatch Operation, including Emergency Alarm ACK Encode, Radio Inhibit/Uninhibit Encode, Radio Monitor Encode, Radio Check Encode, Status Query Encode, Status Query Response Decode, Status Update Decode, and Message Update Decode.

5.21.5 Radio Programming Software and Cables (RFP Section 7.6.4.B)

The mobile and portable radios are both programmed using Customer Programming Software (CPS). The programming cables for portable radios are the same for all tiers. For the mobiles there are two different types of programming cables that can be selected. All cables work on all tiers. The programming software is the same for both portables and mobiles and is not tiered.

5.21.6 Radio Programming Software Capabilities (RFP Section 7.6.4.C)

The APX platform includes easy-to-use Customer Programming Software (CPS), a Windows-based application with drag-and-drop, clone wizard, and programming over IP capabilities. This software drastically decreases the time needed to configure and update radio programming, and simplifies the addition of new software and future enhancements. All APX radios can be configured with Motorola Solutions' Programming Over P25 (POP25) over-the-air programming functionality, which enables radios to be programmed over the air via the ASTRO 25 system while remaining in the field without needing to be brought in from the field. POP25 functionality reduces the time, effort, and costs needed to update radio functionality by allowing radios' configuration to be accessed and updated over the air.

5.22 APPENDIX 1 – ISO CERTIFICATIONS AND MOTOROLA QUALITY MANUAL

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BUREAU VERITAS
Certification

Motorola Solutions, Inc.

HQ : 1303 Algonquin Road
Schaumburg, IL 60196 USA

This is a multi-site certificate, additional site details are listed in the appendix to this certificate

Bureau Veritas Certification certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

ISO 9001:2008

Scope of certification

Customer Requirements Management, Customer Solutions Design, Procurement, Design/Development, Integration Services, Support Services, Training Services, Manufacturing, Distribution, and Repair Services of Mission Critical Communications Solutions

Certification cycle start date: **29 September 2016**

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **15 September 2018**

Original certification date: **1 October 2010**

Certificate No. **US009323-1**

Signed on behalf of BVCH SAS

Local office: Bureau Veritas Certification North America, Inc.
390 Benmar Drive, Houston, Texas, USA
www.us.bureauveritas.com/bvc

ANAB ACCREDITED ISO/IEC 17021 MANAGEMENT SYSTEMS CERTIFICATION BODY

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity please call **+(800) 937-9311**.
Certification body address: 67/71 Boulevard du Château - 92200 Neuilly-sur-Seine - France

Page **1** of **4**

BUREAU VERITAS
Certification

Motorola Solutions, Inc.

Standard

ISO 9001:2008

Certified Locations

Site	Site Specific Scopes
HQ - 1303 E. Algonquin Road Schaumburg, IL 60196	Customer Requirements Management, Customer Solutions Design, Procurement, Design/Development, Integration Services, Support Services, Manufacturing, Distribution, and Repair Services
Site 2: 1301 E. Algonquin Rd. Schaumburg, IL 60196	Customer Requirements Management, Customer Solutions Design, Procurement, Design/Development, Integration Services, Support Services, Manufacturing, and Distribution
Site 3: Konrad-Zuse-Str. 1A 52477 Alsdorf, Germany	Distribution
Site 4: Motorola Solutions UK Ltd.Jays Close, Viables Industrial Estate, Basingstoke, Hampshire RG22 4PD United Kingdom	Customer Requirements Management, Customer Solutions Design, Integration Services, Support Services, and Training Services
Site 5 : Motorola Solutions Germany GmbH Am Borsigturm 130 13507 Berlin, Germany	Customer Requirements Management, Customer Solutions Design, Integration Services, Manufacturing, Distribution, and Repair Services
Site 6 : 1) Motorola Solutions (China) Elec. Co. Ltd. No.7 Xi Xin Avenue West District of Hi-Tech Zone Chengdu, Sichuan, P.R.C.	Design/Development
Site 7 : 809 Pinnacle Dr. Ste E-H Linthicum, MD 21090	Customer Requirements Management, Customer Solutions Design, Support Services
Site 8 : Sydvestvej 15 Glostrup, Denmark DK2600	Customer Requirements Management, Customer Solutions Design, Design/Development, and Support Services

Signed on behalf of BVCH SAS

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Certified Locations

Site	Site Specific Scopes
Site 9 : Telco Kreisel 1, Idstein, Germany 65510	Customer Requirements Management, Customer Solutions Design, and Integration Services
Site 10 : Motorola Solutions Systems Polska Sp.z.o.o Building A & B Green Office Development Czerwone Maki 82 Street, 30-392 Krakow, Poland	Design/Development, Support Services
Site 11 : 10105 Senate Drive Lanham, MD 20706	Repair Services
Site 12 : 1700 Belle Meade Court Lawrenceville, GA 30043	Customer Requirements Management, Customer Solutions Design, and Design/Development
Site 13 : Piso 4 Bosques de Alisos 125 Col Bosque de Las Lomas CP 05120, Mexico City, Mexico 05120	Customer Requirements Management, Customer Solutions Design, Support Services, Integration Services
Site 14 : Motorola Solutions Malaysia Sdn Bhd Plot .2A, (Innoplex) Medan Bayan Lepas, Mukim 12, S.W.D.,Bayan Lepas-11900 Penang Malaysia	Design/Development, Support Services
Site 15 : 8000 West Sunrise Boulevard Plantation, FL 33322	Customer Requirements Management, Customer Solutions Design, Integration Services, Design/Development.
Site 16 : 756 East Winchester Drive, Suite #150 Salt Lake City, UT 84107	Customer Requirements Management, Customer Solutions Design, Design/Development, Support Services

Signed on behalf of BVCH SAS

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Certified Locations

Site	Site Specific Scopes
Site 17 : 10680 Treena St. - San Diego, CA 92131	Customer Requirements Management, Customer Solutions Design
Site18: Motorola Solutions, Ltda. Magalhães de Castro, 4800 – 8th Floor Cidade Jardim – São Paulo – SP 05676-120 – Brazil	Customer Requirements Management, Customer Solutions Design, Integration Services
Site 19 : 7237 Church Ranch Boulevard, Suite 406 Westminster, CO 80021	Customer Requirements Management, Customer Solutions Design, Design/Development, and Support Services
Site 20 123 Tice Blvd, Suite 202 Woodcliff, NJ 07677	Customer Requirements Management and Customer Solutions Design
Site 21 : 8133 Warden Ave. Markham, Ontario Canada L6G 1B3	Customer Requirements Management and Customer Solutions Design

Signed on behalf of BVCH SAS

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www.us.bureauveritas.com/bvc

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Page **4** of **4**

Lloyd's Register
LRQA

CERTIFICATE OF APPROVAL

This is to certify that the Management System of:

Motorola Solutions, Inc.
500 West Monroe
Chicago, Illinois 60661, USA

has been approved by Lloyd's Register Quality Assurance
to the following Management System Standards:

ISO 14001:2004
OHSAS 18001:2007

The Management System is applicable to:

Design, Manufacture and Test of Integrated Communications Solutions and Embedded Electronics Solutions.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Approval
Certificate No: UQA 0112221

Original EMS Approval:	December 1, 2000
Original SMS Approval:	January 1, 2010
Current Certificate:	August 24, 2017
Certificate Expiry:	September 14, 2018

Issued by: Lloyd's Register Quality Assurance, Inc. for and
on behalf of Lloyd's Register Quality Assurance Limited

UKAS
MANAGEMENT
SYSTEMS
001

LRQA Inc. 1330 Enclave Parkway, Suite 200, Houston, Texas 77077, USA
For and on behalf of LRQA Ltd. 1 Trinity Park, Bickenhill Lane, Birmingham, B37 7ES, United Kingdom

Lloyd's Register
LRQA

CERTIFICATE SCHEDULE

Motorola Solutions, Inc.

Head Office:	Activities:
Motorola Solutions, Inc. 500 West Monroe Chicago, Illinois 60661, USA	Corporate Headquarters and EHS Oversite.

Locations:	Activities:
Motorola Solutions, Inc. 2540 & 2520 Galvin Drive Elgin, Illinois 60124, USA	Support Services, Manufacturing, Distribution and Integration Services.
Motorola Solutions, Inc. 1303 E. Algonquin Road Schaumburg, Illinois 60196, USA	Development, Design and Support of Communications Systems and Wireless Solutions.
Motorola Solutions, Inc. 1299 E. Algonquin Road Schaumburg, Illinois 60196, USA	Design, Development, Planning, Definition, Documentation Manufacturing, Testing and Support for Customer Electronics and Accessories.
Motorola Solutions, Inc. 8000 West Sunrise Boulevard Plantation, Florida 33322, USA	Research, Development of Radio Communications Products.
Motorola Solutions Germany GmbH Am Borsigturm 130 Berlin, Germany, D-13507	Manufacture, Repair and Service of Analog and Digital Two Way Radio Products and Systems.

UKAS MANAGEMENT SYSTEMS
001

Approval Certificate No: UQA 0112221
LRQA Inc. 1330 Enclave Parkway, Suite 200, Houston, Texas 77077, USA
For and on behalf of LRQA Ltd. 1 Trinity Park, Bickenhill Lane, Birmingham, B37 7ES, United Kingdom

Lloyd's Register
LRQA

CERTIFICATE SCHEDULE

Motorola Solutions, Inc.

Locations:	Activities:
Motorola Solutions, Inc. Malaysia Sdn.Bhd Plot 2 Bayan Lepas Technoplex Industrial Park MK 12 SWD 11900 Pulau Pinang Malaysia	Design of Two Way Radio Products, Accessories, Digital Private Network Devices, Battery Pack Assembly and Associated Electronics.
Motorola Solutions UK Limited Basingstoke – Viables Jays Close Viables Industrial Estate Basingstoke Hampshire RG22 4PD United Kingdom	Customer, Technical and Operation Support of Communication Products and Solutions for Northern Europe. Regional Hub for Key Supporting Functions, HR, Finance, Marketing, Sales.

Approval
Certificate No: UQA 0112221

Original EMS Approval:	December 1, 2000
Original SMS Approval:	January 1, 2010
Current Certificate:	August 24, 2017
Certificate Expiry:	September 14, 2018

UKAS MANAGEMENT SYSTEMS
001

Approval Certificate No: UQA 0112221
LRQA Inc. 1330 Enclave Parkway, Suite 200, Houston, Texas 77077, USA
For and on behalf of LRQA Ltd. 1 Trinity Park, Bickenhill Lane, Birmingham, B37 7ES, United Kingdom

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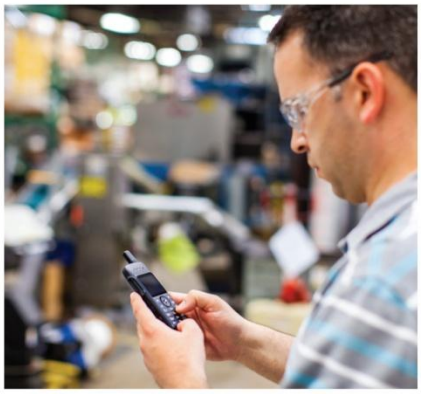
QUALITY MANUAL
CUSTOMERS ARE AT THE CENTER OF EVERYTHING WE DO

MOTOROLA SOLUTIONS ENSURES CUSTOMER-CENTRIC SOLUTIONS, DEPENDABLE PRODUCTS AND SERVICES, ON-TIME DELIVERY, AND RELIABLE SUPPORT



RIGHT NOW…
DAYS FROM NOW …
MONTHS AND YEARS FROM NOW …

OUR COMMITMENT TO QUALITY HELPS MAKE YOUR MOMENTS SUCCESSFUL

The senior leadership team at Motorola Solutions is committed to providing solutions that meet and exceed your expectations. In order to ensure that our quality initiatives drive continual improvements, our management team is responsible for:

- Providing Voice of Customer data
- Developing qualitative and quantitative measurements
- Providing resources for continual improvement efforts
- Empowering teams to make improvements
- Monitoring performance indicators and customer loyalty to drive improvements

Our commitment to quality is rooted in our promise to mobilize and connect people in the moments that matter, and to ensure that customers are at the core of everything we do. All Motorola Solutions employees are expected to perform to the absolute best of their abilities to provide you with the quality you expect from a trusted solution provider.

Jeanne Weiss
Director of Global Quality and Customer Advocacy
Motorola Solutions

OUR QUALITY POLICY

Motorola Solutions
is committed to quality.

We strive to earn your trust by consistently providing dependable products and services, on-time delivery, and reliable support for all your mission-critical applications.

We foster a culture of innovation and accountability that helps ensure our quality management system is continually improving to anticipate, meet, and exceed your expectations in everything we do. Our reputation and quality heritage represent our continued commitment to be your complete solutions provider.

TRUSTED QUALITY

OUR REACH LETS US CONNECT WITH CUSTOMERS AROUND THE WORLD

COMPANY OVERVIEW

Motorola Solutions is a leading provider of mission-critical communication solutions focused on public safety and commercial markets. You can be assured when you select Motorola Solutions you are selecting a premier solution provider in the markets we serve.

Motorola Solutions is a global company with a history of quality and innovation at its core. Highlights of our company footprint include:

- Primary R&D in 6 countries
- 12 Solution Support Centers
- Sales in over 100 countries
- 100K+ Customers
- 2,000 Direct Sales Representatives
- 7,500 Channel Partners
- 12,000 Mission Critical Networks
- 15,000 Employees in 60 countries
- 5,000 Globally Operated Sites

"MOTOROLA SOLUTIONS IS A LONG-TERM TECHNOLOGY PARTNER OF OURS AND HAS PROVEN TO BE ABLE TO DELIVER AND IMPLEMENT RADIO NETWORKS FOR OUR PUBLIC SAFETY NEEDS.

THE ANALOGUE SYSTEM IN PLACE WAS OUTDATED, AND WITH THIS NEW IMPLEMENTATION WE WILL MODERNIZE AND MERGE TWO SEPARATE NETWORKS TO ONE NATIONWIDE DIGITAL LAND MOBILE RADIO NETWORK. OUR FRONTLINE USERS WILL BE ABLE TO BENEFIT FROM A NETWORK OF THE HIGHEST STANDARDS OF SECURITY, STABILITY AND QUALITY."

Janis Ritins,
Head of Information Centre,
Ministry of Interior Republic of Latvia

100+ SALES IN OVER 100 COUNTRIES

2K DIRECT SALES FORCE

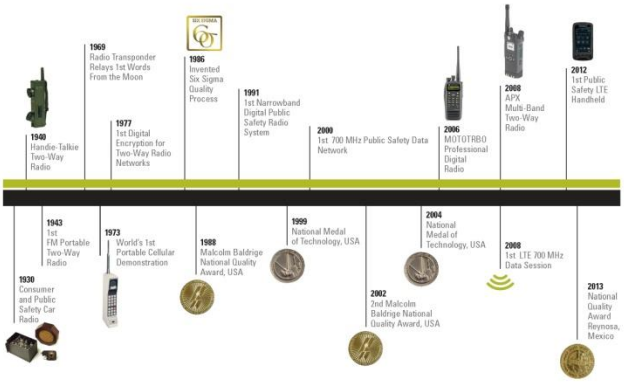
7.5K CHANNEL PARTNERS

12K MISSION CRITICAL NETWORKS

15K EMPLOYEES IN 60 COUNTRIES

MOMENTS THAT DEFINE US

Motorola Solutions is proud of our heritage and is continually building on our legacy and investing in our future. Our investments in research and technology provide next generation solutions for both public safety and commercial customers. Here are some of the highlights:



AROUND THE GLOBE ...

MAXIMIZING SAFETY, PRODUCTIVITY, AND INTELLIGENCE

Whether you are a public safety or commercial customer, we are mobilizing and connecting people when you need it most. Our solutions help prepare you for what is ahead by empowering your workers to make critical decisions and by equipping them to face the unknown with confidence. 2,000 direct sales representatives and 7,500 channel partners make sure you have the support you need when it matters most.

Manufacturing | Retail and Hospitality | Fire and EMS | Transportation and Logistics | Education | Healthcare | Energy, Utilities, and Natural Resources | Law Enforcement

SOLVING COMPLEXITY

Everything we do is about providing solutions to your biggest challenges. It's more than just individual products and services—we craft solutions that connect employees in powerful ways.

We have a comprehensive network of industry-leading channel partners who specialize in providing unique, tailored solutions to suit almost any business need.

ORGANIZED FOR THE CHALLENGES OF TOMORROW

Motorola Solutions is organized around a customer-centric business model that defines the overall interaction of processes in the organization. Our business teams are aligned around customer requirements so that we continually anticipate, meet, and exceed your expectations in everything we do.

Our quality initiatives are designed to provide you dependable products and services, help ensure on-time delivery, and provide reliable support so you can rise to the moment—and be your best when it matters most.

SALES AND PRODUCT OPERATIONS

Our Sales and Product teams are aligned under one organization to ensure we have the ability to act together and act fast to meet your ever-changing needs.

Sales and Operations

This team is your regional focal point. Through Motorola Solutions' unique Sales Way, we develop an understanding of your business, proactively respond to market trends and opportunities, and work closely with other Motorola Solutions teams to ensure alignment. Our Go-To-Customer model ensures we serve your distinct needs through both our direct and PartnerEmpower channel programs.

Highlights of the team include:

- Act as trusted advisors to help solve your business problems
- Design, integration, and provision of your specific solutions
- Provide order administration and logistics, and technical and field support services
- Enable channel partners to differentiate their business within the value based PartnerEmpower program
- Ability to plan, build, manage, and secure communication solutions through our Solutions and Services organization
- Manage Solution Support Center operations to effectively manage our customer issue resolution process

Product, Service, and Solutions Operations

This team is responsible for the management of our product portfolio including the design and development of hardware, software, and services solutions. They are chartered with providing end-to-end solutions for our customers through ongoing research and development. Input to development is received directly from customers, Solution Sales teams, Business Operations, Quality and Customer Advocacy, as well as industry and market trends. The alignment and the collaboration between these teams ensures we are developing solutions to help mobilize and connect your workforce.

Chief Technology Office

The Chief Technology Office is equipped with a powerful combination of capabilities designed to collaborate with all areas of the business with regard to incubating emerging growth opportunities, building consistent platforms, and driving thought leadership.

Key competencies include:

- Innovation Design / User Experience
- Technology / Customer Research
- RF Engineering / RF Silicon
- Intellectual Asset Management
- Software Solutions
- Developing next generation architectures
- Driving focused innovation

Quality and Customer Advocacy Office

This team represents global operations of our Quality Management System and our Customer Advocacy efforts for Motorola Solutions. With support from leaders across all businesses, the charter of this team ensures that employees are engaged and committed to our customer-centric business model, and that all employees focus on exceeding customer expectations in everything we do.

Key areas of focus include:

- Ensure the processes required for the Quality Management System are established, implemented, and maintained
- Provide senior leaders with metrics, analysis, and recommendations for continued improvements of our Quality Management System and solutions portfolio
- Provide organizations with customer experience knowledge collected through face-to-face interviews, surveys, and internal metrics

FINANCE AND BUSINESS OPERATIONS

Our Finance and Business Operations team is responsible for fiscal responsibility and is committed to providing accurate and timely financial reporting and analytics to our business partners to support sound decision making that drives solid financial returns and shareholder value. The team is also responsible for our Procurement and Supply Chain Organizations, which drives excellent manufacturing, distribution, and repair operations focused on achieving on-time delivery of high-quality products and solutions.

QUALITY MANAGEMENT SYSTEM

CUSTOMER-CENTRIC MODEL

The Motorola Solutions Quality Management System is based on a process approach and has four main areas of focus:

- Customer Requirements
- Organizational structure
- Products, Services, and Solutions provided
- Applicable standards' requirements

The Quality Management System applies to global Motorola Solutions' processes including:

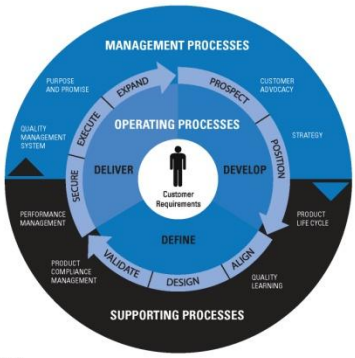
- Strategy and business development
- Design and development of products, services, and solutions
- Manufacturing, distribution, and channel management
- Sales and support functions
- Outsourced, third party processes
- Solution Support Centers

We use ISO 9001 as the primary standard for our Quality Management System, and incorporate other standards as appropriate for our business environment.

Our Customer-Centric Business Model defines the overall interaction of the processes throughout our organization—placing customer requirements at the center. Each function within the model implements and maintains relevant processes, and conducts reviews to help ensure that every process is operating in accordance with our Quality Management System and our customers' requirements.

The business model aligns our Management, Operating, and Supporting processes to focus on external customer requirements while driving improvements on internal processes. Centered around our customers, it ensures we become your trusted partner by anticipating, meeting and exceeding your expectations in everything we do.

MOTOROLA SOLUTIONS GO-TO-CUSTOMER MODEL



DEVELOP: PROSPECT & POSITION

Research and Understand Customer Requirements
Demonstrate Vertical Market Experience
Develop Potential Opportunities
Shape the Concept

DEFINE: ALIGN, DESIGN & VALIDATE

Map Support Teams
Create Customer Specific Designs
Approve and Test Concepts
Review and Refine Solutions

DELIVER: SECURE, EXECUTE & EXPAND

Secure Commitments
Execute Deliverables:
- Procure, Build, Integrate and Distribute
- Install and Commission
- Educate and Train
- Manage and Monitor
- Operate networks

Expand Opportunities:
- Customer Review
- Strengthen Commitment
- Uncover Future Opportunities
- End of Life Take-back Recycling Program*

*Not available in all countries.

MANAGEMENT PROCESSES

As a Motorola Solutions customer, we promise to provide innovative solutions to help you mobilize and connect your teams in the moments that matter most. Our management processes set the overall strategy for the organization to ensure all teams are in alignment towards our strategic goals and objectives. They include:

- Driving customer advocacy by actively listening to voice of the customer and industry data
- Resource planning and development
- Performance reviews against objectives
- Continual improvement through our Quality Management System
- Risk Management

OPERATING PROCESSES

Core activities are implemented on a daily basis to ensure we are ready to anticipate, meet, and exceed your expectations in everything we do so we can continually provide dependable products and services, on-time delivery, and reliable support.

DEVELOP: PROSPECT & POSITION

Sales teams are responsible for understanding our customers' business objectives and challenges in order to develop opportunities for a successful relationship. These teams also understand the competitive landscape and how the full breadth of Motorola Solutions products, services, and solutions meet the customers' requirements.

DEFINE: ALIGN, DESIGN & VALIDATE

Product, Service, and Solutions Operations teams work with our Sales teams to help ensure that Motorola Solutions' resources are aligned to uncover and provide customer specific solutions for all products, including services and solutions. Together they work to help ensure customer requirements are met through design concepts, testing, and validation of requirements.

DELIVER: SECURE, EXECUTE & EXPAND

Sales teams help ensure customer orders are received and verified prior to executing deliverables. Lean Six Sigma principles and methodologies are used for manufacturing and distribution through our Supply Chain and Operations teams.

Project management teams within Sales and Services Operations control the installation and commissioning of products and services, including integration with third party suppliers. When required, our teams provide educational and training opportunities to help ensure customer understanding of our products, services, and solutions.

Reliable support is provided through all business functions, you have the resources to manage and monitor your system, maintain and repair when needed, and operate your network. Take-back programs are offered to responsibly recycle or dispose of end-of-life equipment.

SUPPORTING PROCESSES

Methodologies and tools are used internally to drive the implementation of the Quality Management System and identify opportunities for continual improvement. These include both formal process like those listed below, as well as improvements made from lessons learned.

PERFORMANCE MANAGEMENT

This process is designed to align employees' goals with Motorola Solutions' strategic objectives, as well as measure employees' overall performance. The process evaluates the values and leadership behaviors that each employee is held accountable to. Employees are encouraged and rewarded to move fast, improve decision making, think differently, think big, lead change, take responsible risks, and collaborate.

PRODUCT COMPLIANCE AND PRODUCT LIFE CYCLE MANAGEMENT

These processes are designed to help ensure that products comply with required specifications and standards, and that we have the necessary measures in place for continual improvement to support the complete life cycle of products.

QUALITY LEARNING

Encourages employees to develop critical quality skills and improve overall quality performance by completing training and testing through various internal and external learning opportunities.

"WE ARE HONORED TO BE RECOGNIZED BY RED DOT WITH ITS PRODUCT DESIGN 2013 AWARD—ONE OF THE PREMIER RECOGNITIONS FOR QUALITY IN DESIGN—FOR FIVE OF OUR PRODUCTS. THESE INNOVATIVE PRODUCTS, SUCH AS THE MC40 MOBILE COMPUTER AND SL SERIES RADIO, ARE BUILT TO IMPROVE OUR CUSTOMERS' PRODUCTIVITY AND PERFORMANCE THROUGH ADVANCED DESIGN THINKING."

Paul Steinberg
Senior Vice President and Chief Technology Officer
Motorola Solutions

QUALITY MANAGEMENT SYSTEM

DESIGNED FOR CONTINUAL IMPROVEMENT

Motorola Solutions management drives implementation and continually improves its business processes, products, and the effectiveness of our Quality Management System through the use of the following:

- Motorola Solutions' Quality Policy
- Customer feedback
- Goals and objectives
- Management and operational reviews
- Internal and external audits
- Performance measurements and evaluations

Additionally, there are programs focused on continual improvement designed to share knowledge, coordinate activities, and achieve effective sustainable results for our customers. The following programs are also in place to help foster an atmosphere of continual improvement and dedication to quality:

LEAN SIX SIGMA

Applies key methodologies and processes across the organization in order to reduce or eliminate variation and waste.

QUALITY AUDITS

Audits are conducted regularly by trained internal and external auditors. Audit results are documented, and corrective actions are taken and verified using the closed loop process. For the most up to date certifications, view online at www.motorolasolutions.com/quality.

QUALITY RECOGNITION

Nominations are made by employees to reward individuals or teams that make significant contributions to the organization by improving quality and ultimately improving customer satisfaction. Employees are encouraged to submit ideas and improvement efforts via employee surveys, forums, and other engagement efforts.

PROCESS CONTROL

To support our Quality Management System, Motorola Solutions implements a multipart document control structure.

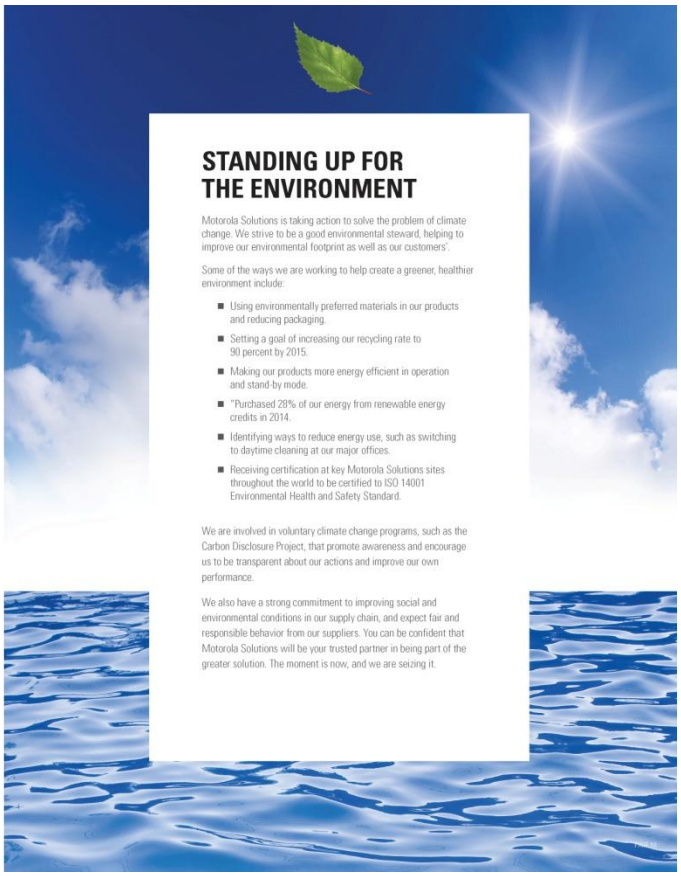
As we focus on continual improvements, processes are established, implemented, amended, and withdrawn as required by the changing needs of the organization. Factors that influence change include:

- Strategy and objective modifications
- Legal requirements and risks: contractual, statutory, stakeholder
- Technology needs

In addition to Solution Sales, Business Operations, and Product Operations, there are specialized services to support the business functions in accordance with process requirements. These business groups are governed by Motorola Solutions policies, have dedicated personnel to support each business function, and support the Quality Management System process. Business functions that fall into this category include:

- Human Resources
- Information Technology
- Legal
- Marketing

Additionally, we rely on third party suppliers to fulfill some of our business requirements. In these situations, Motorola Solutions manages the products or services supplied to ensure we are delivering on our customers' expectations.



STANDING UP FOR THE ENVIRONMENT

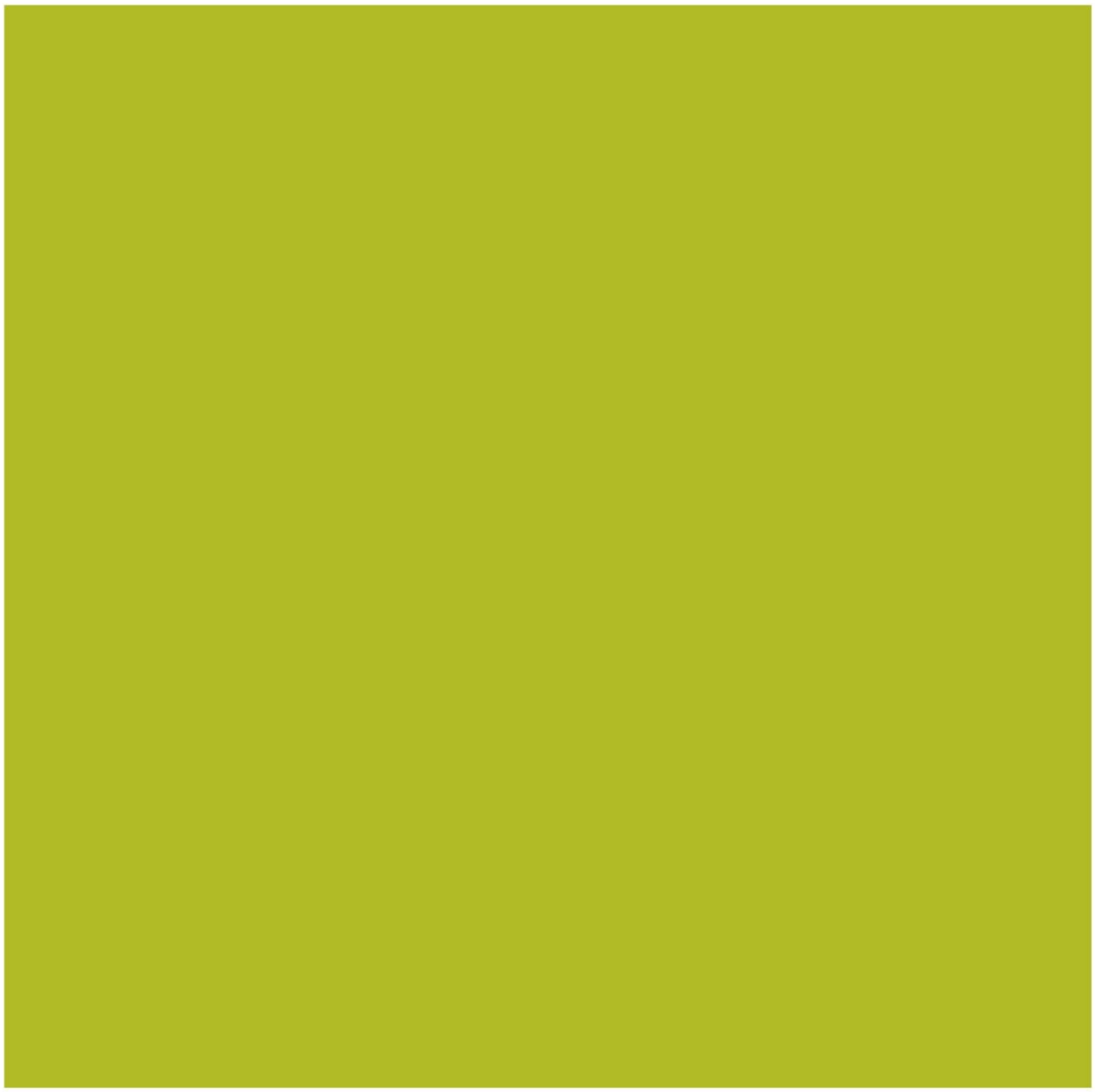
Motorola Solutions is taking action to solve the problem of climate change. We strive to be a good environmental steward, helping to improve our environmental footprint as well as our customers'.

Some of the ways we are working to help create a greener, healthier environment include:

- Using environmentally preferred materials in our products and reducing packaging.
- Setting a goal of increasing our recycling rate to 90 percent by 2015.
- Making our products more energy efficient in operation and stand by mode.
- "Purchased 28% of our energy from renewable energy credits in 2014.
- Identifying ways to reduce energy use, such as switching to daytime cleaning at our major offices.
- Receiving certification at key Motorola Solutions sites throughout the world to be certified to ISO 14001 Environmental Health and Safety Standard.

We are involved in voluntary climate change programs, such as the Carbon Disclosure Project, that promote awareness and encourage us to be transparent about our actions and improve our own performance.

We also have a strong commitment to improving social and environmental conditions in our supply chain, and expect fair and responsible behavior from our suppliers. You can be confident that Motorola Solutions will be your trusted partner in being part of the greater solution. The moment is now, and we are seizing it.



MOTOROLA SOLUTIONS

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5.23 APPENDIX 2 – OPTIONAL SITE IMPROVEMENT STATEMENT OF WORK

5.23.1 Site Development at Courthouse Site

1. Install 1 60' Self Supported Tower on Courthouse rooftop.
2. Install 1 omni antenna at tower top.
3. Mount coax to tower steel - no cable ladder.
4. Removal of existing equipment not included.
5. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 60' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work. Perform a cultural resource study, as needed to identify sensitive historical and archaeological monuments that might be impacted by propose construction.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed the proposed equipment loads.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Site Components Installation

- Supply and install a perimeter grounding system around the compound, shelter and tower The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.

Tower Work

- Supply and install grounding for the towerbase for self-supported towers
- Supply and install grounding on the rooftop and tie it to the building ground.

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 260 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Provide and install 100 linear ft of PVC sleepers and attachment hardware for supporting transmission lines on rooftop every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.
- Supply and install #2/0 stranded copper ground (not to exceed 150 linear feet) for grounding the antennas to the building ground.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 1 cable entry panel with 6 ports.

- Supply and install 1 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee.
- Pick up materials at local warehouse.
- Crane rental and street closure.
- Remote access mobilization.
- Create hole for (n) coax ports.

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.

- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Upgrade the existing grounding and transient voltage suppression systems to Motorola's current R56 Standards, and supply a single point system ground, of ten (10) ohms or less, to be used on all fixed equipment supplied under this proposal. Supply a grounding tie point within ten (10) feet of the-Motorola-supplied equipment.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- "Customer to furnish and provide tower steel data, building steel data, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.

- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola's R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower and building are both structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.

- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.2 Site Development at Horse Mountain Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 100 ' Self Supported Tower.

Motorola Responsibilities:

- Site Engineering
- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility “may have a significant environmental impact” and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the

analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.

- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (2500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola’s R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.

Tower Work

- Supply and install grounding for the towerbase for self supported towers.

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 150 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola’s Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space

must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.

- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- "Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.

- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.

- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).

- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.3 Site Development at Mt Pierce (aka Monument Peak) Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 100' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (2500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.

Tower Work

- Supply and install grounding for the towerbase for self-supported towers

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 150 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.

- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.

- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.

- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.4 Site Development at Pratt Mountain Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 100' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (3500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound and shelter. The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.

Tower Work

- Supply and install grounding for the towerbase for self-supported towers

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 150 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.

- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.

- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.

- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.

- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola's R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.5 Site Development at Rodgers Peak Site

1. Solar power only.
2. Install (1) omni antenna.
3. Mount coax to tower steel - no cable ladder.
4. Removal of existing equipment not included.
5. No additional DC power plant or rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 100' Guyed Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform medium clearing, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (2500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound, shelter and tower The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 20 linear feet).

Tower Work

- Supply and install grounding for the towerbase for monopole or guyed towers

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 150 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the

Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.

- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the

equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.

- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Provide backup power (UPS / Generator) for the new equipment, and UPS sub-distribution panel(s) with breakers wired to dedicated outlets above the proposed equipment locations.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Supply dedicated 20 Amp simplex A. C. outlets at for each major piece of proposed equipment within six (6) feet of the equipment location wired to individual breakers in distribution panels.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.

- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on "normal soil" conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised

piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola's R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola's R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- "Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.6 Site Development at Shelter Cove Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of (e) equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 120' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.

- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 170 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign

  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Upgrade the existing grounding and transient voltage suppression systems to Motorola's current R56 Standards, and supply a single point system ground, of ten (10) ohms or less, to be used on all fixed equipment supplied under this proposal. Supply a grounding tie point within ten (10) feet of the-Motorola-supplied equipment.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.

- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Provide support and entry facilities for the cables (cable ladder/chaseway, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.

- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.

- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier.

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.7 Site Development at Sugar Pine Mountain Site

1. Solar power only.
2. Install (1) omni antenna.
3. Mount coax to tower steel - no cable ladder.
4. Removal of existing equipment not included.
5. No additional DC power plant or rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 80 ' Guyed Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (2500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound, shelter and tower The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 10 linear feet).

Tower Work

- Supply and install grounding for the towerbase for monopole or guyed towers

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 130 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.

- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this

may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Provide backup power (UPS / Generator) for the new equipment, and UPS sub-distribution panel(s) with breakers wired to dedicated outlets above the proposed equipment locations.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.

- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Supply dedicated 20 Amp simplex A. C. outlets at for each major piece of proposed equipment within six (6) feet of the equipment location wired to individual breakers in distribution panels.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- "Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing.

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.

- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.

- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.8 Site Development at Trinidad Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 60' Guyed Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.

- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.
- Perform light clearing of brush, grubbing and disposal of vegetation and shrub growth in the site compound area and a 20-foot path around it (2500 square feet).

Site Components Installation

- Supply and install a perimeter grounding system around the compound, shelter and tower The ground system is to tie to the fence and all new metal structures within the compound to meet current Motorola's R56 standards.
- Conduct 1 three-point ground resistance test of the site. Should any improvements to grounding system be necessary after ground testing, the cost of such improvements shall be the responsibility of Humboldt County.
- Supply and install 1 freestanding 24-inch-wide cable/ice bridge from the tower to the shelter (up to 10 linear feet).

Tower Work

- Supply and install grounding for the towerbase for monopole or guyed towers

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 110 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.

- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.
- Supply and install 1 cable entry panel with 6 ports.
- Ground all metallic objects in the interior of the existing room, to meet current Motorola's Standards and Guidelines for Communications Sites (R56) requirements and terminate near equipment locations.
- Supply and install 2 copper ground buss bar(s).

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization
- Create hole for (n) coax ports

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)

  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.

- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola’s R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.

- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.9 Site Development at Grasshopper Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 60' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted

by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.
- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 110 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer's responsibility.

- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers, building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.

- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Upgrade the existing grounding and transient voltage suppression systems to Motorola's current R56 Standards, and supply a single point system ground, of ten (10) ohms or less, to be used on all fixed equipment supplied under this proposal. Supply a grounding tie point within ten (10) feet of the-Motorola-supplied equipment.
- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Provide support and entry facilities for the cables (cable ladder/chaseway, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- "Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.

- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.
- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.

- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.
- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier."

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.10 Site Development at Shelton Butte Site

1. Install (1) omni antenna at tower top.
2. Mount coax to tower steel - no cable ladder.
3. Removal of existing equipment not included.
4. Install breakers and wiring for DC power plant and rectifier.

Site Scope Summary

- Engineering services for site drawings and regulatory approvals – Included.
- Site acquisition services – Not included.
- Zoning Services – Not included.
- Existing tower to be used for antennas – 40' Self Supported Tower.

Motorola Responsibilities:

Site Engineering

- Prepare site construction drawings, showing the layout of various new and existing site components.
- Conduct site walks to collect pertinent information from the sites (e.g., location of Telco, power, existing facilities, etc.).
- Prepare a lease exhibit and sketch of the site to communicate to the property owner the proposed lease space and planned development at the particular site location.
- Prepare record drawings of the site showing the as-built information.
- Perform National Environmental Policy Act (NEPA) Threshold Screening, including limited literature and records search and brief reporting, as necessary to identify sensitive natural and cultural features referenced in 47 Code of Federal Regulations (CFR) Chapter 1, subsection 1.1307 that may be potentially impacted by the proposed construction activity. This does not include the additional field investigations to document site conditions if it is determined that the proposed communication facility "may have a significant environmental impact" and thus require additional documentation, submittals, or work.
- Perform four point soil resistivity testing at the time of site visit.
- Provide a structural engineering analysis for antenna support structure, if necessary, to support the proposed antenna system. If the tower structure fails the analysis, the cost of any site relocation or modifications to the tower required to support the antenna system will be the responsibility of Humboldt County. NOTE: This task does not include mapping, structural measurement survey, materials testing, geotechnical investigation, and/or other field investigation to acquire the data. If applicable, these tasks will be noted separately in the SOW.
- Preparation, submission and tracking of application for local permit fees (zoning, electrical, building etc.) and procurement of information necessary for filing.

Site Preparation

- Obtain the permits such as electrical, building, and construction permits, and coordinate any inspections with local authorities that may be needed to complete site development work.

- Provide one-time mobilization costs for the construction crews. Any remobilization due to interruptions/delays that are out of Motorola's control will result in additional costs.

Antenna and Transmission Line Installation

- Install 1 antenna(s) for the RF system.
- Supply and install 1 6-foot side arm(s) for antenna mounts.
- Install up to 90 linear feet of 7/8-inch transmission line.
- Perform sweep tests on transmission lines.
- Provide and install six hole hanger blocks and attachment hardware for supporting transmission lines on the antenna support structure every three feet.
- Supply and install 1 ground buss bar at the bottom of the antenna support structure for grounding RF cables before they make horizontal transition.

Existing Facility Improvement Work

- Supply and install 4 40-amp breakers in the distribution panel and wire to outlets located on an average within 35 cable feet.

Miscellaneous Work

- PM/CM Management Fee
- Pick up materials at local warehouse
- 3rd Party Utility Mark Out
- Remote access mobilization

Customer Responsibilities:

- If required, prepare and submit Electromagnetic Energy (EME) plans for the site (as a licensee) to demonstrate compliance with FCC RF Exposure guidelines.
- As applicable, coordinate, prepare, submit, and pay for all required permits and inspections for the work that is the Customer’s responsibility.
- Pay for all utility connection, pole or line extensions, and any easement or usage fees.
- Review and approve site design drawings within 7 calendar days of submission by Motorola or its subcontractor(s). Should a re-submission be required, the Customer shall review and approve the re-submitted plans within 7 calendar days from the date of submittal.
- Pay for the usage costs of power, leased lines and generator fueling both during the construction/installation effort and on an on-going basis.
- Pay for application fees, taxes and recurring payments for lease/ownership of the property.
- Provide personnel to observe construction progress and testing of site equipment according to the schedule provided by Motorola.
- As applicable (based on local jurisdictional authority), the Customer will be responsible for any installation or up-grades of the electrical system in order to comply with NFPA 70, Article 708
- Site Development Schedule (assumes 90 days from contract signing)
  - Assumes Motorola Solutions provides a final RF design that ties in the other sites and Motorola Solutions gives PNS a formal go ahead to build - Towers,

building and Generator will be ordered at this time (Assumes a 12 week lead time)
  - Assumes the customer is providing unencumbered property and gives us the right build - if during the due diligence there are encumbrances or issues, this may impact the new site design and Motorola Solutions may have to regroup/redesign
  - Assumes no soils, NEPA or environmental issues are found during design phase
  - Assumes no zoning approvals or jurisdictional permitting problems (max 60 days)
- Provide property deed or lease agreement, and boundary survey, along with existing as-built drawings of the site and site components to Motorola for conducting site engineering.
- Provide a right of entry letter from the site owner for Motorola to conduct field investigations.
- Maintain existing access road in order to provide clear and stable entry to the site for heavy-duty construction vehicles, cement trucks and cranes. Sufficient space must be available at the site for these vehicles to maneuver under their own power, without assistance from other equipment.
- Arrange for space on the structure for installation of new antennas at the proposed heights on designated existing antenna-mounting structures.
- Provide as-built structural and foundation drawings of the structure and site location(s) along with geotechnical report(s) for Motorola to conduct a structural analysis.
- Provide support facilities for the antenna cables (cable ladder, entry ports, waveguide bridge) from the antenna to the equipment room.
- Secure power connection to the site, associated permitting and installation of a meter, and disconnect within 50 feet of the proposed equipment room location.
- Provide space, HVAC, backup power (UPS, generator), outlets, grounding, surge suppression, lighting, fire suppression and cabling facilities for the equipment room per Motorola's R56 specifications. Ceiling and cable tray heights in the equipment rooms should be such as to accommodate 7-1/2-foot equipment racks, and the ceiling should be 9 feet or greater.
- Confirm that there is adequate utility service to support the new equipment and ancillary equipment.
- Confirm that the existing generator is sufficient to support the new equipment and ancillary equipment loads.
- If required, remove or relocate any existing facilities, equipment, and utilities to create space for new site facilities and equipment.
- If required, provide any physical improvements (walls, roofing, flooring, painting, etc.) necessary to house the equipment in the existing room.
- Upgrade the existing grounding and transient voltage suppression systems to Motorola's current R56 Standards, and supply a single point system ground, of ten (10) ohms or less, to be used on all fixed equipment supplied under this proposal. Supply a grounding tie point within ten (10) feet of the-Motorola-supplied equipment.

- Supply required standby generator power to support the additional proposed equipment. This power source shall be adequate to back up all radio equipment, future equipment growth, and ancillary equipment such as, but not limited to, interior lighting, tower lighting and HVAC.
- Supply required UPS Power to support the additional proposed equipment. This uninterruptible power source shall be adequate to back-up all radio equipment as well as future equipment growth.
- Provide support and entry facilities for the cables (cable ladder/chaseway, entry ports, etc.) between the proposed equipment locations.
- Secure power connection to the room, associated permitting, and installation of a meter and disconnect within 50 feet of the proposed shelter location.
- Customer to furnish and provide tower steel and foundation data, geotech report, current line and antenna inventory, and any past structural analyses.
- Customer to pay costs for local permits (zoning, electrical, building, etc.) and procurement of information necessary for filing."

Assumptions:

- All work is assumed to be done during normal business hours as dictated by time zone (Monday thru Friday, 7:30 a.m. to 5:00 p.m.).
- All recurring and non-recurring utility costs [including, but not limited to, generator fuel (except first fill), electrical, Telco] will be borne by the Customer or site owner.
- All utility installations shall be coordinated and paid for by the site owner and located at jointly agreed to location within or around the new communications shelter or equipment room.
- Site will have adequate electrical service for the new shelter and tower. Utility transformer, transformer upgrades, line, or pole extensions have not been included.
- Pricing has been based on National codes such IBC or BOCA. Local codes or jurisdictional requirements have not been considered in this proposal.
- Hazardous materials are not present at the work location. Testing and removal of hazardous materials, found during site investigations, construction or equipment installation will be the responsibility of the customer.
- A maximum of 30 days will be required for obtaining approved building permits from time of submission, and a maximum of 60 days will be required for zoning approvals from time of submittal.
- No improvements are required for concrete trucks, drill rigs, shelter delivery, and crane access.
- If extremely harsh or difficult weather conditions delay the site work for more than a week, Motorola will seek excusable delays rather than risk job site safety.
- Ground rings installed only in non-rocky soils.
- Removal of existing equipment is not included.
- The existing ground system and soil resistivity at the site is sufficient to achieve resistance of 10 ohms or less. Communication site grounding will be designed and installed per Motorola's R56 standards.

- The existing site has adequate room to expand and install the shelter, including lay-down and staging areas, without encroaching on wetlands, easements, setbacks, right-of-ways, or property lines.
- AM detuning or electromagnetic emission studies will not be required.
- Protective grating over microwave dishes or the communications shelter has not been included in this proposal.
- Structural and foundation drawings of the antenna support structure will be made available to preclude the need for ultrasonic testing, geotechnical borings or mapping of existing tower structural members.
- Lead paint testing of existing painted towers has not been included.
- On the existing tower, the antenna locations for the proposed antenna system design will be available at the time of installation.
- The new shelter can be located within 20 feet of the existing tower location and the generator/fuel tank can be located within 25 feet of the shelter.
- Restoration of the site surroundings by fertilizing, seeding, and strawing the disturbed areas will be adequate.
- The site has adequate utility service to support the proposed equipment loading. Utility transformer upgrades or step-up or down transformers will not be required.
- Underground utilities are not present in the construction area and as such no relocation will be required.
- The existing antenna support structure is structurally capable of supporting the new antenna, cables, and ancillary equipment proposed and will not need to be removed or rebuilt at the existing site. The tower or supporting structure meets all applicable EIA/TIA-222 structural, foundation, ice, wind, and twist and sway requirements. Motorola has not included any cost for structural or foundation upgrades to the antenna support structure.
- The existing cable support facilities from the antenna to the cable entry port can be used for supporting the new antenna cables.
- Structural analyses for towers or other structures that have not been performed by Motorola will relinquish Motorola from any responsibility for the analysis report contents and/or recommendation therein.
- Foundations for shelter, generator, and fuel tank are based on “normal soil” conditions as defined by TIA/EIA 222-F. Footings deeper than 30 inches, raised piers, rock coring, dewatering, or hazardous material removal have not been included.
- Alarming at existing sites will be limited to new component installations and will have to be discussed and agreed to on a site-by-site basis.
- The site will have adequate room for installation of proposed equipment, based on applicable codes and Motorola’s R56 standards.
- The existing utility service and backup power facilities (UPS, generators) have sufficient extra capacity to support the proposed new equipment load.
- A clear obstruction-free access exists from the antenna location to the equipment room.
- The Customer does not desire upgrade of the existing site to meet Motorola’s R56 standards.

- The floor can support the proposed new loading. Physical or structural improvements to the existing room will not be required.
- Electrical panels can support addition of DC power plant and rectifier both in service capacity and breaker availability.
- Adequate primary and back-up electrical service.
- Adequate communications room HVAC, structural integrity, waterproofing.
- Adequate room for (n) equipment racks and coax.
- Tower is structurally capable of supporting additional load without steel or foundation modifications.
- Electrical panels can support addition of DC power plant and rectifier.

Completion Criteria

- Site development completed per issued for construction (IFC) construction drawings, project requirements, contractual obligations (including any customer/Motorola approved changes) and approved by Humboldt County.
- This shall be confirmed by contractor and reviewed with Motorola construction manager and project manager before inspections occur.
- All jurisdictional and contractual required testing and inspections to be performed by the contractor. (Contractual testing and inspections defined and agreed to with project team and customer prior to project kick off; vendor solely responsible for conducting, coordinating and paying for all jurisdictional testing and inspections).
- Motorola site development checklist shall be completed and signed off by contractor prior to customer inspection. (Review with project team and customer and amend checklist as required at project kick off or before work begins).
- Site turn-over package completed and turned over to Motorola (As defined and agreed to with project team and customer).
- All punch list and deficiencies shall be completed prior to customer and Motorola inspections.

5.23.11 Rodgers Peak and Sugar Pine Solar Power

Equipment includes:

- 1080W PV array (3 x 360W Modules)
- 182Ah C/24, 48V Pure Lead Carbon AGM Battery Bank (3000 cycles at 50% Depth of Discharge)
- MPPT charge controller
- Charge controller, Cordex CXC HP Controller, EMI Filter, and 48Vdc distribution factory pre-wired and integrated
- Adjustable tilt, side-of-pole, PV module mount. (Pole not included in quote)
- Designed to support up to 130W average -48Vdc load with 4kWh/m2/day solar resource
- Pricing does not include special handling fees
- DC-rated circuit breakers for PV, battery, and load circuits
- Output load voltage: -42 to -60VDC

Warranty and Maintenance:

All component manufacturer warranties apply. The warranties are pass-through from the various manufacturers. There is a one-year standard workmanship warranty on Alpha's integration of the equipment. To ensure that the system integration and installation meet our standards we test and commission the systems post-installation and then provide a final commissioning report to the customer. Parts repair service is direct through the relevant parts manufacturers.

Assumptions:

- Batteries and power conversion equipment (charge controller) must be installed indoors.
- Calculations are based off minimum 4 shade free sun hours per day regardless of the time of year.
- Array harvest calculations are based on 75.2% of the 1080W STC rated array. (1080W x .752 x 4)
- Battery capacity and cycle life is based off an assumed ~77° F operating temperature.
- Assume that NEC 690.11 PV Arc-Fault and 690.12 PV Rapid Shutdown are not required.
- Power system is isolated from all the other loads on site.
- Assumes normal excavation
- Assumes normal access
- Assumes permitting and bonding provided by others
- Assumes work area footprint large enough for equipment and personnel
- Assumes clear right-of-way
- Assumes facilities accessible by 4x4 pickup truck
- Assumes traffic control provided by others
- Does not include costs for drilling, cutting, removal or replacement of concrete and/or asphalt
- Assumes Tree removal, site clearing and grubbing provided by others
- Does not include costs for storage, testing or other than normal disposal of cuttings/excavating spoils, if required it will be billed at cost + 15%
- Assumes native soil can be used for backfill
- Does not include costs for shoring, rigging or scaffolding, if required it will be charged at cost + 15%
- Assumes Site acquisition, leasing, and Right Of Way (ROW) access provided by others
- Assumes material and equipment can be stored and secured on-site
- Solar array installation sites will be cleared and a suitable, level ground will be provided allowing for a safe work environment
- Unsafe working environments will be subject to working change order and/or hazard pay subject to an increase of 1.5x the labor rate.
- Motorola holds the right to issue stop work orders for unsafe working conditions at no expense to Motorola until working conditions are corrected.
- All change orders will be submitted in writing and agreed upon by both parties prior to commencement of any work

- All conduit will be run above grade. No subterranean work has been included.
- If the plan changes outside our control we reserve the right to re-evaluate the costs.
- We will have heavy machinery access to all arrays

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5.24 APPENDIX 3 – COVERAGE ACCEPTANCE TEST PLAN

5.24.1 Overview

Motorola will validate the proposed coverage for Humboldt County with a Coverage Acceptance Test (CAT) that proves the modeled Average Tile Reliability (Covered Area Reliability) thereby confirming the calculated BAPC (Bounded Area Percent Coverage).

The RFP requires a percentage of the county have 95% reliability. The percentage of the County that is predicted to have 95% reliability is the Bounded Area Percent Coverage (BPAC). Per TSB-88.1-D, Bounded Area Percentage Coverage (BAPC) figure is a statistical representation of the geographical area painted on a coverage map and, as such, should be considered as a data point independent from the system acceptance criterion.

Motorola guarantees the coverage per TSB-88.1-D, where the painted area on the coverage map represents a tile-based area reliability that is calculated by averaging the individual tile reliabilities only for those tiles that meet or exceed the minimum Channel Performance Criteria (CPC). Covered Area Reliability can be used as a system acceptance criterion to validate the predicted coverage maps. Motorola will perform coverage testing, as prescribed in this document, and guarantee that the painted areas on the coverage maps have 95% or better average reliability. The painted area may have individual tiles that are less than 95%, but not less than 90%.

Table 5-50: Required Bounded Area Percent Coverage.

	Required Bounded Area
P25 Portable Inbound DAQ 3.4	56%
P25 Portable Outbound DAQ 3.4	56%
P25 Mobile Inbound DAQ 3.4	86%
P25 Mobile Outbound DAQ 3.4	86%
Analog Mobile Inbound DAQ 3.0	70%
Analog Mobile Outbound DAQ 3.0	70%

BAPC (Bounded Area Percent Coverage) for Covered Area Reliability necessitates that the proportion of the bounded area which is predicted to meet the specified Covered Area Reliability is equal to or greater than the specified proportion (e.g. 56%) in the table above. This criterion is validated by calculating the proportion of the bounded area that is predicted to meet the specified Covered Area Reliability. Motorola Solutions' Hydra coverage prediction tool provides that calculation, and the results are shown in the following table.

		Humboldt County Area (sq km)	Hydra's BAPC-CAR Results	Calculated Area of the Coverage Footprint (sq km)
Digital Portable Outdoor Coverage	**Talk-In**	9161.5	59.63%	5463.00
	Talk-Out		70.45%	6454.28
Digital Mobile Outdoor Coverage	**Talk-In**	9161.5	92.78%	8500.04
	Talk-Out		86.29%	7905.46
Analog Mobile Outdoor Coverage	**Talk-In**	9161.5	83.04%	7607.71
	Talk-Out		74.42%	6817.99

Coverage Test Pass/Fail Criterion: The proportion of the bounded area which is predicted to meet the specified Covered Area Reliability has a Covered Area Reliability equal or greater than the specified area reliability (e.g. 95%). This criterion is validated by performing coverage tests within the Humboldt County defined test area on paved roads.

5.24.2 Coverage Test Method

An objective V.52 DAQ 3.4 Bit Error Rate (BER) test per TSB-88 is proposed to verify the digital subsystem's performance. Both mobile and portable configurations will be tested independently. The coverage test will be performed outbound only, as BER testing is not feasible inbound due to the conventional architecture and lack of backhaul to support the testing on stand-alone sites. If desired, subjective inbound and outbound DAQ tests of the digital system can be performed in lieu of the V.52 tests, and is included as an option in the price pages.

In order to verify the analog simulcast system a subjective DAQ 3.0 based voice coverage test is proposed. Per TSB-88, the two analog stand-alone sites can be tested with SSI outbound, and reciprocity applies inbound. If subjective DAQ testing of the inbound and outbound coverage predictions related to the analog standalone sites is desired a pricing option is available, for further review, in the price pages.

This Coverage Acceptance Test Plan (CATP) is designed to verify that the voice radio system implemented by Motorola Solutions for Humboldt County meets or exceeds the required reliability as shown on Motorola Solutions' maps. The CATP defines the coverage testing method and procedure, the coverage acceptance criterion, the test documentation, and the responsibilities of both Motorola Solutions and Humboldt County.

Coverage Acceptance Testing is based upon a coverage prediction that accurately represents the implemented infrastructure and parameters that are consistent with the contract agreements. To characterize system performance accurately, the actual user equipment radio series deployed for Humboldt County will be used to conduct the coverage test.

The subsequent sections of this document provide a detailed definition of the coverage acceptance test configuration(s) and test criteria.

5.24.3 CATP Definitions

Several definitions are needed to accurately describe the coverage acceptance test method and criteria. Where cited, these terms or methods are defined in TIA TSB-88.1-D[1] or TSB-88.3-D[2].

5.24.3.1 Defined Test Area

The defined test area is the geographical area in which communications will be provided that meet or exceed the specified Channel Performance Criterion (CPC) at the specified reliability for the specified equipment configuration(s). The defined test area(s) are listed in Table 5-52 Coverage Acceptance Test Summary, along with names of the corresponding Motorola Solutions map(s) which show the defined test areas. Please see image below for the map showing the defined test area.

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1 *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 1: Recommended Methods for Technology Independent Performance Modeling* Technical Service Bulletin TSB-88.1-D, Telecommunications Industry Association (TIA), Arlington VA, 2012.

2 *Wireless Communications Systems --- Performance in Noise- and Interference-Limited Situations --- Part 3: Recommended Methods for Technology Independent Performance Verification*, Technical Service Bulletin TSB-88.3-D, Telecommunications Industry Association (TIA), Arlington VA, 2013.

Figure 5-13: Humboldt County Service Area with Tiger 2017 Roads

For the defined test areas (identified in Table 5-52 Coverage Acceptance Test Summary), the coverage reliability commitment is only on-roads. The roads included in the on-road commitment are defined by the US Census Bureau TIGER streets that are accessible by 2-wheel drive vehicles.

For coverage testing, each defined test area will be divided into a grid pattern by Motorola Solutions to produce at least the number of uniformly sized test locations (or tiles) required by the Estimate of Proportions formula. [TSB-88.3-D, §5.2.1,

equation 2] The minimum number of test tiles required varies, from a hundred to many thousands, depending on the size of the defined test area, desired confidence in results, type of coverage test, and the predicted versus required reliability.

5.24.3.2 Channel Performance Criterion (CPC)

The CPC is the specified minimum design performance level in a faded channel. [TSB-88.1-D, §5.2] For this system, the CPC is the Delivered Audio Quality (DAQ) as stated in Table 5-52 Coverage Acceptance Test Summary. The DAQ definitions are provided in Table 5-51 [TSB-88.1-D, §5.4.2, Table 3].

Table 5-51: DAQ Definitions

DAQ	Subjective Performance Description
1	Unusable, speech present but unreadable.
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
3.4	Speech understandable with repetition only rarely required. Some noise/distortion.
4	Speech easily understood. Occasional noise/distortion.
4.5	Speech easily understood. Infrequent noise/distortion.
5	Speech easily understood.

The CPC pass/fail criterion is the faded performance threshold, plus any adjustments for antenna performance, external noise, and in-building or in-vehicle losses. [TSB-88.1-D, §5.4.2, Figure 5] The faded performance threshold for the specified CPC is determined using the receiver's static reference sensitivity adjusted by the projected CPC parameters for the applicable Modulation Type and DAQ as listed in the current version of TSB-88.1, Annex A, Table A-1. For coverage testing of digital voice radio systems, the faded performance threshold is the applicable Bit Error Rate (BER) from the projected CPC parameters.

The CPC for testing the proposed Analog Conventional simulcast channel is a DAQ of 3.0 subjective audio test. The digital Conventional Simulcast channel's CPC is based upon a measured BER of 2.0% which corresponds to a DAQ of 3.4.

5.24.3.3 Reliability

The Covered Area reliability is the percentage of locations within the defined test area that are predicted to meet or exceed the specified CPC. The Motorola Solutions map(s) indicate the Covered Area(s) within which this system is predicted to provide at least the reliability of meeting or exceeding the CPC as stated in Table 5-52 Coverage Acceptance Test Summary.

For the defined test area(s) guaranteed for Covered Area reliability, only the painted covered area on Motorola Solutions' maps will be tested for coverage acceptance. No

acceptance testing will be performed in locations predicted on Motorola Solutions' maps to be below the required Covered Area reliability.

After all accessible tiles in the defined test area have been tested, the Covered Area reliability will be determined by dividing the number of tiles tested that meet or exceed the CPC pass/fail criterion by the total number of tiles tested. [TSB-88.3-D, §5.1, equation 1]

Motorola's coverage acceptance test will prove 95% Covered Area Reliability based on the as-built maps provided to Humboldt county post implementation.

Test Criterion: The proportion of the bounded area which is predicted to meet the specified Covered Area Reliability has a Covered Area Reliability equal or greater than the specified area reliability (e.g. 95%).

Result: This criterion is met by validating the as-built Covered Area Reliability maps within the defined test area (Humboldt County Boundaries)

5.24.3.4 Direction(s) of Test

The direction(s) of test in Table 5-52 Coverage Acceptance Test Summary defines the direction(s) which will be tested for coverage acceptance. Outbound (also called forward link, downlink, or talk-out) is the path from the fixed equipment outward to the mobile or portable radios. Inbound (also called reverse link, uplink, or talk-in) is the path from the mobile or portable radios inward to the fixed equipment. Outbound and Inbound independently means each direction will be evaluated as a separate independent test.

Table 5-52 provides the test directions for the proposed solution.

5.24.3.5 Equipment Configurations

This section defines the equipment configurations and infrastructure design parameters upon which the coverage guarantee and the coverage acceptance test are based. The equipment configurations are defined in Table 5-52 Coverage Acceptance Test Summary, and include user equipment, outdoor/in-building definition, defined test area, number of test tiles, reliability, CPC, CPC pass/fail, and the direction(s) of test. The infrastructure design parameters are defined in Table 5-53 and Table 5-54 Infrastructure Design Parameters, and include site names, site locations, and antenna system parameters. If the implemented system equipment configuration and/or infrastructure design parameters vary from these configurations and/or parameters, a revised coverage map will be used to define the test configuration and potential areas from which test tiles will be included in the revised coverage acceptance test.

Coverage testing will be conducted with equipment installed per the configurations in Table 5-52 Coverage Acceptance Test Summary, and with the mobile antennas in unobstructed locations that are not adjacent to other large objects or metallic items which would distort the antenna patterns.

Table 5-52: Humboldt County Coverage Acceptance Test Summary

User Equipment	Outdoor / In-Building	Defined Test Area & Map Name	Number of Test Tiles	Reliability	CPC	CPC Pass/Fail	Direction(s) of Test
Analog System 1 Simulcast Cell (4 sub-sites), 2 Standalone Sites							
APX Mobile in Car vehicle with unity gain antenna mounted on the roof at least 5 ft high and 14 ft or less of coax	Outdoor	Painted area within Humboldt County Boundaries – Reference Map 12	2250 tiles (1 mile x 1 mile tiles)	95% Covered Area Reliability	DAQ-3.0	Subjective DAQ for the Areas best served by the simulcast subsystem Objective SSI for the Areas best served by the Standalone Conventional Sites (Figure 5-14) Signal Strength Threshold = -98 dBm (includes assumption of 12.6 dB for environmental noise above kTB)	Outbound (Talk-Out)
Digital System 2 Simulcast Cell (3 sub-sites each), 4 Standalone Sites							
APX Mobile in Car vehicle with unity gain antenna mounted on the roof at least 5 ft high and 14 ft or less of coax	Outdoor	Painted area within Humboldt County Boundaries – Reference Map 10	4521 tiles (0.75 mile x 0.75 mile tiles)	95% Covered Area Reliability	DAQ-3.4	2.0% BER Objective with Subjective re-test allowed	Outbound (Talk-Out)
APX Portable transmitting and receiving at hip in Swivel Case using a wired remote corded speaker microphone	Outdoor	Painted area within Humboldt County Boundaries – Reference Map 8	2977 tiles (0.75 mile x 0.75 mile tiles)	95% Covered Area Reliability	DAQ-3.4	2.0% BER Objective with Subjective re-test allowed	Outbound (Talk-Out)

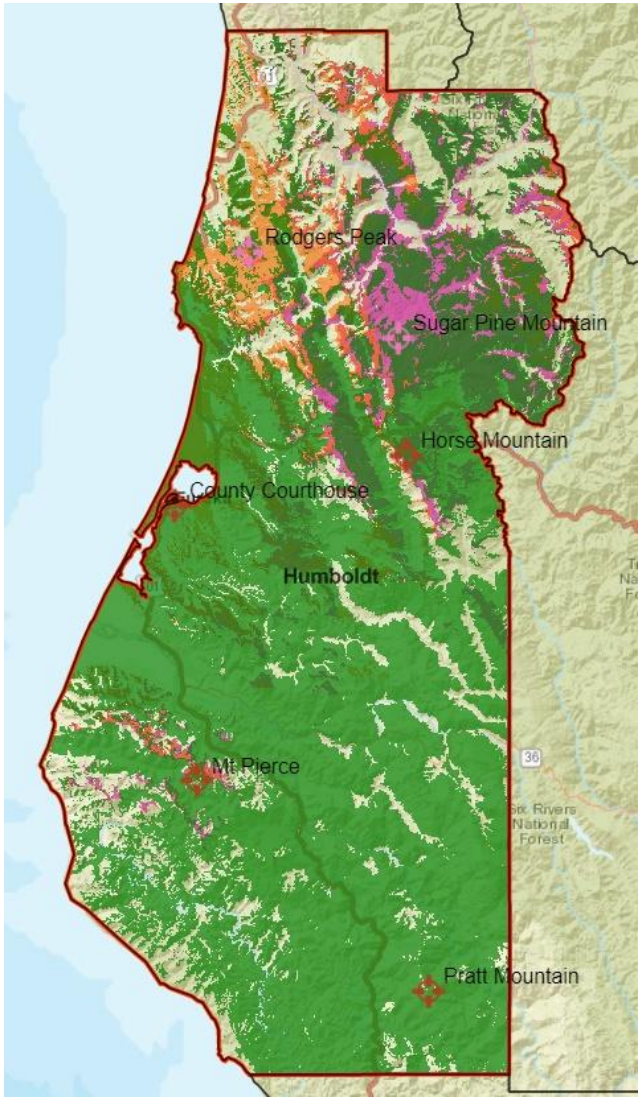

Figure 5-14: Outbound Simulcast Coverage (Green), Outbound Coverage from Sugar Pine (Pink), Outbound Coverage from Rodgers Peak (Orange)

Table 5-53: Humboldt County Analog System Infrastructure Design Parameters

Site Name	Latitude	Longitude	Transmit Antenna System			Receive Antenna System			Effective Faded Sensitivity
			Mount Height / Azimuth	Antenna Model	ERP (dBm)	Mount Height / Azimuth	Antenna Model	External Noise assumed (relative to KToB)	
Standalone Conventional Sites									
Rodgers Peak	41° 9' 28.05" N	124° 1' 23.49" W	100 ft	RFI - OA40-41-DIN	40.58 dBm	100 ft	RFI - OA40-41-DIN	12.6 dB	-104.04 dBm
Sugar Pine Mountain	41° 2' 18.7" N	123° 44' 54.89" W	80 ft	RFI - EA80-41-DIN-T3	39.73 dBm	80 ft	RFI - EA80-41-DIN-T3	12.6 dB	-106.04 dBm
Simulcast/Voting Subsystem									
County Courthouse	40° 48' 11.18" N	124° 9' 43.7" W	120 ft	OA40-41-DIN	47.45 dBm	120 ft	OA40-41-DIN	12.6 dB	-106.74 dBm
Horse Mountain	40° 52' 27.09" N	123° 44' 0.84" W	100 ft	EA80-41-DIN-T3	47.85 dBm	100 ft	EA80-41-DIN-T3	12.6 dB	-106.04 dBm
Mt Pierce	40° 25' 2.3" N	124° 7' 13" W	100 ft	OA40-41-DIN	47.85 dBm	100 ft	OA40-41-DIN	12.6 dB	-107.03 dBm
Pratt Mountain	40° 7' 13.5" N	123° 41' 35.76" W	100 ft	OA40-41-DIN-T3	47.85 dBm	100 ft	OA40-41-DIN-T3	12.6 dB	-107.03 dBm

Table 5-54: Humboldt County Digital Infrastructure Design Parameters

Site Name	Latitude	Longitude	Transmit Antenna System			Receive Antenna System			Effective Faded Sensitivity
			Mount Height	Antenna Model	ERP (dBm)	Mount Height	Antenna Model	External Noise assumed (relative to KToB)	
Trunking North Simulcast Subsystem									
County Courthouse	40° 48' 11.18" N	124° 9' 43.7" W	120 ft	RFI - OA40-41-DIN	48.73 dBm	120 ft	RFI - OA40-41-DIN	12.6 dB	-112.96 dBm
Horse Mountain	40° 52' 27.09" N	123° 44' 0.84" W	100 ft	RFI - EA80-41-DIN-T3	47.63 dBm	100 ft	RFI - EA80-41-DIN-T3	12.6 dB	-112.28 dBm
Trinidad	41° 3' 15.8" N	124° 9' 2.7" W	60 ft	RFI - OA40-41-DIN	51.73 dBm	60 ft	RFI - OA40-41-DIN	12.6 dB	-112.96 dBm
Trunking South Simulcast Subsystem									
Grasshopper	40° 18' 23.9" N	123° 58' 40.4" W	90 ft	RFI - BA80-41-DIN	48.66 dBm	90 ft	RFI - BA80-41-DIN	12.6 dB	-110.28 dBm
Mt Pierce	40° 25' 2.3" N	124° 7' 13" W	100 ft	RFI - OA40-41-DIN	48.63 dBm	100 ft	RFI - OA40-41-DIN	12.6 dB	-113.28 dBm
Pratt Mountain	40° 7' 13.5" N	123° 41' 35.76" W	100 ft	RFI - OA40-41-DIN-T3	48.63 dBm	100 ft	RFI - OA40-41-DIN-T3	12.6 dB	-113.28 dBm
Standalone Sites									
Rodgers Peak	41° 9' 28.05" N	124° 1' 23.49" W	100 ft	RFI - BA80-41-DIN	37.68 dBm	100 ft	RFI - BA80-41-DIN	12.6 dB	-110.28 dBm
Shelter Cove	40° 2' 1.83" N	124° 2' 25.63" W	112 ft	RFI - EA40-41-DIN	45.22 dBm	112 ft	RFI - EA40-41-DIN	12.6 dB	-108.94 dBm
Shelton Butte	41° 14' 17.49" N	123° 37' 58.19" W	70 ft	RFI - BA80-41-DIN	46.98 dBm	70 ft	RFI - BA80-41-DIN	12.6 dB	-110.29 dBm
Sugar Pine Mountain	41° 2' 18.7" N	123° 44' 54.89" W	80 ft	RFI - EA80-41-DIN-T3	39.73 dBm	80 ft	RFI - EA80-41-DIN-T3	12.6 dB	-112.29 dBm

5.24.3.6 CPC Pass/Fail Criterion for a Test Tile

For each equipment configuration, the CPC pass/fail criterion for a test tile is stated in Table 5-52 Coverage Acceptance Test Summary. Each equipment configuration will have only one CPC pass/fail criterion for a test tile.

As defined in Table 1-2, the acceptance test for the analog design includes two pass/fail criteria for areas best served by the simulcast cell and the standalone sites. Although Figure 2 gives an idea on what areas will be tested for SSI and DAQ, Motorola Solutions reserves the right to re-test areas that are covered by more than one site. Tiles that fail a subjective test but pass the objective SSI re-test, will be deemed a pass. Tiles that fail an objective SSI test but pass the subjective re-test will be deemed a pass. Tiles that fail both the subjective and objective SSI test will be deemed a fail.

Below are the attenuator values required to evaluate each equipment configuration. The methodology to determine the attenuator value is demonstrated in TSB-88.1-D §5.4.2, Figure 5. The attenuator value includes the proper values for the equipment configuration requirement plus adjustments for the test equipment setup. Should the test equipment setup losses (e.g. cable length) vary, an adjustment to the attenuator value may be required to represent the required equipment configuration accurately. These values will be defined at the time of the test.

Table 5-55: Attenuator Values to Evaluate Each Equipment Configuration

User Equipment Configuration and Outdoor / In-Building	Attenuator Value
Mobile	0 dB
Portable Outdoors	16.6 dB – Cable Loss + Height Compensation

5.24.3.7 Required Number of Test Tiles in the Defined Test Area

The method used to test coverage is a statistical sampling of the defined test area to verify that the CPC is met or exceeded at the required reliability for each of the defined equipment configurations. It is impossible to verify every point within a defined test area, because there are infinite points; therefore, coverage reliability will be verified by sampling a statistically significant number of randomly selected locations, quasi-uniformly distributed throughout the defined test area. There is one test sample per test tile, where a sample consists of multiple sub-samples.

Coverage acceptance testing will be performed in the defined test area as indicated on Motorola Solutions-provided maps. To verify that the reliability requirement is met, the defined test area indicated on Motorola Solutions' maps will be divided into uniformly sized test tiles, with at least the number of test tiles indicated in Table 5-52 Coverage Acceptance Test Summary. The number of test tiles indicated in Table 5-52 is at least the minimum required by the Estimate of Proportions formula as stated in section 5.24.3.1 (Defined Test Area) of this document.

Per TSB-88.3-D, the stated minimum outdoor tile size is 100 by 100 wavelengths; however, the minimum *practical* test tile size is typically about 400 by 400 meters (about 0.25 by 0.25 miles). The minimum practical tile size for any system is determined by the distance traveled at the speed of the test vehicle while sampling, GPS error margin, and availability of road access within very small test tiles. A related consideration is the time, resources, and cost involved in testing very large numbers of very small tiles. For a given defined test area, all test tiles must be of equal size. The maximum test tile size is 2 by 2 km (1.24 by 1.24 miles) [TSB-88.3-D, §5.5.1]. In some wide-area systems, this constraint on maximum tile size may dictate a greater number of test tiles than the minimum number required by the Estimate of Proportions formula.

No acceptance testing will be performed in locations outside the defined test area as indicated on the Motorola Solutions-provided maps. Motorola Solutions and Humboldt County may agree to perform "information only" tests in locations outside the defined test area; however, these "information only" test results will not be used for coverage acceptance. Any "information only" test locations must be defined before starting the test. If the added locations require significant additional time and resources to test, a change order will be required and Motorola Solutions may charge Humboldt County on a time-and-materials basis.

5.24.3.8 Accessibility to Test Tiles

Prior to testing, Motorola Solutions and Humboldt County will plan the route for the test vehicle(s) through the defined test area, to ensure that at least the minimum required number of tiles is tested. While planning the route (if possible) or during the test, Motorola Solutions and Humboldt County will identify any test tiles that are inaccessible for the coverage test (due to lack of roads, restricted land, etc.). Inaccessible tiles will be eliminated from the acceptance test calculation. [TSB-88.3-D, §5.5.4]

If elimination of inaccessible test tiles results in less than a statistically significant number of test tiles or substantially alters the defined test area, Motorola Solutions reserves the right to adjust the committed reliability based on the reduced number of accessible test tiles within the altered test area and the Estimate of Proportions formula. [TSB-88.3-D, §5.2.1, equation 2]

5.24.3.9 Random Selection of a Test Location in Each Tile

This CATP provides an objective method of randomly selecting and tracking test locations using Motorola Solutions' Voyager℠ coverage testing tool. This method correlates directly with Motorola Solutions' coverage prediction methodology.

Using Voyager, the actual test location within each test tile will be randomly selected by the test vehicle crossing into the tile at an arbitrary point, with an arbitrary speed and direction. If the selected test location is in a shielded area such as a tunnel or underground parking garage, the data from that test location must be eliminated and a replacement test location must be used.

5.24.3.10 CPC Measurements in Each Tile

In each test tile, a voice test exchange will be initiated using predetermined text typical of a common voice exchange between the fixed location and the location. The person conducting the test at the mobile will be moving at a typical speed for the surrounding conditions.

5.24.4 Responsibilities and Preparation

This section identifies the responsibilities of Humboldt County and Motorola Solutions regarding requirements for equipment, personnel, and time during the coverage test.

Humboldt County will provide the following for the duration of the coverage test:

- At least two test vehicles that are representative of the vehicles to be installed with radios
- Two drive teams comprised of at least one Humboldt County personnel acting as a driver. A second Humboldt County representative is also recommended (though not required) per each drive test team to act as a tie-breaker for subjective audio tests.
- Exclusive use of the test channels required by Motorola Solutions during the test.
- For mobile coverage testing, the antenna must be mounted per the equipment configuration utilized in the coverage models.
- Two evaluator teams each with two or more representatives designated by Humboldt County per team to evaluate and record the pass/fail result of each subjective audio transmission. The required quantity of test participants shall be available a minimum of eight hours a day.
- Access to a facility featuring control stations that can facilitate fixed end subjective audio test.
- Portable and Mobile subscribers to execute the testing.

Motorola Solutions will provide the following for the duration of the coverage test:

- One Motorola Solutions representative per each of the two drive teams to navigate, operate Voyager, operate the mobile radio, and to evaluate and record the pass/fail result of each subjective audio transmission.
- One or more Motorola Solutions evaluator representatives to operate the fixed equipment, and to evaluate and record the pass/fail result of each subjective audio transmission.
- At least one Motorola Solutions Voyager coverage testing tool.

As required, Motorola Solutions will provide a receiver signal strength calibration file for the test radio(s) used with the Voyager coverage testing tool.

Before starting the test, Humboldt County and Motorola Solutions will agree upon the time frame for Motorola Solutions' submission of a report containing the coverage test results.

5.24.5 CATP Procedures

A coverage acceptance test will be performed using Motorola Solutions' Voyager tool to randomly select test locations.

Voyager consists of the following:

- A Global Positioning System (GPS) receiver, which will provide the computer with the location and speed of the test vehicle.
- A laptop computer with Voyager software and a mapping database, which includes highways and local streets.

The procedure for the subjective DAQ coverage test outdoors will be as follows:

- A subjective listening test will be performed for coverage acceptance testing, to verify talk-out DAQ performance of the system. Talk-in evaluation is optional.
- In case is agreed that both directions will be evaluated, talk-out and talk-in will be evaluated independently
- To perform a statistically valid subjective DAQ test, a large group of people is required to ensure high confidence in the results. However, obtaining a large group of people for a subjective listening test is usually impractical; therefore, several (three to seven) people in a car or van must be used for the test. Since a group this small cannot provide statistically significant results, it is very important that the personnel participating in the subjective test be familiar with the sound of radio conversations. Before subjectively testing, all personnel who will evaluate audio quality must be "calibrated" by listening to examples of audio that pass and fail the subjective DAQ test.
- A fixed dispatch location will be established. Prior to testing, Humboldt County and Motorola Solutions will agree upon a procedure to allow each audio transmission to be evaluated for approximately five seconds.
- The test participants will be divided into teams, each consisting of personnel from both Humboldt County and Motorola Solutions. Each team will have members that operate a mobile radio in the field, and members that are stationed at the fixed dispatch location.
- As the field test teams drive through the coverage area, test locations within each test tile will be selected randomly by Voyager's GPS location indication. Voyager will be used to log the talk-in (optional) and talk-out pass/fail result as well as any pertinent notes for the location.
- At each test tile location, each field test team member will listen to a talk-out audio transmission, and will record his or her subjective pass/fail evaluation of the DAQ for the tile. Team members stationed at the dispatch location will evaluate talk-in (optional) audio quality of transmissions from the test radio(s) in that tile. Each team member will maintain a test log to record date, time, and subjective pass/fail evaluation for each test tile location. Subjective pass/fail evaluation will be based on the DAQ descriptions in Table 5-51. The determination of whether each test tile passes or fails the required DAQ value will be the majority vote of all team members' pass/fail subjective evaluations for that tile. An odd number of team members are required to avoid ties for the pass/fail majority vote.

- Should any subjective DAQ test tile fail, a retry of the transmission will occur. Should the retry pass, the test tile will be considered a pass. If a retry should occur, it will be noted in the test log notes for that test tile.

5.24.6 CATP Documentation and Coverage Acceptance

During the coverage acceptance test, Voyager generates computer files that include the raw test data. A copy of this data will be provided to Humboldt County at the conclusion of the coverage test. Motorola Solutions will process this data to produce a map detailing the coverage test results, and to determine whether the coverage test was passed for each user equipment configuration.

The coverage acceptance criterion for a user equipment configuration will be that the voice radio system implemented by Motorola Solutions for Humboldt County meets or exceeds the reliability stated in Table 5-52 Coverage Acceptance Test Summary for that user equipment configuration. The system coverage acceptance criterion will be the successful passing of each of the user equipment configurations defined in Table 5-52 Coverage Acceptance Test Summary.

Motorola Solutions reserves the right to review any test tiles that fail. If a coverage test, or a portion thereof, is suspected by Motorola Solutions to have failed due to external interference or local clutter obstructions, those tiles suspected of being affected by an interferer or clutter may be re-tested. If the test tiles re-tested are confirmed to have failed due to interference, external noise, or local clutter those test tiles will be excluded from all acceptance calculations and Motorola Solutions will work with Humboldt County to identify potential solutions to the interference and clutter issues.

Motorola Solutions will conduct this Coverage Acceptance Test only once. If any portion of the test is determined to be affected by proven equipment malfunctions or failures, Motorola Solutions will repeat the portion of the test affected by the equipment malfunction or failure. Humboldt County will have the option to accept the coverage at any time prior to completion of the coverage test or documentation process.

Motorola Solutions will submit to Humboldt County a report detailing the coverage test results. This report will include a document, which is to be signed by both Humboldt County and Motorola Solutions, indicating the test was performed in accordance with this CATP and the results of the test indicate the acceptance or non-acceptance of the coverage portion of the system.

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5.25 APPENDIX 4 – DETAILED PROJECT SCHEDULE

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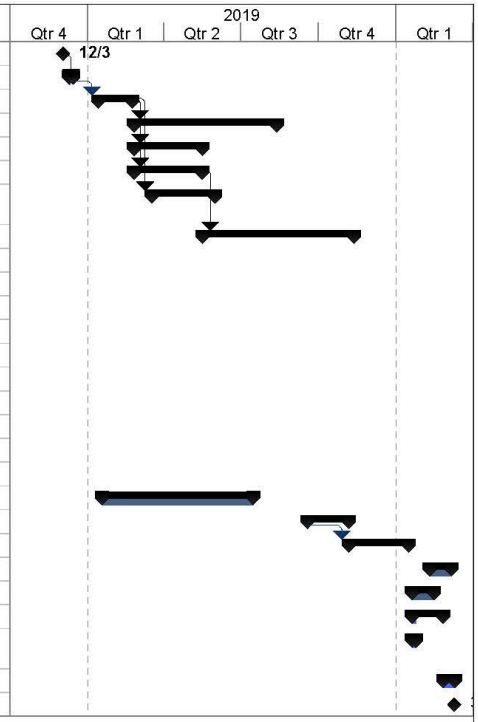
ID	Task Name	Duration	Start	Finish	Predecessors
1	Contract Execution	0 days	Mon 12/3/18	Mon 12/3/18	
2	**Project Plan Kick-off and Project Plan**	**5 days**	**Mon 12/10/18**	**Fri 12/14/18**	**1FS+5 days**
8	**Design Review**	**30 days**	**Mon 1/14/19**	**Fri 2/22/19**	**2FS+16 days**
16	**FCC Licensing**	**120 days**	**Mon 2/25/19**	**Mon 8/12/19**	**8**
19	**Order Processing and Manufacturing**	**60 days**	**Mon 2/25/19**	**Thu 5/16/19**	**8**
21	**Factory Staging**	**60 days**	**Mon 2/25/19**	**Thu 5/16/19**	**8**
26	**Develop Fleetmap, Operational Configuration, and Programming**	**55 days**	**Mon 3/18/19**	**Fri 5/31/19**	**8FS+15 days**
30	**Installation**	**124 days**	**Fri 5/17/19**	**Mon 11/11/19**	**21**
31	Courthouse	124 days	Fri 5/17/19	Mon 11/11/19	
32	Mt Pierce	66 days	Fri 5/17/19	Tue 8/20/19	
33	Horse Mountain	66 days	Fri 5/17/19	Tue 8/20/19	
34	Grasshopper	66 days	Fri 5/17/19	Tue 8/20/19	
35	Pratt Mountain	66 days	Fri 5/17/19	Tue 8/20/19	
36	Trinidad	66 days	Fri 5/17/19	Tue 8/20/19	
37	Shelter Cove	66 days	Fri 5/17/19	Tue 8/20/19	
38	Rogers Peak	66 days	Fri 5/17/19	Tue 8/20/19	
39	Sugar Pine	66 days	Fri 5/17/19	Tue 8/20/19	
40	Shelton Butte	66 days	Fri 5/17/19	Tue 8/20/19	
41	**Microwave**	**126 days**	**Fri 1/18/19**	**Mon 7/15/19**	
56	**Optimization of Fixed Network Equipment**	**35 days**	**Wed 9/18/19**	**Tue 11/5/19**	
62	**Acceptance Testing**	**45 days**	**Tue 11/5/19**	**Wed 1/15/20**	**56**
71	**Training**	**20 days**	**Mon 2/10/20**	**Fri 3/6/20**	
73	**Install Mobiles**	**20 days**	**Mon 1/20/20**	**Fri 2/14/20**	
75	**Migration and Transition of Users**	**27 days**	**Mon 1/20/20**	**Tue 2/25/20**	
84	**Review Customer Support Plan, Escalation Procedures, Technical and User Help Line.**	**5 days**	**Mon 1/20/20**	**Fri 1/24/20**	
86	**Finalize Project**	**10 days**	**Wed 2/26/20**	**Tue 3/10/20**	
97	Final Project Completion	0 days	Tue 3/10/20	Tue 3/10/20	



Project: humboldt Not as simple v3
Date: Mon 8/20/18

Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Progress
Deadline

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5.26 APPENDIX 5 – MICROWAVE FEASIBILITY STUDY

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NOKIA

Microwave System Feasibility Report

Motorola
Humboldt County Radio Upgrade

This report is intended to discover the feasibility of constructing a microwave system to meet the customer's needs as outlined to Nokia. It is based on customer supplied data unless noted otherwise. This information should be used solely to determine if a more formal engineering effort is worthwhile.
No equipment orders, site work, tower structural analysis, frequency coordination or similar activity should be based on this document.

This document was prepared by: Jody Hamilton
MW Transmission Engineer
Jody.Hamilton@Nokia.com
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Microwave Transmission Engineering
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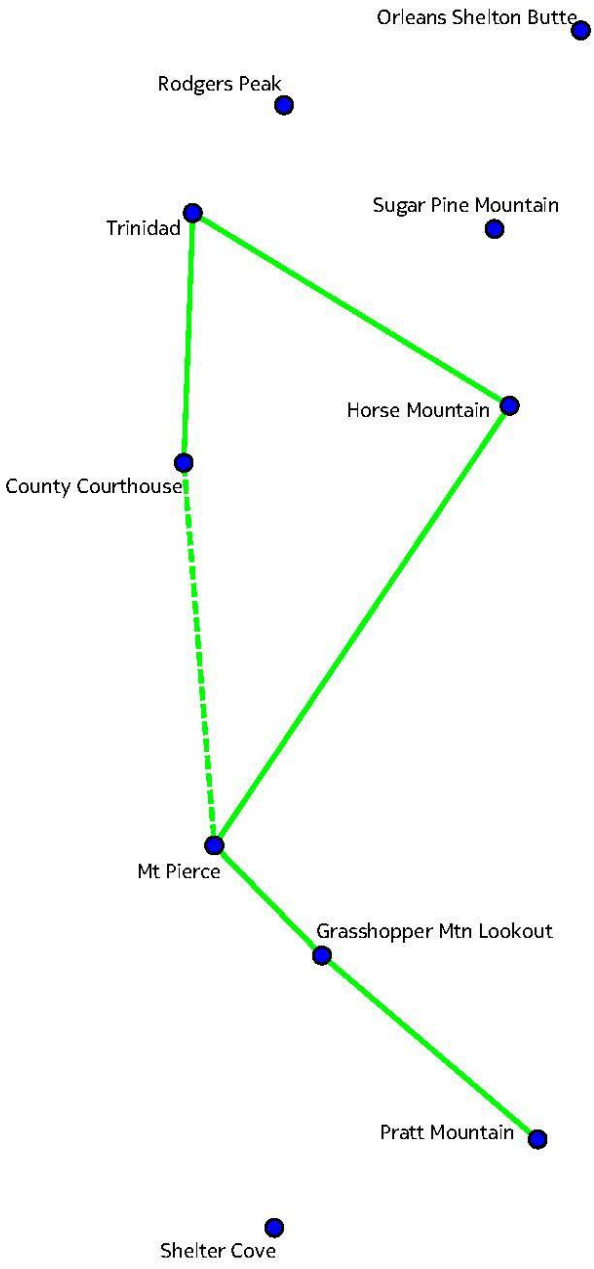

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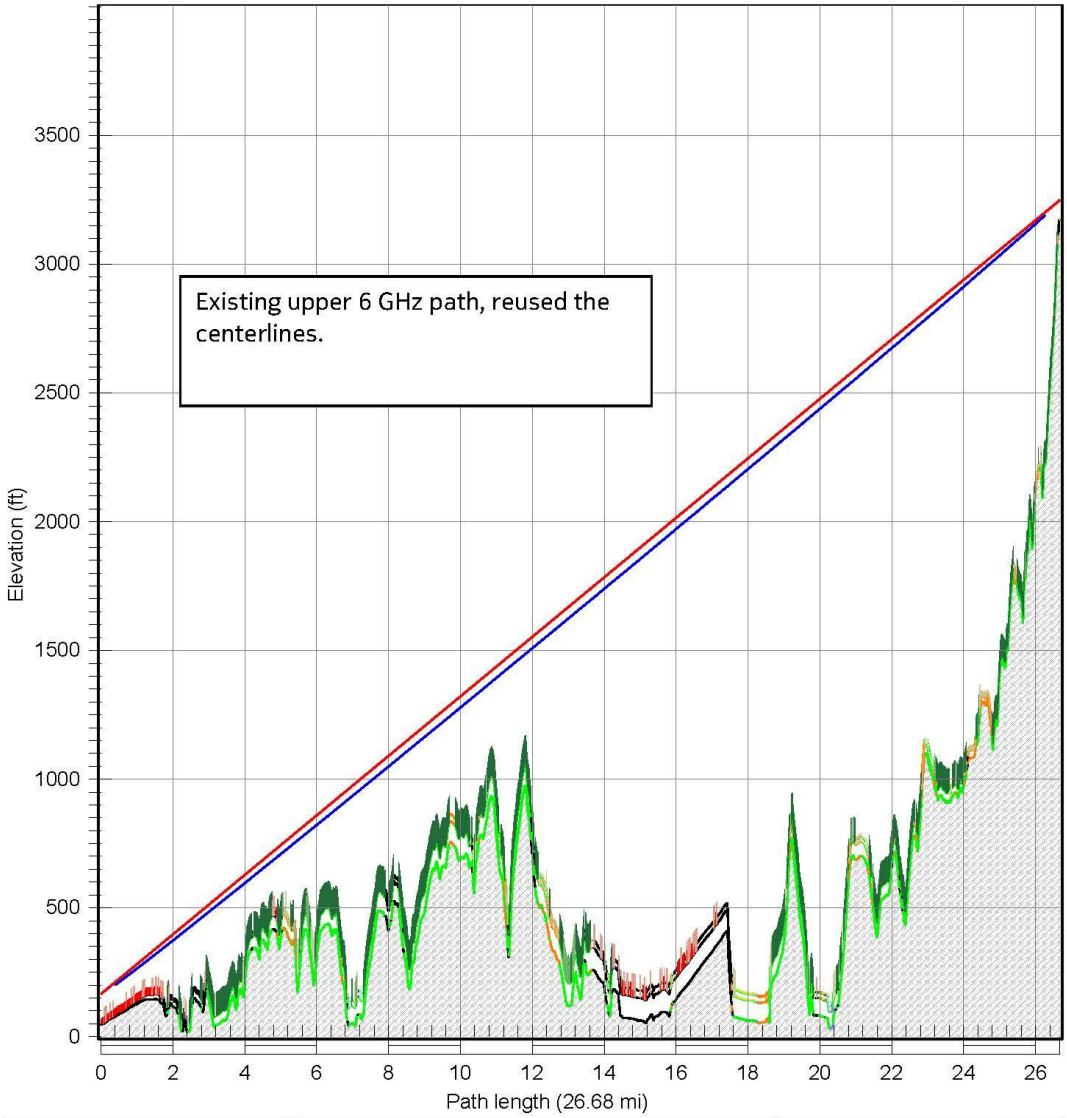
Motorola July 26, 2018



County Courthouse	
Latitude	40 48 09.40 N
Longitude	124 09 43.20 W
Azimuth	175.26°
Elevation	44 ft ASL
Antenna CL	121.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.00, 1.33
%F1 = 60.00

Mt Pierce	
Latitude	40 25 02.30 N
Longitude	124 07 12.70 W
Azimuth	355.29°
Elevation	3171 ft ASL
Antenna CL	77.0 ft AGL

Transmission details (County Courthouse-Mt Pierce.pl5)

	County Courthouse	Mt Pierce
Call sign	KMN36	WQOP601
Latitude	40 48 09.40 N	40 25 02.30 N
Longitude	124 09 43.20 W	124 07 12.70 W
True azimuth (°)	175.26	355.29
Vertical angle (°)	1.11	-1.40
Elevation (ft)	43.64	3171.26
Tower height (ft)	120.00	80.00
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	121.00	77.00
TX line model	IFL	IFL
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	26.69	
Free space loss (dB)	140.94	
Atmospheric absorption loss (dB)	0.37	
Net path loss (dB)	62.51	62.51
Configuration	NSB (1:0)	NSB (1:0)
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	140.00	
C factor	0.26	
Average annual temperature (°F)	54.55	
Fade occurrence factor (Po)	7.693E-002	

NOKIA

Motorola August 13, 2018

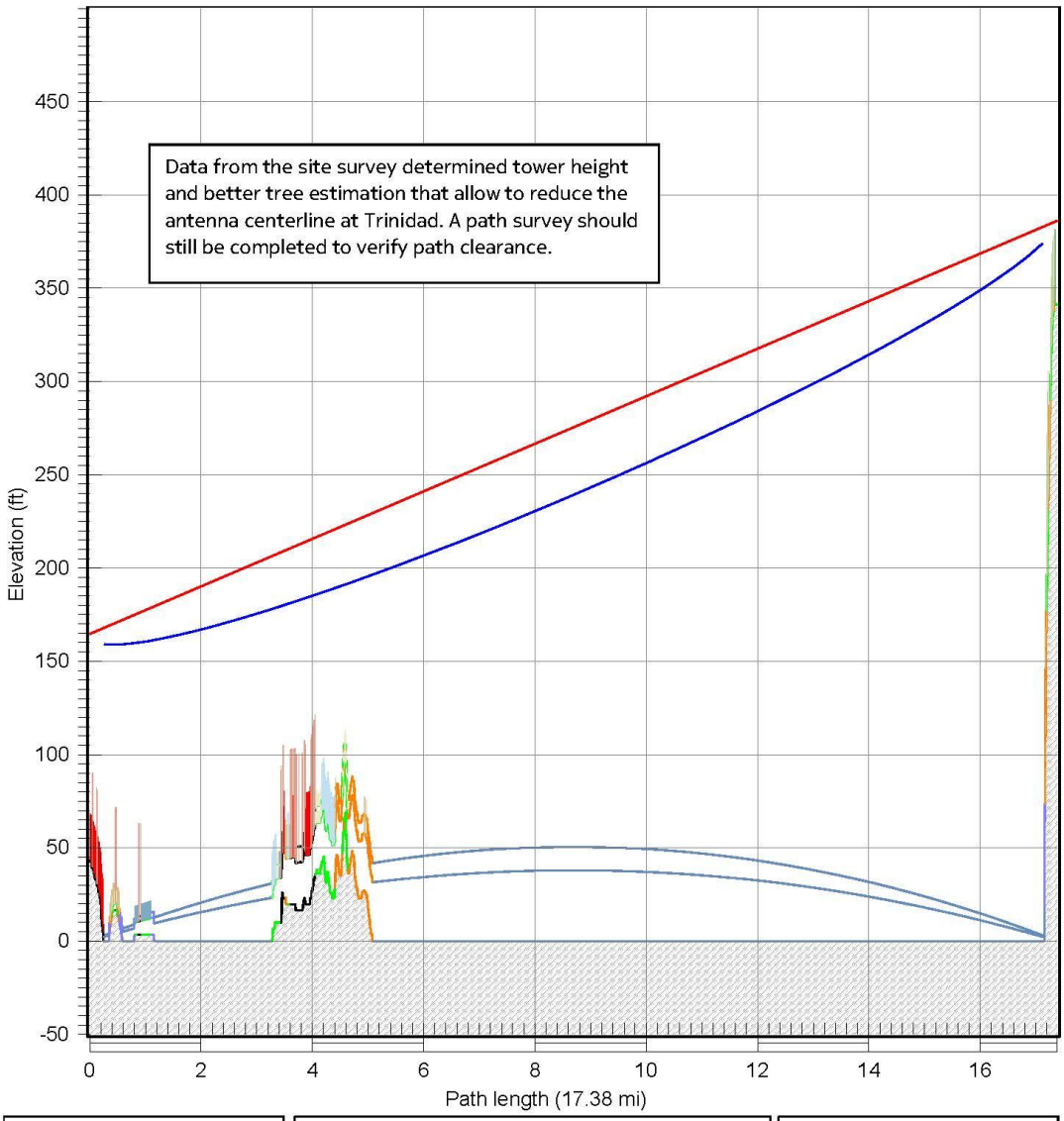
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	65.40	65.40	-36.51	-36.51	22.49	22.49	22.49	22.49
512 209	26.00	26.00	-63.00	-63.00	65.40	65.40	-36.51	-36.51	26.49	26.49	26.49	26.49
256 186	28.00	28.00	-65.00	-65.00	67.40	67.40	-34.51	-34.51	30.49	30.49	30.49	30.49
128 163	29.00	29.00	-68.00	-68.00	68.40	68.40	-33.51	-33.51	34.49	34.49	34.49	34.49
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**68.40**	**68.40**	**-33.51**	**-33.51**	**37.49**	**37.49**	**37.49**	**37.49**
32 109	31.00	31.00	-74.00	-74.00	70.40	70.40	-31.51	-31.51	42.49	42.49	42.49	42.49
16 88	31.00	31.00	-76.50	-76.50	70.40	70.40	-31.51	-31.51	44.99	44.99	44.99	44.99
4 44	32.00	32.00	-87.50	-87.50	71.40	71.40	-30.51	-30.51	56.99	56.99	56.99	56.99

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.9566	99.9566	99.9882	99.9882			99.9763	99.9763
512 209	99.9827	99.9827	99.9953	99.9953			99.9906	0.0142
256 186	99.9931	99.9931	99.9981	99.9981			99.9962	0.0057
128 163	99.9972	99.9972	99.9992	99.9992			99.9985	0.0023
64 139	**99.9986**	**99.9986**	**99.9996**	**99.9996**			**99.9992**	**0.0007**
32 109	99.9996	99.9996	99.9999	99.9999			99.9998	0.0005
16 88	99.9998	99.9998	99.9999	99.9999			99.9999	0.0001
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0001

Multipath fading method - Vigants - Barnett

NOKIA

Motorola July 26, 2018



County Courthouse	
Latitude	40 48 09.40 N
Longitude	124 09 43.20 W
Azimuth	1.94°
Elevation	44 ft ASL
Antenna CL	121.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.00, 1.33
%F1 = 60.00

Trinidad	
Latitude	41 03 15.80 N
Longitude	124 09 02.70 W
Azimuth	181.94°
Elevation	341 ft ASL
Antenna CL	45.0 ft AGL

NOKIA

Motorola August 13, 2018

Transmission details (County Courthouse-Trinidad.pl5)

	County Courthouse	Trinidad
Call sign	KMN36	
Latitude	40 48 09.40 N	41 03 15.80 N
Longitude	124 09 43.20 W	124 09 02.70 W
True azimuth (°)	1.94	181.94
Vertical angle (°)	0.04	-0.23
Elevation (ft)	43.64	341.21
Tower height (ft)	120.00	60.00
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	121.00	45.00
TX line model	IFL	IFL
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	17.38	
Free space loss (dB)	137.22	
Atmospheric absorption loss (dB)	0.24	
Net path loss (dB)	58.66	58.66
Configuration	NSB (1:0)	NSB (1:0)
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	48.37	
C factor	1.04	
Average annual temperature (°F)	54.06	
Fade occurrence factor (Po)	8.468E-002	

NOKIA

Motorola August 13, 2018

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	65.40	65.40	-32.66	-32.66	26.34	26.34	26.34	26.34
512 209	26.00	26.00	-63.00	-63.00	65.40	65.40	-32.66	-32.66	30.34	30.34	30.34	30.34
256 186	28.00	28.00	-65.00	-65.00	67.40	67.40	-30.66	-30.66	34.34	34.34	34.34	34.34
128 163	29.00	29.00	-68.00	-68.00	68.40	68.40	-29.66	-29.66	38.34	38.34	38.34	38.34
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**68.40**	**68.40**	**-29.66**	**-29.66**	**41.34**	**41.34**	**41.34**	**41.34**
32 109	31.00	31.00	-74.00	-74.00	70.40	70.40	-27.66	-27.66	46.34	46.34	46.34	46.34
16 88	31.00	31.00	-76.50	-76.50	70.40	70.40	-27.66	-27.66	48.84	48.84	48.84	48.84
4 44	32.00	32.00	-87.50	-87.50	71.40	71.40	-26.66	-26.66	60.84	60.84	60.84	60.84

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.9803	99.9803	99.9947	99.9947			99.9893	99.9893
512 209	99.9921	99.9921	99.9979	99.9979			99.9957	0.0064
256 186	99.9969	99.9969	99.9992	99.9992			99.9983	0.0026
128 163	99.9987	99.9987	99.9997	99.9997			99.9993	0.0010
64 139	**99.9994**	**99.9994**	**99.9998**	**99.9998**			**99.9997**	**0.0003**
32 109	99.9998	99.9998	99.9999	99.9999			99.9999	0.0002
16 88	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0001

Multipath fading method - Vigants - Barnett

NOKIA

Motorola August 13, 2018

Trinidad	
Latitude	41 03 15.80 N
Longitude	124 09 02.70 W
Azimuth	121.12°
Elevation	341 ft ASL
Antenna CL	15.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.00, 1.33
%F1 = 60.00

Horse Mountain	
Latitude	40 51 37.40 N
Longitude	123 43 45.10 W
Azimuth	301.40°
Elevation	4951 ft ASL
Antenna CL	10.0 ft AGL

Transmission details (Trinidad-Horse Mountain.pl5)

	Trinidad	Horse Mountain
Call sign		WNTS407
Latitude	41 03 15.80 N	40 51 37.40 N
Longitude	124 09 02.70 W	123 43 45.10 W
True azimuth (°)	121.12	301.40
Vertical angle (°)	1.80	-2.08
Elevation (ft)	341.21	4951.12
Tower height (ft)	60.00	10.00
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	15.00	10.00
TX line model	IFL	IFL
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	25.82	
Free space loss (dB)	140.65	
Atmospheric absorption loss (dB)	0.36	
Net path loss (dB)	62.21	62.21
Configuration	NSB (1:0)	NSB (1:0)
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	140.00	
C factor	0.26	
Average annual temperature (°F)	52.85	
Fade occurrence factor (Po)	6.965E-002	

NOKIA

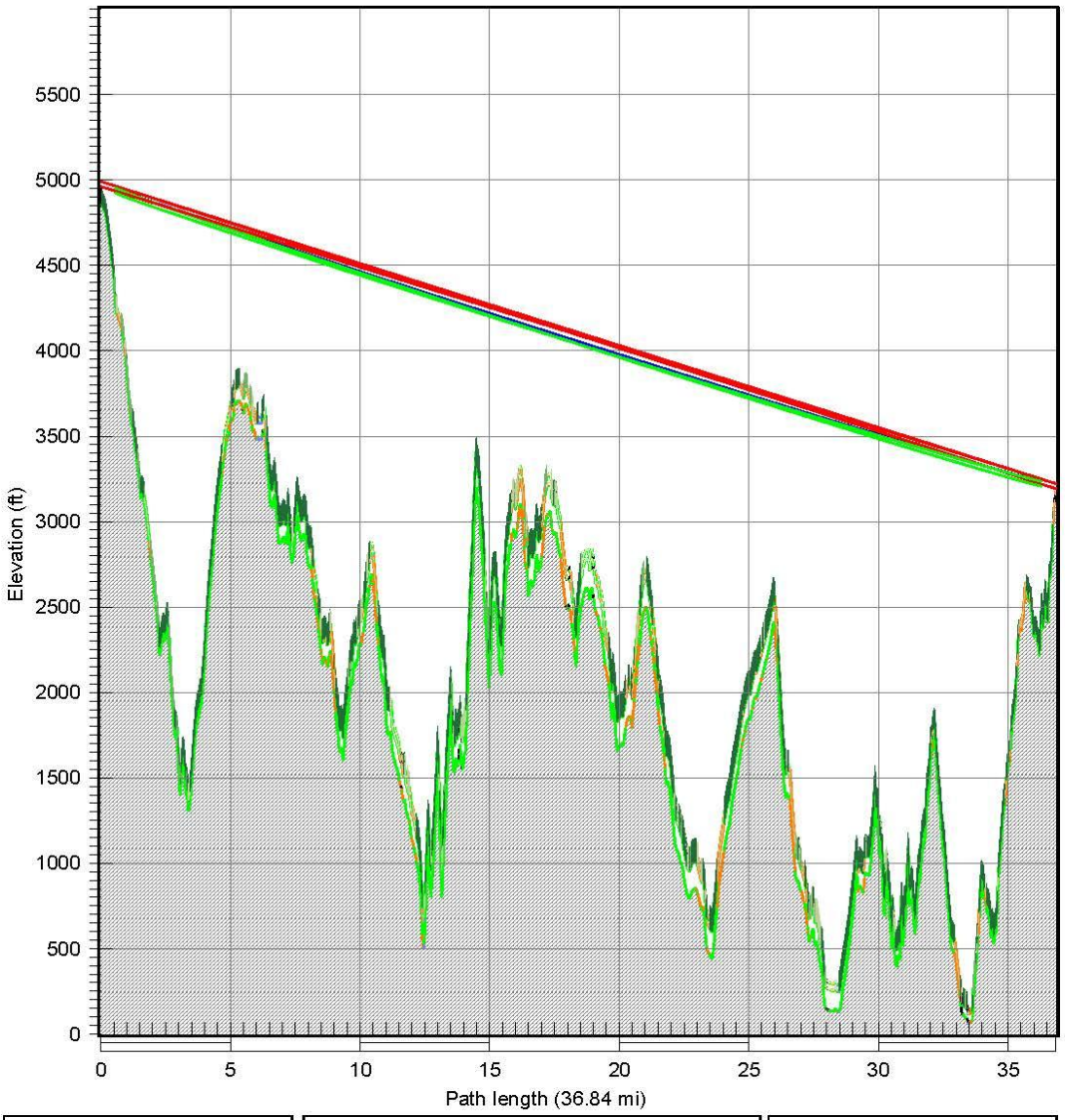
	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	65.40	65.40	-36.21	-36.21	22.79	22.79	22.79	22.79
512 209	26.00	26.00	-63.00	-63.00	65.40	65.40	-36.21	-36.21	26.79	26.79	26.79	26.79
256 186	28.00	28.00	-65.00	-65.00	67.40	67.40	-34.21	-34.21	30.79	30.79	30.79	30.79
128 163	29.00	29.00	-68.00	-68.00	68.40	68.40	-33.21	-33.21	34.79	34.79	34.79	34.79
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**68.40**	**68.40**	**-33.21**	**-33.21**	**37.79**	**37.79**	**37.79**	**37.79**
32 109	31.00	31.00	-74.00	-74.00	70.40	70.40	-31.21	-31.21	42.79	42.79	42.79	42.79
16 88	31.00	31.00	-76.50	-76.50	70.40	70.40	-31.21	-31.21	45.29	45.29	45.29	45.29
4 44	32.00	32.00	-87.50	-87.50	71.40	71.40	-30.21	-30.21	57.29	57.29	57.29	57.29

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.9633	99.9633	99.9903	99.9903			99.9806	99.9806
512 209	99.9854	99.9854	99.9961	99.9961			99.9923	0.0117
256 186	99.9942	99.9942	99.9985	99.9985			99.9969	0.0046
128 163	99.9977	99.9977	99.9994	99.9994			99.9988	0.0019
64 139	**99.9988**	**99.9988**	**99.9997**	**99.9997**			**99.9994**	**0.0006**
32 109	99.9996	99.9996	99.9999	99.9999			99.9998	0.0004
16 88	99.9998	99.9998	99.9999	99.9999			99.9999	0.0001
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0001

Multipath fading method - Vigants - Barnett

NOKIA

Motorola August 13, 2018



Horse Mountain	
Latitude	40 51 37.40 N
Longitude	123 43 45.10 W
Azimuth	214.04°
Elevation	4951 ft ASL
Antenna CL	40.0, 10.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.00, 1.33
%F1 = 60.00, 60.00

Mt Pierce	
Latitude	40 25 02.30 N
Longitude	124 07 12.70 W
Azimuth	33.78°
Elevation	3171 ft ASL
Antenna CL	50.0, 20.0 ft AGL

NOKIA

Motorola August 13, 2018

Transmission details (Horse Mountain-Mt Pierce.pl5)

	Horse Mountain	Mt Pierce
Call sign	WNTS407	WQOP601
Latitude	40 51 37.40 N	40 25 02.30 N
Longitude	123 43 45.10 W	124 07 12.70 W
True azimuth (°)	214.04	33.78
Vertical angle (°)	-0.72	0.32
Elevation (ft)	4951.12	3171.26
Tower height (ft)	10.00	80.00
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	40.00	50.00
TX line model	IFL	IFL
Antenna model	SB 4 - W60C (DR)	SB 4 - W60C (DR)
Antenna gain (dBi)	35.70	35.70
Antenna diameter (ft)	4.00	4.00
Antenna height (ft)	10.00	20.00
TX line model	IFL	IFL
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	36.85	
Free space loss (dB)	143.74	
Atmospheric absorption loss (dB)	0.51	
Diffraction loss	0.00	
Main net path loss (dB)	65.45	65.45
Diversity net path loss (dB)	69.15	69.15
Configuration	HSB (1:1) SD	HSB (1:1) SD
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	140.00	

NOKIA

Motorola August 13, 2018

	Horse Mountain	Mt Pierce
C factor	0.26	
Average annual temperature (°F)	53.50	
Fade occurrence factor (Po)	2.025E-001	
SD improvement factor	12.86	12.86

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	65.40	65.40	-39.45	-39.45	19.55	19.55	19.55	19.55
512 209	26.00	26.00	-63.00	-63.00	65.40	65.40	-39.45	-39.45	23.55	23.55	23.55	23.55
256 186	28.00	28.00	-65.00	-65.00	67.40	67.40	-37.45	-37.45	27.55	27.55	27.55	27.55
128 163	29.00	29.00	-68.00	-68.00	68.40	68.40	-36.45	-36.45	31.55	31.55	31.55	31.55
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**68.40**	**68.40**	**-36.45**	**-36.45**	**34.55**	**34.55**	**34.55**	**34.55**
32 109	31.00	31.00	-74.00	-74.00	70.40	70.40	-34.45	-34.45	39.55	39.55	39.55	39.55
16 88	31.00	31.00	-76.50	-76.50	70.40	70.40	-34.45	-34.45	42.05	42.05	42.05	42.05
4 44	32.00	32.00	-87.50	-87.50	71.40	71.40	-33.45	-33.45	54.05	54.05	54.05	54.05

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.7752	99.7752	99.9399	99.9399			99.8797	99.8797
512 209	99.9122	99.9122	99.9765	99.9765			99.9530	0.0733
256 186	99.9861	99.9861	99.9963	99.9963			99.9926	0.0395
128 163	99.9978	99.9978	99.9994	99.9994			99.9988	0.0063
64 139	**99.9994**	**99.9994**	**99.9999**	**99.9999**			**99.9997**	**0.0009**
32 109	99.9999	99.9999	99.9999	99.9999			99.9999	0.0003
16 88	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000

Multipath fading method - Vigants - Barnett

NOKIA

Motorola August 13, 2018

Mt Pierce	
Latitude	40 25 02.30 N
Longitude	124 07 12.70 W
Azimuth	135.43°
Elevation	3171 ft ASL
Antenna CL	15.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.33
%F1 = 100.00

Grasshopper Mtn Lookout	
Latitude	40 18 23.90 N
Longitude	123 58 40.40 W
Azimuth	315.52°
Elevation	3375 ft ASL
Antenna CL	15.0 ft AGL

Transmission details (Mt Pierce-Grasshopper Mtn Lookout.pl5)

	Mt Pierce	Grasshopper Mtn Lookout
Call sign	WQOP601	
Latitude	40 25 02.30 N	40 18 23.90 N
Longitude	124 07 12.70 W	123 58 40.40 W
True azimuth (°)	135.43	315.52
Vertical angle (°)	0.15	-0.26
Elevation (ft)	3171.26	3374.87
Tower height (ft)	80.00	
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	15.00	15.00
TX line model	IFL	IFL
TX filter loss (dB)	3.50	3.50
RX filter loss (dB)	3.50	3.50
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	10.71	
Free space loss (dB)	133.01	
Atmospheric absorption loss (dB)	0.15	
Net path loss (dB)	61.36	61.36
Configuration	HSB (3:3) Equal Loss Couplers	HSB (3:3) Equal Loss Couplers
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	140.00	
C factor	0.26	
Average annual temperature (°F)	54.62	
Fade occurrence factor (Po)	4.976E-003	

NOKIA

Motorola August 13, 2018

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	61.90	61.90	-35.36	-35.36	23.64	23.64	23.64	23.64
512 209	26.00	26.00	-63.00	-63.00	61.90	61.90	-35.36	-35.36	27.64	27.64	27.64	27.64
256 186	28.00	28.00	-65.00	-65.00	63.90	63.90	-33.36	-33.36	31.64	31.64	31.64	31.64
128 163	29.00	29.00	-68.00	-68.00	64.90	64.90	-32.36	-32.36	35.64	35.64	35.64	35.64
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**64.90**	**64.90**	**-32.36**	**-32.36**	**38.64**	**38.64**	**38.64**	**38.64**
32 109	31.00	31.00	-74.00	-74.00	66.90	66.90	-30.36	-30.36	43.64	43.64	43.64	43.64
16 88	31.00	31.00	-76.50	-76.50	66.90	66.90	-30.36	-30.36	46.14	46.14	46.14	46.14
4 44	32.00	32.00	-87.50	-87.50	67.90	67.90	-29.36	-29.36	58.14	58.14	58.14	58.14

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.9978	99.9978	99.9994	99.9994			99.9988	99.9988
512 209	99.9991	99.9991	99.9998	99.9998			99.9995	0.0007
256 186	99.9997	99.9997	99.9999	99.9999			99.9998	0.0003
128 163	99.9999	99.9999	99.9999	99.9999			99.9999	0.0001
64 139	**99.9999**	**99.9999**	**99.9999**	**99.9999**			**99.9999**	**0.0000**
32 109	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000
16 88	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0000

Multipath fading method - Vigants - Barnett

NOKIA

Motorola August 13, 2018

Grasshopper Mtn Lookout	
Latitude	40 18 23.90 N
Longitude	123 58 40.40 W
Azimuth	130.32°
Elevation	3375 ft ASL
Antenna CL	15.0 ft AGL

Frequency (MHz) = 6175.0
K = 1.00, 1.33
%F1 = 60.00

Pratt Mountain	
Latitude	40 07 16.50 N
Longitude	123 41 38.10 W
Azimuth	310.51°
Elevation	3882 ft ASL
Antenna CL	15.0 ft AGL

NOKIA

Motorola August 13, 2018

Transmission details (Grasshopper Mtn Lookout-Pratt Mountain.pl5)

	Grasshopper Mtn Lookout	Pratt Mountain
Call sign		KNCR242
Latitude	40 18 23.90 N	40 07 16.50 N
Longitude	123 58 40.40 W	123 41 38.10 W
True azimuth (°)	130.32	310.51
Vertical angle (°)	0.17	-0.39
Elevation (ft)	3374.87	3881.76
Tower height (ft)		50.00
Antenna model	SB 6 - W60 C (TR)	SB 6 - W60 C (TR)
Antenna gain (dBi)	39.40	39.40
Antenna diameter (ft)	6.00	6.00
Antenna height (ft)	15.00	15.00
TX line model	IFL	IFL
TX filter loss (dB)	3.50	3.50
RX filter loss (dB)	3.50	3.50
Frequency (MHz)	6175.00	
Polarization	Vertical	
Path length (mi)	19.73	
Free space loss (dB)	138.32	
Atmospheric absorption loss (dB)	0.27	
Net path loss (dB)	66.79	66.79
Configuration	HSB (3:3) Equal Loss Couplers	HSB (3:3) Equal Loss Couplers
Radio model	WVCE61-Q-2048A30S-257	WVCE61-Q-2048A30S-257
TX Power option	High	High
Emission designator	30M0D7W	30M0D7W
Climatic factor	1.00	
Terrain roughness (ft)	140.00	
C factor	0.26	
Average annual temperature (°F)	54.04	
Fade occurrence factor (Po)	3.110E-002	

NOKIA

Motorola August 13, 2018

	TX power (dBm)		RX threshold level (dBm)		EIRP (dBm)		Receive signal (dBm)		Thermal fade margin (dB)		Flat fade margin - multipath (dB)	
1024 232	26.00	26.00	-59.00	-59.00	61.90	61.90	-40.79	-40.79	18.21	18.21	18.21	18.21
512 209	26.00	26.00	-63.00	-63.00	61.90	61.90	-40.79	-40.79	22.21	22.21	22.21	22.21
256 186	28.00	28.00	-65.00	-65.00	63.90	63.90	-38.79	-38.79	26.21	26.21	26.21	26.21
128 163	29.00	29.00	-68.00	-68.00	64.90	64.90	-37.79	-37.79	30.21	30.21	30.21	30.21
64 139	**29.00**	**29.00**	**-71.00**	**-71.00**	**64.90**	**64.90**	**-37.79**	**-37.79**	**33.21**	**33.21**	**33.21**	**33.21**
32 109	31.00	31.00	-74.00	-74.00	66.90	66.90	-35.79	-35.79	38.21	38.21	38.21	38.21
16 88	31.00	31.00	-76.50	-76.50	66.90	66.90	-35.79	-35.79	40.71	40.71	40.71	40.71
4 44	32.00	32.00	-87.50	-87.50	67.90	67.90	-34.79	-34.79	52.71	52.71	52.71	52.71

	Worst month multipath		Annual multipath		Annual rain		Total annual (2 way)	Time in mode (2 way)
1024 232	99.9530	99.9530	99.9873	99.9873			99.9746	99.9746
512 209	99.9813	99.9813	99.9949	99.9949			99.9899	0.0153
256 186	99.9925	99.9925	99.9980	99.9980			99.9960	0.0061
128 163	99.9970	99.9970	99.9992	99.9992			99.9984	0.0024
64 139	**99.9985**	**99.9985**	**99.9996**	**99.9996**			**99.9992**	**0.0008**
32 109	99.9995	99.9995	99.9999	99.9999			99.9997	0.0006
16 88	99.9997	99.9997	99.9999	99.9999			99.9999	0.0001
4 44	99.9999	99.9999	99.9999	99.9999			99.9999	0.0001

Multipath fading method - Vigants - Barnett

NOKIA

MICROWAVE PATH ENGINEERING WARRANTY

FEASIBILITY STUDIES

Nokia provides feasibility studies of microwave radio paths in support of bidding efforts or when purchased by the Customer. Feasibility studies are performed using information provided by or on behalf of the Customer. Results of the feasibility study are provided to the Customer and may include (i) a system map, (ii) a path profile, (iii) path performance calculations, and (iv) a technical report.

Feasibility studies are preliminary in nature and are not intended to represent a final design. Therefore no representations, warranty or guarantee is implied or provided. Customer agrees to assume all risks associated with installing any equipment based on spiderweb maps, preliminary network and system maps, preliminary path profiles (including antenna size and location), path calculations (estimated performance), Google Earth, and topology studies normally presented with a feasibility study.

PATH SURVEYS (DETAILED SURVEY WITH REPORT)

Nokia offers detailed path surveying services to determine or verify site coordinates, site access, location, ground elevation, on-path obstruction location and height, tower information, proposed antenna centerline information, and other parameters required to engineer and implement a microwave radio link. The present and anticipated future effect of observable on-path obstructions, such as vegetation and buildings, are also evaluated and incorporated into the path design where applicable. Where appropriate, roof top access may be utilized in the survey effort. Existing towers are not climbed as a part of this activity.

The results of the path survey are documented and presented in a formal survey report or technical report, as required, to the Customer. Some items performed and included in a formal survey report may include: site location map, site topographic map, access information, site plot plans, existing tower elevation profile, site photographs, site and path observations, path terrain feature descriptions, critical point data, engineering notes, path profiles, and proposed performance calculations.

For detailed Path Surveys, Nokia warrants that geodetic coordinates are accurate to within +/- 1- second of latitude, +/- 1-second of longitude, ground elevations are accurate to within +/- 1 meter, and that heights of identified on-path obstructions at critical points are accurate to within 5-feet. Nokia warrants only the actual paths surveyed.

LINE OF SIGHT SURVEYS (LOS - CLEARANCE VERIFICATION)

Nokia offers a simplified microwave path survey service (from that described above) to determine "line of sight" (LOS) and adequate clearance conditions exist for a planned microwave link. This survey approach is best suited for urban and suburban environments. It can include driving the path as done in a traditional path survey, flashing the path, mirrors, or binoculars methodology. The line of sight survey may also ascertain site coordinates, site access and location, ground elevation, on-path obstruction location and height, tower information, proposed antenna centerline information, and other basic parameters required to

evaluate and design a microwave radio link. The present and anticipated future effect of observable onpath obstructions, such as existing vegetation and existing buildings, are evaluated and incorporated into the path design where applicable and appropriate. Where appropriate, roof top access may be utilized in the survey effort. Existing towers are not climbed as a part of this activity.

For line of sight (LOS) surveys, Nokia warrants that geodetic coordinates are accurate to within +/- 1-second of latitude, +/- 1-second of longitude, and ground elevations are accurate to within +/- 1 meter. Nokia warrants only the actual paths surveyed.

PATH DESIGN

Nokia offers path design services. Path design services are based on formal field survey data gathered by Nokia path surveyors and is warranted. Path designs include profiling a path to determine antenna centerline requirements, and path calculations to determine the antenna and radio types necessary to meet the Customer's microwave link performance and availability objectives. Recommended antenna centerlines are determined for a range of K-factors expected to occur during an average year and by the Fresnel zone clearance criteria stipulated by Bell Laboratories. For areas where poor propagation conditions are known to exist, paths are assessed for susceptibility to obstruction fading outages using the Bell Laboratories Obstruction Fading (OBSFAD) model. Additionally, paths are analyzed for ground-based reflections.

Microwave link availability (path availability) is evaluated using current North American industry accepted models for predicting outage times and diversity improvement factors associated with normal atmospheric multipath fading (flat and dispersive), rain fading, and obstruction fading. Every effort is made by Nokia to anticipate the probable occurrence of abnormal propagation conditions based on historical documentation, experience, geographical location, and field survey data.

The final path design documentation will include one or more of the following, depending on the services purchased by the Customer: (i) a system map, (ii) a final path profile, (iii) final path performance calculations, and (iv) a technical report.

If a radio path using Nokia equipment is installed based on Nokia's recommended path design, then Nokia warrants the radio path calculations shall conform to the Customer's availability objective for normal atmospheric multipath fading. Nokia will not be held responsible for excessive outages or degraded performance due to abnormal fading conditions. Abnormal fading conditions include, but are not limited to:

Formation of extreme radio refractivity gradients associated with:

- Exceptionally large temperature inversions
- Abnormal temperature/humidity layers
- Fog formation
- Signal trapping caused by surface or atmospheric ducting

Reflections from unusual or unidentifiable on-path or off-path terrain features, physical structures, or atmospheric layers.

Rain fading due to rainfall rates that are in excess of the published rates or charts used to predict rain induced outages.

If Nokia suspects that abnormal propagation conditions are the cause of degraded system performance, Nokia will assist the Customer in verifying the conditions leading to the degraded system performance. After the problem has been identified, Nokia will support the Customer in identifying possible solutions to the problem and assess the incremental improvement expected from corrective actions. Any Implementation of corrective action to remedy this type of problem shall be the sole responsibility of the Customer.

FREQUENCY PLANNING

Nokia offers frequency planning services including frequency selection, prior coordination process, interference case resolution, and FCC license application documentation preparation and submittal. Nokia warrants that the interference studies will be conducted using industry-accepted North American methods, hardware, software and algorithms; and that the frequency database will be maintained as accurately as possible at the time of the study. Nokia will not be held responsible for interference cases that arise due to errors or omissions in the database. Upon completion of the frequency planning services, some or all of the following documentation is provided to the Customer:

Prior Coordination Notice
Frequency Coordination Data Sheet
Supplemental Showing pursuant to FCC Rules Part 101.103(d)
Completed FCC Form 601 License Application and Preparation

In the event harmful frequency interference is detected during the implementation of a microwave line in which Nokia provided the frequency planning services, Nokia's total liability is limited to selection of an alternate frequency or frequencies. Should harmful interference occur after the microwave link is deemed operational and accepted, corrective action is the sole responsibility of the Customer.

WARRANTY

Nokia warrants its path surveys and path designs to be substantially free of engineering defects and errors for a period of 12 months from the date of delivery of the study to the Customer. Nokia warrants its line of sight surveys to be substantially free of engineering defects and errors for a period of 6 months from the date of delivery of the study to the Customer. Nokia warrants its frequency planning and Form 601 License Application preparation to be substantially free of engineering defects and errors for a period of 6 months from the date the path was prior coordinated. Except as further limited above, in the event of a proven breach of warranty, the Customer's sole remedy under this warranty shall be that Nokia will provide the incremental labor and material beyond what would have been required during initial installation to correct for the particular error in the path survey or path design. In no case shall Nokia be held liable for any indirect damages including but not limited to incidental, consequential or loss of capital, data, revenue or profit. In the event that such error is not solely and directly related to Nokia's path engineering efforts, expenses for such labor and material shall be borne by the Customer.

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5.27 APPENDIX 6 – OPTIONAL MICROWAVE TRAINING

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NOKIA

Motorola - Humboldt County Microwave

Training Services Proposal

About Nokia
Nokia invests in technologies important in a world where billions of devices are connected. We are focused on three businesses: network infrastructure software, hardware and services, which we offer through Nokia; and advanced technology development and licensing, which we pursue through Nokia Technologies. Each of these businesses is a leader in its respective field.

Nokia is the world's specialist in mobile broadband. From the first ever call on GSM, to the first call on LTE, we operate at the forefront of each generation of mobile technology. Our global experts invent the new capabilities our customers need in their networks. We provide the world's most efficient mobile networks, the intelligence to maximize the value of those networks, and the services to make it all work seamlessly. http://www.nokia.com

Table of contents

1. Customer Training Services

Evolving networks and subscriber demands require a skilled workforce that acts as a differentiator. Nokia Customer Training Services portfolio consists of Training and Learning services to enable customer gain product & technology knowledge and customize competence solutions focused on individual learning. Also the flexible delivery models for blended learning supports customers to learn as per the convenience of their time, place and path to complement the business objectives.

The Training Service portfolio is represented in Figure 1.

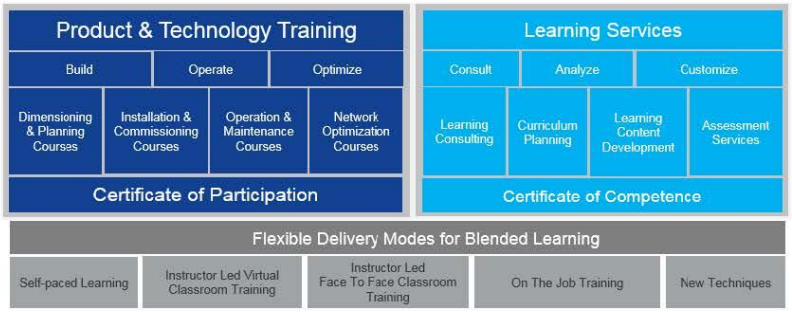

Figure 1: Customer Training Services Portfolio

1.1 Product & Technology Training

Nokia Product & technology training includes predefined curriculum paths to gain necessary knowledge & generic skills to build, operate and optimize customer network & services.

Our extensive training portfolio offers everything to get customer workforce skilled on Nokia products and technology solutions. The courses are categorized further as per job functions in the network:

Dimensioning & Planning courses	• Focus on skills for the definition, planning and implementation of all necessary infrastructures • Identify new requirements, new capabilities and design and develop new or enhanced infrastructure to support products • Respond to requirements of unit cost reductions, product quality improvements, new products, etc.
Installation & Commissioning Courses	• Focus on skills for the allocation, installation, configuration, activation and testing of specific services and resources to meet the customer requirements.
Operation & Maintenance courses	• Focus on skills for the execution of proactive and reactive maintenance activities. • Ensure continuous availability and attainment of SLA or QoS performance levels. • Perform continuous status and performance monitoring to proactively detect possible failures.
Network Optimization courses	• Focus on skills to analyse root causes of performance problems like capacity bottlenecks, sub optimal-configurations etc. • Skills to come up with the proposal for resolving actions.

1.1.1 Course levels

Aware	• "Aware" level learning provides a general overview of a network element, product or technology. • The "Aware" level also comprises of technology and product independent courses. • The courses offered under "Aware" level are common for all technical personnel and some of these courses are also recommended for non-technical staff.
Standard	• "Standard" level learning typically takes place in the early phases of network implementation. • These combined theory and practical sessions aim to make the participants adept at operating and maintaining a specific network element or subsystem. • These are designed to equip installation, commissioning, operation and maintenance personnel with the fundamental skills required to perform the day-to-day tasks associated with the equipment.
Advanced	• "Advanced" level learning provides the participants with the knowledge and skills to perform higher level tasks required in a telecommunications network. • These tasks involve network troubleshooting, network design, and reconfiguration as well as network performance analysis.
Expert	• "Expert" level learning provides mainly product based background knowledge to experts in the operator's organization. • The goal is to provide deeper background knowledge for experts to make them better planners or troubleshooters.

1.2 Learning Services

Learning Support Services covers the following:

Learning Consulting	• Supports identification of areas where competence development adds value to operations and business needs.
Curriculum Planning	• Comprises the analysis & assessment of current skills-sets to deliver a training curriculum targeted at job roles and levels of competences to be achieved.
Learning Content Development	• Learning content build from existing training modules as well as customized deliverables to fit into your unique needs.
Assessment Services	• Confirm the learning outcomes through assessment, including pre- and post-tests, self-assessment, task-based assessments and skill level certification programs.

1.3 Flexible Delivery Modes for Blended Learning

Nokia believes in using training delivery models which fits in customers' business models, competence needs and learning solution planned. Blended learning helps people learn as per their convenience of time, place and path.

1.3.1 Self-Paced Learning

Content and Scope

Nokia supports this delivery model where customer can learn & gain knowledge at their own pace by requesting Nokia eLearning Services on demand basis. It includes a wide range of online learning events e.g. Web-Based Training (WBT) courses, e-Presentations. e-Learning supports informal learning in addition to formal learning needs of its participants. Depending on the customer requirements, the most efficient method is used.

With eLearning Services Nokia helps its customers in enhancing their learning environment by extending the availability of effective knowledge resources in their organization.

e-Learning include a wide range of content covering systems, network architecture, products and platforms as well as new releases. If needed customer specific content can be developed.

The eLearning standard offering is continuously visible through Nokia internet including training descriptions. The training description consists of name of the training, target group(s), objectives, nominal duration, prerequisites, modules, maximum amount of participants and a basic description of the learning environment. The training offering is continuously updated at the internet.

Variations of e-Learning

Depending on the customer requirements, offered services can include different e-Learning types.

Web Based Training, are learning events that use Internet technology to impart knowledge. To increase the efficiency the content is provided to the user on highly animated and interactive style. Contents are presented in a structured way so that students can retrieve them rapidly and easily.

e-Presentations are recorded training presentations in the form of a slide presentation with audio, recorded video interviews or recorded parts of a seminar. Participant can watch and listen to the edited user-friendly explanations of the trainer during the presentation.

Deliverables

The deliverables of e-Learning include:

- Actual e-Learning event delivered by Nokia instructor
- Learning material
- Training confirmation of attendance

Prerequisites and Assumptions

Participants are enrolled to the e-Learning individually according to the target group and prerequisites defined in the training descriptions available at the Nokia internet. Nokia shall not be obliged to take special care or to take special steps to meet the demands of participants that do not meet the prerequisites.

1.3.2 Instructor Led Virtual Classroom Training

Content and Scope

The Virtual Classroom Training is a learning event provided in a virtual classroom through the Internet, where participants can meet up and take part in guided online sessions even if they work at different locations. Virtual Classroom Training is particularly suited for topics that can be conveyed within one or two hours.

The Virtual Classroom Training standard offering is continuously visible through Nokia internet including training descriptions. The training description consists of name of the training, target group(s), objectives, nominal duration, prerequisites, modules, maximum amount of participants and a basic description of the learning environment. The training offering is continuously updated at the internet.

Enrolment to Virtual Classroom Training includes access to the Virtual Classroom environment. Participant receives an enrolment notification email for the Virtual Classroom sessions, providing instructions how to access the environment.

The learning session may include practical exercises on Nokia learning equipment, made remotely available through Remote Lab access.

The results of the Virtual Classroom Training evaluations are stored in Nokia' Learning Management System.

Variations of Virtual Classroom Training

The Virtual Classroom Training can be tailored or customized to meet the needs of the specific requirements, strategy, goals and/or corporate identity of customer. The training proposal (only for exclusive training) includes information regarding the date of the virtual classroom session and is valid for defined amount of days after it has been provided to the customer contact person.

Deliverables

The deliverables of Virtual Classroom Training include:

- Virtual Classroom Training event delivered by Nokia instructor
- Learning material
- Training confirmation of attendance

Prerequisites and Assumptions

The participant should have a secluded and peaceful area around the computer while attending Virtual Classroom Training. To be sure of this, it is worthwhile to check that PC facilities are available in case employees do not have offices and/or sufficient PCs of their own. Another option is to allow employees to use PCs at home from where they have a connection to the Internet.

Participants are selected according to the target group and prerequisites defined in the learning program descriptions. Nokia shall not be obliged to take special care or to take special steps to meet the demands of participants that do not meet the prerequisites.

A Virtual Classroom solution may comprise multiple learning sessions. The length of a session shall not exceed 120 minutes. Two sessions may be delivered per day.

Tools

A synchronous e-Learning tool using the internet technology to provide real-time interaction between the instructor and a group of participants is used as platform for Virtual Classroom Training.

End-user computer requirements include internet connection, audio capabilities, and Virtual Classroom client software.

1.3.3 Instructor Led Classroom Training

Content and Scope

Classroom Training can be either face-to-face or virtual however face-to-face classroom training is an event provided by Nokia EDU qualified instructors carried out in a physical learning environment and fits well for initial and advanced competence development.

The Classroom Training standard offering is continuously visible through Nokia internet including training descriptions. The training description consists of name of the training, target group(s), objectives, nominal duration, prerequisites, modules, maximum amount of participants and a basic description of the learning environment. The training offering is continuously updated at the internet.

Classroom Training is provided in a suitably appointed room located in either a Nokia Training Center, mobile operator premises or training facility. Training equipment may be located within the same room or nearby test bed for practical sessions, or made remotely available through Remote Lab.

The results of the training session evaluation are stored in Nokia' Learning Management System.

Variations of Classroom Training

The **Classroom Training** can be tailored and customized to meet the needs of the specific requirements, strategy, goals and/or corporate identity of the customer. Tailoring means skipping or adding parts to an existing training, or merging parts from different existing training to a new one. It could as well mean extending or shortening (within pedagogical limits) the course duration. Customization means adding new content to a training.

The Classroom Training can also be provided in the form of a **seminar**. A seminar is an instructor-led face-to-face learning event provided by Nokia. The seminar is delivered in an instructive manner and is always knowledge focused. Skills are not taught in seminars. The target audience is varied and size of participation is governed by the room size. Venues are selected based on demand and target audience location.

A **Workshop** is an instructor-led face-to-face learning provided by Nokia to the participants. A workshop is delivered in an informal collaborative manner between the instructor and participants. The workshop is typically skill-oriented, delivered on a test bed in either a Nokia Training Centre or at the mobile operator premises. Workshops normally focus on specific tasks or skills. Workshops are an ideal environment for e.g. troubleshooting sessions.

Deliverables

The deliverables of Classroom Training include:

- Classroom Training event delivered by Nokia instructor
- Learning material
- Training confirmation of attendance

Prerequisites and Assumptions

Participants are enrolled according to the target group and prerequisites defined in the training descriptions available at the Nokia internet. Nokia shall not be obliged to take special care or to take special steps to meet the demands of participants that do not meet the prerequisites.

Unless otherwise agreed, the standard length of a training day is seven (7) hours, including a one-hour lunch break and appropriate morning/afternoon breaks.

1.3.4 On-The-Job Training

Content and Scope

On-the-Job Training (OJT) is practical and theoretical learning event that takes place at the customer's premises in an informal environment using operational equipment.

The participants can be trained on job tasks and task related tools within specified network technologies. The tasks and topics that the participants are trained on are selected based on the learning objectives set by the customer. The service is delivered in a workshop manner: observing and guiding daily activities, reviewing and proposing best practices in operations of the network, holding instructional sessions. Workplace manuals and learning documents are used to assist in learning.

On-the-Job Training represents the opportunity to enable experienced employees to learn in smaller groups faster and more efficiently when concentrating in specific learning needs. Furthermore this is an opportunity to ensure that employees actually apply learning in their daily work right away and target their learning to the relevant job tasks.

The needed learning scope is defined in an interview (face-to-face or phone) between a Nokia expert and a key person of the customer. Estimation of the existing competence level of the participants is provided by the customer. The training scope is based on the Nokia standard training portfolio. Furthermore, OJT scope definition details the learning environment and any limitations in respect to the learning, outlined by the Nokia expert and commonly agreed between him/her and the customer key person. It also outlines the duration per each participant group per OJT session.

The service includes an end report written by the instructor containing the achievements and problems of the delivery and recommendations for further learning areas for the group or individuals. Learning areas can be covered in training or further On-the-Job Training sessions. This way iterative competence development sessions, focusing on the employee's need, can be arranged without intensive pre-evaluation and assessment effort.

Statements of skills and knowledge levels or other grading of performance that would require the application of tests are not within scope of the On-the-Job Training. Assessment of competencies or licensing is not included in the On-the-Job Training service, but they can be purchased as separate services.

On-the-Job Training cannot be applied to content related to service interrupting tasks or procedures like certain topics in network element troubleshooting and any system administration. On-the-Job Training is strictly limited to competence transfer only; the instructor must not perform, support or take part in any operation and maintenance activities unless it can be justified as part of the learning process.

Deliverables

The deliverables of On-the-Job Training include:

- Learning scope definition agreed between Nokia expert and customer's key person.
- OJT delivery between the Nokia instructor and the participants.
- An end report written by the instructor containing the achievements, problems of the delivery and recommendations for further learning areas for the group or individuals.

Prerequisites and Assumptions

The On-the-Job Training can be delivered to maximum 4 participants at a time working on the same tasks, tools and network technologies with similar competence level.

The managers and supervisors of the participants must ensure that enough time is allocated to the instructional sessions. The participants' work time allocation should allow a dedication of 80% of their time to learning and maximum 20% of their time to their normal job duties.

The service is targeted for more experienced employees; therefore the participants are expected to have good understanding in at least two of the three following areas: tasks, tools or network technologies.

All participants, the Nokia instructor and the mobile operator's manager should attend the start of the OJT session for defining the final output of the service delivery.

A room conducive to discussions, review and appraisal should be available.

Tools

Full access to the environment used during the service delivery needs to be available at the beginning of the On-the-Job Training. This includes normally WAN/LAN connection to the network environment with PCs and all needed information like user accounts and passwords according to the training scope. Operational equipment required is described for each case separately on the scope definition of the On-the-Job Training.

1.3.5 New Techniques & Technologies

Nokia is continuously designing and developing new techniques & technology to be able to share more practical content with customer's target groups to increase the level of competence.

2. Courses

2.1 TSM 8000 Fundamentals| TOS00022W_V1.0

Course number	TOS00022W
Brief Description	This course describes the main TSM 8000 applications and its network architecture. It provides an overview of the user interface and explains the main operations that you can perform via this user interface. This course provides information about the TSM 8000 Network Manager through demos made in the TSM 8000 client application.
Target Group	
Objectives	
Prerequisite	
Contents	
Delivery Type	Web Based Training
Duration	00:50 hrs
Maximum Number of Students	n.a.
Course Type	THY - Theoretical course
Course Level	Standard

2.2 TSM 8000 Operations| 3FL30698AAAAZZZZA_v1.0

Course number	3FL30698AAAAZZZZA_ILT_1.0
Brief Description	TSM 8000 Operations| 3FL30698AAAAZZZZA_v1.0
Target Group	Maintenance technicians and alarm center personnel
Objectives	By the end of the course, participants will be able to perform common monitoring operations and tasks on the TSM-8000 system.
Prerequisite	To receive maximum benefit from this course, the student should be familiar with the network(s) being monitored and with MCS-11, TL-1 and SNMP protocols, and transmission equipment. Students must also have computer keyboard skills and a basic understanding of MS DOS and Windows operation systems and applications.
Contents	• Introduction to the TSM-8000 Server-Client product and system features • Local and remote access to the TSM-8000 Client product • TSM-8000 system views and functions • Interpretation of station alarms and indictors • Station trouble diagnosis &$149; System settings • Reports • Hands-on exercises
Delivery Type	Classroom
Duration	2 days
Maximum Number of Students	8
Course Type	PTB - Practical and theoretical course with testbed
Course Level	Advanced

2.3 TSM 8000 Administration| 3FL30699AAAAZZZZA_v1.0

Course number	3FL30699AAAAZZZZA_ILT_1.0
Brief Description	TSM 8000 Administration| 3FL30699AAAAZZZZA_v1.0
Target Group	System administration personnel
Objectives	By the end of the course, participants will be able to: • Configure a TSM-8000 system for mulitple protocols (MCS-11, TL-1 and SNMP) • Perform administrative tasks on a TSM-8000 system COURSE CONENT: • MCS-11 Alcatel Protocol Hardware Network • Configuration • SNMP hardware configuration and settings • TL-1 hardware configuration and settings • System (derived) alarms • Physical networks option menu • SNMP network management • Virtual network configuration • System settings
Prerequisite	To receive the maximum benefit from this course, the student should be familiar with the networks being monitored and with transmission equipment; be familiar with monitoring protocols (MCS-11, TL-1 & SNMP) and polling engines. Student should have keyboarding skills and a basic understanding of MS DOS operating systems and Windows applications. Students should have successfully completed the TSM-8000 Operator course (3FL30698).
Contents	
Delivery Type	Classroom
Duration	3 days
Maximum Number of Students	8
Course Type	PTB - Practical and theoretical course with testbed
Course Level	Advanced

2.4 9500MPR Rel. 8.0 Global Market Functional and HW description | TWT42035_V. 7.0

Course number	TWT42035_V. 7.0
Brief Description	In this training, a description of the hardware architecture and main features of the 9500MPR is provided. This course can be taken in addition to the 9500MPR common functionality O&M course.
Target Group	Sales, pre-sales, Designers and O&M technicians
Objectives	By the end of the course, participants will be able to: • Describe the functionality of the MSS-8, MSS-4, MSS-1 and MSS-O • Describe the functionality of each card of the MSS-8 and -4 • Describe the functionality of the MPT-HL and MPT-HLC (ANSI) • Describe the functionality of the ODUs • Describe the basic concepts of the 9500 MPR • Describe the functionality of the 9500 MPR
Prerequisite	General knowledge on digital radio systems and on PDH-SDH-ETHERNET technologies. Equipment: Traditional classroom setup, overhead projector with screen, whiteboard with markers.
Contents	Session 1: Hardware description • Microwave Service Switch • Control, access and radio cards • RF Radio Tranceivers Session 2: functional description • 9500 MPR Innovations and Overview • System Description • Network Architecture • Traffic Profiles • Traffic Management • Quality of Service (QoS) • Ethernet Ring Protection (ERP) • Packet Throughput Booster (Header Compression) • Cross-connections • Transmit Power Control (TPC) • Adaptive Modulation • AES Management Encryption, vice management • Cross-Polarized Interference Cancelation (XPIC) • Link Aggregation Group (LAG) • Protections • Mono-directional link • Automatic Link Discovery • MPT-x connectivity and relevant configurations • TMN Management
Delivery Type	Classroom
Duration	1 days
Maximum Number of Students	12

Course Type	THY - Theoretical course
Course Level	Standard

2.5 9500 MPR (Microwave Packet Radio) R8.0 Global Market Node (MSS-O/MSS-1/MSS-4/MSS-8) Common Functionality Operations and Maintenance| TWT42036_v7.0

Course number	TWT42036_V7.0
Brief Description	This is an O&M course based upon the 9500 MPR. It includes a description of the craft terminal GUI and how to use it to configure the 9500 MPR, perform system maintenance, performance monitoring, and troubleshooting.By the end of the course, participants will be able to: • Use the Craft Terminal for local configuration of the Node configuration (MPT-HL, MSS-8, MSS-4, MSS-1 and MSS-O) • Perform system maintenance • Perform troubleshooting starting from alarm indication
Target Group	O&M technicians.
Objectives	
Prerequisite	General knowledge of telecommunications transport networks (PDH or Ethernet), digital transmission and radio delivery. Experience in microwave links operation and maintenance, PC and Windows literate. It is highly recommended that the following course be completed prior to attending this class: - Basics of the Internet and Internet Protocols - 3FL99159AAAA Equipment: Traditional classroom setup, overhead projector with screen, whiteboard with markers, and login means to a working 9500 MPR R. 8.0 system.
Contents	• Common Functionalities ◦Common Functionalities Configuration ◦Common Functionalities Maintenance
Delivery Type	Classroom
Duration	2 days
Maximum Number of Students	8
Course Type	PTB - Practical and theoretical course with testbed
Course Level	Standard

2.6 9500 MPR (Microwave Packet Radio) R8.0 Global Market Ethernet Traffic-NETO CT Operations and Maintenance| TWT42037_v7.0

Course number	TWT42037_V7.0
Brief Description	This is a 9500 MPR O&M course that is focused on Ethernet traffic into and out of the 9500 MPR using the NETO CT.
Target Group	O&M technicians
Objectives	By the end of the course the students will be able to: • Provision Ethernet user ports • configure QoS and VLAN functions • generate Ethernet PM statistics • work with Ethernet-related alarms.
Prerequisite	• General knowledge about Telecommunication Networks. Working knowldege or digital transmission and Ethernet, networks. Experience in microwave links operation and maintenance. PC and Windows literate. Equipment: Traditional classroom setup, overhead projector with screen, whiteboard with markers, and login means to a working MPR 9500 R8.0 system (either ANSI or ETSI).
Contents	• Ethernet traffic configuration • Ethernet traffic management
Delivery Type	Classroom
Duration	2 days
Maximum Number of Students	8
Course Type	PTB - Practical and theoretical course with testbed
Course Level	Standard

3. Modes of Offerings

Public Offerings

Contact us for availability of seats in scheduled courses.

Private Offerings

For scheduling and delivery planning of exclusive courses please concede approx. 2 months to us.

4. Deliverables

Training Service -->	Classroom Training (CLT) Private Course at Nokia premises with Nokia test bed *)	Classroom Training (CLT) Private Course at Customer premises with Nokia test bed *)	Classroom Training (CLT) Private Course at Customer premises with Customer test bed *)	Classroom Training (CLT) Public Course at Nokia premises with Nokia test bed *)	Virtual Classroom (VCL) Private Course with Nokia test bed *)	Virtual Classroom (VCL) Public Course with Nokia test bed *)	Self-paced Learning WBT or eTest
Nokia Premises	Nokia service			Nokia service			
Customer Premises		**Customer deliverable**	**Customer deliverable**				
Nokia Test Bed *) only if required	Nokia service	Nokia service		Nokia service	Nokia service	Nokia service	
Customer Test Bed *) only if required			**Customer deliverable**				
Access to Learning Platform					Nokia service	Nokia service	Nokia service
Course Documentation	Nokia service	Nokia service	Nokia service	Nokia service	Nokia service	Nokia service	
Trainer Travel		Nokia service	Nokia service				

4.1 Training Documentation

For any Nokia training delivery the default training documentation is in electronic format, downloaded via URL (e-Documentation). Each participant will receive prior to the course event the invitation letter, which contains a download link, to save a copy of the e-Documentation and make a paper printout prior to the training event start, if paper usage is preferred. Downloading will be available 2 weeks before the course start date and 4 weeks after the course end date. The electronic documentation is provided in .pdf format and allows the participant to add / edit and save notes within the course material. Nokia will timely approach the Buyer training contact, to provide participant names and e-mail addresses so the invitation and download links can be provided. It is required that the participant bring their laptop along to the training event. In case

training documentation is not designed for electronic usage, defined by the course learning objectives, the default is paper.

4.2 Course Evaluation

For any Nokia training delivery the default for course quality evaluation is electronic format (e-Evaluation). An evaluation mail with an encrypted link to the web based evaluation sheet will be send to the participant 6 hours prior to the event end, but not before the event start. On the final day of the course, time will be set aside to complete the evaluation. It is therefore required that the participants bring their laptop to the training event to complete the electronic evaluation on the last day of the course. Up to two reminder mails will be sent to the participant in case they were not able to complete the e-Evaluation.

4.3 Certificate of Participation

For any Nokia training delivery the default is Certificate of Participation in electronic format (eCoP). The eCoP can be downloaded, saved and printed, on completion of the e-Evaluation (refer to Course Evaluation). It is not mandatory for the participant to provide feedback on the e-Evaluation, however the e-Evaluation needs to be opened and either completed or left blank, then submitted to activate the eCoP download link. The Electronic Certificate of Participation will appear in a separate window available to be saved and stored and/or printed.

5. Prices

For prices refer to attachment – "Nokia Customer Training Services Prices".

6. SPECIAL TERMS OF CUSTOMER TRAINING SERVICES

6.1 Definitions

- "Customer" means purchaser or buyer.
- "Delivery" means a training that is delivered by Nokia as a self-study through electronic means, as a workshop, as a seminar or as any other training product provided by Nokia.
- "Nokia" means collectively all affiliates which are part of the Nokia Group.
- "Order" means the purchase order placed by the Customer with Nokia.
- "Private Delivery" is a training service which is customized for one single Customer request.
- "Public Seat" is a training service open for all of Nokia Customers and for which the Customer has licensed a seat.
- "Training" means classroom training services, virtual classroom services and E-learning described in the Order.
- "Training Proposal" means the document issued by Nokia detailing the Training services to be provided.
- "Training Venue" means the address at which the Training is to be provided by Nokia as set out in the Training Proposal.
- Participant is a person of the customer's organization who has been enrolled on the training.

6.2 Pre-requisites for Training Services

- In order for Nokia to ensure that Training Services can be delivered the following information needs to be provided training name, training description, dates, location, preferred Training Venue, duration, and number of participants. Nokia requests 5 (five) calendar days' notice to produce a training a proposal. The proposal and these terms and conditions and a valid accepted purchase order – shall form the binding contract.
- Any training schedule proposed has a validity period of 14 calendar days. If no acceptance is received by Nokia, Nokia reserves the right to use scheduled resources otherwise and without further notice.
- Any variation to these terms and conditions shall be valid only if expressly agreed to in writing by Nokia.
- Training is provided for Nokia Customers, their authorized employees.
- Nokia reserves the right to request proof of identify of a Participant before the Training Services are being delivered not identified participants will be excluded from the training.

6.3 Information and Equipment

- Ownership of all copyright and other intellectual property rights of course materials provided during the training, including but not limited to documentation, data, technical information, know-how specifications, drawings, and designs, where in written , oral or electronic format (hereafter "Information") shall be the exclusive property of Nokia and shall be treated as confidential information by the Customer.
- Nokia grants Customer a non-exclusive, non-transferable, non-assignable limited license to use, internally, a single copy of the Nokia course material for the sole benefit of each eligible participant registered for the applicable Training, e-learning or virtual classroom training.
- All material and Information provided by Nokia to participants during the Training cannot be re-used to provide or assist in the delivery of, a similar Training to any Customer personnel or Customer third party.
- The fees for the Training Services shall be set out in the purchase order. All invoices shall be payable within 30 (thirty) days of the date of the applicable invoice. Nokia shall be entitled to invoice the Customer upon completion of the Training.
- Nokia invoice shall quote the number of the agreement or order – on the provision that the Customer has provided a specific reference.
- All prices are expressed exclusive of value added tax and Customer shall pay the applicable VAT in addition to the price.
- Prices are subject to change at the discretion of Nokia and in all cases, are strictly confidential.

6.4 Training Venue

- The Training shall be performed at the Training Venue on the date agreed and specified in the applicable purchase order.
- If the Training Venue is Customer premises, the Customer shall be responsible for providing an appropriate environment, necessary equipment and connectivity to deploy the Training, and copies of the materials to the participants. In addition, the Customer shall be responsible for identifying a contact person with whom Nokia will coordinate any applicable logistics.
- The Customer is responsible for providing the list of participants to Nokia no later than 14 (fourteen) days prior to the Training start date.
- Nokia will provide the participant with course material in electronic format (e-doc) prior to the Training service in order for the material to be downloaded by the participant and printed if required paper format documentation may be provided, upon request, with an additional cost to the Customer.

6.5 Cancellation

Cancellation timeframes	Implications on cancellation
21 - 28 Calendar days	If the Customer cancels or reschedules the Training 21-28 calendar days prior to Training start day, 50% of the course fee plus non-reimbursable travel costs will be charged to Customer. If Nokia cancels a Training during this time, an alternative Training delivery date will be provided in accordance to a date agreed with the Customer.
0 - 20 calendar days	If the Customer cancels the Training 0 -20 calendar days prior to Training start day, 100% of the course fee plus non-reimbursable travel costs will be charged to Customer. If Nokia cancels the Training during this time, an alternative Training delivery date will be provided in accordance to a date agreed with the Customer.

- Nokia is not liable for any delay or non-performance caused by any event of force majeure.
- Cancellation of self-study bookings (not applicable for e-learning) is only possible upon agreement between the participant and Nokia.

6.6 Limitation of Liability

- Nokia's liability for any direct losses, damages, costs and expenses, including legal fees, awarded against or incurred or paid by the Customer Nokia as a result of Nokia' breach of this Agreement shall be limited to the total amount paid by the Customer for the Training.
- Notwithstanding any other provision of these conditions, neither party shall be liable to the other for any indirect or consequential loss or damage (including but not limited to loss of use, loss of revenue, loss of anticipated savings or loss of profit) howsoever arising under or in connection with these conditions, except for Customer's breach of the license or confidentiality.

6.7 Disputes

- Any dispute or claim must be registered with Nokia within 7 days of completion of the relevant Training, otherwise the Customer shall be deemed to have waived such claim.

6.8 Nokia obligations

- Nokia agrees to provide a quality training experience to Customer. This includes: an instructor qualified to conduct the course(s) as well as all necessary training materials sufficient for the number of registered participants on the scheduled dates.
- The Customer will assure that the participants have completed the necessary pre-requisites otherwise Nokia cannot be held liable for delivery quality.
- Every Training will be evaluated upon completion with a training evaluation, conducted online evaluation only; the participant is requested to complete the online evaluation during the last day of the course.

- The online evaluations submitted by Customer participants on the training delivery will be considered a key indicator of the Training quality.
- Whenever a Training event is evaluated by Customer as of inadequate quality, Nokia will investigate the incident and determine the underlying root causes. This investigation will take into account the input of the Customer participants as well as the instructor. Nokia will share the result of the investigation with the Customer.
- In case of inadequate quality, corrective actions will be decided upon by Nokia. Corrective actions could include among others (i) repetition of the same Training for the same group of Customer participants without any additional fees chargeable to customer except for travel and accommodation expenses, (ii) refund of the training fees, partially or totally, except for travel and accommodation expenses.
- Each participant of a Training Course is required to attend for at least 80% of the Training duration in order to be considered 'Successful'. If a participant does not attend 80% of the training the Trainer will have the option not to mark the participant 'Successful' and therefore the said participant will not be able to download their Recognition of Participation and their Training History will not be updated as having completed the Training.

7. SPECIAL TERMS OF SUPPLY AND / OR SERVICES

7.1 ARTICLE 1 - PURPOSE & APPLICABILITY.

- These special terms and conditions of supply (hereinafter "Special Terms") set forth the terms and conditions according to which NOKIA SOLUTIONS AND NETWORKS OY, Karaportti 3, 02160 Espoo business identity code 2058430-6 including its Affiliates (hereinafter "Nokia") may sell to a purchaser (hereinafter "Purchaser") network infrastructure equipment (hereinafter "Products") for use in the country of the Purchaser (hereinafter "Territory") and provides installation, commissioning and / or technical assistance services ("Care") or any combination of these services in conjunction with the sale of Products available hereunder (hereinafter "Services").
- These Special Terms form a part of each purchase order issued by the Purchaser and accepted in writing by Nokia (hereinafter "Agreement"). Special Terms shall always supersede any conflicting terms of any purchase orders and may be supplemented or amended only by a written agreement between Nokia and the Purchaser.

7.2 ARTICLE 2 - SPECIFICATIONS, ORDERING AND DELIVERY PERIOD

- Technical specifications of the Products are set forth in purchase order, signed by Nokia, or order confirmation, if any. In absence of any specific requirement, Products shall adhere to requirements and specifications generally applicable to Nokia similar products. Nokia may make modifications to Products or provide new versions or models of individual Products.
- Each purchase order from the Purchaser shall become binding upon written confirmation by Nokia. Nokia will confirm delivery time upon request on a case by case basis. Purchaser may change purchase orders only upon prior written approval of Nokia.

7.3 ARTICLE 3 - QUANTITIES, PRICING AND PAYMENT

- Purchaser shall make advance payment 50% prior to shipment and /or Services rendering by Nokia and remaining full payment separately for Products upon delivery and for Services upon performance and monthly for Care. All prices are expressed and all payments shall be effected in Euros (EUR).
- All prices are expressed exclusive of any stamp duty, goods tax and Services tax and any value added, turnover or equivalent taxes levied on account of sales in or upon importation into the Territory where they will be used. Such taxes to be invoiced in addition to the price, if applicable.
- Payments shall be made to the bank account of Nokia specified in the invoice. All invoices shall be payable not later than within 30 days from the date of invoice. In event of any delay in payments, the Purchaser shall pay interest on the amount delayed at the rate of Euribor (3 months) + 5 (five)% per annum for each day from due date to date

of actual payment, on the basis of a 360- day year. Any partial payments shall first cover accrued interest, if any.

7.4 ARTICLE 4 - TERMS OF DELIVERY, RISK AND TITLE, TIME SCHEDULE

- All deliveries of Products by Nokia shall be effected Free Carrier (FCA) at a location defined by Nokia (INCOTERMS 2010), where risk transfers to the Purchaser. Title in Product passes to the Purchaser upon full payment.
- In the event of delay in delivery of Products or Services (apart from Care) for reasons solely attributable to Nokia, the Purchaser, upon full calendar week expiration, shall have the right to claim liquidated damages for delay at the rate of 0.1 % of the price of the delayed Products or delayed Services per each full calendar week of delay, up to an aggregate maximum of 5 % of such price. KPI, penalty for Care shall be defined in Purchase Order with an aggregate maximum penalty cap of 5 % of Care price per quarter. The Parties agree that such liquidated damages do not constitute a penalty and are a reasonable and good faith pre-assessment of the damage that might be suffered by the Purchaser on account of delays in the delivery of Products and represent the sole remedy. No other compensation is applicable on account of delays. The Purchaser has no right to offset any charges to Supplier against other invoices.

7.5 ARTICLE 5 - TESTING AND INSPECTION, WARRANTY

- Purchaser shall inspect the Products (or Services, as applicable) within ten (10) days of delivery (or completion) and promptly inform Nokia of any discrepancies. At the end of such period Products and / or Services are deemed to be accepted by Purchaser.
- Nokia warrants that Products (excluding software) will be new, unused (except for testing) when delivered and, subject to the provisions of this, will be free from defects in materials and workmanship and will function substantially in accordance with applicable technical specification during the warranty period of 12 months from the date of delivery.
- Nokia undertakes to remedy errors and malfunctions discovered in Nokia Software" during a period of ninety (90) days from the date of delivery. Absence of errors in Nokia Software is not warranted. Nokia Software does not include and this article does not apply to software in respect of equipment that Nokia purchases from third parties and delivers to Purchaser in connection with or as part of the delivery of Products.
- No warranty for Services provided.
- Warranties are expressly in lieu of all other conditions and warranties (including without limitation any implied, statutory warranties, etc.).
- Nokia may at any time and at own discretion decide to ramp down the production of Products, extensions, spare parts, replacement parts, or cease their repair services or cease any Services offering.

7.6 ARTICLE 6 - FORCE MAJEURE

- Neither Party shall be liable to the other for any delay or non-performance caused by any event beyond the reasonable control of the affected Party (Force Majeure), including but not limited to war, riot, action and inaction of government, sanctions, embargo, trade (including export) restrictions, strike, or any other labor dispute, fire, accident, transport damage, any severe restrictions on transport, general shortages of components, natural disasters, etc. Each Party shall promptly inform in writing the other Party of any event of Force Majeure, its expected duration and cessation.

7.7 ARTICLE 7 - LIABILITY

- Notwithstanding anything to the contrary set forth in these Special Terms, Nokia's total liability under this Agreement shall be limited to 10 (ten) 10% of the value of payments made by the Purchaser within previous 12-month period.
- Notwithstanding any other provision of the Agreement or these Special Terms, Nokia shall not under any circumstances be liable for any special, indirect, consequential or incidental damages or lost profits, lost opportunities, lost revenues or damages or loss of use howsoever arising under or in connection with the Agreement and these Special Terms and Nokia liability for breach of warranty or otherwise hereunder shall be strictly limited to, in Nokia discretion, repair or replacement of the non-conforming Products (or parts) or the repayment of amounts theretofore paid with respect thereto.

7.8 ARTICLE 8 - GOVERNMENT REGULATIONS. TRANSFER

- Each Party agrees not to export or re-export any Products to any country without obtaining any licenses and permits that may be required under any applicable legislation. No Product and/or Nokia Software should be sold or transferred to third parties by Purchaser unless explicitly agreed by Nokia. In the event that new or increased duties or indirect taxes are levied by the government of the Territory on the importation, sale or use of the Products or on the performance of any Services, then such duties or taxes shall be to the account of the Purchaser. Purchaser shall obtain all governmental consents, permits, approvals and licenses necessary for the timely delivery of Product and rendering of Services.

7.9 ARTICLE 9 - ANTI-CORRUPTION

- Each Party shall comply with requirements of anti-corruption laws and shall not take any action that may violate these requirements. Parties do not pay, do not offer to pay or allow the payment of any monetary assets or valuables, directly or indirectly, to any person for influencing the actions or decisions of those persons in order to obtain any improper advantage or to implement other illegal purposes; do not carry out actions that are qualified by the law applicable for the purpose of this Agreement as giving/receiving of bribes or commercial bribery of any individual persons or entities, including, but not limited to, commercial organizations and their representatives, government and public authorities, state and municipal officials. By entering into this Agreement, Purchaser commits to comply with the requirements of Nokia Code of Conduct, which is publicly

available at http://company.nokia.com/en/about-us/corporate-governance/nokia-code-of-conduct.

7.10 ARTICLE 10 - CONFIDENTIALITY

- Each Party ("Receiving Party" hereto) shall not disclose to third parties nor use for any purpose other than for the proper fulfillment of the purpose of the Agreement any technical or commercial information ("Information") received from the other Party ("Disclosing Party") in whatever form under or in connection with any Agreement without the prior written permission of the Disclosing Party. Each Party shall limit access to Information to those of its personnel for whom such access is reasonably necessary for the proper performance of contract work. The provisions of this article bind the Parties for 5 (five) years period from the Agreement signing date regardless of any termination or cancellation.

7.11 ARTICLE 11 - INTELLECTUAL PROPERTY RIGHTS

- Ownership of the copyright in all drawings, specifications, manuals, documents, data, and software provided by one Party hereto to the other under or in connection with any Agreement shall remain with the Party first referred to above but the receiving Party shall be deemed to have a non-exclusive royalty-free right to use (without prejudice to the software fees specified in the Agreement or in Nokia' tender) such copyright for the performance of its obligations under the Agreement as well as for the operation and maintenance of the Products in the Territory. Such license shall not include any right to grant sublicenses. Unauthorized copying shall be strictly prohibited. The Purchaser will not copy, translate, modify, adapt, decompile, disassemble, etc. or reverse engineer the Nokia Software.
- Subject to the conditions and limitations set forth in Nokia standard terms, each Party undertakes to indemnify the other Party for any cost, loss or damage finally awarded by a competent court in the applicable jurisdiction arising out of infringement of patents, copyrights or registered designs. Combination claims for IPR breach when Products are used with 3rd parties products are excluded.

7.12 ARTICLE 12 - SOFTWARE LICENSE TERMS

- Nokia Software means software developed or acquired by Nokia and delivered via e-channels to the Purchaser of Products. Nokia Software does not include and these Software License Terms do not apply to software in respect of equipment that Nokia purchases from third parties and delivers to the Purchaser in connection with or as part of the delivery of Nokia Products.
- Purchaser is hereby granted a non- transferable and non-exclusive license to use Nokia Software exclusively on the Nokia Products for which Nokia Software is supplied, and only in its own internal business operations, always pursuant to standard Nokia Software license terms. The license does not extend any rights to the Purchaser in respect of the source code of the Nokia Software and is without prejudice to any license fees provided for in the Agreement. The Software license is a time-limited, valid for one (1) year period. Purchaser may not use Nokia Software or any by Nokia supplied third party software with freely available software of any kind. The Purchaser will not rent the Nokia Software or make it available on a time-sharing basis. The Purchaser will reproduce all confidentiality and proprietary notices on each of these copies.

- Title to the Nokia Software and all patents, copyrights, design rights, trade secrets and other proprietary rights in or related to the Nokia Software are and will remain the exclusive property of Nokia and its licensors, whether or not specifically recognized or perfected under the laws of the country where the Nokia Software is located. Nokia (and its licensors) will own all rights in any copy, translation, modification, adaptation or derivation of the Nokia Software, including any improvement or development thereof.

7.13 ARTICLE 13 - ENVIRONMENT, HEALTH AND SAFETY

- Purchaser assumes full responsibility (including financial) for health and safety of its network operations, including proper removal, recycling, etc. of its network equipment/utilities at the equipment's end of life according to environmental principles in local legislation.

7.14 ARTICLE 14 - MISCELLANEOUS

- In event that a Party is in default of a material obligation and fails to remedy within 60 days from a written notice from non-defaulting Party, the latter is entitled to terminate the Agreement at expiration of subsequent 60 days. In event of bankruptcy / comparable procedure or in case the default is not capable of being remedied, the non-defaulting Party may terminate the Agreement forthwith. Termination shall apply to such part of the Agreement as remains unperformed. Any termination of any Agreement (howsoever occasioned) shall be without prejudice to any other rights or remedies a party may be entitled to hereunder and shall not affect any accrued rights or liabilities of either Party.
- Unless otherwise stated in the Agreement, Nokia shall perform its obligations hereunder in accordance with its standard terms. The provisions of regulative nature (transfer, end of life, governing law, court, confidentiality, etc.) survive termination or expiration of the Agreement.
- All Agreements shall be governed by the laws of Finland. Any and all disputes, controversies or claims that may arise between the Parties under or in connection with any Agreement shall be finally settled by arbitration in accordance with the Arbitration Rules of the Finish Central Chamber of Commerce in the English language. The place of arbitration shall be Helsinki, Finland. UN Convention on Contracts for the International Sale of Goods is not applicable to the relations of the Parties under the Agreement.
- No failure or delay of either Party in exercising it rights hereunder shall be deemed to be a waiver of such rights unless expressly made in writing by the Party waiving its rights. If any provision in these terms shall be found or held to be void, the validity of the remaining provisions shall not be affected thereby.
- Neither Party shall assign or transfer to any third party, without the prior written consent of the other Party, any Agreement or any of its share or interest therein. Notwithstanding the foregoing, Nokia may without the prior written consent of the other Party, unconditionally assign or novate all of its rights and obligations under this Agreement, in whole or in part.
- The relationship between Nokia and the Purchaser during the term hereof shall be solely that of vendor and vendee.

- If, in Nokia's reasonable opinion, security or safety of personnel or the safe execution of Services is, or is apt to be, imperiled by security concerns, local conditions, terroristic acts or threats, Nokia may remove some or all of its personnel from the site and/or suspend performances of all or any part of its Services and/or evacuate its personnel. In the event of an evacuation, Buyer shall assist in said evacuation. Any of the foregoing shall be considered to be a force majeure event

5.28 APPENDIX 7 – BLOCK DIAGRAMS

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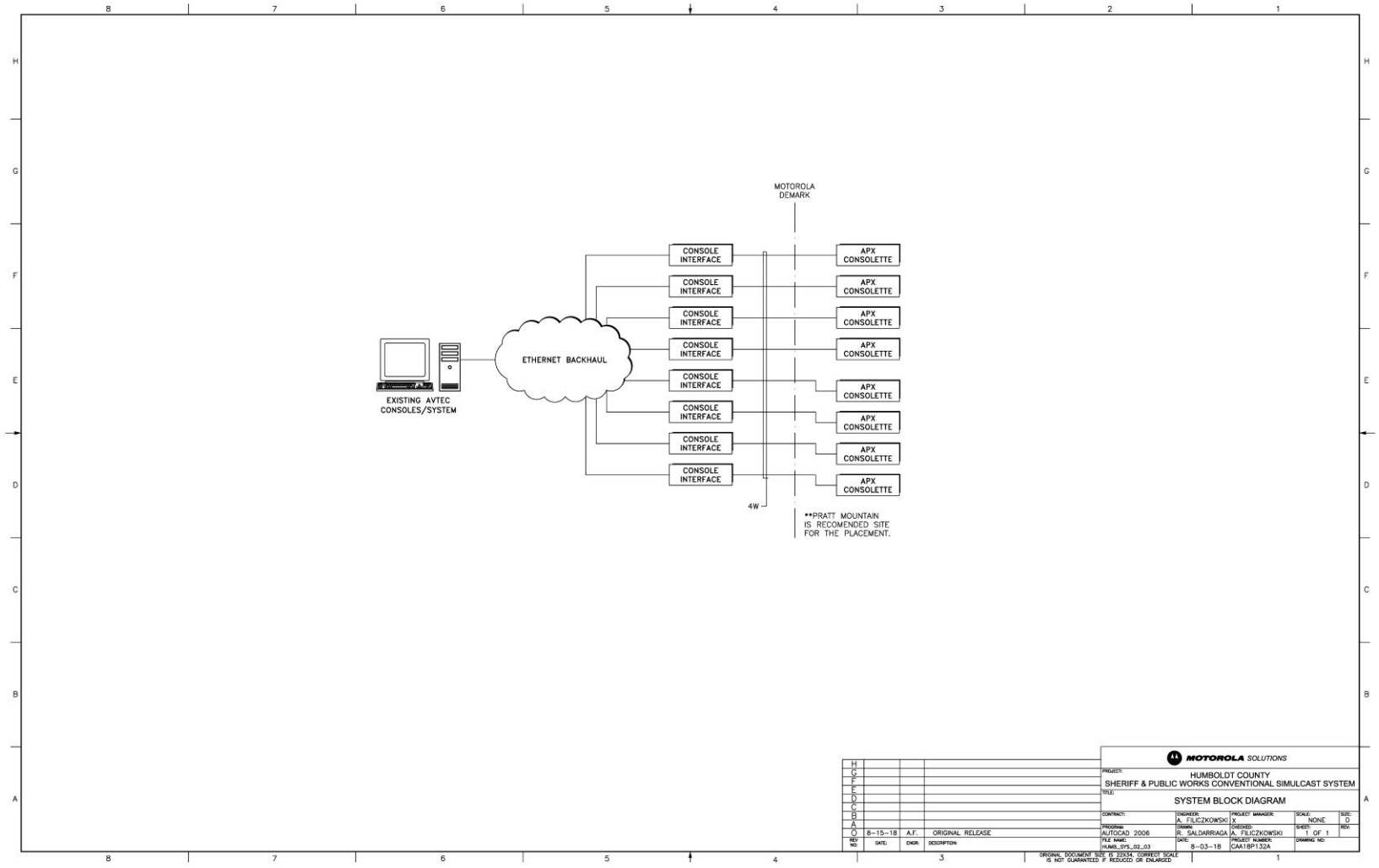
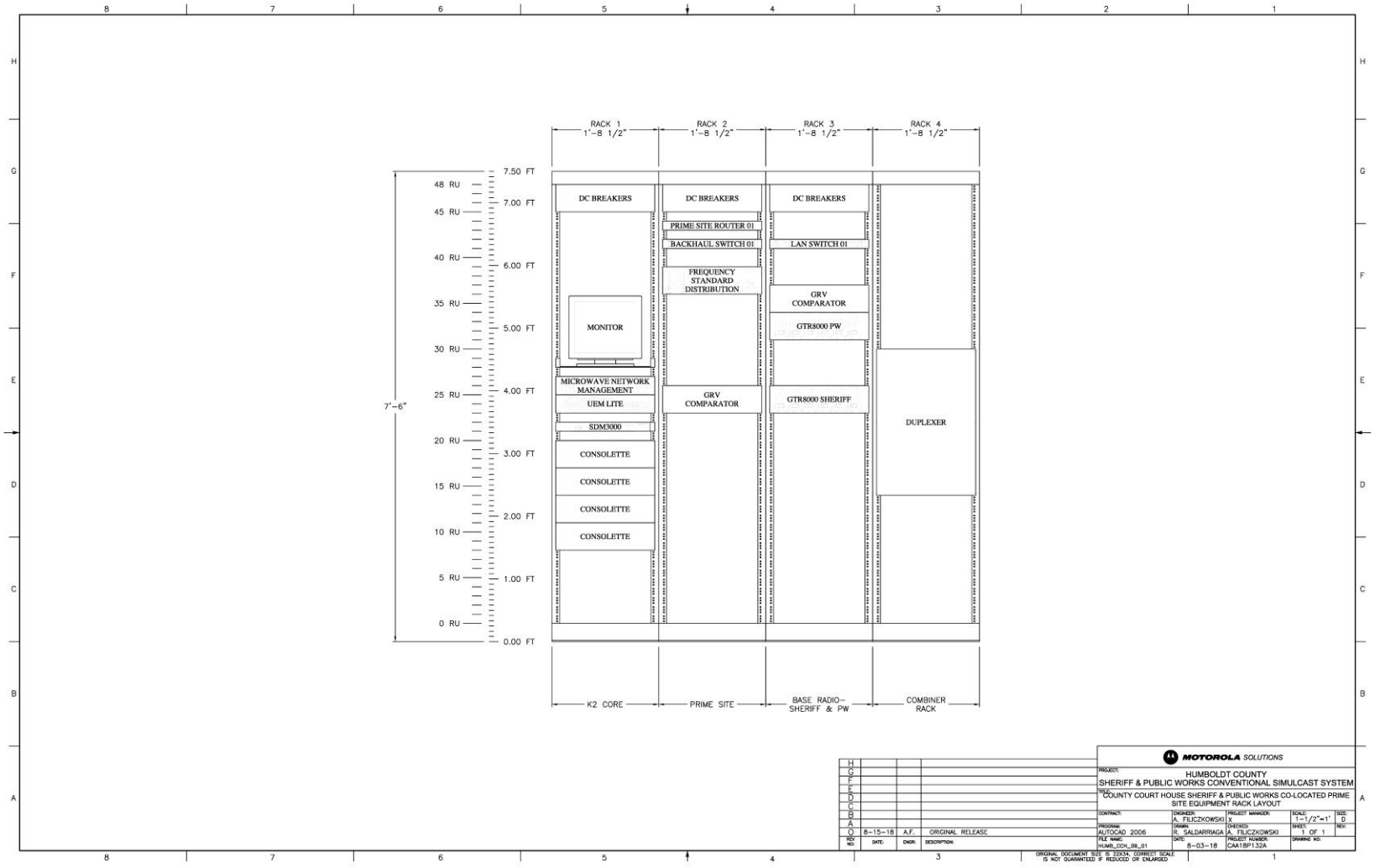
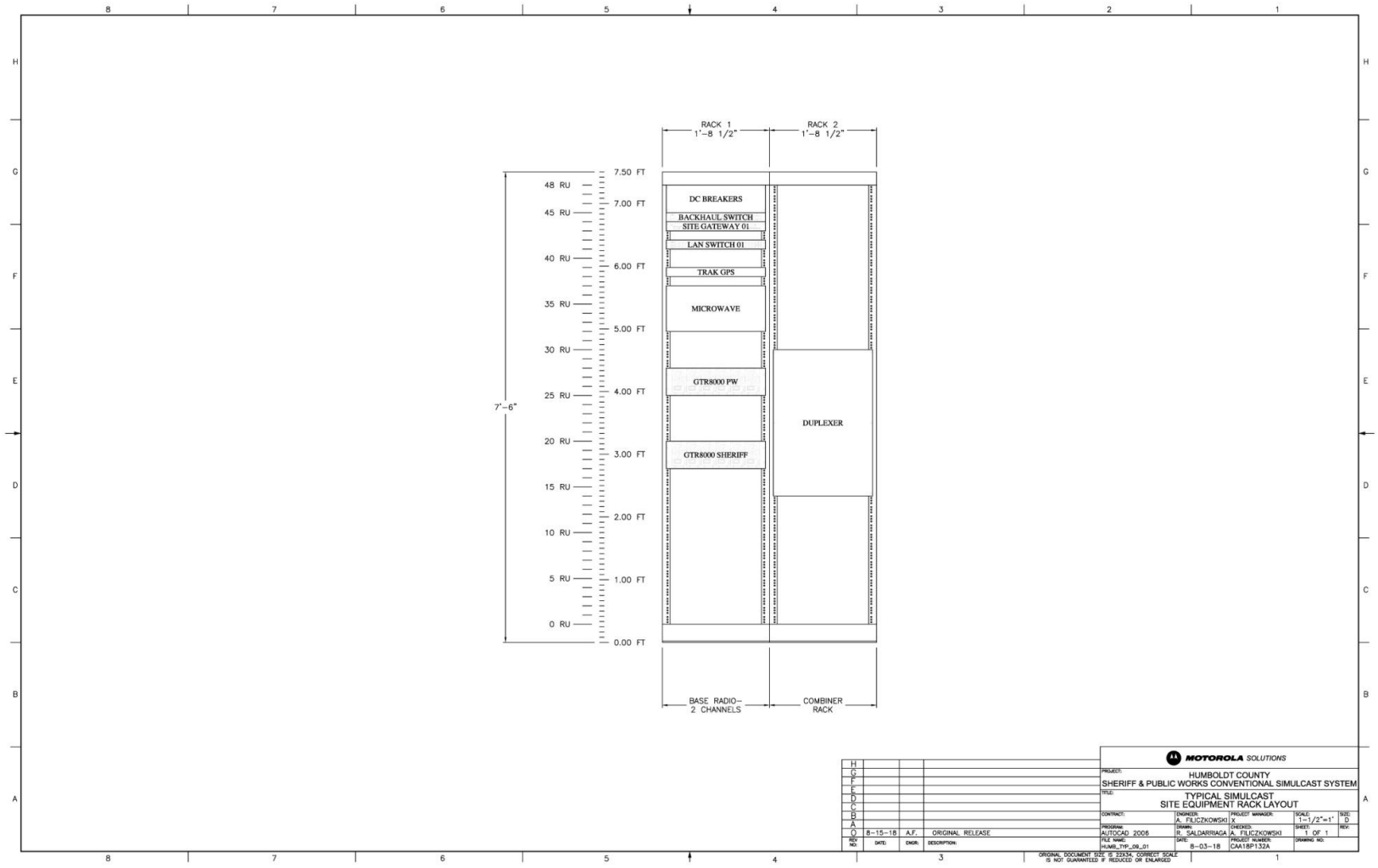

MOTOROLA DEMARK
CONSOLE INTERFACE
APX CONSOLETTE
ETHERNET BACKHAUL
EXISTING AVTEC CONSOLES/SYSTEM
4W
**PRATT MOUNTAIN IS RECOMENDED SITE FOR THE PLACEMENT.
MOTOROLA SOLUTIONS
HUMBOLDT COUNTY
SHERIFF & PUBLIC WORKS CONVENTIONAL SIMULCAST SYSTEM
SYSTEM BLOCK DIAGRAM
8-15-18 A.F. ORIGINAL RELEASE


RACK 1
1'-8 1/2"
RACK 2
1'-8 1/2"
RACK 3
1'-8 1/2"
RACK 4
1'-8 1/2"
48 RU
45 RU
40 RU
35 RU
30 RU
25 RU
20 RU
15 RU
10 RU
5 RU
0 RU
7'-6"
7.50 FT
7.00 FT
6.00 FT
5.00 FT
4.00 FT
3.00 FT
2.00 FT
1.00 FT
0.00 FT
DC BREAKERS
DC BREAKERS
DC BREAKERS
PRIME SITE ROUTER 01
BACKHAUL SWITCH 01
LAN SWITCH 01
FREQUENCY STANDARD DISTRIBUTION
GRV COMPARATOR
MONITOR
GTR8000 PW
MICROWAVE NETWORK MANAGEMENT
UEM LITE
GRV COMPARATOR
GTR8000 SHERIFF
DUPLEXER
SDM3000
CONSOLETTE
CONSOLETTE
CONSOLETTE
CONSOLETTE
K2 CORE
PRIME SITE
BASE RADIO-- SHERIFF & PW
COMBINER RACK
MOTOROLA SOLUTIONS
HUMBOLDT COUNTY
SHERIFF & PUBLIC WORKS CONVENTIONAL SIMULCAST SYSTEM
COUNTY COURT HOUSE SHERIFF & PUBLIC WORKS CO-LOCATED PRIME SITE EQUIPMENT RACK LAYOUT
A.F.
ORIGINAL RELEASE
AUTOCAD 2006
A. FILICZKOWSKI
R. SALDARRIAGA
A. FILICZKOWSKI
1 OF 1
8-03-18
CAA18P132A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RACK 2
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7'-6"
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30 RU
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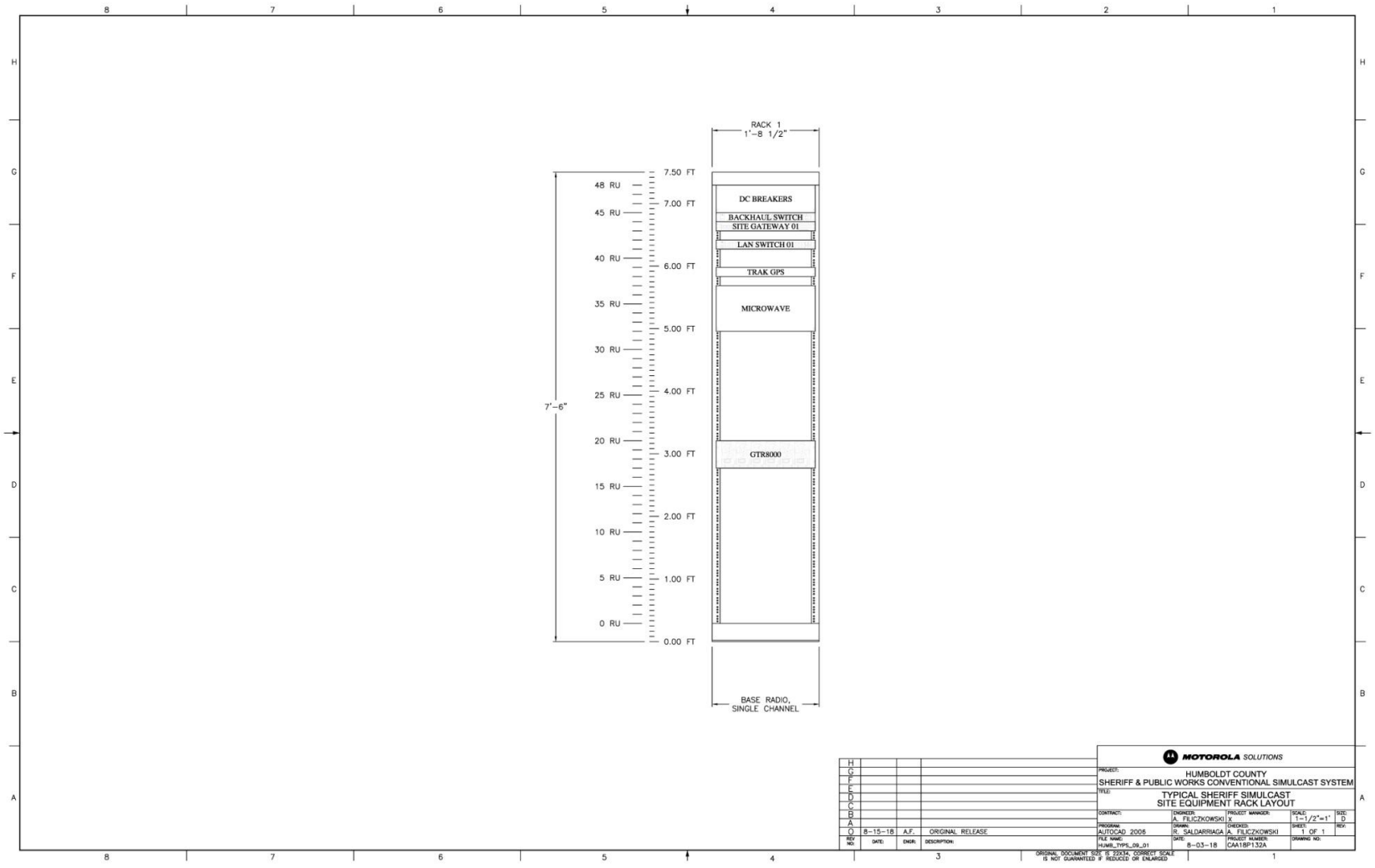
20 RU
15 RU
10 RU
5 RU
0 RU
7.50 FT
7.00 FT
6.00 FT
5.00 FT
4.00 FT
3.00 FT
2.00 FT
1.00 FT
0.00 FT
DC BREAKERS
BACKHAUL SWITCH
SITE GATEWAY 01
LAN SWITCH 01
TRAK GPS
MICROWAVE
GTR8000 PW
GTR8000 SHERIFF
DUPLEXER
BASE RADIO-
2 CHANNELS
COMBINER
RACK
MOTOROLA SOLUTIONS
PROJECT:
HUMBOLDT COUNTY
SHERIFF & PUBLIC WORKS CONVENTIONAL SIMULCAST SYSTEM
TITLE:
TYPICAL SIMULCAST
SITE EQUIPMENT RACK LAYOUT
CONTRACT:
ENGINEER: A. FILICZKOWSKI
PROJECT MANAGER: X
SCALE: 1-1/2"=1'
SIZE: D
PROGRAM: AUTOCAD 2006
DRAWN: R. SALDARRIAGA
CHECKED: A. FILICZKOWSKI
SHEET: 1 OF 1
REV:
FILE NAME: HUMB_TYP_09_01
DATE: 8-03-18
PROJECT NUMBER: CAA18P132A
DRAWING NO:
REV NO: 0
DATE: 8-15-18
DWGR: A.F.
DESCRIPTION: ORIGINAL RELEASE
ORIGINAL DOCUMENT SIZE IS 22X34, CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED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45 RU
40 RU
35 RU
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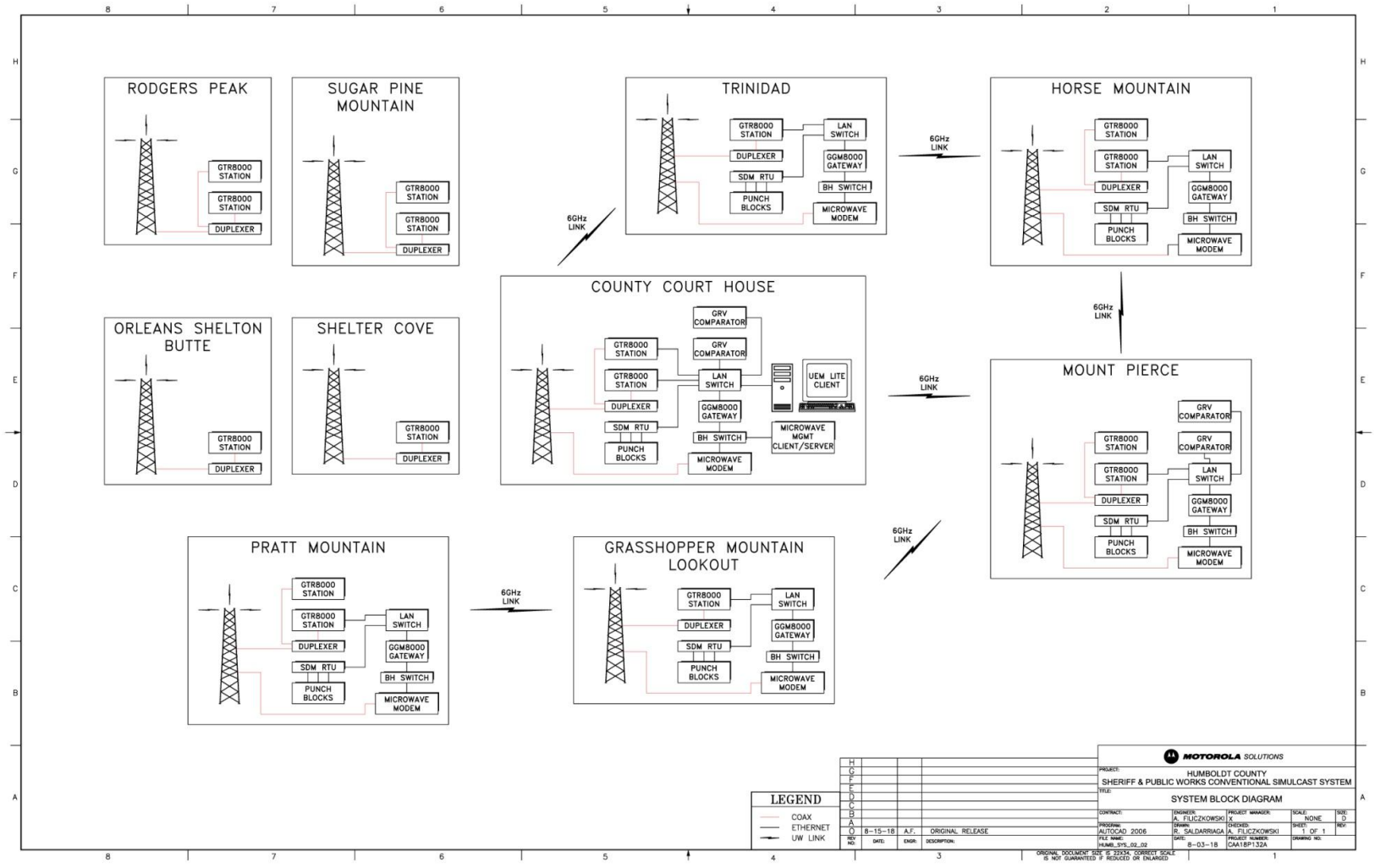
25 RU
20 RU
15 RU
10 RU
5 RU
0 RU
7'-6"
7.50 FT
7.00 FT
6.00 FT
5.00 FT
4.00 FT
3.00 FT
2.00 FT
1.00 FT
0.00 FT
DC BREAKERS
BACKHAUL SWITCH
SITE GATEWAY 01
LAN SWITCH 01
TRAK GPS
MICROWAVE
GTR8000
BASE RADIO,
SINGLE CHANNEL
MOTOROLA SOLUTIONS
HUMBOLDT COUNTY
SHERIFF & PUBLIC WORKS CONVENTIONAL SIMULCAST SYSTEM
TYPICAL SHERIFF SIMULCAST
SITE EQUIPMENT RACK LAYOUT
A. FILICZKOWSKI
R. SALDARRIAGA
A. FILICZKOWSKI
AUTOCAD 2006
HUMBL_TYP5_09_01
8-03-18
CAA18P132A
1-1/2"=1'
1 OF 1
8-15-18 A.F. ORGINAL RELEASE
ORIGINAL DOCUMENT SIZE IS 22X34. CORRECT SCALE IS NOT GUARANTEED IF REDUCED OR ENLARGED


RODGERS PEAK
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GTR8000 STATION
DUPLEXER
SUGAR PINE MOUNTAIN
GTR8000 STATION
GTR8000 STATION
DUPLEXER
TRINIDAD
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
6GHz LINK
HORSE MOUNTAIN
GTR8000 STATION
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
6GHz LINK
ORLEANS SHELTON BUTTE
GTR8000 STATION
DUPLEXER
SHELTER COVE
GTR8000 STATION
DUPLEXER
COUNTY COURT HOUSE
GRV COMPARATOR
GRV COMPARATOR
GTR8000 STATION
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
UEM LITE CLIENT
MICROWAVE MGMT CLIENT/SERVER
6GHz LINK
MOUNT PIERCE
GRV COMPARATOR
GRV COMPARATOR
GTR8000 STATION
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
6GHz LINK
PRATT MOUNTAIN
GTR8000 STATION
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
6GHz LINK
GRASSHOPPER MOUNTAIN LOOKOUT
GTR8000 STATION
LAN SWITCH
DUPLEXER
GGM8000 GATEWAY
SDM RTU
BH SWITCH
PUNCH BLOCKS
MICROWAVE MODEM
LEGEND
COAX
ETHERNET
UW LINK
MOTOROLA SOLUTIONS
HUMBOLDT COUNTY
SHERIFF & PUBLIC WORKS CONVENTIONAL SIMULCAST SYSTEM
SYSTEM BLOCK DIAGRAM
A 8-15-18 A.F. ORIGINAL RELEASE
A. FILICZKOWSKI
R. SALDARRIAGA
A. FILICZKOWSKI
8-03-18
CAA18P132A
1 OF 1

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5.29 APPENDIX 8 – DETAILED EQUIPMENT LIST

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
County Courthouse	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
County Courthouse	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
County Courthouse	NETWORK	1	CA01619AA	ADD: DC POWER
County Courthouse	NFM	1	SQM01SUM0286	ASTRO STANDALONE FAULT MANAGEMENT
County Courthouse	NFM	1	CA03179AA	ADD: NEW 7.17 STANDALONE FAULT MANAGEMENT
County Courthouse	NFM	1	CA02258AB	ADD: APPLICATION SERVER
County Courthouse	NFM	1	UA00247AA	ADD: UEM LITE SESSION
County Courthouse	NFM	1	UA00256AA	ADD: UEM LITE EMAIL NOTIFICATION
County Courthouse	NFM	1	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET
County Courthouse	NFM	1	T8407	ASTRO LITE CLIENT APPL SW 7.17
County Courthouse	NFM	1	CA02193AA	ADD: ANTI-MALWARE DEF UPDATE LIC
County Courthouse	NFM	1	T7885	MCAFEE WINDOWS AV CLIENT
County Courthouse	NFM	1	DSTG191B	TECH GLOBAL EVOLUTION SERIES 19INCH NON TOUCH
SDM3000s	MOSCAD	6	F4544	SITE MANAGER ADVANCED
SDM3000s	MOSCAD	6	VA00905	ADD:24/48 VDC PS TO SM
SDM3000s	MOSCAD	6	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL
SDM3000s	MOSCAD	18	V592	AAD TERM BLCK & CONN WI
County Courthouse	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
County Courthouse	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
County Courthouse	GPS	50	L1700	FSJ1-50A CABLE: 1/4
County Courthouse	GPS	4	DDN9769	F1PNM-HC 1/4
County Courthouse	GRV 8000	1	T8341	GRV 8000 COMPARATOR
County Courthouse	GRV 8000	1	CA03084AA	ADD: COMPARATOR
County Courthouse	GRV 8000	1	CA03320AA	ADD: ASTRO 25 CONVENTIONAL SOFTWARE
County Courthouse	GRV 8000	1	CA03317AA	ADD: DIGITAL CONV SIMULCAST SOFTWARE
County Courthouse	GRV 8000	1	CA03085AA	ADD: GEO REDUNDANCY
County Courthouse	GRV 8000	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
County Courthouse	GRV 8000	1	CA03111AA	ADD: CEC COMPLIANCE
County Courthouse	GRV 8000	1	CA01400AA	ADD: POWER CABLE, DC
County Courthouse	GRV 8000	1	X153AW	ADD: RACK MOUNT HARDWARE
County Courthouse	GRV 8000	1	T8341	GRV 8000 COMPARATOR
County Courthouse	GRV 8000	1	CA03084AA	ADD: COMPARATOR
County Courthouse	GRV 8000	1	CA01949AC	ADD: ANALOG CONV ONLY SW
County Courthouse	GRV 8000	1	CA01952AC	ADD: ANALOG CONV SIMULCAST SW
County Courthouse	GRV 8000	1	CA03085AA	ADD: GEO REDUNDANCY
County Courthouse	GRV 8000	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
County Courthouse	GRV 8000	1	CA03111AA	ADD: CEC COMPLIANCE
County Courthouse	GRV 8000	1	CA01400AA	ADD: POWER CABLE, DC
County Courthouse	GRV 8000	1	X153AW	ADD: RACK MOUNT HARDWARE
County Courthouse	CONV_GTR	1	T7039	GTR 8000 Base Radio
County Courthouse	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
County Courthouse	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
County Courthouse	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
County Courthouse	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
County Courthouse	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
County Courthouse	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
County Courthouse	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
County Courthouse	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
County Courthouse	CONV_GTR	1	T7039	GTR 8000 Base Radio
County Courthouse	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
County Courthouse	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
County Courthouse	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW
County Courthouse	CONV_GTR	1	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE
County Courthouse	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
County Courthouse	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
County Courthouse	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
County Courthouse	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
County Courthouse	RACK	2	TRN7343	SEVEN AND A HALF FOOT RACK
County Courthouse TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
County Courthouse TX	ANTENNA	1	DSOA4041DIN	OFFSET, EXPOSED DIPOLE ARRAY, 9 DBD, 136-174 MHZ, PIM RATED
County Courthouse TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
County Courthouse TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
County Courthouse TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
County Courthouse TX	MAINLINE	100	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
County Courthouse TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
County Courthouse TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
County Courthouse TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
County Courthouse TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
County Courthouse TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
County Courthouse TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
County Courthouse TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
County Courthouse TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Horse Mtn	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
Horse Mtn	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
Horse Mtn	NETWORK	1	CA01619AA	ADD: DC POWER
Horse Mtn	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
Horse Mtn	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK
Horse Mtn	GPS	50	L1700	FSJ1-50A CABLE: 1/4
Horse Mtn	GPS	4	DDN9769	F1PNM-HC 1/4

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Horse Mtn	CONV_GTR	1	T7039	GTR 8000 Base Radio
Horse Mtn	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Horse Mtn	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Horse Mtn	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Horse Mtn	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
Horse Mtn	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Horse Mtn	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Horse Mtn	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Horse Mtn	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Horse Mtn	CONV_GTR	1	T7039	GTR 8000 Base Radio
Horse Mtn	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Horse Mtn	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Horse Mtn	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW
Horse Mtn	CONV_GTR	1	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE
Horse Mtn	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Horse Mtn	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Horse Mtn	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Horse Mtn	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Horse Mtn	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Horse Mtn TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
Horse Mtn TX	ANTENNA	1	DSEA8041DINT3	ELLIPTICAL, EXPOSED DIPOLE ARRAY, 8DBD, 136-174MHZ, 3DEG DT, PIM RATED
Horse Mtn TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Horse Mtn TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Horse Mtn TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Horse Mtn TX	MAINLINE	140	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Horse Mtn TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Horse Mtn TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Horse Mtn TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Horse Mtn TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Horse Mtn TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Horse Mtn TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Horse Mtn TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Horse Mtn TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Trinidad	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
Trinidad	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
Trinidad	NETWORK	1	CA01619AA	ADD: DC POWER
Trinidad	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
Trinidad	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK
Trinidad	GPS	50	L1700	FSJ1-50A CABLE: 1/4
Trinidad	GPS	4	DDN9769	F1PNM-HC 1/4
Trinidad	CONV_GTR	1	T7039	GTR 8000 Base Radio
Trinidad	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Trinidad	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Trinidad	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Trinidad	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
Trinidad	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Trinidad	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Trinidad	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Trinidad	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Trinidad	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Trinidad TX	RFDS	1	DS2636H0101	DUPLEXING SYSTEM,137-174 MHZ 1 CHANNEL INPUT ISOLATORS AC
Trinidad TX	ANTENNA	1	DSOA4041DIN	OFFSET, EXPOSED DIPOLE ARRAY, 9 DBD, 136-174 MHZ, PIM RATED
Trinidad TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Trinidad TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Trinidad TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Trinidad TX	MAINLINE	100	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Trinidad TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Trinidad TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Trinidad TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Trinidad TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Trinidad TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Trinidad TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Trinidad TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Trinidad TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Mt Pierce	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
Mt Pierce	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
Mt Pierce	NETWORK	1	CA01619AA	ADD: DC POWER
Mt Pierce	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
Mt Pierce	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK
Mt Pierce	GPS	50	L1700	FSJ1-50A CABLE: 1/4
Mt Pierce	GPS	4	DDN9769	F1PNM-HC 1/4
Mt Pierce	GRV 8000	1	T8341	GRV 8000 COMPARATOR
Mt Pierce	GRV 8000	1	CA03084AA	ADD: COMPARATOR
Mt Pierce	GRV 8000	1	CA03320AA	ADD: ASTRO 25 CONVENTIONAL SOFTWARE
Mt Pierce	GRV 8000	1	CA03317AA	ADD: DIGITAL CONV SIMULCAST SOFTWARE
Mt Pierce	GRV 8000	1	CA03085AA	ADD: GEO REDUNDANCY
Mt Pierce	GRV 8000	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Mt Pierce	GRV 8000	1	CA03111AA	ADD: CEC COMPLIANCE
Mt Pierce	GRV 8000	1	CA01400AA	ADD: POWER CABLE, DC
Mt Pierce	GRV 8000	1	X153AW	ADD: RACK MOUNT HARDWARE
Mt Pierce	GRV 8000	1	T8341	GRV 8000 COMPARATOR
Mt Pierce	GRV 8000	1	CA03084AA	ADD: COMPARATOR
Mt Pierce	GRV 8000	1	CA01949AC	ADD: ANALOG CONV ONLY SW
Mt Pierce	GRV 8000	1	CA01952AC	ADD: ANALOG CONV SIMULCAST SW
Mt Pierce	GRV 8000	1	CA03085AA	ADD: GEO REDUNDANCY
Mt Pierce	GRV 8000	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Mt Pierce	GRV 8000	1	CA03111AA	ADD: CEC COMPLIANCE
Mt Pierce	GRV 8000	1	CA01400AA	ADD: POWER CABLE, DC
Mt Pierce	GRV 8000	1	X153AW	ADD: RACK MOUNT HARDWARE
Mt Pierce	CONV_GTR	1	T7039	GTR 8000 Base Radio
Mt Pierce	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Mt Pierce	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Mt Pierce	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Mt Pierce	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
Mt Pierce	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Mt Pierce	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Mt Pierce	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Mt Pierce	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Mt Pierce	CONV_GTR	1	T7039	GTR 8000 Base Radio
Mt Pierce	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Mt Pierce	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Mt Pierce	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW
Mt Pierce	CONV_GTR	1	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE
Mt Pierce	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Mt Pierce	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Mt Pierce	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Mt Pierce	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Mt Pierce	RACK	2	TRN7343	SEVEN AND A HALF FOOT RACK
Mt Pierce TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
Mt Pierce TX	ANTENNA	1	DSOA4041DIN	OFFSET, EXPOSED DIPOLE ARRAY, 9 DBD, 136-174 MHZ, PIM RATED
Mt Pierce TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Mt Pierce TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Mt Pierce TX	UPPERJUMPR	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Mt Pierce TX	MAINLINE	140	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Mt Pierce TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Mt Pierce TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Mt Pierce TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Mt Pierce TX	MAINLINE	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Mt Pierce TX	ANTACC	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Mt Pierce TX	SURGE	25	L1705	LDF4-50A CABLE: 1/2
Mt Pierce TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Mt Pierce TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Pratt Mtn	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
Pratt Mtn	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
Pratt Mtn	NETWORK	1	CA01619AA	ADD: DC POWER
Pratt Mtn	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
Pratt Mtn	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK
Pratt Mtn	GPS	50	L1700	FSJ1-50A CABLE: 1/4
Pratt Mtn	GPS	4	DDN9769	F1PNM-HC 1/4
Pratt Mtn	CONV_GTR	1	T7039	GTR 8000 Base Radio
Pratt Mtn	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Pratt Mtn	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Pratt Mtn	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Pratt Mtn	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
Pratt Mtn	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Pratt Mtn	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Pratt Mtn	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Pratt Mtn	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Pratt Mtn	CONV_GTR	1	T7039	GTR 8000 Base Radio
Pratt Mtn	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Pratt Mtn	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Pratt Mtn	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW
Pratt Mtn	CONV_GTR	1	CA01952AA	ADD: ANALOG CONVENTIONAL SIMULCAST SOFTWARE
Pratt Mtn	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Pratt Mtn	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Pratt Mtn	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Pratt Mtn	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Pratt Mtn	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Pratt Mtn TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
Pratt Mtn TX	ANTENNA	1	DSOA4041DINT3	OFFSET, EXPOSED DIPOLE ARRAY, 9DBD, 136-174MHZ, 3DEG DT, PIM RATED
Pratt Mtn TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Pratt Mtn TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Pratt Mtn TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Pratt Mtn TX	MAINLINE	140	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Pratt Mtn TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Pratt Mtn TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Pratt Mtn TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Pratt Mtn TX	MAINLINE	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Pratt Mtn TX	POLYPHASER	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Pratt Mtn TX	LOWERJUMPR	25	DSSSH78	LDF4-50A CABLE: 1/2
Pratt Mtn TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Pratt Mtn TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Grasshopper Mtn	NETWORK	2	CLN1868	2930F 24-PORT SWITCH
Grasshopper Mtn	NETWORK	1	SQM01SUM0205	GGM 8000 GATEWAY
Grasshopper Mtn	NETWORK	1	CA01619AA	ADD: DC POWER
Grasshopper Mtn	GPS	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
Grasshopper Mtn	GPS	1	DSTRAK4008245101	MOUNTING SHELF FOR 8835 GPS CLOCK
Grasshopper Mtn	GPS	50	L1700	FSJ1-50A CABLE: 1/4
Grasshopper Mtn	GPS	4	DDN9769	F1PNM-HC 1/4
Grasshopper Mtn	CONV_GTR	1	T7039	GTR 8000 Base Radio
Grasshopper Mtn	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Grasshopper Mtn	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Grasshopper Mtn	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Grasshopper Mtn	CONV_GTR	1	CA01502AA	ADD: ASTRO 25 CONVENTIONAL SIMULCAST SOFTWARE
Grasshopper Mtn	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Grasshopper Mtn	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Grasshopper Mtn	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Grasshopper Mtn	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Grasshopper Mtn	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Grasshopper TX	RFDS	1	DS2636H0101	DUPLEXING SYSTEM,137-174 MHZ 1 CHANNEL INPUT ISOLATORS AC
Grasshopper TX	ANTENNA	1	DSBA8041DIN	OMNI, EXPOSED DIPOLE ARRAY, 6 DBD, 136-174 MHZ, PIM RATED
Grasshopper TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Grasshopper TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Grasshopper TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Grasshopper TX	MAINLINE	130	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Grasshopper TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Grasshopper TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Grasshopper TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Grasshopper TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Grasshopper TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Grasshopper TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Grasshopper TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Grasshopper TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Shelton Butte	CONV_GTR	1	T7039	GTR 8000 Base Radio
Shelton Butte	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Shelton Butte	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Shelton Butte	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Shelton Butte	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Shelton Butte	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Shelton Butte	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Shelton Butte	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Shelton Butte	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Shelton Butte TX	RFDS	1	DS2636H0101	DUPLEXING SYSTEM,137-174 MHZ 1 CHANNEL INPUT ISOLATORS AC
Shelton Butte TX	ANTENNA	1	DSBA8041DIN	OMNI, EXPOSED DIPOLE ARRAY, 6 DBD, 136-174 MHZ, PIM RATED
Shelton Butte TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Shelton Butte TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Shelton Butte TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Shelton Butte TX	MAINLINE	110	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Shelton Butte TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Shelton Butte TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Shelton Butte TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Shelton Butte TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Shelton Butte TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Shelton Butte TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Shelton Butte TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Shelton Butte TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Shelter Cove	CONV_GTR	1	T7039	GTR 8000 Base Radio
Shelter Cove	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Shelter Cove	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Shelter Cove	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Shelter Cove	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Shelter Cove	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Shelter Cove	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Shelter Cove	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Shelter Cove	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Shelter Cove TX	RFDS	1	DS2636H0101	DUPLEXING SYSTEM,137-174 MHZ 1 CHANNEL INPUT ISOLATORS AC
Shelter Cove TX	ANTENNA	1	DSEA4041DIN	ELLIPTICAL, EXPOSED DIPOLE ARRAY, 5 DBD, 136-174 MHZ, PIM RATED
Shelter Cove TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Shelter Cove TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Shelter Cove TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Shelter Cove TX	MAINLINE	150	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Shelter Cove TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Shelter Cove TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Shelter Cove TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Shelter Cove TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Shelter Cove TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Shelter Cove TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Shelter Cove TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Shelter Cove TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Rodgers Peak	CONV_GTR	1	T7039	GTR 8000 Base Radio
Rodgers Peak	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Rodgers Peak	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Rodgers Peak	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Rodgers Peak	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Rodgers Peak	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Rodgers Peak	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Rodgers Peak	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Rodgers Peak	CONV_GTR	1	T7039	GTR 8000 Base Radio
Rodgers Peak	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Rodgers Peak	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Rodgers Peak	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW
Rodgers Peak	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Rodgers Peak	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Rodgers Peak	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Rodgers Peak	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Rodgers Peak	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Rodgers TX	ANTENNA	1	DSOA4041DIN	OFFSET, EXPOSED DIPOLE ARRAY, 9 DBD, 136-174 MHZ, PIM RATED
Rodgers TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
Rodgers TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Rodgers TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Rodgers TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Rodgers TX	MAINLINE	140	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Rodgers TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Rodgers TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Rodgers TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Rodgers TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Rodgers TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Rodgers TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Rodgers TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Rodgers TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Sugar Pine	CONV_GTR	1	T7039	GTR 8000 Base Radio
Sugar Pine	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Sugar Pine	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Sugar Pine	CONV_GTR	1	CA01948AA	ADD: CONVENTIONAL SOFTWARE
Sugar Pine	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Sugar Pine	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Sugar Pine	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Sugar Pine	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Sugar Pine	CONV_GTR	1	T7039	GTR 8000 Base Radio
Sugar Pine	CONV_GTR	1	CA00717AA	ADD: ASTRO SYSTEM RELEASE 7.17
Sugar Pine	CONV_GTR	1	X530BG	ADD: VHF (136-174 MHZ)
Sugar Pine	CONV_GTR	1	CA01949AA	ADD: ANALOG ONLY CONV SW

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Sugar Pine	CONV_GTR	1	CA01953AA	ADD: POWER EFFICIENCY PACKAGE
Sugar Pine	CONV_GTR	1	CA03111AA	ADD: CEC COMPLIANCE
Sugar Pine	CONV_GTR	1	X265AM	BR PRESELCTOR, 150-174 MHZ
Sugar Pine	CONV_GTR	1	X153AW	ADD: RACK MOUNT HARDWARE
Sugar Pine	RACK	1	TRN7343	SEVEN AND A HALF FOOT RACK
Sugar Pine TX	ANTENNA	1	DSEA8041DINT3	ELLIPTICAL, EXPOSED DIPOLE ARRAY, 8DBD, 136-174MHZ, 3DEG DT, PIM RATED
Sugar Pine TX	RFDS	1	DS2636H0102	DUPLEXING SYSTEM 137-174 MHZ 2 CHANNEL INPUT ISOLATORS AC
Sugar Pine TX	UPPERJUMPR	15	L1705	LDF4-50A CABLE: 1/2
Sugar Pine TX	UPPERJUMPR	2	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE
Sugar Pine TX	JUMPER	2	TDN9289	221213 CABLE WRAP WEATHERPROOFING
Sugar Pine TX	MAINLINE	120	L3323	AVA5-50, 7/8 IN VIRTUAL AIR COAXIAL CABLE, CORRUGATED COPPER
Sugar Pine TX	MAINLINE	2	DDN1077	7-16IN DIN FEMALE CONNECTOR EZ-FIT FOR 7/8IN CABLE (MOTOROLA SPECIFIC)
Sugar Pine TX	MAINLINE	3	DSSG7806B2A	SG78-06B2A GROUNDING KIT FOR 7/8 IN COAXIAL CABLE
Sugar Pine TX	MAINLINE	1	DSL5SGRIP	L5SGRIP 7/8" SUPPORT HOIST GRIP
Sugar Pine TX	ANTACC	5	DSSSH78	SSH-78 7/8" SNAPSTAK HANGER 10PK
Sugar Pine TX	SURGE	1	DSVHF50DMAPGR	RF SPD, 100-512MHZ, DC BLOCK HIGH POWER DIN MALE ANT, DIN FEMALE EQUIP
Sugar Pine TX	LOWERJUMPR	25	L1705	LDF4-50A CABLE: 1/2
Sugar Pine TX	LOWERJUMPR	1	DDN1088	L4TNM-PSA TYPE N MALE PS FOR 1/2 IN CABLE
Sugar Pine TX	LOWERJUMPR	1	DDN1090	L4TDM-PSA 7-16 DIN MALE PS FOR 1/2 IN CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
TX STA JMPR	TX STA JMPR	240	L1702	FSJ4-50B CABLE: 1/2" SUPERFLEX POLY JKT PER FOOT
TX STA JMPR	TX STA JMPR	32	DSF4NRHC	F4NR-HC 1/2" TYPE N MALE RIGHT ANGLE CONNECTOR
RX STA JMPR	RX STA JMPR	240	L1700	FSJ1-50A CABLE: 1/4" SUPERFLEX POLY JKT PER FOOT
RX STA JMPR	RX STA JMPR	32	DSF1TBMC	F1TBM-C 1/4" BNC MALE CONNECTOR
		0		
SPARES	SPARES	1	DSTRAK88358M	GPS CLOCK, 10MHZ, DOCXO, 48VDC INCL ANT,100' COAX W/DONGLE SNMPV3
SPARES	SPARES	1	DLN6886	FRU: GRV8000 SPARE
SPARES	SPARES	2	DLN6898	FRU: FAN MODULE
SPARES	SPARES	2	DLN6805	FRU: ENERGY EFFICIENT POWER SUPPLY
SPARES	SPARES	2	DLN6897	FRU: PA VHF
SPARES	SPARES	2	DLN6892	FRU: XCVR VHF V2
SPARES	SPARES	6	F4544	SITE MANAGER ADVANCED
SPARES	SPARES	6	VA00905	ADD:24/48 VDC PS TO SM
SPARES	SPARES	6	VA00872	ADD: SDM ASTRO RTU FW CURR ASTRO REL
SPARES	SPARES	1	SQM01SUM0205	GGM 8000 GATEWAY
SPARES	SPARES	1	CA01619AA	ADD: DC POWER
SPARES	SPARES	1	CLN1868	2930F 24-PORT SWITCH
SPARES	SPARES	1	TT3225	Z2 MINI WORKSTATION 258G 8G NON RET
Humboldt APX 6000	APX6000	187	H98KGD9PW5BN	APX6000 VHF MHZ MODEL 1.5 PORTABLE
Humboldt APX 6000	APX6000	187	Q806	ADD: ASTRO DIGITAL CAI OPERATION
Humboldt APX 6000	APX6000	187	H35	ADD: CONVENTIONAL OPERATION
Humboldt APX 6000	APX6000	187	Q387	ADD: MULTICAST VOTING SCAN
Humboldt APX 6000	APX6000	187	QA09006	ADD: ADAPTIVE NOISE SUPPRESSION
Humboldt APX 6000	APX6000	187	Q157	ADD: APX DATA CABLE

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Humboldt APX 6000	APX6000	187	H885BK	ADD: 3Y ESSENTIAL SERVICE
Humboldt Mobiles	APX4500	188	M22KSS9PW1 N	APX4500 VHF
Humboldt Mobiles	APX4500	188	Q811	ADD: SOFTWARE P25 CONVENTIONAL
Humboldt Mobiles	APX4500	188	G387	ADD: MULTICAST VOTING SCAN
Humboldt Mobiles	APX4500	188	GA00804	ADD: APX O2 CONTROL HEAD (Green)
Humboldt Mobiles	APX4500	188	G444	ADD: APX CONTROL HEAD SOFTWARE
Humboldt Mobiles	APX4500	188	G66	ADD: DASH MOUNT
Humboldt Mobiles	APX4500	188	G493	ADD: ANT 3 DB ROOF TOP 470-495 MHZ
Humboldt Mobiles	APX4500	188	G90	ADD: NO MICROPHONE NEEDED
Humboldt Mobiles	APX4500	188	B18	ADD: AUXILARY SPKR 7.5 WATT
Humboldt Mobiles	APX4500	188	GA00235	ADD: NO GPS ANTENNA NEEDED
Humboldt Mobiles	APX4500	188	G24	ADD: 3Y ESSENTIAL SERVICE
Humboldt CS	APX4500	7	M22KSS9PW1 N	APX4500 VHF
Humboldt CS	APX4500	7	Q811	ADD: SOFTWARE P25 CONVENTIONAL
Humboldt CS	APX4500	7	G387	ADD: MULTICAST VOTING SCAN
Humboldt CS	APX4500	7	GA00804	ADD: APX O2 CONTROL HEAD (Green)
Humboldt CS	APX4500	7	G444	ADD: APX CONTROL HEAD SOFTWARE
Humboldt CS	APX4500	7	G66	ADD: DASH MOUNT
Humboldt CS	APX4500	7	G89	ADD: NO RF ANTENNA NEEDED
Humboldt CS	APX4500	7	W382	ADD: CONTROL STATION DESK GCAI MIC
Humboldt CS	APX4500	7	G142	ADD: NO SPEAKER NEEDED
Humboldt CS	APX4500	7	G91	ADD: CONTROL STATION POWER SUPPLY
Humboldt CS	APX4500	7	W665	ADD: CONTROL STATION OPERATION

SUB SYS	BLOCK	QTY	NOMENCLATURE	DESCRIPTION
Humboldt CS	APX4500	7	GA00235	ADD: NO GPS ANTENNA NEEDED
Humboldt CS	APX4500	7	G24	ADD: 3Y ESSENTIAL SERVICE
Console Backup Control Stations	APX7500CON	8	L30KSS9PW1 N	APX CONSOLETTE VHF
Console Backup Control Stations	APX7500CON	8	GA00306	ADD: VHF MP PRIMARY BAND
Console Backup Control Stations	APX7500CON	8	G806	ADD: ASTRO DIGITAL CAI OPERATION
Console Backup Control Stations	APX7500CON	8	G48	ENH: CONVENTIONAL OPERATION
Console Backup Control Stations	APX7500CON	8	G387	ADD: MULITCAST VOTING SCAN
Console Backup Control Stations	APX7500CON	8	W382	ADD: CONTROL STATION DESK GCAI MIC
Console Backup Control Stations	APX7500CON	8	CA01598	ADD: AC LINE CORD US
Console Backup Control Stations	APX7500CON	8	L999	ADD: FULL FP W/05/KEYPAD/CLOCK/VU
Console Backup Control Stations	APX7500CON	8	G78	ADD: 3Y ESSENTIAL SERVICE
Console Backup Control Stations	APX7500CON	8	RMN5070A	AS. SPECTRA & XTL5000 DESKTOP MIC
Console Backup Control Stations	APX7500CON	8	HKN6233	ASSEMBLY,ACCESSORY,APX CONSOLETTE RACK MOUNT TRAY HARDWARE KIT

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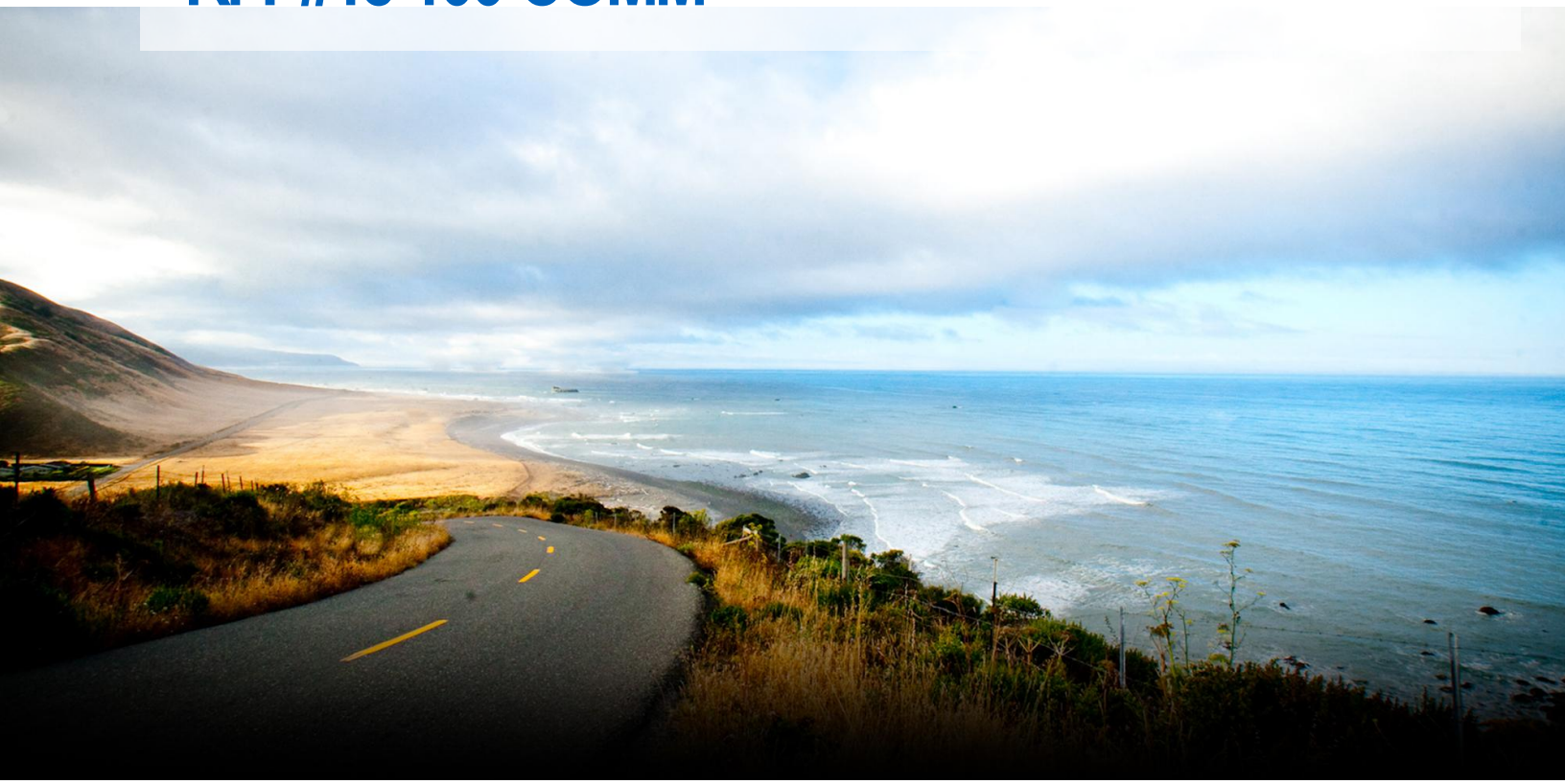
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 6
COST PROPOSAL

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 10, 2018**

RFP#18-100-COMM



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SECTION 6

COST PROPOSAL

All pricing is ONLY submitted in the Excel multi-tabbed pricing file, RFP Attachment H – Radio System Package Pricing Workbook.

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MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 7
ADDITIONAL DOCUMENTATION

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM

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TABLE OF CONTENTS

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SECTION 7

ADDITIONAL DOCUMENTATION

Proposals shall include a detailed description of any and all reports, drawings, studies, invoices and any other pertinent documents that will be prepared and/or used to meet the requirements of this RFP. Samples of each document described in the additional documentation section of the Proposal shall be attached to the Proposal.

7.1 PRODUCT LITERATURE

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APX RADIO MANAGEMENT

RADIO PROGRAMMING MADE SIMPLE

Managing your radio fleet is an important part of day-to-day operations. But it can also be expensive and time consuming. Updates to add or remove channels, upgrade firmware, or add purchased features through FLASHport upgrade, take substantial time and resources because each radio has to be programmed individually. Motorola's Customer Programming Software Radio Management application simplifies APX™ radio configuration and management, saving you time and money while ensuring your users can accomplish their mission without interruption.

The APX CPS Management application can program up to 16 radios at one time and track which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

ACCESS AND SHARE CODEPLUGS

When codeplug updates occur, the radio codeplug database can be stored on a network server allowing remote programmers to access and program radios and share a codeplug template across multiple radios. Changes to codeplug templates can be automatically applied to all affected radios while radio programming jobs can be scheduled ahead of time giving you more flexibility and operational efficiency.

MINIMIZE DOWNTIME

Save time and fuel by programming radios either via a USB port on a local or remote PC, or with Over-the-Air-Programming (OTAP) on a Project 25 system. With USB programming, a Device Programmer application resides on a PC and you can connect up to 16 radios via a USB hub to expedite the programming. To read/write multiple radios through a single computer or USB hub, the radios must be programmed with a unique IP address the first time they are read/written.

No application knowledge or application interaction is necessary by the user to program a radio with the Device Programmer application. The user simply plugs the radio into a USB port and the application automatically reads and writes the updates from the server to the radio.

Radio Management batch programming of APX radios via OTAP can only occur with a Motorola ASTRO® 25 Project 25 system, which has voice priority over data, so a user's call, emergency notifications or critical communications will not be interrupted with OTAP. Should an OTAP session be interrupted with communications, programming will resume after the call without the need to restart, expediting the process.

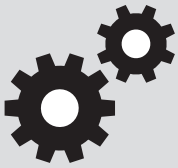
RADIO MANAGEMENT COMPONENTS

RM CLIENT

Radio management user interface is integrated into the CPS, giving radio managers a unified view into their radio fleet from a single dashboard.

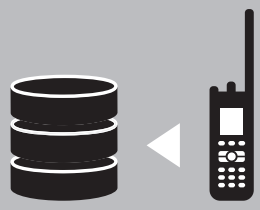
RM SERVER

Provides radio managers with flexible options for managing radios, templates, codeplug data and programming jobs via a hardware or cloud based database.



JOB PROCESSOR

Responsible for preprocessing of programming jobs by validating and transforming template and radio data into a format that can be written to the radio.



DEVICE PROGRAMMER

Performs read and write jobs to the APX radios.

FLEXIBLE ARCHITECTURE

RM INSTALLED ON ONE COMPUTER

All Radio Management components are installed on a single machine.

Use Case: A small self-maintained agency can gain the benefit of the integrated database that maintains all the template versions and keeps tracks all radio information and updates without having to maintain separate spreadsheets and codeplug files in the computer directory. An administrator can schedule jobs on the terminal, log out or lock the computer, and allow radio users to update their APX radios via the connected USB cable on their own time, without his or her presence required.

- Install all three Radio Management parts – CPS, RM Server and RM Device Programmer on a single PC
- Configuration is automatically handled by the RM Device Programmer
- Simple installation with full RM functionality

RM INSTALLED ON MULTIPLE COMPUTERS

Allows the Device Programmer to program radios at different locations by distributing the workload across multiple computers, a centrally located server and a remote RM client.

Use Case: A medium-sized agency can have two radio administrators. They can log into the centralized server located at the County IT building via the RM Clients on their personal laptops to make changes and schedule jobs. Meanwhile, there can be three programming kiosks (RM Device Programmers) throughout the county. Radio users can come to receive updates on their own convenience and avoid driving to and from the radio shop – one kiosk at the Fire Station, one at the Police Station, and one at City Hall. Fire-fighters, police officers and general government radio users all have a nearby kiosk for radio programming.

- Install the RM Server and RM Device Programmer at a central location at your shop
- Install the CPS on one or more PCs
- Share the same configuration database with multiple users who can access it remotely

FULLY DISTRIBUTED RM SYSTEM

Multiple Job Processors, RM Clients and RM Device Programmers share the workload and allow configuration and programming from different locations.

Use Case: A large-scale operation has a centrally-located RM Server in an IT server room along with four Job Processor servers that enable a higher throughput of jobs. RM Device Programmers are installed at each of the programming kiosks in the key government buildings, police stations, fire stations, and correctional facilities. The RM Device Programmers are also installed in all the MW810 mobile computers in the police vehicle fleet. These mobile computers can be used to program the APX mobile radios in the vehicle using the front microphone port USB interface on the APX control head. The radio shop has three RM Device Programmer computers and each one has a USB hub with 16 programming cables so that 48 radios can be programmed in parallel whenever future firmware upgrades need to be deployed. The RM Clients are also installed in the five personal laptops of the respective Radio Fleet Technicians.

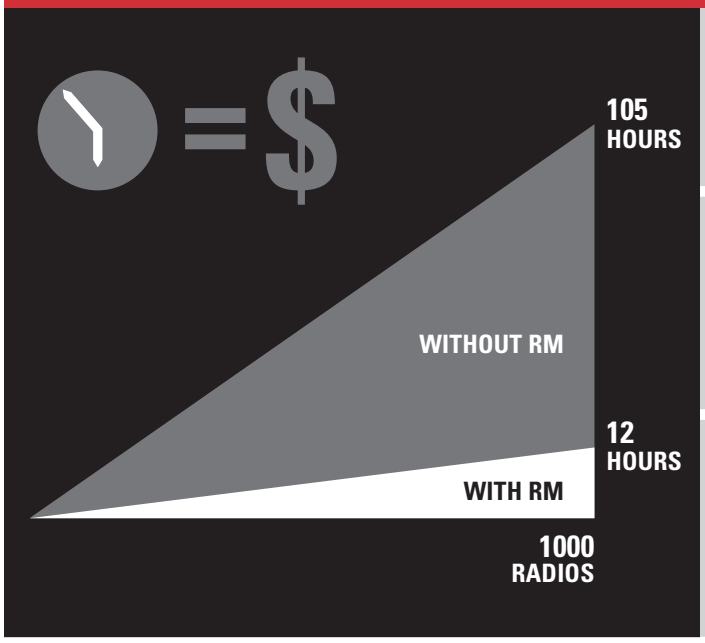
- Install the CPS, RM Server and up to five wired RM Device Programmer's on separate PCs
- Keep the RM Server at your shop
- Conveniently and remotely access codeplug configurations on the RM Server from your CPS
- Install light-weight RM Device Programmers at customer's site
- It's green! No more driving around burning up fossil fuels for codeplug changes

FACT SHEET
APX RADIO MANAGEMENT

RADIO MANAGEMENT ADVANTAGES

- Efficient radio inventory management
- Centralized radio configuration and codeplug management
- Automated radio updates of both codeplugs and software flash versions
- Remote over the air programming via the P25 radio system
- Batch programming via USB configuration (up to 16 radios at one time)
- No missed calls with Over-the-Air Programming due to voice priority with Motorola's ASTRO 25 systems

CPS RADIO MANAGEMENT (RM) REDUCES TOTAL COST OF OWNERSHIP



HOW LONG DOES IT TAKE TO FLASH 1,000 RADIOS?

WITHOUT RM
105 HOURS
13 WORKING DAYS

WITH RM
12 HOURS
1.5 WORKING DAYS

* Time shown are average estimates based on small sample of actual data on APX 7000

For additional information, contact your Motorola representative or visit **motorolasolutions.com**.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

MOTOROLA

MOTOROLA SOLUTIONS

BE BETTER EQUIPPED TO BE MISSION READY

APX™ 4500 PROJECT 25 MOBILE RADIO

A downed power line or the city transit system coming to a halt during rush hour, when the unexpected strikes, you must interoperate seamlessly and securely with other agencies and responders – often across multiple Project 25 (P25) systems. You need to instantly connect and be informed to make better decisions and respond effectively. While the advanced technology of APX™ radios expertly equips you for the unexpected, your organization may be challenged to improve operating expenses.

That's where the APX 4500 P25 mobile radio fits the bill perfectly. It delivers all the benefits of TDMA technology in a compact P25 capable mobile. The APX 4500 brings together powerful technology in an easy-to-use radio that's easy on your budget. It seamlessly unifies public works, utility, rural public safety and transportation users to first responders so they can communicate effectively in the moments that matter.

CONVENIENTLY SMALL, EASY TO INSTALL

The APX 4500 is designed to get the job done without getting in the way. A simplified dash mount design makes installation quick and easy, fitting into the existing XTL™ footprint so you can reuse mounting holes and cables.

Count on the APX 4500 to withstand wet, dusty and hazardous conditions, too. Its IP56 durability rating is the highest level of certification for uncompromising durability and world class quality in a mobile performer you can hose down.

KEEPS CREWS IN TOUCH, AND UP TO THE MINUTE

Safety runs in the APX family and the APX 4500 mobile is no exception. Like all our APX P25 radios trusted by responders worldwide, the APX 4500 mobile redefines safety. Your crews can count on quick, seamless interoperability and extended range – whether they are talking from the top of a pole or the bottom of a trench. You can depend on AES encryption for secure, tamperproof voice and data communications every time they connect.

With integrated GPS in the APX 4500, you can keep an eye on workers and assets you can't see, tracking their locations continuously. The O2 control head with color display is easy to read and operate in all lighting conditions, from bright sunlight to dark streets. The intelligent lighting on the O2 control head notifies your workers when a call is received, an emergency arises, or when they are out of range. Plus, an enlarged multifunction knob makes it easy to use talk-group and volume settings when they're wearing gloves.

Over-the-air programming on the APX 4500 keeps your crews current in the field. You can update the latest mobile without interrupting voice communications while they work.

SIZED RIGHT FOR YOUR BUDGET

The APX 4500 lets you reuse many accessories which utilize the O5 and O3 control heads on XTL radios, so you can maximize your investment while you benefit from the latest technology. Since the APX 4500 is P25 Phase 2 capable for twice the voice capacity, you can add more users without adding more frequencies or infrastructure. It is backwards and forwards compatible with all Motorola mission critical radio systems, so you can interoperate with confidence while you improve operating expenses.

APX™ 4500 SPECIFICATIONS

FEATURES AND BENEFITS:

Available in 700/800 MHz, VHF, UHFR1, UHFR2, and 900 MHz. Supports NPCS band (901-902 MHz and 940-941 MHz)

512 Channels

Trunking Standards supported:

- Clear or digital encrypted Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver (6.25/12.5/25/30 kHz)

Embedded digital signaling (ASTRO and ASTRO 25)

Intelligent Priority Scan

Integrated Encryption Hardware

Integrated GPS/GLONASS for outdoor location tracking

Intelligent lighting

Radio profiles

Unified Call List

Meets applicable MIL-STD 810C, D, E, F, G

Ships standard IP56

Tactical Inhibit

Instant Recall

Customer Programming Software (CPS) supported on Windows XP, Vista, 7 and 8

(Windows 7 or 8 required for CPS R12.00.00 [June 2014] and later)

- Supports USB Communications
- Built in FLASHport™ support

Re-uses XTL™ accessories, plus new IMPRES accessories

OPTIONAL FEATURES:

AES Encryption

Programming over Project 25 (POP25)

Text Messaging

12 character RF ID asset tracking

Tactical OTAR

APX 4500 CONTROL HEAD PORTFOLIO

O2 RUGGED CONTROL HEAD

- Large color display with intelligent lighting
- 3 lines of text 14 characters max / 1 line of icons / 1 line of menus
- Built in 7.5 W speaker
- Multifunction volume/channel knob
- Night/day mode button

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2	900 MHz
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz	896-902 MHz 935-941 MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz	12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power (Adjustable)*	10-30 W	10-35 W	10-50 W	10-40 W	10-45 W (450-485 MHz) 10-40 W (485-512 MHz) 10-25 W (512-520 MHz)	1-30 W (896-901 MHz) (935-940 MHz) 1-3 W (901-902 MHz) (940-941 MHz)
Frequency Stability* (-30°C to +60°C; +25°C Ref.)	0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM	±0.8 PPM
Modulation Limiting*	±5/±2.5 kHz	±5/±4 (NPSPAC) /±2.5 kHz	±5/±2.5 kHz	±5/±2.5 kHz	±5/±2.5 kHz	±2.5 kHz
Modulation Fidelity (C4FM) 12.5 kHz Digital Channel	1.5%	1.5%	2.5%	1.1%	1.1%	1.5%
Emissions*	Conducted† -75/-85 dBc; Radiated† -20/-40 dBm	Conducted -75 dBc; Radiated -20 dBm	Conducted -85 dBc; Radiated -20 dBm	Conducted -85 dBc; Radiated -20 dBm	Conducted -85 dBc; Radiated -20 dBm	Conducted† -70 dBc; Radiated† -20 dBm
Audio Response*	+1, -3 dB (EIA)	+1, -3 dB (EIA)	+1, -3 dB (EIA)	+1, -3 dB (EIA)	+1, -3 dB (EIA)	+1, -3 dB (EIA)
FM Hum & Noise 25 & 20 kHz 12.5 kHz	-50 dB -48 dB	-50 dB -48 dB	-53 dB -52 dB	-53 dB -50 dB	-53 dB -50 dB	— -45 dB
Audio Distortion* 25 & 20 kHz 12.5 kHz	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	0.50% 0.50%	— 0.80%

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

		700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2		900 MHz
Frequency Range/Bandsplits		764-776 MHz	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz		935-941MHz
Channel Spacing		25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz		25/12.5 kHz		25/12.5 kHz		12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit		Full Bandsplit
Audio Output Power 3% distortion, 8/3.2 Ohm speakers		7.5/15 W	7.5/15 W	7.5/15 W		7.5/15 W		7.5/15 W		7.5/15 W
Frequency Stability* (-30°C to +60°C; +25°C Ref.)		±0.8 PPM	±0.8 PPM	±0.8 PPM		±0.8 PPM		±0.8 PPM		±0.8 PPM
Analog Sensitivity*	12 dB SINAD	-121 dBm (0.199 µV)	-121 dBm (0.199 µV)	Pre-Amp -123 dBm (0.158 µV)	Standard -119 dBm (0.251 µV)	Pre-Amp -123 dBm (0.158 µV)	Standard -119 dBm (0.251 µV)	Pre-Amp -123 dBm (0.158 µV)	Standard -119 dBm (0.251 µV)	Standard -120dBm (0.224 µV)
Digital Sensitivity	5% BER	-121.5 dBm (0.210 µV)	-121.5 dBm (0.210 µV)	-123 dBm (0.158 µV)	-119 dBm (0.251 µV)	-123 dBm (0.158 µV)	-119 dBm (0.251 µV)	-123 dBm (0.158 µV)	-119 dBm (0.251 µV)	-121dBm (0.200 µV)
Intermodulation	25 kHz 12.5 kHz	82 dB 82 dB	82 dB 82 dB	84 dB 85 dB	86 dB 86 dB	82 dB 83 dB	86 dB 85 dB	82 dB 83 dB	86 dB 85 dB	— 82 dB
Spurious Rejection		91 dB	91 dB	95 dB		93 dB		93 dB		91 dB
Audio Distortion at rated*		2%	2%	2%		2%		2%		2%
Selectivity*	25 kHz 12.5 kHz 30 kHz	85 dB 75 dB —	85 dB 75 dB —	89 dB 77 dB 90 dB		83 dB 72 dB —		83 dB 72 dB —		— 74dB —

DIMENSIONS

	Inches	Millimeters
Mid Power Radio Transceiver	2 x 7 x 6.4	50.8 x 178 x 163
O2 Control Head	2.7 x 8.1 x 2.1	69 x 207 x 53
Mid Power Radio Transceiver and O2 Control Head - Dash Mount	2.7 x 8.1 x 8.8	69 x 207 x 223
Mid Power Radio Transceiver and O2 Control Head Weight	5.28 lbs	2.45 kg

RADIO MODELS

700/800 (763-870 MHz)	M22URS9PW1AN
VHF (136-174 MHz)	M22KSS9PW1AN
UHF Range 1 (380-470 MHz)	M22QSS9PW1AN
UHF Range 2 (450-520 MHz)	M22SSS9PW1AN

SIGNALING (ASTRO MODE)

Signaling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO® Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

GPS SPECIFICATIONS

Channels	12
Tracking Sensitivity	-153 dBm
Accuracy**	<10 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<10 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted) GPS

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz, 896-941 MHz						
Minimum RF Power Output	2-30 W (764-776 MHz), 2-30 W (794-806 MHz), 2-35 W (806-824 MHz), 2-35 W (851-870 MHz), 1-50 W (136-174 MHz). 1-40 W (380-470 MHz), 1-45 W (450-485 MHz), 1-40 W (485-512 MHz), 1-25 W (512-520 MHz), 1-30 W (896-901 MHz), 1-3 W (901-902 MHz), 1-30 W (935-940 MHz), 1-3 W (940-941 MHz)						
Operation	13.8V DC ±20% Negative Ground						
Standby at 13.8V	0.85A (764-870 MHz), 0.85A (136-174 MHz), 0.85A (380-470 MHz), 0.85A (450-520 MHz)						
Receive Current at Rated Audio at 13.8V	3.2A (764-870 MHz), 3.2A (136-174 MHz), 3.2A (380-470 MHz), 3.2A (450-520 MHz)						
Transmit Current (A) at Rated Power	136-174 MHz (10-50 W) 380-470 MHz (10-40 W) 380-470 MHz (10-40 W)	13A (50 W) 11A (40 W) 11A (45 W)	8A (15 W) 8A (15 W) 8A (15 W)	764-870 MHz (2-35 W) 896-901 MHz (1-30 W) 935-940 MHz(1-30 W) 901-902 MHz(1-3 W) 940-941 MHz(1-3 W)	12A (35 W) 10A (30 W) 10A (30 W) 5A (3 W) 5A (3 W)	8A (15 W) 7A(15 W) 7A(15 W)	

MOBILE MILITARY STANDARDS 810 C, D, E , F, G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature Storage	501.1	I	501.2	I/A1	501.3	I/A1	501.4	I/Hot	501.5	I/A1
High Temperature Operation	501.1	II	501.2	II/A1	501.3	II/A1	501.4	II/Hot	501.5	II
Low Temperature Storage	502.1	I	502.2	I/C3	502.3	I/C3	502.4	I/C3	502.5	I/C3
Low Temperature Operation	502.1	I	502.2	II/C1	502.3	II/C1	502.4	II/C1	502.5	II
Temperature Shock	503.1	-	503.2	I/A1-C3	503.3	I/A1-C3	503.4	I/Hot-C3	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain Blowing	506.1	I	506.2	I	506.3	I	506.4	I	506.5	I
Rain Steady	506.1	II	506.2	II	506.3	II	506.4	III	506.5	III
Humidity	507.1	II	507.2	II	507.3	II	507.4	-	507.5	II-Aggravated
Salt Fog	509.1	-	509.2	-	509.3	-	509.4	-	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand		-	510.2	II	510.3	II	510.4	II	510.5	II
Vibration Min. Integrity	514.2	VIII/F, Curve-W	514.3	I/10	514.4	I/10	514.5	I/24	514.6	I-Cat.24
Vibration Loose Cargo	514.2	XI	514.3	II/3	514.4	II/3	514.5	II/5	514.6	-
Shock Functional	516.2	I	516.3	I	516.4	I	516.5	I	516.6	I, V, VI

ENCRYPTION

Supported Encryption Algorithms	AES and ADP
Encryption Algorithm Capacity	Single
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing, OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology(NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

* Measured in the analog mode per TIA/EIA 603 under nominal conditions
** Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal -130 dBm signal strength)
† Specs includes performance for the non-GNSS/GNSS bands

Specifications subject to change without notice. All specifications shown are typical. Radio meets applicable regulatory requirements.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30°C/+60°C
Storage Temperature	-40°C/+85°C
Humidity	Per MIL-STD
ESD	IEC 801-2 KV
Water and Dust Intrusion	IP56, MIL-STD

TRANSMITTER CERTIFICATION

700/800 (764-775, 793-805, 806-824, 851-869 MHz)	AZ492FT7055
VHF (136-174 MHz)	AZ492FT3826
UHF R1 (380-470 MHz)	AZ492FT4915
UHF R2 (450-520 MHz)	AZ492FT4916
900 MHz (896-901, 901-902, 935-940, 940-941 MHz)	AZ492FT5865

FCC EMISSIONS DESIGNATORS

FCC Emissions Designators	8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E, 20K0F1E, 10K0F3E (for AZ492FT5865 only)

Motorola Solutions, Inc. 500 West Monroe Street, Chicago, Il 60661 U.S.A. **motorolasolutions.com**

MOTOROLA SOLUTIONS

APX™ 6000 SINGLE-BAND PORTABLE RADIO

From day one, the single-band APX 6000 P25 portable radio has delivered legendary APX ruggedness and reliability, without compromising on the form factor or features required for routine activities and extreme emergencies. Now, as the ever-increasing needs of public safety personnel grow, we are evolving the APX 6000 to support newer technologies like Wi-Fi®, Adaptive Audio Engine and Bluetooth® 4.0 wireless technology. These advances help improve the operational efficiency and response time of public safety agencies while enhancing the safety of personnel and communities.

VOICE AND DATA, ALL AT ONCE

Update your radio fleet without interrupting voice communications with secure Wi-Fi. This dramatically improves the speed of configuring new codeplugs, firmware and software features over-the-air via Radio Management*. Agencies can pre-provision up to 20 secure Wi-Fi hotspots so personnel can easily access updates at the facility or in the field.

HEAR AND BE HEARD

The APX 6000 is equipped with a 3-watt speaker, 3 integrated microphones and the Adaptive Audio Engine. This changes the level of noise suppression, microphone gain, windporting and speaker equalisation to produce clear and loud audio in any environment.

SEAMLESS ON-SCENE COMMUNICATION

Ensure fast and seamless communication and collaboration across all responders arriving on a scene. Mission Critical Geofence automatically changes a radio's active talkgroup based on its GPS location and an agency-defined virtual barrier. For example, an incident commander can create a geofence around the 3-block radius of a burning building so that all arriving personnel are automatically placed in the same talkgroup.

EMERGENCY FIND ME

Bluetooth 4.0 places a wide range of wireless accessories at your disposal and provides personnel with an added level of security by improving response time in emergencies. With Emergency Find Me, a Bluetooth-enabled beacon signal guides other Bluetooth-enabled APX radios within range to assist the user in distress.

*Radio Management application simplifies APX radio configuration and management by programming up to 16 radios at one time and tracking which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

SPECIFICATIONS

RF BANDS

- 700/800 MHz, VHF, UHF Range 1 & UHF Range 2
- 9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking
- 3600 Baud SmartNet®, SmartZone®, SmartZone, Omnilink Trunking
- Digital APCO 25, Conventional, Analogue MDC 1200, Quick Call II System Configurations Narrow and Wide Bandwidth Digital Receiver (6.25 kHz Equivalent/25/20/12.5 kHz)[1]

STANDARD FEATURES

- Mission Critical Wireless Bluetooth® 4.0 (LE)[2]
- Emergency Find Me[2]
- ASTRO® 25 Integrated Voice & Data
- Integrated GPS/GLONASS for Outdoor Location Tracking
- Voice Announcements
- ISSI 8000 Roaming
- Radio Profiles
- Dynamic Zone
- Intelligent Lighting
- Single-Key ADP Encryption
- IP68 submersion (2 metres, 2 hours)
- IMPRES 2 Battery (PMNN4485)
- Text Message

PROGRAMMING

- Utilises Windows Customer Programming Software (CPS) with Radio Management

ADAPTIVE AUDIO ENGINE (OPTIONAL)

- 3-W Speaker with Adaptive Equalisation
- Adaptive Dual-Sided Operation
- Adaptive Noise Suppression Intensity
- Adaptive Gain Control
- Adaptive Windporting

OPTIONAL FEATURES

- Wi-Fi 802.11 b/g/n
- LEX L10 Collaboration
- RFID Volume Knob
- Multi-key for 128 keys and Multi-Algorithm
- Programming Over Project 25 (OTAP)
- Over the Air Rekey (OTAR)
- Digital Tone Signaling
- Mission Critical Geofence
- P25 Authentication
- Man Down Capability
- High Impact Green and Public Safety Yellow Coloured Housing Options
- Rugged Option: IP68 (2m/4hr), Mil Std 512.X Delta - T
- Listed by UL to the standards ANSI/TIA 4950-A and CAN/CSA C22.2 NO. 157-92 Classification Rating: Class I, Division 1, Groups C, D; Class II, Division 1, Group E, F, G; Class III, Hazardous (Classified) Locations. ANSI/ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15; Class I, Division 2, Groups A, B, C, D; T3C. Tamb = -25° C to +60° C. when used with Motorola Solutions Battery: NNTN8921A NNTN8930A 7.4V

1 Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 KHz for United States - State & Local Markets only.

2 Compatible with BT 2.1, HSP, PAN, DUN and SPP Profiles found in off-the-shelf Bluetooth accessories and Bluetooth 4.x

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776, 793-806 MHz 806-824, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 Watts Max	1-6 Watts Max	1-5 Watts Max	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dB	-75 dB	-75 dB	-75 dB
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	25k 25.5k	-52 dB -47 dB	-55 dB -50 dB	-52 dB -47 dB	-52 dB -46 dB
Audio Distortion[1]	700 MHz 800 MHz	1.00 %	1.00 %	1.00 %	1.00 %

BATTERIES FOR APX 6000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2 2550mAh[1]	3.4" x 2.3" x 1.5"	5.0 oz	PMNN4485	2550 mAh
Li-Ion IMPRES 2 3400mAh	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4486	3400 mAh
Li-Ion IMPRES 2 4850mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4487	4850 mAh
Li-Ion IMPRES 2 5100mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4494	5100 mAh
Li-Ion IMPRES 2 2650 mAh[2]	3.4" x 2.3" x 1.7"	5.7 oz	NNTN8930	2650 mAh
Li-Ion IMPRES 2 4500mAh[2]	5" x 2.3" x 1.7"	11.0 oz	NNTN8921	4500 mAh

1 The standard shipping battery for the APX6000
2 HAZLOC approved.

RADIO MODELS

	MODEL 1.5 	MODEL 2.5 	MODEL 3.5 
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-colour backlight	Top display plus: Full bitmap colour LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	Top display plus: Full bitmap colour LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction Navigation key 4x3 keypad Home and Data buttons
Channel Capacity[1]	96	1000	1000
FLASHport Memory	64 MB	64 MB	64 MB
700/800 MHz (763-870 MHz)	H98UCD9PW5BN	H98UCF9PW6BN	H98UCH9PW7BN
VHF (136-174 MHz)	H98KGD9PW5BN	H98KGF9PW6BN	H98KGH9PW7BN
UHF Range 1 (380-470 MHz)	H98QDD9PW5BN	H98QDF9PW6BN	H98QDH9PW7BN
UHF Range 2 (450-520 MHz)	H98SDD9PW5BN	H98SDF9PW6BN	H98SDH9PW7BN
Buttons & Switches	Large PTT button ■ Angled On/Off volume control ■ Orange emergency button ■ 16 position top-mounted rotary switch ■ 2-position concentric switch ■ Multi-colour backlight ■ 3-position toggle switch ■ 3 programmable side buttons		

Regulatory Information

	FCC ID
700/800 (764-869 MHz)	AZ489FT7086
VHF (136-174 MHz)	AZ489FT7087
UHF Range 1 (380-470 MHz)	AZ489FT7077
UHF Range 2 (420-520 MHz)	AZ489FT7085

FCC Emissions Designators

FCC Emissions Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E[2]

Power Supply

Power Supply	One rechargeable Li-Ion IMPRES 2 2550mAh battery standard (PMNN4485), with alternate battery options available.

1 Enhancement package available
2 Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 kHz for United States - State & Local Markets only.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500 mW	500 mW	500 mW	500 mW
Analogue Sensitivity[2] Digital Sensitivity[3]	12 dB SINAD 1% BER (800 MHz) 5% BER	0.25 µV 0.375 µV 0.24 µV	0.17 µV 0.243 µV 0.15 µV	0.224 µV 0.298 µV 0.200 µV	0.203 µV 0.296 µV 0.204 µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	-76 dB -70 dB	-78 dB -73 dB	-77 dB -67 dB	-76 dB -67 dB
Intermodulation		-80.1 dB	-80.2 dB	-80.3 dB	-80.2 dB
Spurious Rejection		-75 dB	-78 dB	-80.5 dB	-80.8 dB
FM Hum and Noise	25 kHz 12.5 kHz	-54 dB -79 dB	-54.3 dB -50.1 dB	-53.5 dB -47.5 dB	-52.5 dB -47.3 dB
Audio Distortion at Rated[1]		0.90%	0.90%	0.70%	0.70%

1 Measured in the analogue mode per TIA / EIA 603 under nominal conditions
2 Measured conductively in analogue mode per TIA / EIA 603 under nominal conditions.
3 Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G										
	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY		
Length	5.47 in	139 mm
Width Push-To-Talk button	2.39 in	60.7 mm
Depth Push-To-Talk button	1.40 in	35.6 mm
Width Top	2.98 in	75.7 mm
Depth Top	1.58 in	40.1 mm
Depth Bottom of Battery	1.24 in	31.5 mm
Weight of the radios without battery	10.9 oz	309 g

ENCRYPTION	
Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronisation	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS/GPS/GNSS SPECIFICATIONS	
Constellations	GPS & GLONASS
Tracking Sensitivity	-164 dBm
Accuracy[2]	<5 metres (95%)
Cold Start	<60 seconds (95%)
Hot Start	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

RUGGED SPECIFICATIONS	
Leakage (submersion)	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 metres, 4 hours)

HOUSING COLOUR

Black (Standard), Public Safety Yellow, and High Impact Green

ENVIRONMENTAL SPECIFICATIONS	
Operating Temperature[1]	-30 °C to +60 °C
Storage Temperature[1]	-50 °C to +85 °C
Humidity Per MIL-STD	ESD IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 metres, 4 hours)

1 Temperatures listed are for radio specifications. Battery storage is recommended at 25 °C, ±5 °C to ensure best performance.

2 Measured conductively with >6 satellites visible at a nominal -130 dBm signal strength. Specs provided are 95th percentile values.

EMISSION DESIGNATORS

LMR:	8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E, 20K0F1E
Bluetooth:	852KF1D, 1M17F1D, 1M19F1D, 1M04F1D
WLAN (Wi-Fi):	13M7G1D, 17M0D1D, 18M1D1D

WIRELESS CONNECTIVITY AND SECURITY

Frequency Range/Bandsplits:
Bluetooth: 2402 - 2480 MHz, WLAN (Wi-Fi): 2400 - 2483.5 MHz

WLAN (Wi-Fi) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs[1]

Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection

Bluetooth 4.0 Low Energy uses 128-bit AES-CCM encryption

1 2400 - 2483.5 MHz for EMEA region and includes guardband.
Channels 1 – 11 used for FCC/IC region.

For more information, visit www.motorolasolutions.com.au

MOTOROLA SOLUTIONS

SILL 08/16 APX6000

MOTOROLA SOLUTIONS

APX™ PROJECT 25 RADIO ACCESSORIES

SAFETY WITHOUT COMPROMISE

MISSION CRITICAL PERFORMANCE THAT PUTS SAFETY FIRST

APX PORTABLE RADIO ACCESSORIES

Motorola P25 APX radios deliver what first responders need to increase their safety and improve their situational awareness.

Get the most out of your APX radio by extending its power and reliability with APX accessories. They are the only accessories, tested and certified for use with APX radios. Our accessories endure rigorous testing to help keep you safer. There's simply no substitute for APX accessories.

Hazards that can impede other batteries, don't affect ours. We build superior batteries specifically for Motorola radios, then test them in real-world conditions against other manufacturers to prove they are the toughest and most reliable around.

APX 8000 | APX 8000XE | APX 7000 | APX 7000XE

APX 6000 | APX 6000XE | APX 4000 | APX 4000 | APX 3000 | APX 1000 | SRX 2200

MOTOROLA'S EXCLUSIVE AUDIO FEATURES ARE MADE FOR MISSION CRITICAL MOMENTS

IMPRES™ ENERGY: YOUR BATTERY SAFER, SMARTER, POWERED FOR LONGER

Only IMPRES technology gives you the most accurate information on the state of your battery so you know it's fully charged to last the entire shift. IMPRES batteries can be charged 150 more times than a standard battery.

DUAL-MIC NOISE SUPPRESSION: I HEAR YOU, EVEN WHEN YOU CAN'T HEAR YOURSELF

Virtually blocks out all background noise in demanding and extreme noise environments so you can always communicate clearly.

IMPRES™ AUDIO: I HEAR YOU, HOWEVER YOU SPEAK

Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

WINDPORTING AUDIO: I HEAR YOU, NOT THE WIND

Reduce the effect of wind and other outdoor noise so your messages are always heard clearly.

NOISE-CANCELING AUDIO: HEAR YOU, NOT THE NOISE

Reduce the effect of background crowd noise, sounds of sirens and horns so your messages are always heard clearly.

APX PORTABLE RADIO ACCESSORIES

XE SERIES REMOTE SPEAKER MICROPHONE (RSM)

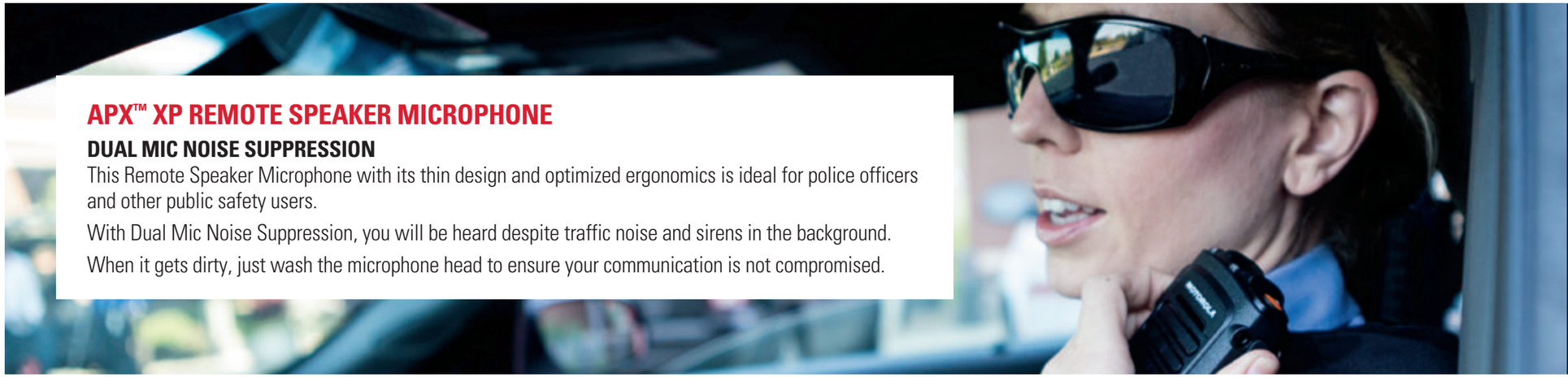
Designed by Firefighters for Firefighters. These rugged microphones have exaggerated controls you can operate with bulky gloves and an asymmetrical shape so you can find the controls you need without looking. The new XE500 RSM features a designated Channel Knob that has been designed to mimic the Channel Knob of the radio. The XE500 utilizes 5 integrated microphones and an Adaptive Audio Engine which automatically changes the level of noise suppression, microphone gain, windporting and speaker equalization to produce clear and loud audio an any environment. The strategic placement of the microphones and enhanced water drainage provide users with the flexibility to wear it straight, upside down and even sideways.

COMPATIBILITY	ACCESSORY			FEATURES											MARKET[1]						
XE REMOTE SPEAKER MICROPHONE (RSM)																					
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
	XE RSM																				
APX 8000 APX 8000XE APX 7000		Xtreme Temperature Cable High Impact Green Housing	NNTN8575A	●	Dual Mic Noise Suppression	Step 				1		IP68	FM UL†	75 x 100 x 33		●				●	
		Xtreme Temperature Cable Black Housing	NNTN8575ABLK	●	Dual Mic Noise Suppression	Step 				1		IP68	FM UL†	75 x 100 x 33		●				●	
APX 7000XE APX 6000 APX 6000XE	**XE500 RSM**																				
		XE500 High Impact Green, Channel Knob, Xtreme Temperature Cable	PMMN4106A	●	Multi Mic Noise Suppression	Step 				1		IP68	UL†	75 x 98 x 33		●				●	
		XE500 Black Housing, Channel Knob, Xtreme Temperature Cable	PMMN4106ABLK	●	Multi Mic Noise Suppression	Step 				1		IP68	UL†	75 x 98 x 33		●				●	

[1] These are recommended uses based on typical use case for each market listed.
[2] Two settings switch for volume – high and low.
† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

APX PORTABLE RADIO ACCESSORIES



APX™ XP REMOTE SPEAKER MICROPHONE

DUAL MIC NOISE SUPPRESSION

This Remote Speaker Microphone with its thin design and optimized ergonomics is ideal for police officers and other public safety users.

With Dual Mic Noise Suppression, you will be heard despite traffic noise and sirens in the background.

When it gets dirty, just wash the microphone head to ensure your communication is not compromised.

WIRELESS REMOTE SPEAKER MICROPHONE

Secure pairing is easier than ever with voice prompts as there is no need to navigate menus or enter codes.

Removing the cord from the RSM makes getting ready for work quicker than ever. No more worrying about getting tangled with the seatbelt or other equipment.

This wireless RSM features a large, but recessed push-to-talk and emergency buttons to ensure that users have easy access to controls but don't have to worry about accidental activation. Additional features include volume control, an audio jack, 360 degree rotatable clip, as well as a task light that allows you to read items such as a driver's license in the dark.

COMPATIBILITY	ACCESSORY			FEATURES											MARKET[1]							
REMOTE SPEAKER MICROPHONES (RSM) Our robust portfolio includes Remote Speaker Microphones and secondary audio accessories engineered to give you clearer communications even in loud environments.									All remote speaker microphones are built with top quality materials including durable **Kevlar®** cables that survive tough working conditions.													
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE	EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		IMPRES XP RSM with Dual Mic Noise Suppression, Volume Control, 1-Programmable Button and Orange Button. Rugged, Submersible (IP68)	NMN6271	●	Dual Mic Noise Suppression	 Step				1		IP68		95 x 69 x 27	●			●	●	●		●
		IMPRES XP RSM with Dual Mic Noise Suppression, 3.5mm threaded jack, Volume Control, 1-Programmable Button and Orange Button (IP55)	NMN6274	●	Dual Mic Noise Suppression	 Step				1	3.5 mm	IP55		95 x 69 x 27	●			●	●	●		●
		XP RSM Replacement Cable with Audio Jack	NNTN6610																			
		XP RSM Replacement Cable without Audio Jack	NNTN6611																			
APX 8000 APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		Wireless RSM with Battery, Clip (RLN6544) and Dual Unit Charger (PMLN7120)	RLN6554		Windporting	 Step				1	3.5 mm	IP55		88 x 63 x 26	●		●	●	●	●		●

[2] Two settings switch for volume – high and low.

[1] These are recommended uses based on typical use case for each market listed.

IMPRES AUDIO (MOTOROLA EXCLUSIVE): Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

WINDPORTING (MOTOROLA EXCLUSIVE) OR NOISE-CANCELLING: Windporting reduces the effect of wind and other outdoor noises on your microphone performance and prevents water from clogging the microphone and distorting your transmission. Noise-cancelling microphones negates crowd or machinery noise so your voice comes through loud and clear anytime you speak directly into the microphone.

AUDIO JACK: Connect a variety of comfortable earpiece styles to the remote speaker microphone for a more discreet communication option.

ORANGE BUTTON: This essential programmable button on top of the microphone is easily activated if you are in trouble. This button can also be set for any programmable feature on the radio, such as emergency.

PROGRAMMABLE BUTTON: This programmable button allows you to access key features while you keep your radio on your belt or hidden under a jacket.

VOLUME CONTROL: Conveniently access the volume control. Toggle switch allows you to easily adjust between high and low volume as needed.

IP RATING: The international standard for rating dust and water protection. The first digit represents the level of dust protection: 5 provides excellent protection from dust. The second digit represents water protection. IP54 provides protection from water sprayed from all directions, IP55 protects against driving rain, 💧IP57 resists submersion in 1 meter of fresh water for 30 minutes and 💧IP68 exceeds industry specs. Product is Ruggedized and is heated at 27°C higher than the water temperature for 2 hours then immediately immersed to a depth of 1 meter for another 2 hours.

INTRINSIC SAFETY RATING: Motorola-approved accessories are a critical part of the overall radio system certified by a recognized testing organization as intrinsically safe. Non-Motorola approved accessories may not be certified for APX and if used, could result in equipment that is NOT approved or unsafe in a hazardous environment.

APX PORTABLE RADIO ACCESSORIES

REMOTE SPEAKER MICROPHONES (RSM) Our robust portfolio includes Remote Speaker Microphones and secondary audio accessories engineered to give you clearer communications even in loud environments.

All remote speaker microphones are built with top quality materials including durable **Kevlar®** cables that survive tough working conditions.

COMPATIBILITY	ACCESSORY			FEATURES											MARKET[1]						
APX PORTABLE RADIOS	REMOTE SPEAKER MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	DISPLAY	CHANNEL CONTROL	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (WITHOUT CLIP), (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		IMPRES Display RSM with Audio Jack, Channel Selector, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4104	●	Windporting	 Step		●	●	2	8-Pin	IP68	FM UL†	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES Display RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4103	●	Windporting	 Step		●		2	8-Pin	IP68	FM UL†	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4101	●	Windporting	 Step				2	8-Pin	IP68	FM UL†	68 x 106 x 31	●	●	●	●	●	●	●
		IMPRES RSM Windporting, Rugged (IP68)	PMMN4083	●	Windporting					0		IP68	FM	60 x 78 x 28	●	●	●	●	●	●	●
		IMPRES RSM with 3.5mm Threaded and NON-Threaded Audio Jack and Orange Button. Noise Cancelling (IP54) NOT INTENDED FOR FIRE MARKETS	PMMN4084	●	Noise-Canceling					0	3.5 mm	IP54	FM	60 x 78 x 28	●		●	●	●	●	●
		IMPRES Windporting RSM with Volume Toggle Switch, Orange Button, 3.5mm NON-Threaded Jack (IP55)	PMMN4099	●	Windporting	 High/Low[2]				1	3.5 mm	IP55	UL†	60 x 78 x 28	●		●	●	●		●
SRX 2200		Windporting RSM, small, submersible (IP57), Coyote Brown	NNTN8235		Windporting					0		IP57	FM UL†	55 x 60 x 27		●					
		Windporting RSM with NON-Threaded 3.5mm Audio Jack, small (IP54), Coyote Brown	NNTN8236		Windporting					0	3.5 mm	IP54	FM UL†	55 x 60 x 27		●					
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		IMPRES RSM with NON-Threaded Audio Jack, Orange Button, Noise Cancelling (IP54) NOT INTENDED FOR FIRE MARKETS	PMMN4062	●	Noise-Canceling					0	3.5 mm	IP54	FM UL†	60 x 78 x 28	●	●	●	●	●	●	●
		IMPRES RSM with Volume Toggle Switch, Orange Button and 1-Programmable Button, Windporting (IP57)	PMMN4065	●	Windporting	 High/Low[2]				1		IP57	FM UL†	60 x 78 x 28	●	●	●	●	●	●	●
		IMPRES RSM with NON-Threaded Audio Jack, Windporting (IP55)	PMMN4069	●	Windporting					0	3.5 mm	IP55	FM UL†	60 x 78 x 28	●	●	●	●	●	●	●

[1] These are recommended uses based on typical use case for each market listed.
[2] Two settings switch for volume – high and low.
† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS			
APX PORTABLE RADIOS	**REMOTE SPEAKER MICROPHONES ACCESSORIES AND REPLACEMENT PARTS**	DESCRIPTION	PART NUMBER
XE RSM REPLACEMENT PARTS			
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE		Xtreme Temperature Replacement Cable for XE RSM (NNTN8203 and NNTN8575 series)	30009402002
		XE RSM Clip Assembly with brass insert designed to work with the Boston Leather Straps (AY000223A01, AY000229A01) requires Clip Button NNTN8749	NNTN8271
		XE500 RSM Clip Assembly with brass insert designed to work with the Boston Leather Straps (AY000223A01, AY000229A01) requires Clip Button NNTN8749	PMLN7633
		Clip Button	NNTN8749
ACCESSORIES AND REPLACEMENT PARTS			
		Dual Unit Charger,rapid rate charger, 120V (US Plug)	PMLN7120
APX 8000 APX 7000		Vehicular Charger	PMLN6716
APX 7000XE APX 6000		Wireless RSM with Battery and Clip	RLN6544
APX 6000XE		Wireless RSM Battery, 1750 mA Li-Ion	PMNN4461
APX 4000 APX 3000		D Ring Swivel Clip (12 pack)	NNTN4990
SRX 2200			

*This cable has not been certified with the APX 8000XE

FIRE MARKET SOLUTION

The XE and XE500 RSM clip paired with a clip button allows easy and secure access to your RSM when used with a Boston Radio Strap with Button Back Holder.

APX WIRELESS RSM

Every feature on this RSM has been purposefully designed. Large, yet recessed push-to-talk and emergency buttons are easy to access and designed to prevent accidental activation. Additional features include a volume control, audio jack and task light that allows you to read items such as a driver's license in the dark. This RSM features all of the advanced capabilities of Mission Critical Wireless including enhanced security, fast push-to-talk and quick touch pairing with voice prompts that confirm pairing actions. This RSM also features a removable and rechargeable battery. Charge the RSM on the go with the vehicular charger or in the office with the dual-unit desk charger.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES		
REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS						
PORTABLE RADIOS	**REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS**	DESCRIPTION	PART NUMBER	EARPIECE TYPE	CONNECTOR TYPE	INTRINSIC SAFETY RATING
APX 8000 **APX 8000XE** **APX 7000** **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **APX 1000** **SRX 2200**		Receive-Only Earpiece with Comfort Eartube, FM approved	RLN4941†	Clear Rubber Eartip	3.5mm	FM
		Receive-Only Earpiece with Comfort Eartube	PMLN7560	Clear Rubber Eartip	3.5mm	
		Receive-Only Earbud, FM and UL approved	AARLN4885	Foam Earbud	3.5mm	FM UL†
		EP7 Sonic Defender, use with RLN4941	RLN6511 RLN6512 RLN6513			
		Receive-Only Earpiece with translucent tube and rubber eartip	PMLN7560	Clear Rubber Eartip	3.5mm	
		D-Shell Rx-Only Earpiece	PMLN4620	Over-the-Ear	3.5mm	FM UL†
		Receive-Only Flexible Earpiece	WADN4190	Over-the-Ear	3.5mm	FM UL†
		Receive and Transmit Boomless Temple Transducer (for HMN4104, HMN4103 and HMN4101 only)	RMN5116	Over-the-Head	8-Pin	FM UL†
		Receive-Only Earpiece with translucent tube and rubber eartip (for HMN4104, HMN4103 and HMN4101 only)	RLN6424	Clear Rubber Eartip	8-Pin	FM UL†
		Replacement Foam Plugs for RLN5887 and RLN6242. Noise reduction = 25dB. (Pack of 50 pairs)	5080384F72	Foam Eartip		
		Replacement Rubber Eartip for RLN6424 (Pack of 25)	5080370E97			

NOTE: See page 24 for high noise earpiece solutions.

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

WHICH MICROPHONES ARE 50% LOUDER AND CLEARER?

APX Remote Speaker Microphones and Public Safety Microphones deliver audio that is clearer, easier to understand, and up to 50% louder. That's because they have the same speaker found in APX portable radios for the best-in-class accessory audio available.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			
REMOTE SPEAKER MICROPHONE ACCESSORIES AND REPLACEMENT PARTS				
PORTABLE RADIOS	**REMOTE SPEAKER MICROPHONES ACCESSORIES AND REPLACEMENT PARTS**	**DESCRIPTION**	**PART NUMBER**	**CONNECTOR TYPE**
APX 8000XE **APX 7000** **APX 7000XE**		Display RSM Interface Cable, 5-Pin Nexus Female Receptacle	PMKN4107	5-Pin Nexus Female
APX 6000 **APX 6000XE** **APX 4000**		Display RSM Interface Cable 4-Pin Nexus Male Plug	PMKN4112	4-Pin Nexus Male
APX 3000 **APX 1000** **SRX 2200**		Display RSM Interface Cable, 12-Pin Hirose Male Connector	PMKN4113	12-Pin Hirose Male
		Replacement Coil Cord Kit for HMN4104, 4103 and 4101	3075336B17	
		Replacement Coil Cord Kit for PMMN4062, PMMN4065, PMMN4069, PMMN4083 and PMMN4099.	RLN6075	

WHICH MICROPHONE IS RIGHT FOR ME?

WINDPORTING AUDIO: I HEAR YOU, NOT THE WIND
If you work outdoors in demanding weather, a Windporting microphone is right for you. It reduces the effects of wind and other sounds whenever you use the microphone. It also prevents water from clogging the microphone for clear transmissions.

NOISE-CANCELING AUDIO: I HEAR YOU, NOT THE NOISE
Talking in a crowd or near heavy equipment? A Noise-Canceling microphone reduces background sounds. To optimize noise reduction, hold the microphone in the correct position directly in front of your mouth, facing the source of the noise.

DUAL MIC NOISE SUPPRESSION: I HEAR YOU, EVEN WHEN YOU CAN'T HEAR YOURSELF
Virtually blocks out all background noise in demanding and extreme noise environments so you can always communicate clearly.

COMPATIBILITY	ACCESSORY	FEATURES	MARKET[1]

PUBLIC SAFETY MICROPHONES Our robust portfolio includes Public Safety Microphones and secondary audio accessories engineered to give you clearer communications even in loud environments.

APX PORTABLE RADIOS	PUBLIC SAFETY MICROPHONES	DESCRIPTION	PART NUMBER	IMPRES	WINDPORTING OR NOISE-CANCELING	VOLUME CONTROL[2]	ORANGE PROGRAMMABLE BUTTON	PROGRAMMABLE BUTTON	AUDIO JACK	IP RATING*	INTRINSIC SAFETY RATING	SIZE (MM)	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 7000 700/800 MHz only **APX 6000** 700/800 MHz only **APX 3000** 700/800 MHz only		IMPRES Windporting Public Safety Microphone (30 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4061	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM UL†	60 x 78 x 28	●				●		
		IMPRES Windporting Public Safety Microphone (24 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4060	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM UL†	60 x 78 x 28	●				●		
		IMPRES Windporting Public Safety Microphone (18 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4059	●	Windporting	Hi/Low		1	3.5 mm	IP55	FM UL†	60 x 78 x 28	●				●		

[1] These are recommended uses based on typical use case for each market listed.
[2] Two settings switch for volume – high and low.
† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES		
COMMPORT™ Integrated microphone/receiver lets you talk discreetly and hear clearly and still be aware of everything around you, from traffic noise to other responders.						
APX PORTABLE RADIOS	**EARPIECES**	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT
APX 7000 **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		Integrated Ear Microphone/Receiver System with Palm PTT (Includes adapter BDN6783)	RLN6480	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Palm
		Integrated Ear Microphone/Receiver System with PTT on Adapter (Includes adapter BDN6783)	RLN6482	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	On Adapter
		Integrated Ear Microphone/Receiver System with Snap-On-Side PTT (Includes adapter BDN6783)	RLN6481	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Side
		Integrated Ear Microphone/Receiver System with Ring PTT (Includes adapter BDN6783)	RLN6483	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Ring
		Integrated Ear Microphone/Receiver System with Body PTT (Includes adapter BDN6783)	RLN6484	Over-the-Ear, Clear Silicone Eartube	On Earpiece, Above Ear	Body

HOW DOES COMMPORT™ WORK?

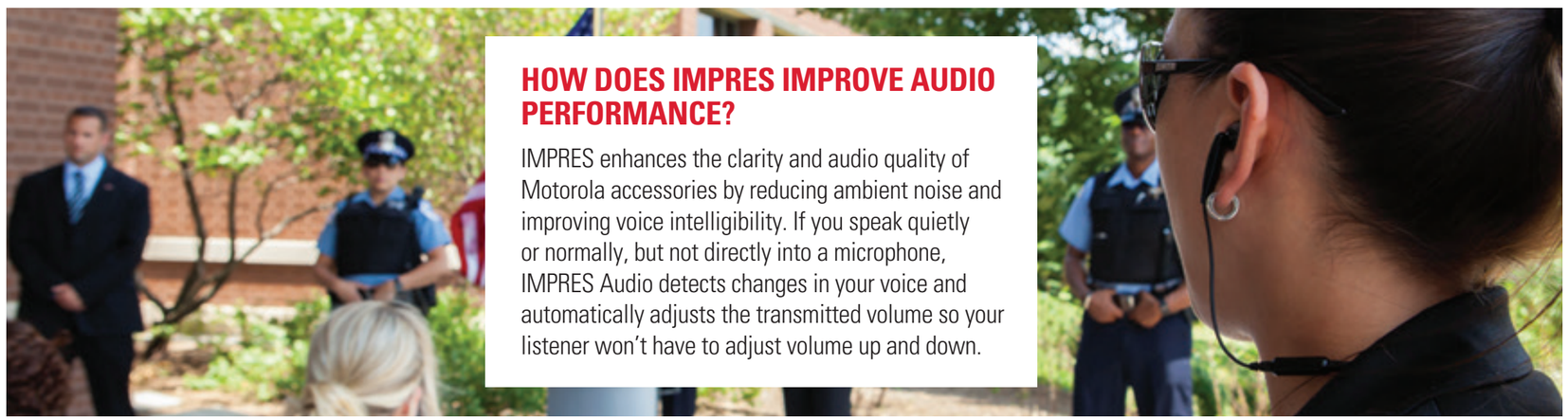
The miniature microphone and receiver connect to your APX radio and fasten securely and comfortably to your ear. Unlike bone conduction or boom mic technology, the CommPort System picks up sound waves as they cross the face so you hear and can be heard virtually in any environment.

COMPATIBILITY	ACCESSORY		
COMMPORT™			
APX PORTABLE RADIOS	**ACCESSORIES AND REPLACEMENT PARTS**	DESCRIPTION	PART NUMBER
		Replacement Palm PTT for RLN6480	NKN6510
		Replacement Cable for RLN6481	NKN6508
APX 7000		Replacement Snap-On-Side PTT for RLN6482	NKN6525
APX 7000XE		Replacement Ring PTT for RLN6483	NKN6512
APX 6000		Replacement Remote Body PTT for RLN6484	NNTN4188
APX 6000XE		Ear Microphone Assembly	NTN8819
APX 4000		CommPort Maintenance Kit (Includes 10 replacement ear tubes, 10 microphone seals and 2 windscreens)	NTN8821
APX 3000		Adhesive Pads for secure attachment to ear (Pack of 90)	NTN8986
SRX 2200		Ear Straps for secure attachment to ear (pack of 10)	NTN8988
		Replacement Ear Tubes (pack of 10)	RLN5037
		Replacement Collar Clip	4285838B01
		Back Cover Clip	4202006A01

APX PORTABLE RADIO ACCESSORIES

EAR MICROPHONE SYSTEM

COMPATIBILITY	ACCESSORY			FEATURES						MARKET[1]						
APX PORTABLE RADIOS	EAR MICROPHONE SYSTEM	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
		IMPRES Ear Microphone with Bone Conduction and programmable button, black	PMLN5653	●	In-Ear Mic	In-Ear Mic	Large, Ring-guarded, Recessed		FM APPROVED FOR APX™ 7000, APX 7000XE, APX 6000, APX 6000XE	●		●	●			
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200 APX 1000		Earguard with Adjustable Loop	0180300E25													
		Earholder, Black, Small	0180358B32													
		Earholder, Black, Medium	0180358B33													
		Earholder, Black, Large	0180358B34													
		Earholder, Clear, Medium	0180358B36													
		Earholder, Clear, Large	0180358B37													



HOW DOES IMPRES IMPROVE AUDIO PERFORMANCE?

IMPRES enhances the clarity and audio quality of Motorola accessories by reducing ambient noise and improving voice intelligibility. If you speak quietly or normally, but not directly into a microphone, IMPRES Audio detects changes in your voice and automatically adjusts the transmitted volume so your listener won't have to adjust volume up and down.

SURVEILLANCE KITS AND EARPIECES

Transmit and receive discreetly with a variety of surveillance kits that feature a streamlined design and rugged cables that withstand tough conditions. A quick-disconnect, durable and comfortable translucent tube enables easy sharing between shifts.

Two-wire kits have one wire for receiving transmissions and one wire with a combined microphone and push-to-talk. Three-wire kits feature separate wires for receiving transmissions, push-to-talk and microphone.

COMPATIBILITY	ACCESSORY			FEATURES						MARKET[1]						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		1-Wire Receive-only earpiece, black	PMLN6125	●	Ear Hanger				FM UL†	●		●	●			
		1-Wire Receive-only earpiece, beige	PMLN6126	●	Ear Hanger				FM UL†	●		●	●			
		IMPRES 2-Wire Surveillance Kit, programmable button, black	PMLN6127	●	Ear Hanger	 Mic and PTT combined on a single wire	 Mic and PTT combined on a single wire		FM UL†	●		●	●			
		IMPRES 2-Wire Surveillance Kit, programmable button, beige	PMLN6128	●	Ear Hanger				FM UL†	●		●	●			

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

[1] These are recommended uses based on typical use case for each market listed.

IMPRES AUDIO (MOTOROLA EXCLUSIVE): Ensure your voice is heard clearer, crisper, and louder regardless of level or direction you're speaking into the accessory.

MICROPHONE AND PTT: Some accessories have a microphone on the same wire as push-to-talk (2-Wire surveillance kit) or on a separate wire (3-Wire surveillance kits). Microphones are small, easy to mount and hide during surveillance operations, yet powerful enough to pick up whispered transmissions and reduce ambient noise.

PROGRAMMABLE BUTTON: This programmable button allows you to access key features while you keep your radio on your belt or hidden under a jacket.

INTRINSIC SAFETY RATING: Motorola-approved accessories are a critical part of the overall radio system certified by a recognized testing organization as intrinsically safe. Non-Motorola approved accessories may not be certified for APX and if used, could result in equipment that is NOT approved or unsafe in a hazardous environment.

APX PORTABLE RADIO ACCESSORIES

SURVEILLANCE KITS

COMPATIBILITY	ACCESSORY			FEATURES						MARKET[1]						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	EARPIECE TYPE	MICROPHONE	PTT	PROGRAMMABLE BUTTON	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6129	●	Clear Rubber Eartip	 Mic & PTT combined on a single wire	 Mic & PTT combined on a single wire		FM UL†	●		●	●			
		IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6130	●	Clear Rubber Eartip				FM UL†	●		●	●			
APX 7000		IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6123	●	Clear Rubber Eartip	 Separate wire	 Separate wire		FM UL†	●		●	●			
		IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6124	●	Clear Rubber Eartip				FM UL†	●		●	●			
APX 7000XE		2-Wire Surveillance Kit, with Extra Loud Earpiece, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6038		Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire			●		●	●			
APX 6000		3-Wire Surveillance Kit, with Extra Loud Earpiece, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6039		Ear Hanger	Separate wire	Separate wire			●		●	●			
APX 6000XE		2-Wire Surveillance Kit, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6032		Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire			●		●	●			
APX 4000		3-Wire Surveillance Kit, Beige, Hirose Connector. Requires NNTN7869 Hirose Adapter	ZMN6031		Ear Hanger	Separate wire	Separate wire			●		●	●			
APX 3000		1-Wire Receive-Only Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6664		Ear Hanger				FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
APX 1000		1-Wire Receive-Only Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6726		Ear Hanger				FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			
SRX 2200		1-Wire Receive-Only Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6727		Ear Hanger				FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

[1] These are recommended uses based on typical use case for each market listed.

APX PORTABLE RADIO ACCESSORIES

SURVEILLANCE KITS

COMPATIBILITY	ACCESSORY						MARKET[1]						
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT	INTRINSIC SAFETY RATING	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		1-Wire Receive-Only Surveillance Kit with Translucent Tube, Beige, 3.5mm Threaded. Requires BDN6783	RLN5314	Clear rubber eartip			UL†	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Translucent Tube, Black, 3.5mm Threaded. Requires BDN6783	RLN5313	Clear rubber eartip			UL†	●		●	●			
APX 8000 APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		2-Wire Surveillance Kit with Translucent Tube, Black, 3.5mm Threaded. Requires BDN6783	RLN5312	Clear rubber eartip	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire		●		●	●			
		1-Wire Receive-Only Surveillance Kit with Volume Control and Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6666	Ear Hanger			FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
		1-Wire Receive-Only Surveillance Kit with Volume Control and Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6728	Ear Hanger			FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		2-Wire Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6667	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
		2-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6729	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			
		2-Wire Surveillance Kit with Extra-Loud Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6669	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
		2-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6731	Ear Hanger	Mic & PTT combined on a single wire	Mic & PTT combined on a single wire	FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			
		3-Wire Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6668	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			
		3-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6730	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			
		3-Wire Surveillance Kit with Extra-Loud Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6670	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE APX7000/7000XE	●		●	●			
		3-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6732	Ear Hanger	Separate wire	Separate wire	FM approved with APX6000/6000XE APX7000/7000XE UL†	●		●	●			

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

[1] These are recommended uses based on typical use case for each market listed.

APX PORTABLE RADIO ACCESSORIES

SURVEILLANCE KIT ACCESSORIES AND REPLACEMENT PARTS

APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	COMPATIBLE SURVEILLANCE KITS
APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Completely Discreet Earpiece Kit with Neckloop, Beige, Includes RLN4921, RLN4920 and RNN4005	RLN4922		
		Phonak Nano Ear Receiver, Beige (Neckloop must be ordered separately)	GMLN5261		
		Phonak Nano Ear Receiver, Brown (Neckloop must be ordered separately)	GMLN5262		
		Replacement Earwax guards. 5 per pack. Compatible with RLN4922	RLN4919		
		Optional Retention Hooks, Pack of 10	NNTN8457		
		Phonak Phonito Intra Ear Receiver Included in the RLN4922	RLN4921		
		Phonak Inductive Neckloop Included in the RLN4922	RLN4920		
		1.4 Volt Battery – Pack of 6	RNN4005		
		Low Noise Kit with Quick Disconnect translucent tube and clear rubber eartip	RLN6242	Clear rubber eartip	PMLN6123, PMLN6124, PMLN6129, PMLN6130
		Replacement standard clear rubber eartip, Pack of 50	RLN6282	Clear rubber eartip	PMLN6123, PMLN6124, PMLN6125, PMLN6126, PMLN6127, PMLN6128, PMLN6129, PMLN6130
		Replacement Foam Plugs for RLN5887 and RLN6242. Noise reduction = 25dB.* Pack of 50 pairs.	5080384F72	Foam eartip	PMLN6123, PMLN6124, PMLN6129, PMLN6130
		Low Noise Kit with 1 clear rubber eartip	RLN5886	Clear rubber eartip	RLN5882, RLN5883, PMLN5111, PMLN5112, PMLN6125, PMLN6126
		High Noise Kit* with 2 foam earplugs	RLN5887	Foam eartip	
		Clear EP7-Small Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6511	Comply™ foam eartip	RLN5882, RLN5883, PMLN5111, PMLN5112, PMLN6123, PMLN6124, PMLN6125, PMLN6126, PMLN6127, PMLN6128, PMLN6129, PMLN6130
		Clear EP7-Medium Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6512	Comply™ foam eartip	
		Clear EP7-Large Hearing Protectors [Sonic Defenders] Ultra Earplugs Noise reduction = 28dB	RLN6513	Comply™ foam eartip	

* For High Noise Kit solution - combine RLN6242 Low Noise Kit with translucent tube and clear rubber eartip and RLN6281 Replacement Foam Plugs for RLN6242. Noise reduction = 25dB.

SURVEILLANCE KIT ACCESSORIES AND REPLACEMENT PARTS

APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Small Clear Comfortable Earpiece, right ear	RLN4760	Clear comfortable earpiece
		Medium Clear Comfortable Earpiece, right ear	RLN4761	Clear comfortable earpiece
		Large Clear Comfortable Earpiece, right ear	RLN4762	Clear comfortable earpiece
		Small Clear Comfortable Earpiece, left ear	RLN4763	Clear comfortable earpiece
		Medium Clear Comfortable Earpiece, left ear	RLN4764	Clear comfortable earpiece
		Large Clear Comfortable Earpiece, left ear	RLN4765	Clear comfortable earpiece
SURVEILLANCE KIT AUDIO ADAPTERS				
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		3.5mm Threaded Audio Adapter	BDN6783†	BDN6664, BDN6665, BDN6666, BDN6667, BDN6668, BDN6669, BDN6726, BDN6727, BDN6728, BDN6729, BDN6730, BDN6731, BDN6732, BDN6670
		6 Pin Hirose Keyload & Audio Adapter, FM/IS rated	NNTN7869	ZMN6031, ZMN6032, ZMN6038, ZMN6039

† UL: For detailed Hazardous Location Certification, refer to pages 55-62.

APX PORTABLE RADIO ACCESSORIES

XBT HEAVY-DUTY WIRELESS HEADSET IN USE

It's the middle of a shift and with machinery running at full speed, your workplace is a noisy place to be. You need to communicate on your radio while still being aware of everything around you. XBT heavy-duty headsets connect wirelessly to your radio, suppressing noise for clearer communications. With patented SENS™ situational awareness technology, these headsets ensure you'll hear critical communications from co-workers in the field with you.

COMPATIBILITY	ACCESSORY			FEATURES								MARKET[1]						
HEADSETS																		
APX PORTABLE RADIOS	HEADSETS	DESCRIPTION	PART NUMBER	IMPRES	HEADSET TYPE	SPEAKER	NOISE-CANCELLING / NOISE-REDUCTION	MICROPHONE	PTT	INTRINSIC SAFETY RATING	WEIGHT	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
		IMPRES Temple Transducer with boom microphone and inline push-to-talk 7580384M19 - Replacement rubber temple cover (1 pair)	PMLN5101	●	Behind-the-Head	Bone Conduction		Boom	In-line	FM UL†	Lightweight	●		●		●	●	●
		Earset D-Shell	PMLN5096		Over-the-Ear	Single-Ear		Boom	In-line	UL†	Lightweight							
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Ultra Lite Headset	PMLN5102		Over-the-Head	Single-Ear		Boom	In-line	UL†	Lightweight							
		Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN5275		Behind-the-Head	Dual-Ear	●	Boom	In-line	FM UL†	Heavy-Duty					●	●	●
		Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN6852		Behind-the-Head	Dual-Ear	●	Boom	On Ear Cup		Heavy-Duty					●	●	●
		Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN6853		Behind-the-Head	Dual-Ear	●	Boom	On Ear Cup	FM UL†	Heavy-Duty					●	●	●
		Heavy-Duty Over-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN7466		Over-the-Head	Dual-Ear	●	Boom	On Ear Cup		Heavy-Duty					●	●	●
		Heavy-Duty Over-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN7467		Over-the-Head	Dual-Ear	●	Boom	On Ear Cup		Heavy-Duty					●	●	●
APX 8000 APX 8000XE		Lightweight Over-the-Head Headset single muff with in-line push-to-talk and boom mic REX4648 - replacement foam earpad and microphone cover kit	RMN5058		Over-the-Head	Single-Ear		Boom	In-line	FM UL†	Lightweight		●			●	●	●
APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		XBT Operations Critical Wireless Behind-the-Neck Headset	RLN6490		Behind-the-Neck	Dual-Ear	●	Boom	Radio, headset or wireless PTT pod		Heavy-Duty					●		●
		XBT Operations Critical Wireless Headband Style Headset	RLN6491		Over-the-Head	Dual-Ear	●	Boom	Radio, headset or wireless PTT pod		Heavy-Duty					●		●

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

[1] These are recommended uses based on typical use case for each market listed.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY				FEATURES					
3M PELTOR HEAVY DUTY HEADSETS										
APX PORTABLE RADIOS	**3M PELTOR HEAVY DUTY HEADSETS**	**DESCRIPTION AND ADAPTER TYPE**	**PART NUMBER**	**PELTOR PART NUMBER**	HEADSET TYPE	CONNECTOR TYPE	SPEAKER	NOISE REDUCTION RATING (NRR)	NOISE CANCELLING MICROPHONE	PTT (APX)
DIRECT CONNECT										
APX 8000 **APX 8000XE** **APX 7000** **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		MT Series Over-The-Head Headset, direct radio connect	RMN5137	MT7H79A-C5063-34	Over-The-Head	Connects directly to Radio	Dual-Ear	25dB	Boom	On Ear Cup
		MT Series Neckband Headset, direct radio connect	RMN5138	MT7H79B-C5063-34	Neckband	Connects directly to Radio	Dual-Ear	24dB	Boom	On Ear Cup
		MT Series Hard Hat Attached Headset, direct radio connect	RMN5139	MT7H79P3E-C5063-34	Hard Hat Attached	Connects directly to Radio	Dual-Ear	21dB	Boom	On Ear Cup
PTT ADAPTER CONFIGURATIONS										
APX 8000 **APX 8000XE** **APX 7000** **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		MT Series Over-the-Head Headset with Nexus connector	PMLN6088	MT7H79A-34	Over-the-Head	Nexus	Dual-Ear	25dB	Boom	Requires PTT Adapter PMLN6095
		MT Series Neckband Headset with Nexus connector	RLN6477	MT7H79B-34	Neckband	Nexus	Dual-Ear	24dB	Boom	Requires PTT Adapter PMLN6095
		MT Series Hard Hat Attached with Nexus connector	RMN4051	MT7H79P3E-34	Hard Hat Attached	Nexus	Dual-Ear	21dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Over-The-Head Headset with Nexus connector	RMN4052	MT15H7A-34	Over-The-Head	Nexus	Dual-Ear	26dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Neckband Headset with Nexus connector	RMN5135	MT15H7B-07-34	Neckband	Nexus	Dual-Ear	25dB	Boom	Requires PTT Adapter PMLN6095
		TacticalPro Series Hard Hat Attached with Nexus connector	RMN4053	MT15H7P3E-34	Hard Hat Attached	Nexus	Dual-Ear	22dB	Boom	Requires PTT Adapter PMLN6095
		PTT Nexus Adapter	PMLN6095	FL5063-34						
RSM CONFIGURATIONS										
APX 7000 **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		HT Series Listen Only Over-The-Head Headset with 3.5mm NON threaded connector	RMN4055	HTM79A-34	Over-The-Head	3.5mm NON threaded	Dual-Ear	25dB	(Listen-Only)	APX radio requires RSM: PMMN4062, PMMN4069 or PMMN4084
		HT Series Listen Only Neckband Headset with 3.5mm NON threaded connector	RMN5132	HTM79B-34	Neckband	3.5mm NON threaded	Dual-Ear	24dB	(Listen-Only)	
		HT Series Listen Only Hard Hat Attached Headset with 3.5mm NON threaded connector	RMN5133	HTM79P3E-34	Hard Hat Attached	3.5mm NON threaded	Dual-Ear	23dB	(Listen-Only)	

COMPATIBILITY	ACCESSORY			
REPLACEMENT PARTS				
APX PORTABLE RADIOS	**REPLACEMENT PARTS**	**DESCRIPTION**	**PART NUMBER**	**PELTOR PART NUMBER**
APX 7000 **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		Earmuff Hygiene Kit Black Earseals	RLN4923	HY79
		Hygiene Tape for Microphone	RLN6542	HYM1000
		Boom Microphone Wind Screen	RLN6543	M40/1
		Metal Boom with Microphone	RMN5131	MT7N

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES				MARKET[1]						
HEARING PROTECTION														
APX PORTABLE RADIOS	SURVEILLANCE ACCESSORIES	DESCRIPTION	PART NUMBER	IMPRES	HEADSET TYPE	SPEAKER	NOISE-CANCELLING / NOISE-REDUCTION	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Clear EP7-Small Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6511		Comply™ Foam Ear tip		Noise Reduction					●	●	●
		Clear EP7-Medium Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6512		Comply™ Foam Ear tip		Noise Reduction					●	●	●
		Clear EP7-Large Hearing Protectors [Sonic Defenders] Ultra Earplugs, noise reduction = 28dB	RLN6513		Comply™ Foam Ear tip		Noise Reduction					●	●	●
TACTICAL SOLUTIONS														
APX 8000		Tactical PTT/VOX Interface Module	PMLN6765					●	●	●	●	●		●
APX 8000XE		Tactical PTT Only Interface Module	PMLN6827					●	●	●	●	●		●
APX 7000		Tactical Boomless Temple Transducer (requires Interface Module PMLN6765 or PMLN6827)	PMLN6766		Over-the-head	Bone Conduction	Noise Cancelling	●		●	●	●		●
APX 7000XE		Tactical Throat Microphone (requires Interface Module PMLN6765 or PMLN6827)	PMLN6828		Neckband	Earbud	Noise Cancelling	●		●	●	●		●
APX 6000		Tactical Ear Microphone (requires Interface Module PMLN6765 or PMLN6827)	PMLN6829		In-Ear	In-Ear	Noise Cancelling	●	●			●		●
APX 6000XE		Tactical Temple Transducer / Boom Mic (requires Interface Module PMLN6765 or PMLN6827)	PMLN6833		Over-the-head	Bone Conduction	Noise Cancelling	●			●	●		●
APX 4000		Tactical Remote Body PTT (for use with Interface Module PMLN6765 or PMLN6827)	PMLN6767					●	●	●	●	●		●
APX 3000		Tactical Remote Ring PTT (for use with Interface Module PMLN6765 or PMLN6827)	PMLN6830						●		●			●
SRX 2200														

[1] These are recommended uses based on typical use case for each market listed.

WHAT ARE THE EP7 SONIC DEFENDERS ULTRA EARPLUGS?

RLN6511, RLN6512, RLN6513

The EP7 Sonic Defenders Ultra Earplugs provide extra comfort and/or noise protection for users wearing surveillance accessories or users wearing heavy duty headsets / helmets. With a foam-tipped stem design and soft memory-foam Comply™ Canal Tips, these comfortable earplugs protect your hearing without blocking your ability to hear routine sounds or conversations. Safe sounds are allowed to pass through into the ear canal, while potentially harmful noises (above 85dB) are reduced through a filter.

Filter caps are included and can be inserted for additional hearing protection or removed for use with surveillance kits.* With a patented EarLock® technology to hold them in place, all-day comfort, and a low-profile design, these earplugs can be worn while wearing a helmet or mask, or while using a phone or heavy duty headset. Lanyard is included in each earplug kit, as shown in picture.

*EP7 earpiece will not provide full 28dB Noise Reduction when the noise-reducing filter is removed.

Motorola's Tactical Solution offers a high performance interface enhanced by high speed DSP (Digital Signal Processor) which only detects the human voice.

Providing steady and trouble free transmission without clipping your message even in the noisiest environments.

Combined with various headset assures efficient and safer operation in a variety of work environments.

APX PORTABLE RADIO ACCESSORIES

HOW DO MISSION CRITICAL WIRELESS ACCESSORIES HELP ME?

They free you from being physically connected to the radio and are ideal for surveillance operations. They look CONSUMER, but are mission critical in performance and provide exceptional flexibility, high security, superior audio performance and a new dimension of freedom. Carry your radio in a backpack, bag or purse without being constrained by wires. YOUR RADIO, UNLEASHED.

COMPATIBILITY	ACCESSORY			FEATURES										MARKET[1]						
MISSION CRITICAL WIRELESS ACCESSORIES (MCW) This portfolio is a game changer, giving you the flexibility to remove the radio from your belt and stay connected within 30 feet.																				
PORTABLE RADIOS	ACCESSORIES	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT	TALK TIME (HOURS) 5/5/90 DUTY CYCLE	CHARGE TIME (HOURS)	WEIGHT (GRAMS)	SIZE (MILLIMETERS)	RANGE (FEET LINE OF SIGHT)	IP RATING*	INTRINSIC SAFETY RATING[2]	POLICE	FIRE / EMS	MILITARY	FEDERAL AGENCIES	UTILITIES AND PUBLIC WORKS	OIL, GAS AND MINING	TRANSPORTATION
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		Mission Critical Wireless Earpiece with 12" cable and push-to-talk pod	NTN2570	Over-the-Ear (CommPort™)	Directional, above the Earpiece	●	10	3	43	70 x 41 x 25	30	IP54	FM	●	●	●	●	●		●
		Mission Critical Wireless push-to-talk pod	NTN2571	N/A	N/A	●	10	3	43	70 x 41 x 25	30	IP54	FM	●	●	●	●	●		●
		Mission Critical Wireless Remote Control Keyfob with programmable buttons	NNTN8442	N/A	N/A	●	10	3	26	67 x 32 x 16	30	IP54		●			●			

[1] These are recommended uses based on typical use case for each market listed.

[2] Accessory solution is FM certified when used with an FM certified radio system and FM certified adapter if required.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

EARPIECE TYPE: Choose the right fit for your operations – a simple, low cost, discreet earbud or the rugged, high performance CommPort™ style earpiece.

MICROPHONE: The in-line microphone on the earbud earpiece is designed for general use, while the directional microphone on the CommPort™ style earpiece is ideal for lower noise environments.

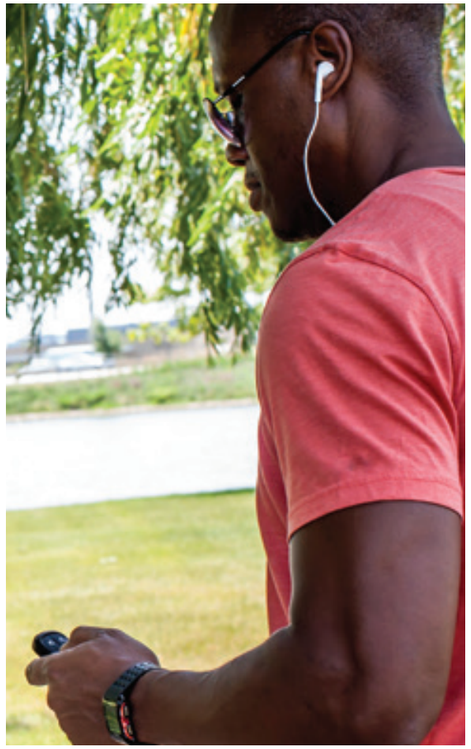
APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES		
MISSION CRITICAL WIRELESS ACCESSORIES This portfolio is a game changer, giving you the flexibility to remove the radio from your belt and stay connected within 30 feet.						
PORTABLE RADIOS	**ACCESSORIES**	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT
APX 8000 **APX 8000XE** **APX 7000** **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		1- Wire Surveillance kit with Translucent Acoustic tube for Wireless PTT Pods	PMLN7052	Clear Rubber Eartip	In-line	On Pod, ordered separately
		1- Wire Earbud for Wireless Push-to-Talk pod with 11.5" cable, Black	NNTN8294	Earbud	In-line	On Pod, ordered separately
		1- Wire Earbud for Wireless Push-to-Talk pod with 45" cable, Black	NNTN8295	Earbud	In-line	On Pod, ordered separately
		Covert Audio Kit for Mission Critical Wireless PTT Pod	NNTN8296	1 earbud and 2 earbud headsets	In-line	On Pod, ordered separately
		Y-Adapter and Retention Hook for Mission Critical Wireless Push-to-Talk Pod	NNTN8385		Directional, on separate wire	On Pod, ordered separately
		Neckloop for Discreet Earpiece Kit	RLN4920			
		Accessory Kit, Completely Discreet Wireless Surveillance Kit. Includes: Wireless Neckloop, Y-adapter and retention hook(NNTN8385), Completely Discreet Earpiece Kit (RLN4922) and Mission Critical Wireless push-to-talk pod (NTN2571)	NNTN8434			
		Commercial 3.5mm Earbud Headset Adapter, 10 per pack	NNTN8737			
		Replacement Wireless Earpiece 12 inch cable	NTN2572	Over-the-Ear (CommPort™)	Directional above the ear comport mic	On Pod, ordered separately
		Mission Critical Wireless Covert Pack-N-Go Kit, Basic. Kit includes: NNTN8296 Basic Mission Critical Wireless Covert Kit, NTN2571 Mission Critical Wireless Push-to-Talk (PTT) Pod and NNTN8442 Mission Critical Wireless Remote Control Unit	RLN6489	Earbud and earbud headset	On Y-Adapter or in-line on earbuds	On PTT and MCW Keyfob
		Mission Critical Wireless Covert Pack-N-Go Kit, Advanced. Kit includes: All contents of Covert Pack-n-Go Kit plus RLN4922 Completely Discreet Earpiece Kit and NNTN8385 Wireless Neckloop Y-adapter	RLN6501	Completely Discreet Earpiece, earbud and earbud headset	On Y-Adapter or in-line on earbuds	On PTT and MCW Keyfob

COMPATIBILITY	ACCESSORY			FEATURES		
MISSION CRITICAL WIRELESS ACCESSORIES This portfolio is a game changer, giving you the flexibility to remove the radio from your belt and stay connected within 30 feet.						
PORTABLE RADIOS	**ACCESSORIES**	DESCRIPTION	PART NUMBER	EARPIECE TYPE	MICROPHONE	PTT
APX 8000 **APX 8000XE** **APX 7000** **APX 7000XE** **APX 6000** **APX 6000XE** **APX 4000** **APX 3000** **SRX 2200**		Wireless Earpiece Maintenance Kit with 10 silicone ear tubes, 10 microphone seal strips and 2 foam windscreens for NTN2572 Over-the-Ear earpiece	NTN8821	Over-the-Ear (CommPort™)		
		Ear strap for CommPort™ earpiece to secure earpiece to ear (10 per pack)	NTN8988	Over-the-Ear (CommPort™)		
		Eartubes for CommPort™ earpiece (10 per pack)	RLN5037	Over-the-Ear (CommPort™)		
		Replacement ear tips kit for wireless ear buds (20 Small, 20 Medium, 20 Large and 10 clips)	NNTN8361	Earbud		
		Replacement Swivel Clip for Wireless PTT Pod	PMLN6246			
		Replacement or spare micro-usb plug-in charger (US)	PMPN4027			

WHAT MAKES THE COVERT PACK-AND-GO KIT A MUST-HAVE?

Organize and stow all your APX wireless accessories on the go, all in one place. Keep this durable kit in a backpack or messenger bag and you'll always have the right accessories on hand. With a dozen secure straps and deep mesh pockets, you can access exactly what you need when an operation happens.



APX PORTABLE RADIO ACCESSORIES

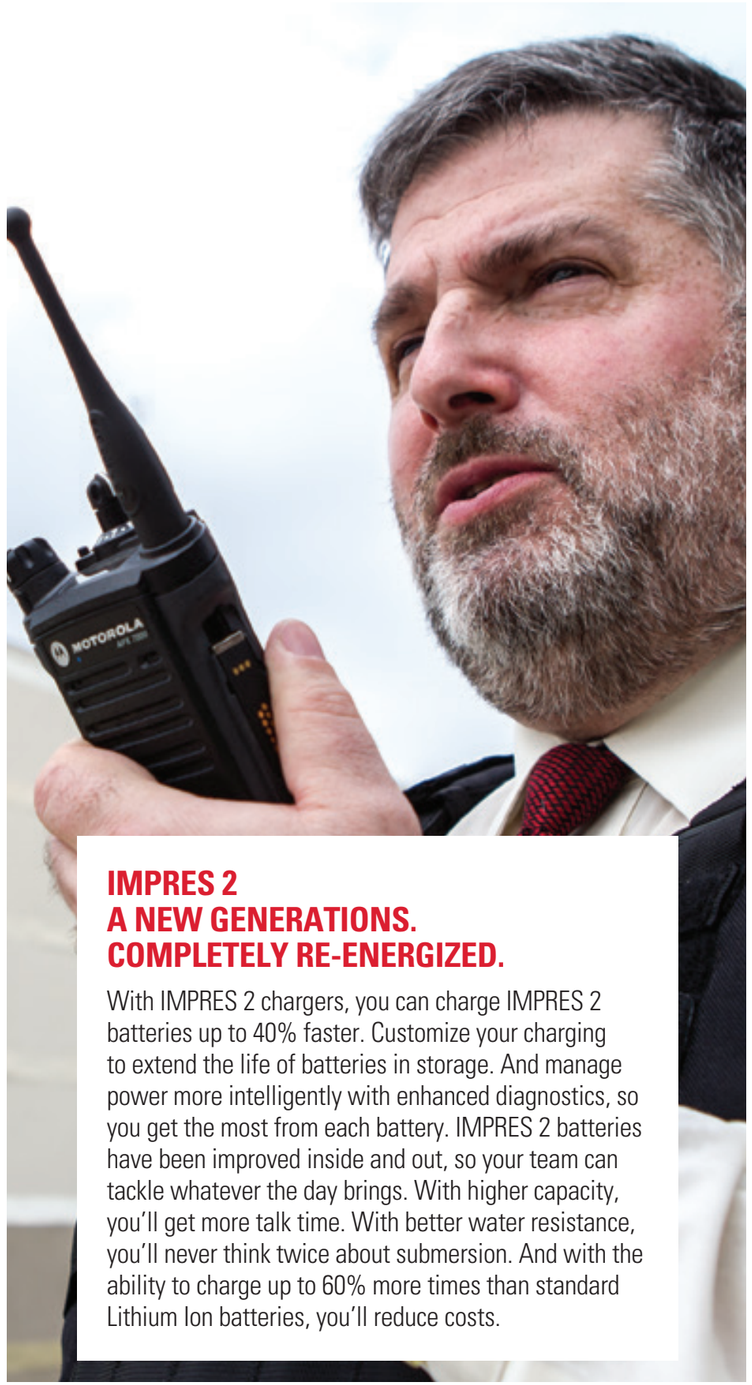
MOTOROLA IMPRES 2 BATTERIES

COMPATIBILITY	ACCESSORY			FEATURES							
PORTABLE RADIOS	BATTERIES	DESCRIPTION	PART NUMBER	IMPRES	CHEMISTRY	TYPICAL RATED CAPACITY (mAh)	APPROXIMATE OPERATIONAL TIME (HOURS) 5/5/90 DUTY CYCLE	DIMENSIONS (MILLIMETERS) (H x W x D)	WEIGHT (MAX. GRAMS)	INTRINSIC SAFETY RATING	IP RATING*
APX 8000 APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES 2 Li-Ion 3400mAh Battery, Rugged IP68, replaced the NNTN7038 3100mAh	PMNN4486	●	Li-Ion	3400	15.5	86 x 59 x 42	185		IP68 Rugged
		IMPRES 2 Li-Ion 2550mAh Battery, Rugged IP68, replaced the NNTN4403 2200mAh Battery	PMNN4485	●	Li-Ion	2550	11.5	86 x 59 x 37	150		IP68 Rugged
		IMPRES 2 Li-Ion 4850mAh Battery, Rugged IP68, -30ºC Rated, replaced the NNTN7034 4400mAh Battery	PMNN4487	●	Li-Ion	4850	21	130 x 59 x 42	320		IP68 Rugged
		IMPRES 2 Li-Ion 5100mAh Battery, Rugged IP68	PMNN4494	●	Li-Ion	5100	21.5	130 x 59 x 42	320		IP68 Rugged
APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES 2 Li-Ion 2650mAh Battery, Rugged IP68	NNTN8930	●	Li-Ion	2650	13.5	86 x 59 x 42	165	UL†	IP68 Rugged
		IMPRES 2 Li-Ion 4500mAh Battery, Rugged IP68	NNTN8921	●	Li-Ion	4500	18.5	130 x 59 x 42	320	UL†	IP68 Rugged
APX 8000XE		IMPRES 2 Li-Ion 3400 mAh, Rugged IP68	PMNN4504	●	Li-Ion	3400	10	86 x 59 x 42	185	UL†	IP68 Rugged
		IMPRES 2 Li-Ion 4850 mAh, Rugged IP68, -30ºC Rated	PMNN4505	●	Li-Ion	4850	14.5	130 x 59 x 42	320	UL†	IP68 Rugged

MOTOROLA IMPRES TWO-WAY BATTERIES The only batteries developed, tested and certified for optimal performance with your APX radio.
APX batteries are Proven Tough, in lab test after lab test, to withstand shocks, knocks, drops and shakes and outperform the other brands.

APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES Li-Ion 2350 mAh, Intrinsically Safe - FM, Submersible, Rugged Battery-IP68	NNTN8092	●	Li-Ion	2350	11	86 x 59 x 42	160	FM	IP68
		IMPRES Li-Ion 4300 mAh Intrinsically Safe - FM, Submersible, Rugged Battery-IP68	NNTN7033	●	Li-Ion	4300	19.5	130 x 59 x 42	285	FM	IP68
		IMPRES NiMH 2300 mAh, Submersible Battery-IP67	NNTN7037	●	NiMH	2300	10.5	136 x 59 x 40	335		IP67

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.



IMPRES 2
A NEW GENERATIONS. COMPLETELY RE-ENERGIZED.

With IMPRES 2 chargers, you can charge IMPRES 2 batteries up to 40% faster. Customize your charging to extend the life of batteries in storage. And manage power more intelligently with enhanced diagnostics, so you get the most from each battery. IMPRES 2 batteries have been improved inside and out, so your team can tackle whatever the day brings. With higher capacity, you'll get more talk time. With better water resistance, you'll never think twice about submersion. And with the ability to charge up to 60% more times than standard Lithium Ion batteries, you'll reduce costs.

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

APX PORTABLE RADIO ACCESSORIES

MOTOROLA IMPRES TWO-WAY BATTERIES The only batteries developed, tested and certified for optimal performance with your APX radio.
APX batteries are Proven Tough, in lab test after lab test, to withstand shocks, knocks, drops and shakes and outperform the other brands.

COMPATIBILITY	ACCESSORY			FEATURES							
PORTABLE RADIOS	BATTERIES	DESCRIPTION	PART NUMBER	IMPRES	CHEMISTRY	TYPICAL RATED CAPACITY (mAh)	APPROXIMATE OPERATIONAL TIME (HOURS) 5/5/90 DUTY CYCLE	DIMENSIONS (MILLIMETERS) (H x W x D)	WEIGHT (MAX. GRAMS)	INTRINSIC SAFETY RATING	IP RATING*
APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES NiMH 2300 mAh, Submersible Rugged Battery-IP68	NNTN7573	●	NiMH	2300	10.5	136 x 59 x 40	335		IP68
		IMPRES NiMH 2200 mAh Intrinsically Safe - FM, Submersible Battery-IP67	NNTN7036	●	NiMH	2200	10.5	136 x 59 x 40	335	FM	IP67
		IMPRES NiMH 2200 mAh Intrinsically Safe - FM, Submersible Rugged Battery-IP68	NNTN7035	●	NiMH	2200	10.5	136 x 59 x 40	335	FM	IP68
		APX Clamshell Battery Pack (requires 12 AA Alkaline batteries, not included), Submersible Battery-IP57	PMNN4439		AA Alkaline/ Li-Ion	Alkaline: 2700 Li-Ion: 6100	Alkaline: 12 Li-Ion: 27	165 x 60 x 60	Alkaline: 476 Li-Ion: 380		IP57
SRX 2200		Military, Li-Ion 3100 mAh, Submersible, Rugged Battery-IP68, Coyote Brown	NNTN8182		Li-Ion	3100	14	86 x 59 x 42	185		IP68
APX 4000 APX 3000 APX 1000		IMPRES Li-Ion 2000 mAh Slim, Submersible, Battery-IP67	NNTN8128	●	Li-Ion	2000	8.5	115 x 52 x 18	160		IP67
		APX 4000 two knob radio IMPRES Hi-Cap Li-Ion 2500 mAh battery Submersible (IP57)	NNTN8560	●	Li-Ion	2500	11	113 x 52 x 23	195	UL†	IP57
		IMPRES Li-Ion 2350 mAh Submersible, Battery-IP67	PMNN4424	●	Li-Ion	2350	10.5	115 x 52 x 23	170		IP67
		IMPRES Li-Ion 2800 mAh Submersible, Battery-IP67	PMNN4448	●	Li-Ion	2800	13	115 x 52 x 23	170		IP67
		IMPRES Li-Ion 2350 mAh Intrinsically Safe - FM, Submersible, Battery-IP67	NNTN8129	●	Li-Ion	2350	10.5	115 x 52 x 23	170	FM	IP67
APX 3000		IMPRES Li-Ion 1300 mAh Slim, Submersible, Battery-IP67	NNTN8305	●	Li-Ion	1300	6	115 x 52 x 14	98		IP67

* International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes. Rugged batteries exceed industry standards (IPx7) for submersibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

HOW DO IMPRES BATTERIES AND CHARGERS SAVE MONEY?

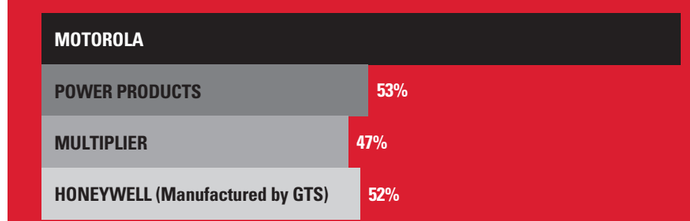
They reduce the number of spare batteries you buy and increase the time before you need replacements. Only IMPRES batteries can be charged 150 additional times versus a standard battery – a 43% increase in charge cycles. If you charge radios two to three times a week, you'll get more than an extra year out of every IMPRES battery. YOUR BATTERY. SAFER, STRONGER, POWERED FOR LONGER.

KNOCKS. DROPS. SHOCKS. VIBRATION. STATIC.

If your radio gets banged on a ride, rattled by heavy equipment or shocked by static electricity, our batteries will stay true and stand tough. These rigorous lab tests prove that Motorola radio batteries perform robustly and reliably, despite the toughest conditions. What's more, we stand behind every battery we build.

See www.motorolasolutions.com/proventough for details.

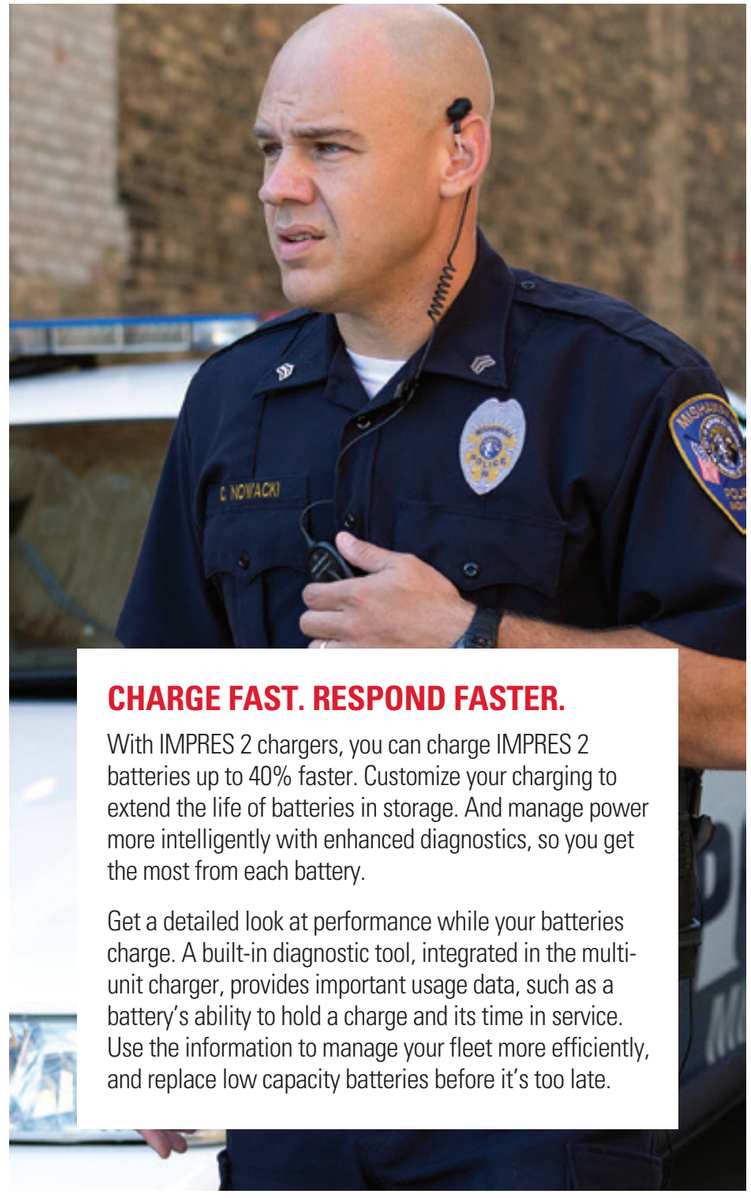
PROVEN TOUGH BATTERY TESTING PASS RATE



APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES							
CHARGER SOLUTIONS Choose from a variety of solutions including single-unit, unique dual-unit, multi-unit, travel and vehicular chargers and be confident your radio is charged and ready to go the moment you need it.											
PORTABLE RADIOS	**CHARGERS**	**DESCRIPTION**	**PART NUMBER**	**IMPRES**	**CHEMISTRY**	**POWER SOURCE**	**DIMENSIONS (MILLIMETERS) (H x W x D)**	**NUMBER OF POCKETS**	**RECONDITIONING CAPABLE**	**CHARGING CURRENT (MAX.)**	**NUMBER OF DISPLAYS**
DESKTOP, SINGLE AND MULTI-UNIT CHARGERS											
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES 2 Single-Unit Fast Charger, 115V (US Plug)	NNTN8860	●	Li-Ion, NiMH	115VAC	60 x 97 x 163	1	●	Fast	
		IMPRES 2 Single-Unit Fast Charger, 100-240V (US Plug) (3300420 9T04 US Cord, 3004209T01 EU Cord, 3004209T02 UK Cord)	NNTN8863	●	Li-Ion, NiMH	100-240VAC	60 x 97 x 163	1	●	Fast	
APX 4000 APX 3000 APX 1000		IMPRES Single-Unit Rapid Rate Charger, 120V (US Plug)	WPLN4232	●	Li-Ion, NiMH	120VAC	60 x 97 x 163	1	●	Rapid Rate	
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES Dual-Unit Rapid Rate Charger with 2 Displays, 120V (US plug)	NNTN7593	●	Li-Ion, NiMH	120VAC	64 x 142 x 208	2	●	Rapid Rate	2
		IMPRES 2 Multi-Unit Fast Charger with 6 Displays and 6 Integrated USB Charging Ports, 100-240V (US Plug) (33004209T04 US Cord, 3087791G04 EU Cord, 3087791G07 UK Cord)	NNTN8844	●	Li-Ion, NiMH	100-240VAC	153 x 445 x 292	6	●	Fast	6
APX 4000 APX 3000 APX 1000		IMPRES Multi-Unit Rapid Rate Charger with 6 Displays, 120V (US plug)	WPLN4219	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	6
		IMPRES Multi-Unit Rapid Rate Charger with 1 Display, 120V (US plug)	WPLN4212	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	1
SRX 2200		Military, IMPRES Multi-Unit Rapid Rate, Charger, 120V (US Plug) with Pocket Inserts	NNTN8185	●	Li-Ion, NiMH	120VAC	153 x 445 x 292	6	●	Rapid Rate	
VEHICULAR, TRAVEL CHARGERS AND VEHICULAR ADAPTER (VA)											
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		IMPRES Single-Unit Rapid Rate Vehicular Charger	NNTN7624	●	Li-Ion, NiMH	12VDC hardwire	82 x 97 x 200	1		Rapid Rate	
APX 4000 APX 3000 APX 1000		IMPRES Single-Unit Rapid Rate Vehicular Charger	NNTN7616	●	Li-Ion, NiMH	12VDC hardwire	82 x 97 x 200	1		Rapid Rate	
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		Travel Charger with voltage regulated vehicular charger adapter, custom charger base, mounting bracket, and coil cord	RLN6434		Li-Ion, NiMH	12VDC cigarette lighter adapter	67 x 67 x 70	1			
APX 4000 APX 3000 APX 1000		Travel Charger with voltage regulated vehicular charger adapter, custom charger base, mounting bracket, and coil cord	NNTN8525		Li-Ion, NiMH	12VDC cigarette lighter adapter	64 x 67 x 57	1			
APX 6000 APX 6000XE SRX 2200 VHF IS NOT SUPPORTED		APX Vehicular Adapter includes fused power cable, 2 keys for the lock, screws for attaching VA to the trunnion & quick start guide. Trunnion mounting bracket NTN8940 must be ordered separately.	NNTN8527*		Li-Ion		254 x 137 x 84	1		Rapid Rate	
		Trunnion Mounting Bracket	NTN8940								

*Radios require firmware version, R13.00.00 or later.



CHARGE FAST. RESPOND FASTER.

With IMPRES 2 chargers, you can charge IMPRES 2 batteries up to 40% faster. Customize your charging to extend the life of batteries in storage. And manage power more intelligently with enhanced diagnostics, so you get the most from each battery.

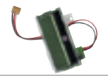
Get a detailed look at performance while your batteries charge. A built-in diagnostic tool, integrated in the multi-unit charger, provides important usage data, such as a battery's ability to hold a charge and its time in service. Use the information to manage your fleet more efficiently, and replace low capacity batteries before it's too late.

IMPRES BATTERIES AND CHARGERS: Get the most out of every battery and eliminate the surprise of "low battery alerts". IMPRES Display chargers tell you exactly how much capacity is in an IMPRES battery before you attach it to your radio and exactly when an IMPRES battery has reached the end of service life.

BATTERY WARRANTY: Take advantage of the longest warranty in the industry. Our warranty protects against any defects in workmanship for **four years** – twice as long as most leading competitive batteries.

NUMBER OF POCKETS: APX multi-unit chargers let you simultaneously charge up to 6 radios and/or batteries.

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
CHARGER SOLUTIONS			
APX PORTABLE RADIOS	**CHARGER ACCESSORIES**	DESCRIPTION	PART NUMBER
SINGLE AND MULTI-UNIT CHARGER ACCESSORIES			
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Display Module for IMPRES Multi-Unit Charger	RLN5382
		Wall Mount Bracket for IMPRES Multi-Unit Charger	NLN7967
APX 7000 APX 7000XE APX 6000 APX 6000XE SRX 2200		Insert for WPLN4108/4130 XTS Multi-Unit Charger (6 per pack)	NNTN7686
		Insert for NTN1873/WPLN4111 XTS Single-Unit Charger	NNTN7687
APX 3000 APX 4000 APX 1000		Insert for WPLN4108/4130 XTS Multi-Unit Charger (6 per pack)	NNTN8170
		Insert for NTN1873/WPLN4111 XTS Single-Unit Charger	NNTN8169
IMPRES BATTERY MANAGEMENT TOOLS			
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		IMPRES Battery Reader	NNTN7392
		IMPRES Battery Fleet Management Software (http://www.motorolasolutions.com/US-EN/Business+Product+and+Services/Accessories/Two-Way+Radio+Accessories/Batteries/IMPRES)	NNTN7676
		IMPRES Battery Fleet Management License Key	HKVN4036
		IMPRES Battery Fleet Management Multi-Unit Charger Interface Unit	NNTN7677
		IMPRES Battery Fleet Management Single-Unit Charger Interface Unit	NNTN8045
KEYLOAD CABLES			
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		Keyloader Cable, KVL3000 & KVL4000	WPLN6904
APX 8000XE		Keyload RS-232 Cable	WPLN6905
		Keyload Cable	CKN6904

HOW DO I KNOW MY BATTERIES WILL LAST AN ENTIRE SHIFT?

With the unique IMPRES Battery Reader and IMPRES Battery Fleet Management systems, you can efficiently manage batteries with real-time data not available from other manufacturers.

These easy-to-use software applications show you if there is enough capacity for a full shift, alert you to low capacity batteries, prevent downtime and eliminate throwing batteries out prematurely.

APX PORTABLE RADIO ACCESSORIES

CARRY SOLUTIONS

Motorola Carry Solutions were developed to meet the demands of public safety and other users who operate in the most rigorous of environments. A variety of carrying accessories are available for comfort and convenience.

LEATHER CARRY CASES

Motorola Leather Carry Cases constructed of top-grain leather are designed to withstand the harsh conditions of public safety users.

COMPATIBILITY | **ACCESSORY** | **FEATURES**

CARRY SOLUTIONS Carry cases and holders are available in sizes designed to fit your radio and battery and permit audio to be heard clearly. Our carry accessories keep your hands-free, so you can concentrate on the task at hand.

PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS	COMPATIBLE BATTERIES
APX 7000		Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5331	Plastic	3	Fixed		
APX 7000XE		Carry Holder for 1.5, 2.5 and 3.5 Model Radios only	PMLN6102	Plastic	3	Fixed		
APX 6000		Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5709	Plastic	2.5	Fixed		
APX 8000XE APX 6000XE		Carry Holder for 1.5, 2.5 and 3.5 Model Radios	PMLN5880	Plastic	3	Fixed		
APX 3000		Covert Carry Holster	PMLN6327	Plastic	3	Fixed		
 APX 7000		Leather Carry Case with 3" Fixed Belt Loop	PMLN5323	Hard Leather	3	Fixed	●	NNTN7038 NNTN8092 NNTN8930 PMMN4403 PMMN4485 PMMN4486
		Leather Carry Case with 3" Fixed Belt Loop	PMLN5326	Hard Leather	3	Fixed	●	NNTN7033 NNTN7034 NNTN8921 PMMN4487 PMMN4494
		Leather Carry Case with 3" Fixed Belt Loop	PMLN5329	Hard Leather	3	Fixed	●	NNTN7035 NNTN7036 NNTN7037 NNTN7573
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5324	Hard Leather	2.75	Swivel	●	NNTN7038 NNTN8092 NNTN8930 PMMN4403 PMMN4485 PMMN4486

COMPATIBILITY | **ACCESSORY** | **FEATURES**

CARRY SOLUTIONS

PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS	COMPATIBLE BATTERIES
 APX 7000		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	PMLN5327	Hard Leather	2.75	Swivel	●	NNTN7033 NNTN7034
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	PMLN5330	Hard Leather	2.75	Swivel	●	NNTN7035 NNTN7036 NNTN7037 NNTN7573
		Dual Display Radio Flip Leather Carry Case with 2.75" Swivel Belt Loop	PMLN5560	Hard Leather	2.75	Swivel	●	NNTN7038 NNTN8092 PMMN4403
APX 8000 APX 6000 APX 8000XE APX 6000XE APX 7000 APX 7000XE		Molded Nylon carry case with quick disconnect swivel and adjustable lanyard	PMLN6802	Nylon		Swivel		
 APX 7000XE		Leather Carry Case with 3" Fixed Belt Loop	NNTN8112	Hard Leather	3	Fixed	●	NNTN7038 NNTN8092 PMMN4403
		Leather Carry Case with 3" Fixed Belt Loop	NNTN8114	Hard Leather	3	Fixed	●	NNTN7033 NNTN7034
		Leather Carry Case with 3" Fixed Belt Loop	NNTN8116	Hard Leather	3	Fixed	●	NNTN7035 NNTN7036 NNTN7037 NNTN7573

MATERIAL: Choose from comfortable and flexible nylon cases, rugged, durable hard leather cases or carry holsters.

SWIVEL OR FIXED LOOP: Secure to a belt loop and the case swings freely from side to side. The swivel latch system also allows the radio and case to be removed from the belt loop by simply inverting, lifting it up and out of the belt loop. Fixed loops provide a sturdy attachment to your belt.

APX PORTABLE RADIO ACCESSORIES

CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES				
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS	COMPATIBLE BATTERIES
APX 7000XE		Leather Carry Case and 2.75" Swivel Belt Loop	NNTN8111	Hard Leather	2.75	Swivel		NNTN7038 NNTN8092 PMMN4403
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	NNTN8113	Hard Leather	2.75	Swivel	●	NNTN7033 NNTN7034 PMNN4487 PMNN4494 NNTN8921
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	NNTN8115	Hard Leather	2.75	Swivel	●	NNTN7035 NNTN7036 NNTN7037 NNTN7573
		Boston Leather Carry Case with D Rings – Requires an Audio Accessory, Radio strap holds down radio by strapping over the Audio Accessory connector, used with Boston Leather radio straps	AY000222A01	Hard Leather			●	
		Leather Carry Case with 3" Fixed Belt Loop for	PMLN5658	Hard Leather	3	Fixed	●	NNTN7038 NNTN8092 PMMN4403 PMNN4485 PMNN4486 NNTN8930 (for APX 6000)
APX 8000		Leather Carry Case with 3" Fixed Belt Loop	PMLN5660	Hard Leather	3	Fixed	●	NNTN7033 NNTN7034 PMNN4487 PMNN4494 NNTN8921 (for APX 6000)
APX 6000		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	PMLN5657	Hard Leather	2.75	Swivel	●	NNTN8092 PMMN4485 PMNN4486 NNTN8930 (for APX 6000)
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	PMLN5659	Hard Leather	2.75	Swivel	●	NNTN7033 NNTN7034 PMNN4487 PMNN4494 NNTN8921 (for APX 6000)
APX 8000XE APX 6000XE		Leather Carry Case with 3" Fixed Belt Loop	PMLN5876	Hard Leather	3	Fixed	●	NNTN7038 NNTN8092 PMMN4403 PMNN4485 (for APX 6000XE) PMNN4486 (for APX 6000XE) NNTN8930 (for APX 6000XE) PMNN4504 (for APX 8000XE)

CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES				
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS	COMPATIBLE BATTERIES
APX 8000XE APX 6000XE		Leather Carry Case with 3" Fixed Belt Loop	PMLN5879	Hard Leather	3	Fixed	●	NNTN7033 NNTN7034 PMNN4487 (for APX 6000XE) PMNN4494 (for APX 6000XE) NNTN8921(for APX 6000XE) PMNN4505 (for APX 8000XE)
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop	PMLN5875	Hard Leather	2.75	Swivel	●	NNTN7038 NNTN8092 PMMN4403 PMNN4485 (for APX 6000XE) PMNN4486 (for APX 6000XE) NNTN8930 (for APX 6000XE) PMNN4504 (for APX 8000XE)
		Leather Carry Case with D-Rings and 2.75" Swivel Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5877	Hard Leather	2.75	Swivel	●	NNTN7033 NNTN7034 PMNN4487 (for APX 6000XE) PMNN4494 (for APX 6000XE) NNTN8921(for APX 6000XE) PMNN4505 (for APX 8000XE)
APX 4000 APX 1000		Leather Carry Case with 2.5" Swivel Belt Loop	PMLN6085	Hard Leather	2.5	Swivel		
		Carry case for APX 4000 two knob radios	PMLN7182	Hard Leather	2.5	Swivel	●	
		Replacement belt loop for PMLN7182	PMLN7229					
SRX 2200		Nylon, Coyote brown carry pouch designed to fit with the elite special ops "MOLLE" vest (sold separately)	NNTN8269	Nylon	Up to 5	Fixed		
		Coyote Brown Carry Case	RLN6253	Nylon	Up to 5	Fixed		
APX 7000		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7038, PMMN4403 and NNTN8092 Batteries	PMLN5322	Nylon	3	Fixed	●	NNTN7038 PMMN4403 NNTN8092
		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7033 and NNTN7034 Batteries	PMLN5325	Nylon	3	Fixed	●	NNTN7033 NNTN7034
		Nylon Carry Case with 3" Fixed Belt Loop for NNTN7035, NNTN7036, NNTN7037 and NNTN7573 Batteries	PMLN5328	Nylon	3	Fixed	●	NNTN7035 NNTN7036 NNTN7037 NNTN7573

APX PORTABLE RADIO ACCESSORIES

CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES			
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 8000 APX 7000		Carry Case for APX Radio with Clamshell Battery	PMLN6712	Nylon	Up to 5	Fixed	●
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE		2.5" Hard Plastic Belt Clip (not compatible with UHF Portable Radios)	NTN8266	Plastic	2.5		
		3" Hard Plastic Belt Clip	HLN6875	Plastic	3		
		Universal Chest Pack with Radio Holder, Pen Holder and Velcro Secured Pouch	HLN6602	Nylon			
		Break-a-Way Chest Pack with Radio Holder Pen Holder and Velcro Secured Pouch	RLN4570	Nylon			
		Replacement Strap for HLN6602 and RLN4570	1505596Z02	Nylon			
APX 4000 APX 1000		2" Hard Plastic Belt Clip	PMLN4651	Plastic	2		
		2.5" Hard Plastic Belt Clip	PMLN7008	Plastic	2.5		
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 1000		Replacement 2.5" Leather Swivel Belt Loop	PMLN5407	Hard Leather	2.5	Swivel	
		Replacement 2.75" Leather Swivel Belt Loop	PMLN5408	Hard Leather	2.75	Swivel	
		Replacement 3" Leather Swivel Belt Loop	PMLN5409	Hard Leather	3	Swivel	

CARRY SOLUTIONS

COMPATIBILITY	ACCESSORY			FEATURES			
PORTABLE RADIOS	CARRY SOLUTIONS	DESCRIPTION	PART NUMBER	MATERIAL	BELT LOOP/CLIP DIMENSION (INCHES)	SWIVEL / FIXED	D-RINGS
APX 7000		Replacement Carry Case Strap with Snaps, Long. Used with NNTN8111, NNTN8112, NNTN8113, NNTN8114, NNTN8115 and NNTN8116	PMLN5800	Leather			
APX 8000 APX 6000 APX 8000XE APX 6000XE APX 7000 APX 4000 APX 7000XE SRX 2200		1.75" Wide Leather Belt	4200865599	Leather			
		Adjustable Nylon Carrying Strap	NTN5243	Nylon			
APX 8000 APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 SRX 2200		Boston Leather Fireman's Radio Strap	RLN6486	Leather			
		Boston Leather Fireman's Radio Strap - XL	RLN6487	Leather			
		Boston Leather Fireman's Radio Strap with button back holder	AY000223A01	Leather			
		Boston Leather Fireman's Radio Strap with button back holder - XL	AY000229A01	Leather			
		Boston Leather Anti-Sway Strap for Boston Leather Fireman's Radio Strap	RLN6488	Leather			

APX PORTABLE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES					
ANTENNAS									
PORTABLE RADIOS	**ANTENNAS**	DESCRIPTION	PART NUMBER	UHF / VHF / 700/800 MHz	FREQUENCY BAND (MHz)	INTEGRATED GPS	LENGTH (CM)	TYPE	INTRINSIC SAFETY RATING
APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		700/800 MHz, GPS Whip Antenna	NAF5085	700/800	764-870	●	20	Whip	UL†
		UHF, GPS Whip Antenna	PMAE4065	UHF	380-520	●	14.2	Whip	UL†
APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		VHF, GPS Whip Antenna	NAR6593	VHF	136-174	●	20	Whip	UL†
APX 4000		900 MHz, GPS Antenna	PMAF4008	800/900	896-941	●	6	Whip	
		800/900 MHz, GPS Combination Helical Antenna	PMAF4003	800/900	806-941	●	18	Helical	UL†
APX 8000/8000XE APX 7000 APX 6000/6000XE APX 4000 APX 1000		1/4 Wave, 700/800 MHz, GPS Stubby Antenna	NAR6595	700/800	764-870	●	9.8	Stubby	UL†
APX 6000 APX 6000XE APX 4000 APX 1000		UHF Range 1, GPS Stubby Antenna	FAF5259	UHF	380-470	●	9.3	Stubby	UL†
		UHF Range 2, GPS Stubby Antenna	FAF5260	UHF	470-520	●	9.3	Stubby	UL†
APX 8000 APX 8000XE APX 7000 APX 7000XE		VHF, 700/800 MHz Dual Band, GPS Whip Antenna	NAR6594	VHF, 700/800	136-174; 764-870	●	20	Whip	UL†
		VHF, UHF Dual Band, GPS Whip Antenna	PMAT4001	VHF, UHF	136-174; 380-520	●	21.8	Whip	UL†
		UHF 700/800 MHz Dual Band, GPS Whip Antenna	PMAS4001	UHF, 700/800	380-520; 764-870	●	19.7	Whip	UL†
APX 7000 (700/800 MHz only) APX 6000 (700/800 MHz only)		GPS Antenna (Directly connected to radio when a public safety microphone is used)	NAG4000	700/800		●	7	Stubby	
		700/800 Public Safety Microphone Only Stubby Antenna	PMAF4002	700/800	764-870		9	Stubby	
APX 8000		VHF, 700/800, UHF Range 1, UHF Range 2 GPS (radio only)	KT000026A01	VHF, 700/800		●		Whip	UL†
APX 3000		Flexible Antenna, 700/800 MHz Includes one flexible antenna spacer	PMAF4006	700/800	764-870	●	41	Flexible	
		Flexible Antenna, UHF Includes three flexible antenna spacers	PMAE4080	UHF	308-470	●	77	Flexible	
		Flexible Antenna, VHF Includes two flexible antenna spacers	PMAD4125	VHF	136-174		44	Flexible	
PROGRAMMING CABLES									
APX 8000XE APX 7000 APX 7000XE APX 6000 APX 6000XE APX 4000 APX 3000 APX 1000 SRX 2200		Programming and Test Cable	PMKN4013						
		Programming Cable	PMKN4012						

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

APX HAZLOC RATINGS FOR ACCESSORIES

UL

APX 1000 / APX 4000 2-KNOB

Radio Models for HAZLOC are listed by UL to standards ANSI/TIA 4950 and CAN/CSA C22.2 NO. 157-92. Classification Rating Division 1, Class I, Groups C, D; Class II Group E, F, G; Class III. T3C. Tamb = -25°C to +60°C. Intrinsically Safe when used with Motorola Battery NNTN8560, 7.4V.

UL

APX 6000 / APX 6000Li / APX 6000XE / SRX 2200

Radio Models for HAZ LOC are listed by UL to standards: ANSI/TIA 4950-A and CAN/CSA C22.2 NO. 157-92 Classification Rating Class I, Division 1, Groups C, D; Class II, Division 1, Group E, F, G; Class III, Hazardous (Classified) Locations.

ANSI/ISA 12.12.01-2015 and CAN/CSA C22.2 No.213-15 Class I, Division 2, Groups A, B, C, D; T3C. Tamb = -25° C to +60° C. Intrinsically Safe when used with Motorola Battery: NNTN8921A NNTN8930A 7.4V

APX 7000 / APX 7000XE

Radio Models for HAZ LOC are listed by UL to standards: ANSI/TIA 4950-A and CAN/CSA C22.2 NO. 157-92 Classification Rating Class I, Division 1, Group D; Class II, Division 1, Group E, F, G; Class III, Hazardous (Classified) Locations.

ANSI/ISA 12.12.01-2015 and CAN/CSA C22.2 No.213-15 Class I, Division 2, Groups A, B, C, D; T3C. Tamb = -25° C to +60° C. Intrinsically Safe when used with Motorola Battery: NNTN8921A NNTN8930A 7.4V

UL

APX 8000XE

Land Mobile Radio Models for use in HAZ LOC are listed by UL to non-incendive standards: ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15 as safe for use in Class I, Division 2, Groups A,B,C,D; Class II, Division 2, Groups F,G; Class III, Division 2 Hazardous (Classified) Locations. Non-Incendive (Non Incendiaire) when used with Motorola Battery: PMNN4504A (Rated 7.4 V, 3400 mAh) or PMNN4505A (Rated 7.4 V, 4850 mAh)

APX HAZLOC RATINGS FOR ACCESSORIES

SURVEILLANCE KITS

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376C	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	3.5mm Threaded Audio Adapter	BDN6783B		●	
	3-Wire Surveillance Kit with Earpiece, Beige, 3.5mm Threaded. Requires BDN6783.	BDN6668A		●	
	1-Wire Receive-Only Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6726A		●	
	1-Wire Receive-Only Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6727A		●	
	2-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6729A		●	
	3-Wire Surveillance Kit with Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6730A		●	
	2-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6731A		●	
	3-Wire Surveillance Kit with Extra-Loud Earpiece, Black, 3.5mm Threaded. Requires BDN6783.	BDN6732A		●	
	Receive-Only Earbud, FM and UL approved	AARLN4885B		●	
	Receive-Only Earpiece with translucent tube and rubber eartip (for HMN4104, HMN4103 and HMN4101 only)	RLN6424A			●

SURVEILLANCE KITS

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	RE-CERTIFICATION PMLN7376C	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	Receive and Transmit Boomless Temple Transducer (for HMN4104, HMN4103 and HMN4101 only)	RMN5116A			●
	IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6123A	●	●	
	IMPRES 3-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6124A	●	●	
	1-Wire Receive-only earpiece, black	PMLN6125A	●	●	
	1-Wire Receive-only earpiece, beige	PMLN6126A	●	●	
	IMPRES 2-Wire Surveillance Kit, programmable button, black	PMLN6127A	●	●	
	IMPRES 2-Wire Surveillance Kit, programmable button, beige	PMLN6128A	●	●	
	IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, black	PMLN6129A	●	●	●
	IMPRES 2-Wire Surveillance Kit with translucent tube, programmable button, beige	PMLN6130A	●	●	

APX HAZLOC RATINGS FOR ACCESSORIES

REMOTE SPEAKER MICROPHONES (RSM)

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376C	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	IMPRES RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4101B			●
	IMPRES Display RSM with Audio Jack, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4103B			●
	IMPRES Display RSM with Audio Jack, Channel Selector, Volume Control, 2-Programmable Buttons and Orange Button. Windporting, Rugged, Submersible (IP68)	HMN4104B			●
	Xtreme Temperature Cable High Impact Green Housing	NNTN8575A			●
	Xtreme Temperature Cable Black Housing	NNTN8575ABLK			●
	XE500 High Impact Green, Channel Knob, Xtreme Temperature Cable	PMMN4106A		●	●
	XE500 Black Housing, Channel Knob, Xtreme Temperature Cable	PMMN4106ABLK		●	●
	Windporting RSM, small, submersible (IP57), Coyote Brown	NNTN8235A		●	
	Windporting RSM with NON-Threaded 3.5mm Audio Jack, small (IP54), Coyote Brown	NNTN8236A		●	
	IMPRES Windporting Public Safety Microphone (18 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported	PMMN4059A		●	
	IMPRES Windporting Public Safety Microphone (24 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4060A		●	
	IMPRES Windporting Public Safety Microphone (30 inch cable) with 3.5mm NON-Threaded Audio Jack, Volume Control, Orange Button. PSM Antenna required. Large (IP55). VHF not supported.	PMMN4061A		●	

REMOTE SPEAKER MICROPHONES (RSM)

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376C	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	IMPRES RSM with NON-Threaded Audio Jack, Orange Button, Noise Cancelling (IP54) NOT INTENDED FOR FIRE MARKETS	PMMN4062A		●	
	IMPRES RSM with Volume Toggle Switch, Orange Button and 1-Programmable Button, Windporting (IP57)	PMMN4065A	●	●	
	IMPRES RSM with NON-Threaded Audio Jack, Windporting (IP55)	PMMN4069A		●	
	IMPRES Windporting RSM with Volume Toggle Switch, Orange Button, 3.5mm NON-Threaded Jack (IP55)	PMMN4099A			●

APX HAZLOC RATINGS FOR ACCESSORIES

EARPIECES AND HEADSETS

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	D-Shell Rx-Only Earpiece	PMLN4620B		●	
	Earset D-Shell	PMLN5096A		●	
	Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN5275C	●	●	
	Heavy-Duty Behind-the-Head Headset with Noise-Cancelling boom microphone, noise reduction = 24dB	PMLN6853A		●	
	Receive-Only Earpiece with Comfort Eartube, FM and UL approved	RLN4941A	●	●	●
	1-Wire Receive-Only Surveillance Kit with Translucent Tube, Black, 3.5mm Threaded. Requires BDN6783	RLN5313B		●	●
	Receive-Only Flexible Earpiece	WADN4190B	●		

BATTERIES

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376C	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	APX 4000 two knob radio IMPRES Hi-Cap Li-Ion 2500 mAh battery Submersible (IP57)	NNTN8560A	●		
	IMPRES 2 Li-Ion 2650mAh Battery, Rugged IP68	NNTN8930A		●	
	IMPRES 2 Li-Ion 4500mAh Battery, Rugged IP68	NNTN8921A		●	
	IMPRES 2 Li-Ion 3400 mAh, Rugged IP68	PMNN4504A			●
	IMPRES 2 Li-Ion 4850 mAh, Rugged IP68, -30°C Rated	PMNN4505A			●

APX HAZLOC RATINGS FOR ACCESSORIES

ANTENNAS

MODEL NUMBER OF INTRINSIC SAFETY MANUAL			MN001121A01-AC	PMLN7376D	PMLN7375A
	DESCRIPTION	PART NUMBER	APX 1000 APX 4000 2-KNOB	APX 6000, APX 6000LI, APX 6000XE, SRX 2200, APX 7000, APX 7000XE	APX 8000XE
	700/800 MHz, GPS Whip Antenna	NAF5085A	●	●	
	VHF, GPS Whip Antenna	NAR6593A	●	●	
	VHF, 700/800, UHF Range 1, UHF Range 2, GPS (radio only)	KT000026A01			●
	1/4 Wave, 700/800 MHz Stubby/GPS Antenna	NAR6595A	●	●	●
	1/4 Wave, 700/800 MHz, GPS Stubby Antenna	PMAE4065A	●	●	
	UHF Range 1, GPS Stubby Antenna	FAF5259A	●	●	
	UHF Range 2, GPS Stubby Antenna	FAF5260A	●	●	
	VHF, UHF Dual Band, GPS Whip Antenna	PMAT4001A		●	
	VHF, 700/800 MHz Dual Band, GPS Whip Antenna	NAR6594A		●	
	UHF 700/800 MHz Dual Band, GPS Whip Antenna	PMAS4001A		●	●
	900MHz, GPS Antenna	PMAF4003A	●		

APX MOBILE RADIOS ACCESSORIES

APX 7500 WITH O5 CONTROL HEAD

APX 6500 WITH O5 CONTROL HEAD

APX 4500 WITH O2 CONTROL HEAD

APX 1500 WITH O2 CONTROL HEAD

COMMUNICATE SAFELY AND EASILY WHEREVER YOU GO

You count on your mobile radio to function clearly and easily so you can concentrate on the mission and communicate safely.

Get the most out of your APX radio by extending its power and reliability with APX accessories. Every mobile microphone, speaker, alarm and control station accessory is best-in-class technology, designed and optimized specifically for your APX mobile. There's simply no substitute for APX accessories.

APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
LONG RANGE WIRELESS get ready in seconds without having to worry about the wires getting in the way. No more getting tangled with your seatbelt. Work, safer, smarter and more comfortable in demanding environments.			
APX PORTABLE RADIOS	**REMOTE SPEAKER MICROPHONES**	**DESCRIPTION**	**PART NUMBER**
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Long Range Wireless Mobile Accessory Kit, includes Wireless Remote Speaker Microphone (RLN6544), Mobile Microphone Bluetooth Gateway (PMMN4097C), Vehicular Charger (PMMN6716)	RLN6551
		Long Range Wireless Mobile Accessory Kit (No Power Charger), includes Wireless Remote Speaker Microphone (RLN6544), Mobile Microphone Bluetooth Gateway (PMMN4097C), Charger must be purchased separately	RLN6552
ACCESSORIES AND REPLACEMENT PARTS			
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Dual Unit Charger,rapid rate charger, 120V (US Plug)	PMLN7120
		Vehicular Charger	PMLN6716
		Wireless RSM with Battery and Clip	RLN6544
		Mobile Microphone with Bluetooth Gateway	PMMN4097
		Wireless RSM Battery, 1750 mA Li-Ion	PMNN4461
		D Ring Swivel Clip (12 pack)	NNTN4990
		Receive-Only Earpiece with Comfort Eartube, FM and UL† approved	RLN4941
		Receive-Only Earpiece with Comfort Eartube	PMLN7560
		Receive-Only Earbud, Single Wire, Threaded 3.5 mm connector	BDN6781
		Receive-Only Earbud, FM and UL† approved	AARLN4885
		EP7 Sonic Defender, use with RLN4941	RLN6511 RLN6512 RLN6513

† UL: For detailed Hazardous Location Certification, refer to pages 51-58.

LONG RANGE WIRELESS REMOTE SPEAKER MICROPHONE (RSM)

The Long Range Wireless Remote Speaker Microphone (RSM) pairs instantly with touch pairing to the mobile microphone with Bluetooth gateway. The Long Range Wireless RSM works up to 100 meters away line-of-sight from the mobile radio, keeping you in communication where you never thought possible. Plug and play – Just attach the mobile gateway microphone to your radio, align the two devices where indicated by the blue dot and you are ready to go. Voice prompts will walk you through pairing quickly.

APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY			FEATURES	
MICROPHONES Access critical features directly on the Keypad microphone. Navigational buttons and a full keypad allow users to navigate radio menus, dial phone numbers and send text messages. Three programmable buttons are available for additional customization.					
MOBILE RADIOS	**MICROPHONES**	DESCRIPTION	PART NUMBER	MICROPHONE STYLE	IMPRES
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Keypad Microphone	HMN4079	Keypad + Navigation	
		Standard Palm Microphone	HMN1090	Standard	
		Water Resistant Palm Microphone	HMN1089	Standard	
 **APX 7500 SERIES**		Water Resistant Palm Microphone for Motorcycle Mounted Mobiles	HMN1079	Standard	
 **APX 7500 SERIES**		Telephone Keypad Handset with Hang-Up Cup	HMN4097	Telephone + Keypad	
 **APX 6500 SERIES**		Hang-Up Handset with Armored Cable	HKN1018	Telephone	
 **APX 4500 SERIES**		Handset with Hang-Up Cup	HLN1457	Telephone	
 **APX 1500 SERIES**		Desktop Microphone	RMN5070	Desktop	
		IMPRES Visor Microphone, requires PTT Switch GLN7278 or RLN5926	RMN5054	Visor	●

IMPRES™ AUDIO ACCESSORIES

Mission critical voice transmissions have to be heard over engine, siren, road and wind noise. Fortunately, Motorola's exclusive IMPRES audio accessories are designed to optimize its output based on the accessory in use. IMPRES Visor Microphones are able to pick up and transmit the user's voice consistently to the receiving user regardless of how close they are speaking into the microphone.

COMPATIBILITY	ACCESSORY		
MOBILE MICROPHONE ACCESSORIES			
MOBILE RADIOS	**MOBILE MICROPHONE ACCESSORIES**	DESCRIPTION	PART NUMBER
		Microphone Hang-Up Clip	HLN5391
 **APX 7500 SERIES**		Microphone Extension Cable, 2-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4093
		Microphone Extension Cable, 10-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4033
 **APX 6500 SERIES**		Microphone Extension Cable, 20-Feet. Not compatible with HMN4097 handset or HMN4079 Keypad	PMKN4034
 **APX 4500 SERIES**		Emergency Push Button, can be used with the Visor Microphone	HLN5131
 **APX 1500 SERIES**		Emergency Footswitch, can be used with the Visor Microphone	HLN5113
		Footswitch Push-To-Talk, can be used with the Visor Microphone	GLN7278
		Push Button Push-To-Talk, can be used with the Visor Microphone	RLN5926
		Replacement Cable for HMN4079	3075336B10
CONTROL STATION ACCESSORIES			
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Desktop Tray with Speaker	HLN6042
		Power Supply, 25-60W, for low power radios (cord included)	HPN4007
		110V Line Cord, Replacement Cable for HPN4007	3060665A04

APX MOBILE RADIO ACCESSORIES

INSTALLATION AND MOUNTING ACCESSORIES Mount your radio in your vehicle without compromising safety. Trunnion kits give you the flexibility to mount the radio under your dash, in your dash, between the seats or on the floor. Remote mount kits allow the radio to be mounted in the trunk when dash space is limited.

MOBILE RADIOS	INSTALLATION AND MOUNTING ACCESSORIES	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		High Power Trunnion Kit; Quick Release with Lock	HLN7003
		Mid Power Trunnion Kit; Standard Installation Bracket	HLN7002
		Mid Power Trunnion Lock	HLN6372
		Remote Mount Control Head Trunnion Compatible with 02/05 and 07 control heads.	HKN6186
		Low Profile Remote Mount Control Head Trunnion Kit	HLN7031
		Motorcycle Enclosure, Black	HLN7022

EXTERNAL ALARM ACCESSORIES External alarm accessories enable additional switching power when external accessories are attached.

MOBILE RADIOS	EXTERNAL ALARM ACCESSORIES	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		External Alarm Buzzer	HLN6953
		External Alarm Relays	HLN6969

SPEAKERS AND SIRENS Boost audio at your control station on your desk or in your vehicle with external speakers.

MOBILE RADIOS	SPEAKERS AND SIRENS	DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Remote Mount, Water Resistant Speaker, 7.5 Watt Rated Audio	HSN4038
		Remote Mount, Water Resistant Speaker, 15 Watt Rated Audio	HSN4040
		Non-Water Resistant Speaker, 13 Watt Rated Audio	HSN4032
		Siren Speaker, Round with Chrome Finish	TDN6251
		Siren Speaker, Rectangular with White Finish	TDN6252
		Siren Speaker, Round with Grey Finish	TDN6254
		Siren Speaker, Under Hood with Grey Finish	TDN6253

REPLACEMENT SIREN ACCESSORIES

MOBILE RADIOS		DESCRIPTION	PART NUMBER
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Status/Message Direct Entry Keypad, 8 Buttons	H1338
		Mobile Siren	HLN1439

APX MOBILE RADIO ACCESSORIES

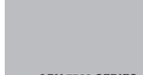
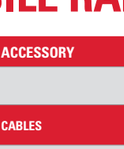
HOW CAN I COMMUNICATE SAFELY ON THE ROAD?

The IMPRES visor microphone with the external push-button or footswitch PTT lets you communicate hands-free so you can communicate safely and easily without taking your eyes off the road. IMPRES audio helps ensure your voice is heard regardless of how closely you are speaking into the microphone or how much engine, siren or road noise is in the background.

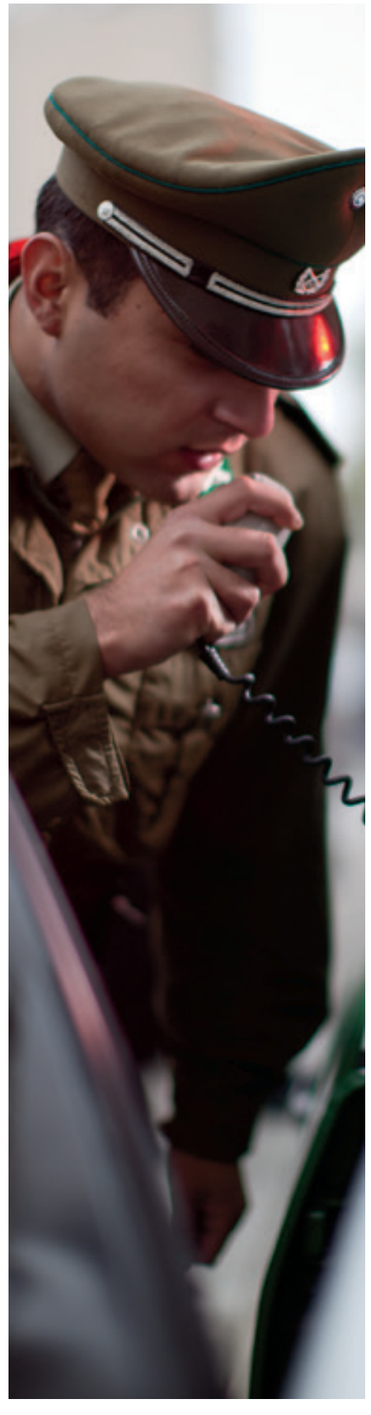
COMPATIBILITY	ACCESSORY		
SIREN ACCESSORIES			
MOBILE RADIOS	**SIREN ACCESSORIES**	DESCRIPTION	PART NUMBER
 **APX 7500 SERIES**		Siren Switchbox	HLN6819
 **APX 6500 SERIES**		Mode Direct Entry Keypad, 8-Buttons	H1835
 **APX 4500 SERIES**		Siren Cable, O3 Siren to Switchbox	HKN6146
 **APX 1500 SERIES**		Siren Cable, Direct Keypad for O3 Control Head	HKN6145

COMPATIBILITY	ACCESSORY		
SIREN ACCESSORIES			
MOBILE RADIOS	**SIREN ACCESSORIES**	DESCRIPTION	PART NUMBER
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Direct Entry Keypad Cable, DEK to O5 Control Head, rear connector	HKN6189
		Siren Cable, O5 Siren to Switchbox	HKN4363
UNIVERSAL RELAY CONTROLLER			
APX 7500 SERIES **APX 6500 SERIES** **APX 4500 SERIES** **APX 1500 SERIES**		Universal Relay Controller for O9 Control Head, 10 DC Outputs, 15 Amps per Channel	PMUN1046
		Universal Relay Controller to Transceiver Cable	3064153H05

APX MOBILE RADIO ACCESSORIES

COMPATIBILITY	ACCESSORY		
CABLES			
MOBILE RADIOS	**CABLES**	DESCRIPTION	PART NUMBER
CONTROL HEAD CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		O3 Handheld Control Head Extension Cable, 17-Feet	PMLN4958
		O3 Handheld Control Head Accessory Cable	PMLN4959
		Control Head Cable with Connections for Power, Speaker and Headset Jack	HKN6187
		Control Head Cable with Connections for Power and Speaker	HKN6188
REMOTE MOUNT CABLES			
 APX 7500 SERIES  APX 6500 SERIES  APX 4500 SERIES  APX 1500 SERIES		Remote Mount Cable, 131-Feet	HKN6164
		Remote Mount Cable, 115-Feet	HKN6165
		Remote Mount Cable, 75-Feet	HKN6166
		Remote Mount Cable, 50-Feet	HKN6167
		Remote Mount Cable, 30-Feet	HKN6168
		Remote Mount Cable, 17-Feet	HKN6169
		Remote Mount Cable, 10-Feet	HKN6170
		Cable, Remote Control Head Vehicular Interface Port Connector for O5 Control Head	HKN6196
		Cable, Remote Control Head Mobile Accessory Port Connector for O5 Control Head	HKN6961
APX 7500 SERIES		Motorcycle Remote Cable for O5 Control Head	3075217A02

COMPATIBILITY	ACCESSORY		
CABLES			
MOBILE RADIOS	**CABLES**	DESCRIPTION	PART NUMBER
POWER CABLES			
 APX 7500 SERIES  APX 6500 SERIES  APX 4500 SERIES  APX 1500 SERIES		Mid Power, Dash Mount Power Cable, 10-Feet	HKN4191
		Mid Power, Remote Mount Power Cable, 20-Feet	HKN4192
		Mid Power, Rear Ignition Cable, Dash Mount	HLN6863
		High Power, Remote Mount Power Cable 20-Feet	HKN6110
		Motorcycle Power Cable	HKN6032
DATA CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		RS232 Cable for Rear Accessory Port, Dash Mount Only, 6-Feet	HKN6160
		RS232 Cable for Rear Accessory Port, Remote Mount Only, 20-Feet	HKN6161
		RS232 Cable for Mobile Microphone Port	HKN6183
		RS232 Cable for J600 Transceiver Interconnect Board, 22-Feet	HKN6122
KEYLOAD CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		Keyloader Cable, KVL3000 and KVL4000	TKN8531
		Keyload Adapter for Mobile Microphone Port	HKN6182
PROGRAMMING CABLES			
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		USB Cable, Rear Accessory Port, Remote Mount, 15-Feet (for use with customer program software)	HKN6172
		USB Cable, Rear Accessory Port, Dash Mount, 6-Feet (for use with customer program software)	HKN6163
APX 7500 SERIES APX 6500 SERIES		Programming Cable	HKN6184



APX MOBILE RADIO ACCESSORIES

ANTENNAS

For optimum range and quality, it is important to match the mobile radio's frequency with the proper Motorola antenna. These are available as standard 1/4 wave models or can include 3dB, 3.5dB or 5dB signal gain.

COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.						
MOBILE RADIOS	**ANTENNAS**	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		VHF 1/4 Wave Antenna, 136-144 MHz	HAD4006	VHF	136-144	Through-hole
		VHF 1/4 Wave Antenna, 144-150.8 MHz	HAD4007	VHF	144-150.8	Through-hole
		VHF 1/4 Wave Antenna, 150.8-162 MHz	HAD4008	VHF	150.8-162	Through-hole
		VHF 1/4 Wave Antenna, 162-174 MHz	HAD4009	VHF	162-174	Through-hole

FREQUENCY BAND: Most antennas only cover a portion of a frequency band. Our wideband UHF and VHF antennas offer coverage across the entire band, enhancing your communication flexibility.

COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS						
MOBILE RADIOS	**ANTENNAS**	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		VHF 1/4 Wave Antenna, 136-162 MHz	HAD4016	VHF	136-162	Through-hole
		VHF 1/4 Wave Antenna, 146-174 MHz	HAD4017	VHF	146-174	Through-hole
		VHF Wideband Antenna, 136-174 MHz	HAD4021	VHF	136-174	Through-hole
		VHF Wideband Antenna 3.0 dB Gain, 136-174 MHz	HAD4022	VHF	136-174	Through-hole
		VHF Wideband Antenna 3.0 dB Gain, 136-174 MHz	RAD4010ARB	VHF	136-174	Through-hole

APX MOBILE RADIO ACCESSORIES

ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
VHF ANTENNAS (RF ONLY)						
APX 7500 SERIES		VHF 1/4 Wave Antenna, 136-144 MHz	RAD4002ARB	VHF	136-144	Motorcycle
		VHF 1/4 Wave Antenna, 144-150.8 MHz	RAD4003ARB	VHF	144-150.8	Motorcycle
		VHF 1/4 Wave Antenna, 150.8-162 MHz	RAD4004ARB	VHF	150.8-162	Motorcycle
		VHF 1/4 Wave Antenna, 162-174 MHz	RAD4005ARB	VHF	162-174	Motorcycle
UHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		UHF 1/4 Wave Antenna, 380-433 MHz	HAE6012	UHF	380-433	Through-hole
		UHF 1/4 Wave Antenna, 450-470 MHz	HAE4003	UHF	450-470	Through-hole
		UHF 1/4 Wave Antenna, 450-470 MHz	HAE4004	UHF	450-470	Through-hole
		UHF 3 dB Gain Antenna, 450-495 MHz	HAE4012	UHF	450-495	Through-hole
		UHF 3 dB Gain Antenna, 494-512 MHz	HAE4013	UHF	494-512	Through-hole
		UHF 3.5 dB Gain Antenna, 380-433 MHz	HAE6010	UHF	380-433	Through-hole

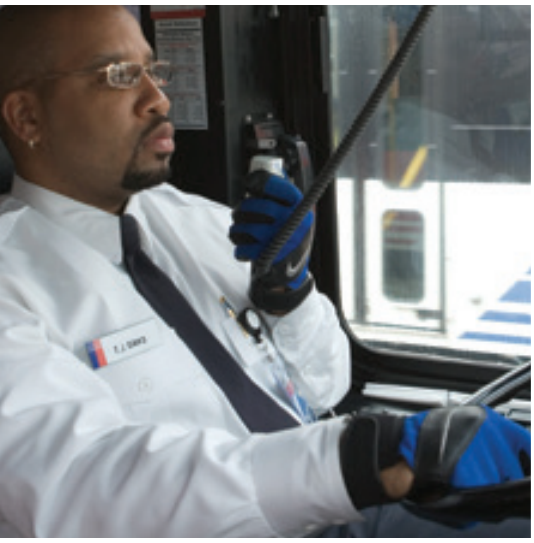
COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS						
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
UHF ANTENNAS (RF ONLY)						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		UHF 3.5 dB Gain Antenna, 450-470 MHz	HAE4011	UHF	450-470	Through-hole
		UHF 5 dB Gain Antenna, 380-433 MHz	HAE6011	UHF	380-433	Through-hole
		UHF 5 dB Gain Antenna, 455-470 MHz	RAE4014ARB	UHF	455-470	Through-hole
		UHF 5 dB Gain Antenna, 494-512 MHz	RAE4016ARB	UHF	494-512	Through-hole
		UHF 2 dB Gain Wideband Antenna, 380-470 MHz	HAE6013	UHF	380-470	Through-hole
		UHF 2 dB Gain Wideband Antenna, 450-512 MHz	HAE6015	UHF	450-512	Through-hole
		UHF 2 dB Gain Wideband Antenna, 380-520 MHz	HAE6031	UHF	380-520	Through-hole
		UHF Wideband Low Profile Antenna, 450-512 MHz	HAE6016	UHF	450-512	Through-hole
APX 7500 SERIES		UHF 1/4 Wave Antenna, 380-433 MHz	HAE6014	UHF	380-433	Motorcycle
		UHF 1/4 Wave Antenna, 425-470 MHz	HAE6032	UHF	425-470	Motorcycle

APX MOBILE RADIO ACCESSORIES

ANTENNAS A variety of antennas ensure the best possible reception wherever you operate. Choose from antennas with integrated GPS to standalone RF antennas.

COMPATIBILITY	ACCESSORY			FEATURES		
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
UHF ANTENNAS (RF ONLY)						
 APX 7500 SERIES		UHF 1/4 Wave Antenna, 450-482 MHz	HAE6033	UHF	450-482	Motorcycle
		UHF 1/4 Wave Antenna, 482-512 MHz	HAE6034	UHF	482-512	Motorcycle
		UHF 1/4 Wave Low Profile Antenna, 450-512 MHz	HAE6035	UHF	450-512	Motorcycle
700/800 MHZ ANTENNAS (RF ONLY)						
APX 7500 SERIES  APX 6500 SERIES  APX 4500 SERIES  APX 1500 SERIES		1/4 Wave Antenna, 762-870 MHz	HAF4016	700/800	762-870	Through-hole
		3 dB Gain Low Profile Antenna, 762-870 MHz	HAF4013	700/800	762-870	Through-hole
		3 dB Gain Elevated Feed Antenna, 762-870 MHz	HAF4014	700/800	762-870	Through-hole
		3 dB Gain Collinear Antenna, 762-870 MHz	HAF4017	700/800	762-870	Through-hole

COMPATIBILITY	ACCESSORY			FEATURES		
ANTENNAS						
MOBILE RADIOS	ANTENNAS	DESCRIPTION	PART NUMBER	UHF / VHF / (800/900 MHz)	FREQUENCY BAND (MHz)	MOUNTING STYLE
700/800 MHZ ANTENNAS (RF ONLY)						
 APX 7500 SERIES		3 dB Gain Antenna, 762-870 MHz	HAF4015	700/800	762-870	Motorcycle
		Low Profile Antenna, 762-780 MHz	HAF4018	700/800	762-870	Motorcycle
GPS ANTENNAS						
APX 7500 SERIES APX 6500 SERIES APX 4500 SERIES APX 1500 SERIES		GPS Roof Mount Antenna SMA Male connector with RG-174 17ft cable	HAG4000	GPS Only		Roof Mount
		GPS Glass Mount Antenna SMA Male connector with RG-174 17ft cable	PMAN4001	GPS Only		Glass Mount
 APX 7500 SERIES		GPS Motorcycle Antenna	HAG4001	GPS Only		Motorcycle



For more information on Motorola mission critical accessories,
visit **motorolasolutions.com/apx**.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

MOTOROLA SOLUTIONS

WIRELESS DISPATCH EVERYWHERE

APX™ MULTI-BAND CONSOLETTE

Racing to an emergency or repairing a power outage, every moment matters as you mount a response. The right control station can make all the difference in making sure communications are clear, continuous and coordinated – across multiple users, agencies and miles.

The APX™ Multi-Band Consolette is the ideal complement to your dispatch console. It's the low cost, mid-power RF control station for the ASTRO® 25 system when you want a wireless dispatch solution. Plus, you can use it as an emergency backup station when infrastructure is off-line or for wireless access to different system types for increased interoperability between agencies.

CONNECT WITH CONFIDENCE

Designed around proven APX technology, this Consolette combines forward-thinking technology with time-tested functionality. Project 25 Phase 2 technology delivers twice the voice capacity so you can add more users without adding more frequencies or infrastructure. And its multiband operation assures seamless interoperability – so you can talk with confidence to a squad car or desk station, a job site across town or an incident in the next county.

MIGRATE AT YOUR OWN PACE

The APX Multi-Band Consolette is backwards and forwards compatible, developed to meet current P25 standards and future-ready to support new technology and data applications. Now you can achieve your interoperability objectives—whether upgrading an existing system or designing a new one—based on your dollars and deadlines.

BUILT FOR THE TOUGHEST TASKS

Innovative design and skillful engineering make the APX Multi-Band Consolette a tireless performer. It can be easily serviced or programmed without removing the lid and the robust metal housing assures extra durability. An integrated front panel numeric keypad gives you fast access to radio controls. And it meets stringent FCC and UL certifications for exceptional safety.

ROBUST AND MISSION-READY

When a power loss occurs, count on the automatic battery revert to connect your people 24/7. All you need is a DC source, such as a marine battery, to switch over automatically and keep communications going strong.

Rich in features, the APX Multi-Band Consolette gives you easy access to contact information with one unified call list and the largest number of interface connections to a wide variety of consoles and desk sets. What's more, an ACIM wireless interface provides back-up dispatch if your console's link to the ASTRO 25 trunked system is ever lost.

APX MULTI-BAND CONSOLETTE

STANDARD FEATURES

Available in 700/800 MHz, VHF, UHF R1, and UHF R2 bands

Up to 2000 Channels

Optional multiband operation

Trunking Standards supported:

- Clear or digitally encrypted ASTRO® 25 Trunked Operation
- Capable of SmartZone®, SmartZone Omnilink, SmartNet®

Analog MDC-1200 and Digital APCO P25 Conventional System Configurations

Narrow and wide bandwidth digital receiver

(6.25 kHz equivalent/12.5 kHz/30 kHz/25 kHz)*

Embedded digital signaling (ASTRO and ASTRO 25)

Integrated Encryption Hardware

Seamless Wideband Scan

Intelligent Priority Scan

Intelligent Lighting

Radio Profiles

Unified Call List

Tone remote control

Tactical Inhibit

Instant Recall

ACIM/CCGW interface including:

- ID decode
- Call alert encode

Interfaces supported:

- Recorder
- Wireline
- Vehicle Interface Port
- Crosspatch
- Headsets (2)**

110/220VAC operation with battery revert capability

VU Meter and Clock

Expansion Slot Standard

2 configurations available:

- Full featured front panel
- Limited front panel

Customer Programming Software:

- Utilizes Windows 7, XP and Vista
- Supports USB Communications
- Built in FLASHport™ support

OPTIONAL FEATURES:

Enhanced Encryption Software Options

Programming over Project 25 (POP25)

Text Messaging

Over the Air Rekeying (OTAR)

Extended Dispatch Operation including:

- Emergency Alarm ACK Encode
- Radio Inhibit/Uninhibit Encode
- Radio Monitor Encode
- Radio Check Encode
- Status Query Encode
- Status Query Response Decode
- Status Update Decode
- Message Update Decode

*Per the FCC Narrowbanding rules, new products submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 kHz for United States – State & Local Markets only.

** Available on full featured models only.

CONTROL HEAD FEATURES

Tri-color LCD display

- 4 lines: 2 lines text (14 characters), 1 line icons, 1 line soft menu keys
- 3 x 6 keypad microphone accessory with 3 programmable soft keys
- 5 programmable soft key buttons and 5 scroll-through menus with up to 24 programmable soft keys

AUXILIARY DISPLAY FEATURES

LCD display

3 soft menu buttons to activate or control the following Consolette features:

- Clock
- Volume Units Meter (VU)
- Crosspatch Linking
- Auxiliary Controls/VIP Activation
- Over-the-air Audible TX Alert Tones

SIGNALLING (ASTRO MODE)

Signalling Rate	9.6 kbps
Digital ID Capacity	10,000,000 Conventional / 48,000 Trunking
Digital Network Access Codes	4,096 network site addresses
ASTRO Digital User Group Addresses	4,096 network site addresses
Project 25 – CAI Digital User Group Addresses	65,000 Conventional / 4,094 Trunking
Error Correction Techniques	Golay, BCH, Reed-Solomon codes
Data Access Control	Slotted CSMA: Utilizes infrastructure-sourced data status bits embedded in both voice and data transmissions.

APX CONSOLETTE

Dimensions (W x D x H)	Limited Front Panel Configuration 16 x 18 x 4.2 in (406 x 457 x 107 mm) Full Featured Front Panel Configuration 16 x 18.75 x 4.2 in (406 x 476 x 107 mm)
Weight	Limited Front Panel Configuration 18.5 lbs (8.4 kg) Full Featured Front Panel Configuration 19.5 lbs (8.9 kg)

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

	700 MHz	800 MHz	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	764-776 MHz 794-806 MHz	806-824 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing	25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz	25/12.5 kHz	25/12.5 kHz
Maximum Frequency Separation	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj*	10-30 W	10-35 W	10-50 W	10-40 W	10-45 W (450-485 MHz) 10-40 W (485-512 MHz) 10-25 W (512-520 MHz)
Frequency Stability* (–30°C to +60°C; +25°C Ref.)	±0.00015 %	±0.00015 %	±0.0002 %	±0.0002 %	±0.0002 %
Modulation Limiting*	±5 kHz / ±2.5 kHz	±5 kHz/±4 kHz (NPSPAC) /±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz	±5 kHz / ±2.5 kHz
Modulation Fidelity (C4FM) 12.5kHz Digital Channel	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz	±2.8 kHz
Emissions*	Conducted+ –70/–85 dBc Radiated+ –20/–40 dBm	Conducted + –70 dBc Radiated+ –20 dBm	Conducted + –85 dBc Radiated –20 dBm+	Conducted + –85 dBc Radiated –20 dBm+	Conducted+ –85 dBc Radiated –20 dBm+
Audio Response*	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)	+1, –3 dB (EIA)
FM Hum & Noise 25 & 20 kHz 12.5 kHz	–40 dB –34 dB	–40 dB –34 dB	–50 dB –40 dB	–45 dB –40 dB	–45 dB –40 dB
Audio Distortion*	2 %	2 %	2 %	2 %	2 %

RECEIVER – TYPICAL PERFORMANCE SPECIFICATIONS

		700 MHz	800 MHz	VHF		UHF Range 1		UHF Range 2	
Frequency Range/Bandsplits		764-776 MHz	851-870 MHz	136-174 MHz		380-470 MHz		450-520 MHz	
Channel Spacing		25/12.5 kHz	25/12.5 kHz	30/25/12.5 kHz		25/12.5 kHz		25/12.5 kHz	
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit		Full Bandsplit		Full Bandsplit	
Audio Output Power at 3% distortion*		2.5 W++	2.5 W++	2.5 W++		2.5 W++		2.5 W++	
Frequency Stability* (–30°C to +60°C; +25°C Ref.)		±0.00015 %	±0.00015 %	±0.0002 %		±0.0002 %		±0.0002 %	
Analog Sensitivity*	12 dB SINAD	0.25 µV	0.25 µV	Pre-Amp 0.2 µV	Standard 0.3 µV	Pre-Amp 0.2 µV	Standard 0.3 µV	Pre-Amp 0.2 µV	Standard 0.3 µV
Digital Sensitivity	1% BER	0.3 µV	0.3 µV	0.25 µV	0.4 µV	0.25 µV	0.4 µV	0.25 µV	0.4 µV
	5% BER	0.25 µV	0.25 µV	0.2 µV	0.3 µV	0.2 µV	0.3 µV	0.2 µV	0.3 µV
Intermodulation		80 dB	80 dB	80 dB	85 dB	80 dB	85 dB	80 dB	85 dB
Spurious Rejection		90 dB	90 dB	90 dB		90 dB		90 dB	
Audio Distortion at rated*		3.00 %	3.00 %	3.00 %		3.00 %		3.00 %	
Selectivity*	25 kHz	80 dB	80 dB	—		82 dB		82 dB	
	12.5 kHz	65 dB	65 dB	70 dB		70 dB		70 dB	
	30 kHz	—	—	90 dB		—		—	

PRODUCT SPEC SHEET
APX™ MULTI-BAND CONSOLETTE

POWER AND BATTERY DRAIN

Model Type	136-174 MHz, 380-470 MHz, 450-520 MHz, 764-870 MHz					
Minimum RF Power Output	10-35 W (764-870 MHz), 10-50 W (136-174 MHz), 10-40 W (380-470 MHz), 10-45 W (450-485 MHz), 10-40 W (485-512 MHz), 10-25 W (512-520 MHz)					
AC Operation	110 to 220VAC 50-60Hz					
AC Current	110 VAC: 0.85 A (Idle/Rx) 1.7 A (Tx) 220 VAC: 0.42 A (Idle/Rx) 0.85 A (Tx)					
AC Surge Spec	EN6100-4-5 Level 5					
DC Operation	13.8 V DC +/-20% Negative Ground					
Standby at 13.8V	1.25 A (764-870 MHz), 1.25 A (136-174 MHz), 1.25 A (380-470 MHz), 1.25 A (450-520 MHz)					
Receive Current at Rated Audio at 13.8V	1.5 A (764-870 MHz), 1.5 A (136-174 MHz), 1.5 A (380-470 MHz), 1.5 A (450-520 MHz)					
Transmit Current (A) at Rated Power	136-174 MHz (10-50 W) 380-470 MHz (10-40 W) 450-520 MHz (10-45 W)	13 A (50 W) 8 A (15 W) 11 A (40 W) 8 A (15 W) 11 A (45 W) 8 A (15 W)		764-870 MHz (10-35 W)	12 A (50 W)	8 A (15 W)

ENCRYPTION

Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 128 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-30 °C / +60 °C
Storage Temperature	-40 °C / +85 °C
Humidity	95% relative humidity
ESD	IEC 61000-4-2
Duty Cycle	EIA/TIA Intermittent Duty Cycle

FCC TYPE ACCEPTANCE ID

FCC ID	BAND AND POWER LEVEL
AZ492FT5858	10-35 W (764-870 MHz)
AZ492FT3824	10-50 W (136-174 MHz)
AZ492FT7037	10-50 W (136-174 MHz)and 10-35 W (764-870 MHz)
AZ492FT7047	10-50 W (136-174 MHz) and 10-45 W (450-520 MHz)
AZ492FT4895	10-50 W (136-174 MHz) and 10-40 W (380-470 MHz)
AZ492FT4894	10-40 W (380-470 MHz)
AZ492FT7043	10-40 W (380-470 MHz) and 10-35 W (764-870 MHz)
AZ492FT4904	10-40 W (380-470 MHz) and 10-45 W (450-520 MHz)
AZ492FT4896	10-45 W (450-520 MHz)
AZ492FT7044	10-45 W (450-520 MHz) and 10-35 W (764-870 MHz)

* Measured in the analog mode per TIA/EIA 603 under nominal conditions

\+ Specs includes performance for the non-GNSS/GNSS bands

++ Output power into 20 Ohm internal speaker

Specifications subject to change without notice. All specifications shown are typical.

Radio meets applicable regulatory requirements.

For more information about how to interoperate without boundaries, visit motorolasolutions.com/apx

Motorola Solutions, Inc.
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MOTOROLA

APX™ SINGLE-BAND CONSOLETTE

WIRELESS DISPATCH EVERYWHERE

TRANSMITTER SPECIFICATIONS

Frequency Range	896-902 MHz 935-941 MHz
Channel Spacing	12.5 kHz
Maximum Frequency Separation	Full Bandsplit
Rated RF Output Power*	1-30 W (896-901 MHz, 935-940 MHz) 1-3 W (901-902 MHz, 940-941 MHz)
Frequency Stability* (-30 °C to +60 °C, +25 °C Ref)	0.8 ppm
Modulation Limiting*	±2.5 kHz
Modulation Fidelity (C4FM)	1.5%
Conducted Emissions*	-70 dBc
Radiated Emissions*	-20 dBm
Audio Response*	+1/-3 dB (EIA)
FM Hum and Noise	-45 dB
Audio Distortion*	0.8%

DIMENSIONS

Standard Model	16.0 x 18.0 x 4.2 in (406 x 457 x 107 mm), WxDxH 18.5 lbs (8.4 kg)
Full-Featured Model	16.0 x 18.8 x 4.2 in (406 x 476 x 107 mm), WxDxH 19.5 lbs (8.9 kg)

RECEIVER SPECIFICATIONS (TYPICAL)

Frequency Range	935-941 MHz
Channel Spacing	12.5 kHz
Maximum Frequency Separation	Full Bandsplit
Frequency Stability* (-30 °C to +60 °C, +25 °C Ref)	0.8 ppm
Analog Sensitivity* (12 dB SINAD)	-120 dBm
Digital Sensitivity (5% BER)	-121.5 dBm
Intermodulation	82 dB
Spurious Rejection	91 dB
Selectivity	74 dB
Audio Output at 3% Distortion	7.5 W (8 ohm) 15 W (3.2 ohm)
Audio Distortion at Rated Power	2%

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-22 F to 140 F (-30 °C to +60 °C)
Storage Temperature	-22 F to 185 F (-40 °C to +85 °C)
Humidity	95% relative humidity
Electrostatic Discharge (ESD)	Per IEC 61000-4-2
Duty Cycle	Per EIA/TIA Intermittent Duty Cycle

INTERFACES

FRONT	REAR
Microphone Connector	Recorder
Secondary Microphone (Full-Featured Model)	Wireline
	Interface Port
	Crosspatch
	Power

USER INTERFACE

STANDARD MODEL	FULL-FEATURED MODEL
4-line Tri-color LCD display • 1 line radio status icons • 2 lines text, up to 14 characters per line • 1 line soft menu key legends	Adds Auxiliary User Interface: • Clock and VU Meter • Crosspatch Interface • Auxiliary Controls • Secondary Microphone Connector
5 programmable soft keys	
Navigation Pad	
Volume knob	
Mode Selector	
Emergency Button	
Microphone Connector	

FEATURES AND CAPABILITIES

STANDARD	OPTIONAL
900 MHz Band	Enhanced Encryption Software
Up to 30 W Output Power	Programming over Project 25 (POP25)
Clear or Encrypted Digital P25 Trunked Operation	Text Messaging
SmartZone®, SmartZone Omnilink, SmartNet® Analog Trunked Operation	Over the Air Rekeying (OTAR)
Digital P25 Conventional Operation	Extended Dispatch Operation including: • Emergency Alarm ACK Encode • Radio Inhibit/Uninhibit Encode • Radio Monitor Encode • Radio Check Encode • Status Query Encode • Status Query Response Decode • Status Update Decode • Message Update Decode
Analog MDC-1200 Conventional Operation	
Intelligent Lighting	
Intelligent Priority Scan	
Unified Call List	
Tone Remote Control	
110/240 Vac power with battery revert capability	
Tactical Inhibit	
Instant Recall	

* Measured in the analog mode per TIA/EIA 603 under nominal conditions
Specifications subject to change without notice. All specifications shown are typical values

For more information, please visit us on the web at: www.motorolasolutions.com/APX

MOTOROLA SOLUTIONS

Motorola Solutions Inc., 500 West Monroe St, Chicago, IL 60661, U.S.A. **motorolasolutions.com**

MOTOROLA SOLUTIONS

APX™ 6000XE SINGLE-BAND PORTABLE RADIO

From day one, the APX 6000XE P25 two-way portable radio has met agencies' most demanding performance expectations. It delivers trusted performance in a single-band solution without compromising on the extreme form factor or features that are required for routine activities and emergencies. Now, as the ever increasing needs of public safety personnel grow, we are evolving the APX 6000XE to support new technologies like Wi-Fi®, Adaptive Audio Engine, and Bluetooth® 4.0 wireless technology.

VOICE AND DATA, ALL AT ONCE

Update your radio fleet without interrupting voice communications with secure Wi-Fi. This dramatically improves the speed of configuring new codeplugs, firmware and software features over-the-air via Radio Management*. Agencies can pre-provision up to 20 secure Wi-Fi hotspots so personnel can easily access updates at the facility or in the field.

HEAR AND BE HEARD

The APX 6000XE is equipped with a 3-watt speaker, 3 integrated microphones and Adaptive Audio Engine. This changes the level of noise suppression, microphone gain, windporting and speaker equalization to produce clear and loud audio in any environment.

EMERGENCY FIND ME

Bluetooth 4.0 places a wide range of wireless accessories at your disposal and provides personnel with an added level of security by improving response time in emergencies. With Emergency Find Me, a Bluetooth-enabled beacon signal guides other Bluetooth-enabled APX radios within range to assist the user in distress.

CLEAR IN-MASK COMMUNICATIONS

With Bluetooth 4.0 standard on all APX XE radios, we are able to partner with SCBA industry leaders to provide in-mask communications so you can clearly hear and be heard. Collaborations with both MSA and Scott Safety allow us to deliver intelligible voice and data communications.

SEAMLESS ON-SCENE COMMUNICATION

Ensure fast and seamless communication and collaboration across all responders arriving on a scene. Mission Critical Geofence automatically changes a radio's active talkgroup based on its GPS location and an agency-defined virtual barrier. For example, an incident commander can create a geofence around the 3-block radius of a burning building so that all arriving military personnel are automatically placed in the same talkgroup.

IMPROVE SAFETY WITH REAL-TIME DATA

APX Personnel Accountability Application allows incident command personnel to quickly and accurately account for first responders with APX radios roll call and an interactive GUI. This real-time information allows you to maintain control of a chaotic fireground.

SPECIFICATIONS

RF BANDS

- 700/800 MHz, VHF, UHF Range 1 & UHF Range 2
- 9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking
- 3600 Baud SmartNet®, SmartZone®, SmartZone, Omnilink Trunking
- Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations Narrow and Wide Bandwidth Digital Receiver (6.25 kHz Equivalent/25/20/12.5 KHz)

STANDARD FEATURES

- Mission Critical Wireless Bluetooth 4.0 (LE)[1]
- Emergency Find Me[1]
- IP68 (2m/4hr), Mil Std 512.X Delta - T
- Listed by UL to the standards ANSI/TIA 4950-A and CAN/CSA C22.2 NO. 157-92 Classification Rating: Class I, Division 1, Groups C, D; Class II, Division 1, Group E, F, G; Class III, Hazardous (Classified) Locations. ANSI/ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15; Class I, Division 2, Groups A, B, C, D; T3C. Tamb = -25 °C to +60 °C. When used with Motorola Battery: NNTN8921A NNTN8930A (Standard on XE) 7.4V
- ASTRO 25 Integrated Voice & Data
- Integrated GPS/GLONASS for Outdoor Location Tracking
- Intelligent Priority Scan
- Voice Announcements
- Instant Recall
- ISSI 8000 Roaming
- Radio Profiles
- Dynamic Zone
- Intelligent Lighting
- Single-Key ADP Encryption
- IMPRES 2 Battery (NNTN8930)
- Text Message
- Software Key

PROGRAMMING

- Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management[2]

ADAPTIVE AUDIO ENGINE (OPTIONAL)

- 3 Watt Speaker with Adaptive Equalization
- Adaptive Dual-Sided Operation
- Adaptive Noise Suppression Intensity
- Adaptive Gain Control
- Adaptive Windporting

OPTIONAL FEATURES

- Wi-Fi 802.11 b/g/n
- Data Modem Tethering
- RFID Volume Knob
- Multi-key for 128 keys and Multi-Algorithm
- Programming Over Project 25 (OTAP)
- Over the Air Rekey (OTAR)
- Digital Tone Signaling
- LEX L10 Collaboration
- P25 Authentication
- Man Down Sensor
- High Impact Green and Public Safety Yellow Colored Housing Options

1 Per the FCC Narrowbanding rules, new products (APX6000XE UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 kHz for United States - State & Local Markets only.

2 CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776, 793-806 MHz 806-824, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 W Max	1-6 W Max	1-5 W Max	1-5 W
Frequency Stability[1] (–30 °C to +60 °C; +25 °C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dB	-75 dB	-75 dB	-75 dB
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	25K 12.5k	-52 dB -47 dB	-55 dB -50 dB	-52 dB -47 dB	-52 dB -46 dB
Audio Distortion[1]	700 MHz 800 MHz	1.00 %	1.00 %	1.00 %	1.00 %

1 Measured in the analog mode per TIA / EIA 603 under nominal conditions

BATTERIES FOR APX 6000XE

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2 3400mAh	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4486	3400 mAh
Li-Ion IMPRES 2 4850mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4487	4850 mAh
Li-Ion IMPRES 2 5100mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4494	5100 mAh
Li-Ion IMPRES 2 2650 mAh[1]	3.4" x 2.3" x 1.7"	5.7 oz	NNTN8930	2650 mAh
Li-Ion IMPRES 2 4500mAh	5" x 2.3" x 1.7"	11.0 oz	NNTN8921	4500 mAh
Li-Ion IMPRES 2, 3100 mAh, TIA 4950-A, IP68	3.4" x 2.3" x 1.7"	7.1 oz	PMNN4547	3100 mAh

1 The standard shipping battery for the APX 6000XE

RADIO MODELS

	MODEL 1.5 	MODEL 2.5 	MODEL 3.5 
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction Navigation key 4x3 keypad Home and Data buttons
Channel Capacity[1]	96	1000	1000
FLASHport Memory	64 MB	64 MB	64 MB
700/800 MHz (763-870 MHz)	H98UCD9PW5BN	H98UCF9PW6BN	H98UCH9PW7BN
VHF (136-174 MHz)	H98KGD9PW5BN	H98KGF9PW6BN	H98KGH9PW7BN
UHF Range 1 (380-470 MHz)	H98QDD9PW5BN	H98QDF9PW6BN	H98QDH9PW7BN
UHF Range 2 (450-520 MHz)	H98SDD9PW5BN	H98SDF9PW6BN	H98SDH9PW7BN
Buttons & Switches	Large PTT button ▪ Angled On/Off volume control ▪ Orange emergency button ▪ 16 position top-mounted rotary switch ▪ 2-position concentric switch ▪ Multi-color backlight ▪ 3-position toggle switch ▪ 3 programmable side buttons		

Regulatory Information

	FCC ID	Industry Canada
700/800 (764-869 MHz)	AZ489FT7086	109U-89FT7086
VHF (136-174 MHz)	AZ489FT7087	109U-89FT7087
UHF Range 1 (380-470 MHz)	AZ489FT7077	109U-89FT7077
UHF Range 2 (420-520 MHz)	AZ489FT7085	109U-89FT7085

FCC Emissions Designators

FCC Emissions Designators	11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E[2]

Power Supply

Power Supply	One rechargeable Li-Ion IMPRES 2 2650 mAh Battery Standard (NNTN8930), with alternate battery options available.

1 Enhancement package available
2 Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25KHz for United States - State & Local Markets only.

RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500 mW	500 mW	500 mW	500 mW
Analog Sensitivity[2] Digital Sensitivity[3]	12 dB SINAD 1% BER (800 MHz) 5% BER	0.25 µV 0.375 µV 0.24 µV	0.17 µV 0.243 µV 0.15 µV	0.224 µV 0.298 µV 0.200 µV	0.203 µV 0.296 µV 0.204 µV
Selectivity[1]	25 kHz channel 12.5 kHz channel	-76 dB -70 dB	-78 dB -73 dB	-77 dB -67 dB	-76 dB -67 dB
Intermodulation		-80.1 dB	-80.2 dB	-80.3 dB	-80.2 dB
Spurious Rejection		-75 dB	-78 dB	-80.5 dB	-80.8 dB
FM Hum and Noise	25 kHz 12.5 kHz	-54 dB -79 dB	-54.3 dB -50.1 dB	-53.5 dB -47.5 dB	-52.5 dB -47.3 dB
Audio Distortion at Rated[1]		0.90%	0.90%	0.70%	0.70%

1 Measured in the analog mode per TIA / EIA 603 under nominal conditions

2 Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.

3 Accuracy specs are for long-term tracking (95th percentile values >5 satellites visible at a nominal -130 dBm signal strength).

PORTABLE MILITARY STANDARDS 810 C, D, E , F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV

DIMENSIONS OF THE RADIOS WITHOUT BATTERY		
Length	6.2 in	156 mm
Width Push-To-Talk button	2.4 in	61 mm
Depth Push-To-Talk button	1.4 in	36 mm
Width Top	3.3 in	84 mm
Depth Top	2.1 in	54 mm
Depth Bottom of Battery	1.2 in	32 mm
Weight of the radios without battery	13.7 oz	389 g

ENCRYPTION	
Supported Encryption Algorithms	ADP, AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS/GPS/GNSS SPECIFICATIONS	
Constellations	GPS & GLONASS
Tracking Sensitivity	-164 dBm
Accuracy[1]	<5 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

RUGGED SPECIFICATIONS	
Leakage (submersion)	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 meters, 4 hours)

ENVIRONMENTAL SPECIFICATIONS	
Operating Temperature[2]	-30 °C to +60 °C
Storage Temperature[2]	-50 °C to +85 °C
Humidity Per MIL-STD	ESD IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 meters, 4 hours)

HOUSING COLOR
Black (Standard), Public Safety Yellow, and High Impact Green

1 Measured conductively in analog mode per TIA / EIA 603 under nominal conditions

2 Temperatures listed are for radio specifications. Battery storage is recommended at 25 °C, ±5 °C to ensure best performance.

EMISSION DESIGNATORS

LMR:	8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E, 20K0F1E
Bluetooth:	852KF1D, 1M17F1D, 1M19F1D, 1M04F1D
WLAN (Wi-Fi):	13M7G1D, 17M0D1D, 18M1D1D

WIRELESS CONNECTIVITY AND SECURITY

Frequency Range/Bandsplits: Bluetooth: 2402 - 2480 MHz, WLAN (Wi-Fi): 2400 - 2483.5 MHz
WLAN (Wi-Fi) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs[1]
Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection
Bluetooth 4.0 Low Energy uses 128-bit AES-CCM encryption

1 2400 - 2483.5 MHz for EMEA region and includes guardband.
Channels 1 – 11 used for FCC/IC region.

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MOTOROLA SOLUTIONS

ASTRO® 25 TWO-WAY RADIOS AT A GLANCE SAFETY REDEFINED

YOU ARE READY FOR THE NEXT CALL.
WITH APX™, SO IS YOUR RADIO.

In an emergency, other first responders may be a few feet or several miles away. When every second counts, you need a radio you can rely on to get the job done. Since coordinating response and protecting lives is at the heart of every mission, every two-way radio transmission is crucial. Every radio has one job and one job only: to keep you safe.

ASTRO 25 is the leading Project (P25) standards-based system used by over 11,000 agencies around the world. With uncompromising real-world performance and legendary Motorola reliability, the ASTRO 25 solution continues to evolve, adding practical innovations and performance-driven capabilities that enable government agencies to protect the communities they work in and support neighboring communities through interoperability.

The APX P25 two-way radio series redefines safety in communication. APX puts the right device into the hands of the right user. Every feature and function is designed with its users in mind – from the rugged, easy to operate design to the loudest, clearest audio. The result is the ability to keep your people and community safer than ever before.

THE WORLD'S LEADING P25 PLATFORM

IMMEDIATE AND ASSURED VOICE IN AN EMERGENCY

When the emergency is critical, a call for help must get through. Motorola's ASTRO 25 system is a dedicated, communication system optimized to make sure the voice call gets through even during times of peak demand.

ACCESSIBILITY IN CHALLENGING ENVIRONMENTS

Tunnels, high rises and sub-basements create unique challenges for wireless communications, but ASTRO 25 is optimized to handle them. We offer unique solutions to minimize interference in specific environments.

RELIABLE VOICE AND DATA INTEGRATED AS ONE

Expanding your data usage while maintaining mission critical voice, ASTRO 25 provides reliable, always-available communications so multiple agencies can share voice and data communication simultaneously among their teams, deploy resources efficiently, maintain communication security and track personnel.

FUTURE READY PLATFORM

ASTRO 25 and APX radios are flexible and future- ready, adapting to your communications needs and evolving to support new technologies and applications, so you can be ready for the next call the moment it happens.

INTEROPERABILITY ON DEMAND

A variety of our APX radios work across P25 systems and digital and analog networks to achieve true interoperability. Some of these radios, such as the APX 8000/APX 8000XE, APX 7000/7500 offer not only this, but also the means to communicate seamlessly through any multiple frequency bands.

THE MOST COMPLETE LINEUP OF TWO-WAY RADIOS DESIGNED TO KEEP YOU SAFE

Agencies expect their investment to deliver maximum value and performance. From day one, every portable and mobile radio will meet your most demanding performance expectations.

ASTRO 25 PORTABLES

APX 8000

Providing unlimited mobility and seamless WiFi connectivity, the APX 8000 multi-band radio places instant interoperability into the hands of mission-critical first responders.

- All-Band to enable communications across multiple agencies
- WiFi for quicker wireless and codeplug updates
- Adaptive Audio Engine to provide better audio experience in any environment

APX 8000XE

The APX 8000XE is redefining mission critical communications by delivering an intrinsically safe radio that combines unlimited mobility, loud audio and secure WiFi connectivity for safety personnel in extreme environments.

- All-band to enable communications across multiple agencies
- WiFi for quicker wireless and codeplug updates
- Adaptive Audio Engine to provide better audio experience in any environment
- 2m/4h submersion and intrinsically safe standard for extreme conditions

APX 7000L

Delivering simultaneous LMR voice with LTE data, the APX 7000L is an ideal solution for federal government first responders that require the most up-to-date information faster and more efficiently.

- Provides simultaneous voice and data operation
- Support for 4G LTE and FirstNet LTE Public Safety network providing access to nationwide wireless data coverage
- Available in 800 MHz (3W) & VHF MHz only

APX 7000XE

Taking safety to the extreme, the APX 7000XE is specifically designed for extreme environments with exaggerated controls and dual-band interoperability in a rugged design.

- Dual-Band to enable instant, interoperable communications
- 2m/2h submersion and intrinsically safe standard for harsh conditions
- Largest emergency button in the industry

APX 7000

Efficiently manage mission critical voice and data in any environment across multiple agencies. The APX 7000 dual-band radio can operate in any of 2 bands (700/800, VHF, UHF R1, or UHFR2 MHz frequencies).

- Dual-Band to enable instant, interoperable communications
- Largest Colored Front Display offered on the APX series
- Dual 1 Watt Speakers to receive loud and clear audio

APX 6000XE

Designed for gloved users working in extreme environments with exaggerated ergonomics and rugged specifications, the APX 6000XE is ideal for agencies requiring advanced features in a smaller, single-band form factor.

- Single band with extreme ergonomics and excellent audio
- Extreme 1-sided noise reduction designed to locate the talker while canceling out ambient noise
- Equipped with a unique speaker grill design that improves water runoff

APX 6000

Delivering outstanding performance in a lightweight form factor, the APX 6000 is built for agencies requiring a single band solution with advanced features.

- Economical single band solution for federal, and state and local public safety users
- Innovative T-grip design gives you a secure grip and better control
- Available in 3 models (Top and Front display with full DTMF keypad, Top and Front display with limited keypad and Top Display Only)

ASTRO 25 PORTABLES

APX 4000		Durable and compact with key features in an easy to use design, the APX 4000 is ideal for agencies requiring a budget friendly P25 Phase 2 solution. • Available in 2 models - Multi-function Single knob and Dedicated Dual Knob for volume and channel controls • Offered in black housing only
APX 3000		Allowing your teams to operate discreetly without attracting interest or creating a distraction, the APX 3000 P25 TDMA capable covert radio can help you communicate securely while blending into the surroundings. • Slim, compact radio that operates via accessories • Optional flexible antenna attaches to the body under clothing • Radio ships standard with a 3-wire surveillance kit (black or beige)
APX 1000		Engineered with a simplified control top to ensure ease of use, the APX 1000 is ideal for local government and public works users that require a budget friendly P25 Phase 2 solution. • Meets IP54 Environmental Specifications • Available in models 1.5, 2 and 3

ASTRO 25 MOBILES

APX 7500

Delivering interoperability on demand, the APX 7500 was designed for first responders who need best-in-class audio and intuitive technology.

- Multi-band capable for better coordination among agencies
- Complete portfolio of 5 control heads and 5 mounting options
- Supports Dual Radio operation and integrates vehicle controls

APX 6500

A complete solution for mission critical responders, the APX 6500 was built for first responders that need advanced features in a single band form factor.

- Single-band capable and supports dual radio operation with APX 7500
- Mid-power model fits into any existing XTL footprint, so you can reuse mounting holes and cables
- RFID label helps you track mobile radio information without uninstalling

ASTRO 25 MOBILES

APX 4500		Durable with basic features, the APX 4500 is ideal for public works, utilities and natural resources customers requiring a rugged P25 mobile solution. • Compatible with rugged O2 Control Head, designed for extreme environments • Durable IP56 certified form factor • Leverage XTL accessories for O5 and O3 control heads to maximize your investment
APX 1500		Compact, easy-to-install dash mount design with basic features, the APX 1500 is ideal for local government and public works users needing a budget-friendly P25 mobile solution. • Flexible, space-saving design for easier installation • Compatible with O2 control head for intuitive operation • Standard APX features (ie. intelligent lighting, dual-mic noise suppression, ADP privacy)

ASTRO 25 CONTROL HEADS

09		Compatible with APX 7500 and 6500 radios. Contains an extra large full color display with intelligent lighting, integrated full size DTMF keypad, large programmable one-touch buttons, dedicated siren controls, integrated response selector, and day/night mode capability.
07		Compatible with APX 7500 and 6500 radios. Contains large color display with intelligent lighting, multiple control head configurations with O2 and O7, motorcycle configuration available, multifunction volume/channel knob, day/night mode, and available with Lighting and Siren Controls or DTMF keypad.
05		Compatible with APX 7500 and 6500 radios. Provides tri-color display with intelligent lighting support, compatible with keypad microphone, can configure up to 4 O5 control head configurations, and available in motorcycle configuration.
03		Compatible with APX 7500 and 6500 radios. Contains full integrated DTMF keypad, hand-held control head with intuitive user interface, and large color display with intelligent lighting. Compatible with Siren and Light Interface Module.
02		Compatible with APX 7500, 6500, 4500, and 1500 radios. Provides XE ergonomics controls, multiple control head configuration with O2 and O7, motorcycle availability, multifunction control knob, intelligent lighting, with a built in 7.5 watt speaker.

ASTRO TWO-WAY PORTABLES

SELECT THE RIGHT PRODUCT TO ENSURE SAFETY AND RELIABILITY

Features	APX 8000	APX 8000XE	APX 7000L	APX 7000	APX 7000XE	APX 6000	APX 6000XE	APX 4000	APX 3000	APX 1000
Supported Frequencies										
VHF (136 - 174) Power Level 6W	●	●	●	●	●	●	●	●	●	●
UHFR1 (380 - 470) Power Level 5W	●	●		●	●	●	●	●	●	●
UHFR2 (450 - 520) Power level 6W	●	●		●	●	●	●	●	●	●
700/800 MHz (764 - 870) Power Level 3W	●	●	●	●	●	●	●	●	●	●
900 MHz (896 - 901, 935 - 940) Power Level 2.5W								●		●
Protocols and Systems Supported										
Multi-Band Capable	●	●	●	●	●					
Dynamic Dual Mode (FDMA/ TDMA)	●	●	●	●	●	●	●	●	●	●
Analog Conventional	●	●	●	●	●	●	●	●	●	●
P25 Phase I (FDMA) Conventional and Trunking	●	●	●	●	●	●	●	●	●	●
P25 Phase II (TDMA) Trunking	●	●	●	●	●	●	●	●	●	●
Smart Net/Smart Zone Analog and Digital Trunking	●	●	●	●	●	●	●	●	●	●
3600 and 9600	●	●	●	●	●	●	●	900 MHz Only	●	
MDC-1200 Analog Signaling	●	●	●	●	●	●	●	●	●	●
Standard Channels	3000	3000	3000	3000	3000	1000	1000	512	512	512
Encryption Capability										
Encryption Capability (Optional)	AES and DES	AES and DES	AES and DES	AES and DES	AES and DES	AES and DES	AES and DES	AES ONLY	AES and DES	
Multi-key	128	128	128	128	128	64	64	48	48	48
ADP	●	●	●	●	●	●	●	●	●	SW only
Radio Authentication	●	●	●	●	●	●	●	●	●	●
POP 25	●	●	●	●	●	●	●	●	●	●
P25 OTAR	●	●	●	●	●	●	●		●	
Applications										
Rugged	Std IP67, Delta T option	IS & Delta T Std	Std IP67, Delta T option	Std IP67, Delta T option	IS & Delta T Std	Std IP67, Delta T option	IS & Delta T Std	Std IP67, Delta T option	Standard IP67	Standard IP54
Models	1.5, 2.5, 3.5	1.5, 2.5, 3.5	1.5, 3.5	1.5, 3.5	1.5, 3.5	1.5, 2.5, 3.5	1.5, 2.5, 3.5	2 and 3	1	1.5, 2, and 3
Colors	Black, Yellow, Green	Black, Yellow, Green	Black	Black, Yellow, Green	Black, Yellow, Green	Black, Yellow, Green	Black, Yellow, Green	Black	Black	Black
Color Sleeves/Stickers				Sleeves Only Red, Orange, Blue		Sleeves Only Red, Orange, Blue		Metallic Display Stickers only		Metallic Display Stickers only
Mission Critical Wireless (Bluetooth)	●	●	●	●	●	●	●	●	●	
Option Board/Expanded Mem	●	●	●	●	●					
Mandown	●	●	●	●	●	●	●	●	●	
GPS	●	●	●	●	●	●	●	●	●	●
Integrated Voice and Data	●	●	●	●	●	●	●	●	●	●
Enhanced Data	●	●	●	●	●	●	●	●	●	
Voice Announcement	●	●	●	●	●	●	●	●	●	●

ASTRO TWO-WAY MOBILES

SELECT THE RIGHT PRODUCT TO ENSURE SAFETY AND RELIABILITY

Features	APX 7500	APX 6500	APX 4500	APX 1500
Control Heads				
Control Heads	O2, O3, O5, O7, O9	O2, O3, O5, O7, O9	O2	O2
Max. # of Control Heads	4	2	1	1
Rugged (IP Rating)	IP54	IP54	IP56	IP54
Protocols and Systems Supported				
Multi-Band Capable	●			
Dynamic Dual Mode Capable (FDMA/TDMA)	●	●	●	●
Analog Conventional	●	●	●	●
P25 Phase I (FDMA) Conventional and Trunking	●	●	●	●
P25 Phase II (TDMA) Trunking	●	●	●	●
SmartNet/SmartZone Analog and Digital Trunk	●	●	●	●
3600 and 9600	●	●	3600 or 9600	9600 Only
MDC-1200 Analog Signaling	●	●	●	●
Standard Channels	3000	1000	512	512
Mounting Options				
Dash Mount	●	●	●	●
Remote Mount	●	●	●	
Motorcycle	●			
Control Station	●	●	●	●
Consolette	●			
Encryption Capability				
Encryption Capability (Optional)	AES and DES	AES and DES	AES Only	ADP
Multi-key	128	64	48	
ADP	●	●	●	●
POP 25	●	●	●	●
P25 OTAR	●	●		
Applications				
Integrated Voice and Data	●	●	●	●
Enhanced Data	●	●	●	
Integrated GPS - Outdoor Location	●	●	●	●
Radio Authentication	●	●	●	●
Voice Announcement	●	●	●	●
Dual Radio Capability	●	●		

ADVANCED SOFTWARE FEATURES

DIGITAL TONE SIGNALING – Instantly alerts large groups of on-duty and off-duty responders over their APX radio to reduce response time.

LEX L10 COLLABORATION – Uses the LEX L10 Mission Critical LTE Handheld to remotely manage the zone, channel, volume and monitor signal strength and battery of the APX portable radio using Mission Critical Bluetooth.

WIFI – Quickly update codeplug, firmware and FLASHport features using the high-speed of WiFi 802.11n with WEP, WPA and WPA-2 security, while maintaining voice communications.

INTELLIGENT LIGHTING – Uses color alerts to notify you of the radio mode, potential emergencies or specific events.

RADIO PROFILES – Radios can be configured to adjust audio level, lighting and tones through user selected or automated options. Whether on surveillance or working in bright sunlight, you can customize settings as needed.

EXTREME AUDIO PROFILE – Intelligent 2-microphone noise reduction software and the latest AMBE vocoder dynamically adjusts for changing high noise environments.

TEXT MESSAGING – Offers a freeform or canned messaging solution so you can efficiently and discreetly send and receive messages to and from subscribers or dispatch operators.

UNIFIED CALL LIST – Consolidates all call lists underneath one unified list so you can easily access all information associated with a particular contact.

VOICE ANNOUNCEMENT – Allows you to navigate through channels/ talk-groups and zones in the radio while an audible, pre-recorded voice file provides a description of the selected channel or zone.

P25 TDMA CAPABLE – Provides twice the voice capacity, so you can add more users to your system without the need for additional frequencies or infrastructure.

MULTIBAND OPERATION – Multiple frequency bands supported with best-in-class transceiver specifications and performance.

SEAMLESS SCAN – Seamless scanning of multiple protocols including FDMA and TDMA systems and multiple RF bands.

ENHANCED DATA – Utilizing TDMA technology, this feature offers greater capacity and reliability of the slotting mechanism where fewer collisions occur.

SITE SELECTABLE ALERT – Continuous tones sent to alert sites of mining detonation activity, evacuation of sites, or vehicle stops.

ADVANCED HARDWARE FEATURES

GPS LOCATION – Integrated GPS receiver can transmit the outdoor location of an individual or vehicle to map-based location software.

MISSION CRITICAL WIRELESS BLUETOOTH – A unique Bluetooth® solution that provides an encrypted link to high performance accessories and applications to support different mission critical environments. Supports commercial off the shelf (COTS) and personal area network (PAN) devices.

MAN DOWN – Unique accelerometer that senses the physical position of the user to communicate updated information to incident command/ dispatch. Contains an audible beach with a unique critical emergency tone that will repeat itself until the emergency is manually deactivated.

RADIO AUTHENTICATION – Providing an extra, secure level of verification every time a radio registers onto a system.

FUTURE READY

MEMORY – Equipped with 64 MB of industrial grade internal memory and a removable memory MicroSD card slot. The removable memory card allows future expandability for growing technology needs.

PROGRAMMING OVER PROJECT 25 – Motorola's POP25 solution allows subscriber radios to be programmed over the air via the ASTRO 25 systems while remaining in the field without interruption.

ASTRO 25 TWO-WAY RADIO APPLICATIONS

Highlighting the most reliable and efficient application solution for ASTRO subscriber radio products to meet each customer's need.

APX™ P25 PERSONNEL ACCOUNTABILITY

Created and designed for fire safety personnel and battalion officers, APX P25 Personnel Accountability is an integrated solution that provides a cohesive report and improves responder safety. A NIMS compliant based solution, APX Accountability allows for better roll call integration, integrated graphical user interface (GUI) and Personnel Accountability Report (PAR) timers based on when agencies arrive on scene and when key events have occurred on scene.

USER-FRIENDLY GUI

Partnering with Systems Definition Inc., we developed a new, streamlined GUI that integrates multiple tasks on a single screen. Now, incident commanders can manage all of their tasks – conducting roll call, monitoring PAR checks and issuing evacuation notifications – from the convenience of one user-friendly screen.

ROLL CALL ALERT

With advanced features such as roll-call accountability, you no longer have to acknowledge your status with a voice-based response. Simply open the roll call window from the laptop at incident command to initiate an accountability roll call. Each responder acknowledges the Incident Commander's request for PAR from their APX series portable radios; they simply press the PTT button to acknowledge. Incident command receives confirmation of who has acknowledged the roll call and a count of those yet to respond. As a result, they not only have better accountability of personnel but the solution significantly reduces cycle time on PAR checks throughout the incident.

MAN DOWN ALERT

An optional, automatic Man Down alert on APX series P25 portable two-way radios adds another valuable level of safety. The on-board accelerometer in the radio monitors an individual's movement and orientation. If a responder is motionless or in a horizontal position for a predetermined amount of time, the APX portable radio will automatically transmit an emergency alert, notifying incident command that the responder is in distress.

APX™ RADIO MANAGEMENT

The APX CPS Management application can program up to 16 radios at one time and track which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

ACCESS AND SHARE CODEPLUGS

When codeplug updates occur, the radio codeplug database can be stored on a network server allowing remote programmers to access and program radios and share a codeplug template across multiple radios. Changes to codeplug templates can be automatically applied to all affected radios while radio programming jobs can be scheduled ahead of time giving you more flexibility and operational efficiency.

MINIMIZE DOWNTIME

Save time and fuel by programming radios either via a USB port on a local or remote PC, or with Over-the-Air-Programming (OTAP) on a Project 25 system. With USB programming, a Device Programmer application resides on a PC and you can connect up to 16 radios via a USB hub to expedite the programming. To read/write multiple radios through a single computer or USB hub, the radios must be programmed with a unique IP address the first time they are read/written.

No application knowledge or application interaction is necessary by the user to program a radio with the Device Programmer application. The user simply plugs the radio into a USB port and the application automatically reads and writes the updates from the server to the radio.

Radio Management batch programming of APX radios via OTAP can only occur with a Motorola ASTRO® 25 Project 25 system, which has voice priority over data, so a user's call, emergency notifications or critical communications will not be interrupted with OTAP. Should an OTAP session be interrupted with communications, programming will resume after the call without the need to restart, expediting the process.

APX™ BATTERY MANAGEMENT

A radio is only as good as the battery that powers it. So when a battery fails and communication is lost, it impacts every aspect of your organization from serving customers to saving lives. But monitoring and maintaining the status of a large fleet of batteries can be time-consuming, inefficient and potentially overwhelming.

That's why we created our proprietary IMPRES™ Battery Management technology. It saves you the guesswork, complexity and costs of managing hundreds even thousands of radio batteries and chargers wherever they're located, and make it easier for your employees to do their work safely and successfully.

HOW DOES IT WORK?

Our IMPRES Battery Management software automatically collects critical data from IMPRES batteries when they are inserted into an IMPRES charger including battery age, capacity, charge and recondition history, the dates manufactured and put into service. This software analyzes battery data and tells you how "healthy" a battery is and when it needs to be changed, so you can quickly and efficiently determine when to remove a poor-performing battery, purchase a new one or redeploy it to less demanding, users, and even identify missing batteries.

VIEW CURRENT REPORTS OR CREATE CUSTOM ONES

Use existing reports or customize new ones to see the most relevant information for your organization. Data is stored in your database and can be exported to an Excel file or printed. IMPRES Battery Management software records and organizes a variety of data so you can:

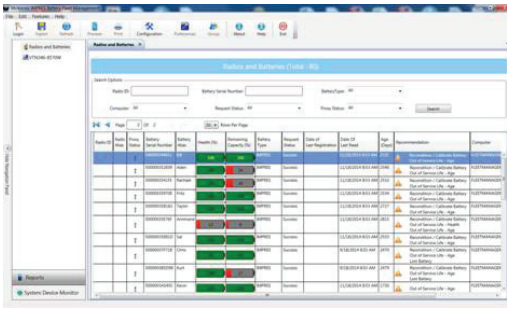
- See a status snapshot of your entire battery fleet
- Evaluate whether batteries are meeting your performance criteria
- Determine when batteries are nearing their end-of-life
- Decide exactly when to buy new batteries
- Get a lost battery report
- Optimize your charger utilization
- Monitor all devices in the system

IMPRES BATTERY MANAGEMENT DELIVERS BATTERY-CRITICAL INFORMATION

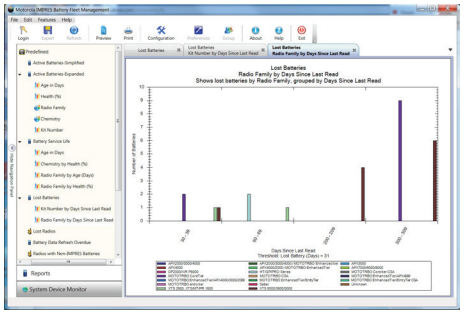
- Tells you when batteries are below an acceptable capacity
- Helps ensure users have enough capacity for a full work shift
- Alerts you to low capacity batteries so you can remove them
- Eliminates unexpected downtime and work interruptions
- Avoids the expense of throwing batteries away prematurely
- Confirms chargers are optimally distributed and used

EACH SOFTWARE LICENSE SUPPORTS:

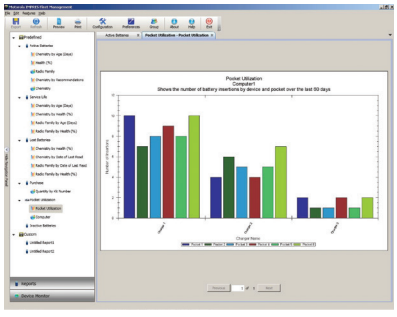
- 1 System Administrator Server
- 19 Remote Clients
- 25 IMPRES Chargers or IMPRES Battery Readers per client
- 25,000 IMPRES Batteries (the total number of batteries for the entire system cannot exceed 25,000)



Active battery report



Lost battery by location



Charger pocket utilization

DIGITAL VEHICULAR REPEATER SYSTEM (DVRS)

Digital Vehicular Repeater Systems (DVRS) from Futurecom is a radio system component that provides repeater capability between portable subscribers and RF base station infrastructure, extending radio coverage of your network.

Installed in the trunk of a car, fire truck, or other vehicles, the DVRS extends your ASTRO 25 network when portable users are outside of your vehicle, inside of a building or in any marginal coverage area.
The DVRS also supports fixed mounting and is transportable.

FEATURES AND BENEFITS

- Flexible Coverage
- In-Band/Cross-Band
- Intelligent Activation
- End-to-End Encryption
- Portable ID Pass-Through
- Flash Upgradable
- Power Output 1-10W
- Compatible with XTL 5000, XLT 2500, APX 7500 and APX 6500 Remote Mount
- P25 Digital/Analog Operation
- Available in VHF, UHF, 700 MHz and 800 MHz

Vehicle Radio Extender (VRX) 1000 from Futurecom is an alternative radio system component to the Digital Vehicle Repeater Systems (DVRS) delivering extended ASTRO25 network to portable radios in areas where coverage isn't the most reliable. The compact and durable design allows for ease of installation in patrol cars and utility trucks.

The 3W simplex radio extender is available in 700/800 MHz, VHF and UHF frequencies and compatible with P25 APX 7500, APX6500 and APX 4500 mobile radios.

FEATURES AND BENEFITS

- Flexible Coverage
- IP54 Rated
- Power Output .5-3W
- Compatible with APX 7500, APX 6500, APX 4500 Remote Mount
- P25 Analog Operation
- Simplex Operation
- Available in VHF, UHF, 700/800 MHz
- In-Band/Cross-Band

MOTOROLA SOLUTIONS

IMPRES™ SMART ENERGY BATTERIES

TALK LONGER, WORK SMARTER AND SPEND LESS IN THE LONG RUN

CHEAP BATTERIES COME WITH A HIGH PRICE

If you buy batteries on the initial purchase price alone, you could end up spending more in the long run. **While other brands may look the same, their quality and performance vary dramatically.** The technology inside makes a big difference in how they impact the performance of your radio and how often they have to be charged.

If you're not using IMPRES™, your batteries may need constant recharging, stop working when your people need them most or even damage your radio. And that's a high price to pay on what you've invested in your valuable two-way radio system.

"In the long run, IMPRES batteries are considerably cheaper than other batteries because they're more reliable and they last longer."

Keith Lippert,
Communications Operations Supervisor
City of Madison, Wisconsin

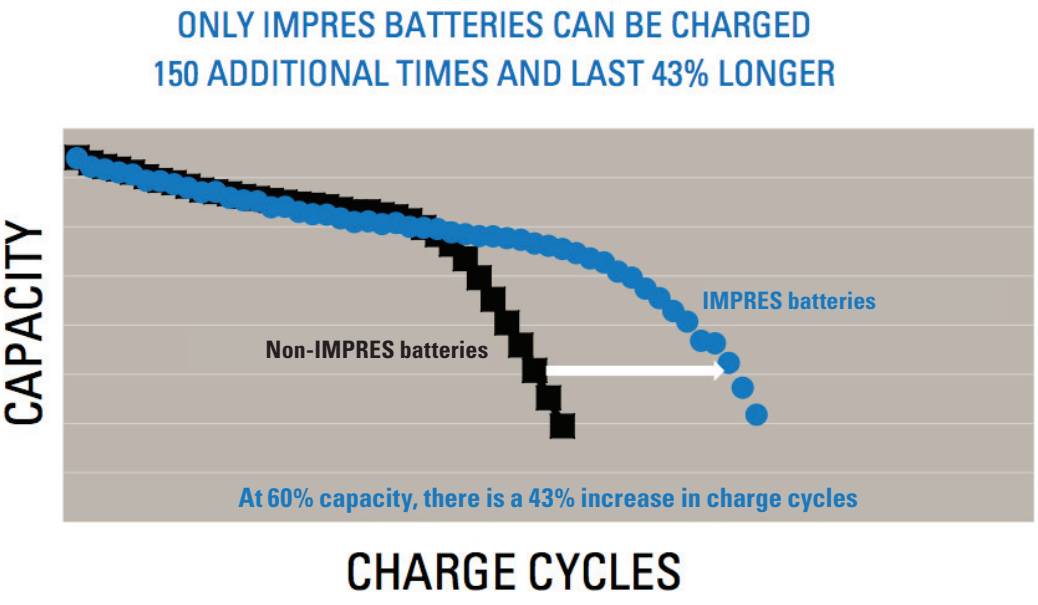
IMPRES BATTERIES LAST A LOT LONGER, AND SAVE YOU A LOT MORE

Are you overbuying batteries? Many administrators do because they're uncertain if their batteries will work or unsure when they need to be switched out. They replace at predetermined intervals or give workers spare batteries just in case.

IMPRES enables you to reduce the number of spare batteries you buy and increase the time before you need replacement batteries.

Only IMPRES batteries can be charged 150 additional times compared to a standard battery – a 43% increase in charge cycles. If you charge radios two to three times a week, you'll likely get more than an extra year out of every IMPRES battery.

Investing in IMPRES is designed to save you money because you buy fewer batteries over the life of the radio and have fewer disruptions to operations.



IMPRES BATTERIES CAN HELP YOU TALK LONGER AND WORK SMARTER

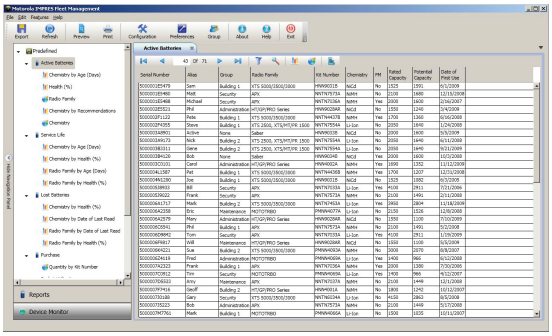
It's critical for your workers to know that a fully-charged battery will last the entire shift. How do you know which batteries to replace – if you don't have time to put them through an analyzer?

IMPRES shows you exactly how much capacity is left, so you can squeeze every bit of energy out of IMPRES batteries.

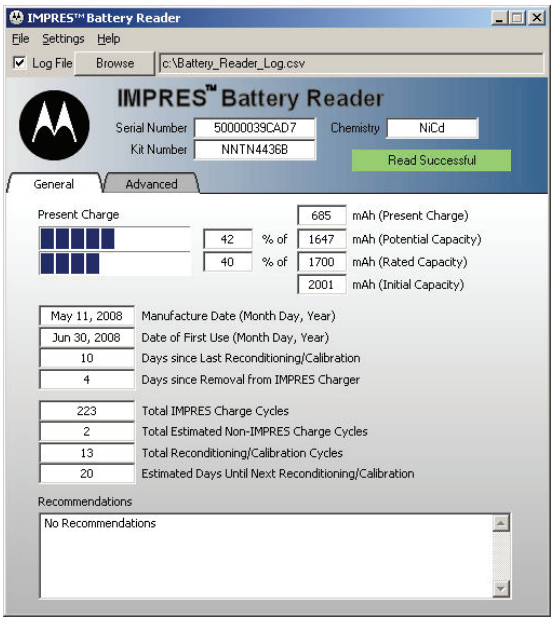
With IMPRES, you can know battery capacity instantly, because if your radio or charger has a display, it shows you the exact capacity available. You can be more confident your radio battery is ready to go.

And with the unique IMPRES Battery Reader and IMPRES Battery Fleet Management systems, you can more efficiently manage your batteries with real world data not available with other manufacturers' batteries. These easy-to-use software applications let you know if there is enough capacity for a full shift, alert you to low capacity batteries so you can remove them, prevent downtime and eliminate throwing batteries out prematurely.

BATTERY INFORMATION AVAILABLE ON THE MOTOTRBO XPR 7550



IMPRES BATTERY FLEET MANAGEMENT



IMPRES BATTERY READER

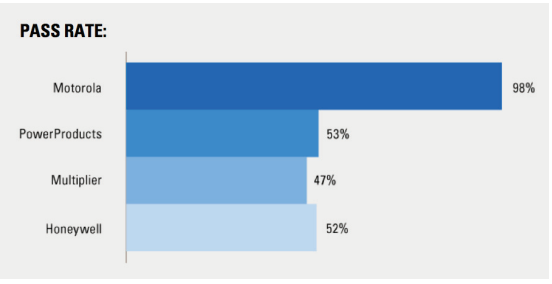
MOTOROLA BATTERIES PERFORM BETTER TO HELP YOUR WORKERS STAY SAFER

Whether your people are pursuing a suspect or patrolling a power plant, you can't shortchange their safety. Their radio is their lifeline and if the battery fails, so do they.

Motorola batteries survive day-to-day abuse and the hazards of the workplace.

In test after test, Motorola batteries outperform the rest – twice as tough as other brands. We design, build and rigorously test every battery to the same high standards as our radios to withstand dust, water, knocks, drops, shocks and more. An innovative circuit design protects against overcharging and electrical shock. And since select Motorola batteries are certified "intrinsically safe" for use with our radios, you can be confident they'll work in the stressful environments of your work place.

Motorola batteries help keep your workforce safer and your costs in check. Only our batteries are backed by 4-year warranty, twice as long as most leading competitive batteries.* When you invest in safety and productivity with Motorola and with IMPRES, it does pay off.



* Our warranty protects against any defects in workmanship for four years.

RADIO MODELS AND COMPATIBLE IMPRES™ BATTERIES

APX™ 7000, APX 6000, APX 7000XE, APX 6000XE

Battery Part Number	Battery Description	Special Features
PMNN4403	2150 mAh Li-Ion slim	IP67 - Submersible
NNTN8092	2300 mAh Li-Ion	Rugged - Submersible, Intrinsically Safe
NNTN7038	2900 mAh Li-Ion	IP67 - Submersible
NNTN7034	4200 mAh Li-Ion high capacity	Rugged - Submersible
NNTN7033	4100 mAh Li-Ion high capacity	Rugged - Submersible Rated to -30 C, Intrinsically Safe
NNTN7035	2000 mAh NiMH	Rugged - Submersible, Intrinsically Safe

The batteries listed above are designed to be charged in the following IMPRES chargers
WPLN7080 – IMPRES Single-Unit Charger
NNTN7586 – IMPRES Dual-Unit Charger
NNTN7593 – IMPRES Dual-Unit Charger with Displays
NNTN7065 – IMPRES Multi-Unit Charger
NNTN7073 – IMPRES Multi-Unit Charger with Displays
NNTN7624 – IMPRES Vehicular Charger
NNTN7686 – Insert for WPLN4108/4130 XTS Multi-Unit Charger
NNTN7687 – Insert for NTN1873/WPLN4111 XTS Single-Unit Charger

APX™ 4000

NNTN8128	1900 mAh Li-Ion slim	IP67 - Submersible
NNTN8129	2300 mAh Li-Ion	IP67 - Submersible, Intrinsically Safe
PMNN4424	2300 mAh Li-Ion	IP67 - Submersible

The batteries listed above are designed to be charged in the following IMPRES chargers
WPLN4232 – IMPRES Single-Unit Charger
WPLN4212 – IMPRES Multi-Unit Charger
WPLN4219 – IMPRES Multi-Unit Charger with Displays
NNTN7616 – IMPRES Vehicular Charger
NNTN8170 – Insert for WPLN4108/4130 XTS Multi-Unit Charger
NNTN8169 – Insert for NTN1873/WPLN4111 XTS Single-Unit Charger

ASTRO® DIGITAL XTS® 5000, XTS 3500, XTS 3000

Battery Part Number	Battery Description	Special Features
NTN9862	2750 mAh Li-Ion Slim	
NNTN6034	4150 mAh Li-Ion high capacity	Rated to -30 C
NNTN7453	3950 mAh Li-Ion high capacity	IP57 - Submersible, Intrinsically Safe
PMNN4093	3000 mAh NiMH high capacity	
NNTN4435	1800 mAh NiMH	
NNTN4436	1700 mAh NiMH	Intrinsically Safe
NNTN4437	1700 mAh NiMH	IP57 - Submersible, Intrinsically Safe

ASTRO DIGITAL XTS 2500, XTS 1500, MT 1500™, PR1500

Battery Part Number	Battery Description	Special Features
NNTN7554	2050 mAh Li-Ion slim	IP67 - Submersible
NNTN7335	2700 mAh Li-Ion	IP67 - Submersible
NTN9858	2100 mAh NiMH	
NTN9857	2000 mAh NiMH	Intrinsically Safe
NNTN6263	2000 mAH NiMH	IP67 - Submersible, Intrinsically Safe

All Astro Digital XTS batteries are designed to be charged in the following IMPRES chargers
WPLN4111 – IMPRES Single-Unit Charger
WPLN4108 – IMPRES Multi-Unit Charger
WPLN4130 – IMPRES Multi-Unit Charger with Displays
WPLN4208 – IMPRES Vehicular Charger

MOTOTRBO™ (XPR™ 6500, XPR 6550, XPR 6580, XPR 6300, XPR 6350, XPR 6380)

Battery Part Number	Battery Description	Special Features
PMNN4066	1500 mAh Li-Ion	IP57 - Submersible
PMNN4069	1400 mAh Li-Ion	IP57 - Submersible, Intrinsically Safe
PMNN4077	2150 mAh Li-Ion	IP57 - Submersible

MOTOTRBO™ (XPR 7550, XPR 7350, XPR 3500, XPR 3300)

Battery Part Number	Battery Description	Special Features
PMNN4407	1500 mAh Li-Ion slim	IP67 - Submersible
PMNN4409	2150 mAh Li-Ion high capacity	IP67 - Submersible
NNTN8129	2300 mAh Li-Ion high capacity	IP67 - Submersible, Intrinsically Safe

These batteries are designed to be charged in the following IMPRES chargers

WPLN4232 – IMPRES Single-Unit Charger
WPLN4212 – IMPRES Multi-Unit Charger
WPLN4219 – IMPRES Multi-Unit Charger with Displays
NNTN7616 – IMPRES Vehicular Charger

PROFESSIONAL SERIES (HT1250, HT1250.LS, HT1250.LS+, HT1550.XLS, MTX850, MTX850.LS, MTX8250, MTX950, MTX9250, PR860)

Battery Part Number	Battery Description	Special Features
HNN4003	2350 mAh Li-Ion	
HNN4001	1800 mAh NiMH	
HNN4002	1700 mAh NiMH	Intrinsically Safe

The batteries listed above are designed to be charged in the following IMPRES chargers
WPLN4182 – IMPRES Single-Unit Charger
WPLN4187 – IMPRES Multi-Unit Charger
WPLN4192 – IMPRES Multi-Unit Charger with Displays
NNTN7618 – IMPRES Vehicular Charger

THE FOLLOWING HARDWARE AND SOFTWARE APPLICATIONS SUPPORT ALL IMPRES BATTERIES LISTED ABOVE

IMPRES Battery Fleet Management
NNTN7676 IMPRES Battery Fleet Management Software
HKVN4036 IMPRES Battery Fleet Management Entitlement Key
NNTN7677 Multi-Unit Charger Interface Unit (CIU)
NNTN8045 Single-Unit Charger Interface Unit (CIU) – not compatible with WPLN4111 (XTS Single Unit Charger)

IMPRES Battery Reader
NNTN7392 IMPRES Battery Reader Package – includes battery reader hardware, system software, USB cord, adapter inserts for MOTOTRBO, HT-series and APX.

[1] International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes.

[2] Rugged batteries exceed industry standards (IPx7) for submergibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

[3] Intrinsically Safe: Motorola approved batteries are a critical part of the specific radio and accessory system certified by a recognized testing organization as intrinsically safe. Use of non-Motorola approved batteries could result in equipment that is unapproved or unsafe in a hazardous environment.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

R3-9-2018B

MOTOROLA

IMPRES™ BATTERY MANAGEMENT

SAFER, SMARTER, POWERED FOR LONGER

YOUR BATTERY
SAFER, SMARTER, POWERED FOR LONGER

Your radio is only as good as the battery that powers it. When your radio battery fails and communication is lost, it impacts the performance and safety of your organization – whether you're operating an industrial facility, serving customers in a hotel or saving lives. Yet maintaining a large fleet of batteries can be frustrating, time-consuming and costly.

The IMPRES Battery Management application makes all the difference. It eliminates the guesswork, complexity and expense of managing hundreds – even thousands – of batteries, wherever they are. With IMPRES, you can count on your radios to power up in the moments that matter.

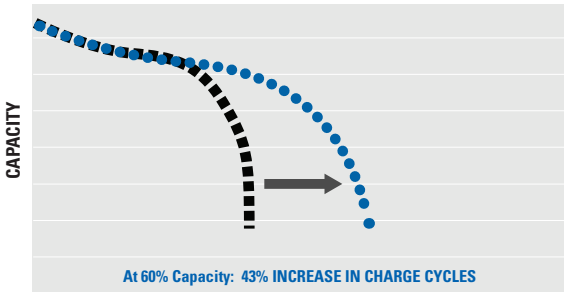
IMPRES IS THE DIFFERENCE BETWEEN "READY" AND "RAN OUT"

Only IMPRES Battery Management provides the most accurate information on each battery in your fleet so you know they're fully charged and will last the entire shift.

IMPRES software automatically collects battery-critical data including capacity, charge and recondition history, and put-in-service dates.

Because IMPRES batteries can be charged 150 times more than standard batteries, you stock fewer spares and replace fewer batteries.

ONLY IMPRES BATTERIES CAN BE CHARGED
150 TIMES MORE THAN STANDARD BATTERIES
AND LAST 43% LONGER



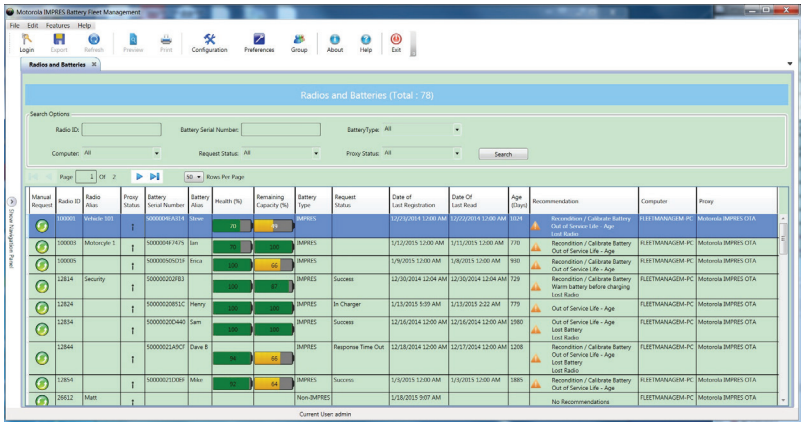
COMMUNICATE CONTINUOUSLY, WORK EFFICIENTLY

IMPRES Battery Management delivers battery-critical information to enhance the performance and safety of your organization.

- Tells you when batteries are below your specified minimum capacity
- Ensures there is enough capacity for an entire shift
- Eliminates unplanned downtime and work interruptions
- Avoids the expense of throwing batteries away prematurely
- Decreases the need for excess battery inventory
- Asset tracking for batteries and in the OTA version, for radios

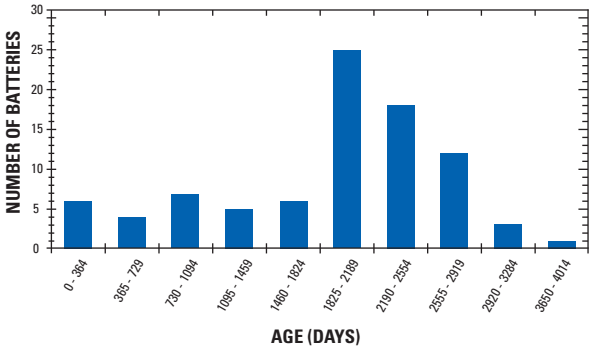
REAL TIME BATTERY HEALTH REPORT

ENABLES IMMEDIATE BATTERY HEALTH AND CAPACITY QUERYING



AGE IN DAYS

SHOWS ALL BATTERIES GROUPED BY AGE (DAYS)

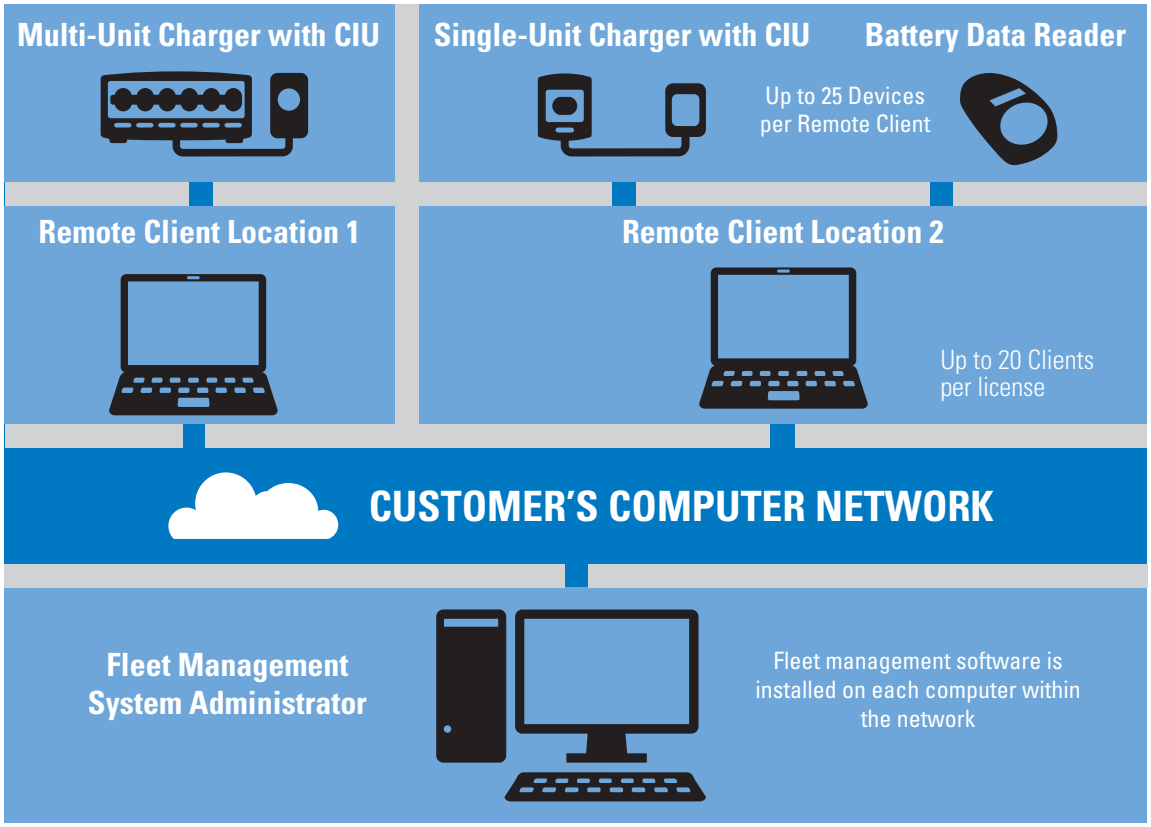


IMPRES BATTERY MANAGEMENT IN THE CHARGER

IMPRES BATTERY MANAGEMENT VIA NETWORKED CHARGERS

IMPRES Battery Management collects accurate, up-to-the-moment information each time an IMPRES battery is inserted into an IMPRES charger. You'll know how long batteries will last and be confident anyone using a radio can communicate at full potential.

IMPRES Battery Management helps you monitor and manage battery health in real time. It is designed for APX™, XTS®, MOTOTRBO™ XPR Series and HT Professional radios.



IMPRES BATTERY MANAGEMENT OVER THE AIR

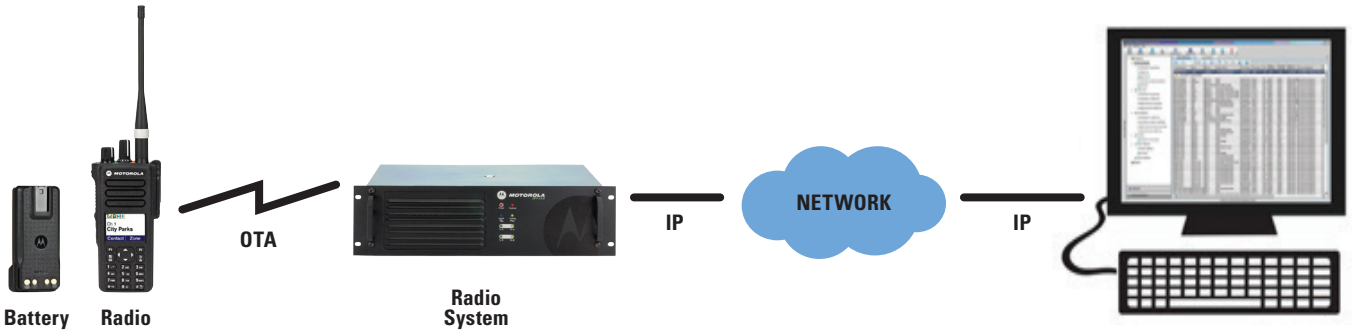
NEW IMPRES OVER THE AIR (OTA) BATTERY MANAGEMENT

IMPRES OTA Battery Management, for XPR 7000 or XPR 3000 Series radios when used with IMPRES batteries, automatically collects battery information over the air while radios are in use. It eliminates the need for wired network connections and a computer at charger locations. It also enables real-time data querying of any radio in the field and adds radio related data for radio asset tracking and other uses.

IMPRES OTA Battery Management requires MOTOTRBO XPR 7000 and XPR 3000 radios with software upgrade 2.4 and IMPRES Battery Management software 2.0 and a software license key. See ordering guide on page 7 for detailed information.

The IMPRES OTA Battery Management application communicates with the radio system through an IP Data Gateway in one of two ways, through the Motorola Network Interface Service (MNIS), which communicates via IP to the system, or a mobile radio configured as a control station.

1. Motorola Network Interface Service (MNIS)



2. Mobile radio configured as a control station

GAUGE BATTERY STATUS AT A GLANCE

IMPRES BATTERY READER

The IMPRES Battery Reader provides data similar to IMPRES Battery Management. It provides charging, reconditioning and key usage data that can affect overall battery performance. By enabling quick data-based diagnostics, the IMPRES Battery Reader helps optimize talk time, improve cycle life and reduce battery replacement.

The Battery Reader is a stand alone tool that is ideal for a technician's workbench to enable quick, individual battery analysis.

IMPRES BATTERY READER

This standard package (NNTN7392) includes:

- IMPRES Battery Reader
- USB cord
- HT Series adapter insert
- MOTOTRBO adapter insert
- APX adapter insert
- System Software CD

Laptop not included

- Get a quick view of the battery's ability to hold a charge
- See accurate insights into the age of the battery
- Know each battery's usage and performance
- Track warranty claims and potential battery problems
- Export data to Excel for archiving and easy access in the future
- Install quickly and easily. Simply attach the IMPRES Battery Reader to a PC via the USB port; no additional power is needed
- Works with all IMPRES batteries

IMPRES BATTERY MANAGEMENT ORDERING GUIDE

IN THE CHARGER

FOR APX, XTS, MOTOTRBO XPR 3000, XPR 6000 and XPR 7000 SERIES AND HT PROFESSIONAL RADIOS

To deploy IMPRES Battery Management:

- **Download NNTN7676** IMPRES Battery Management Software
- **Purchase HKVN4036** Entitlement ID(s) for up to 20 PCs
- **Purchase NNTN7677** Charger Interface Unit for each Multi-Unit Charger and/or **NNTN8045** Charger Interface Unit for each Single-Unit Charger

The APX Dual Unit Charger accommodates a standard USB cable

OVER THE AIR

FOR MOTOTRBO XPR 7000 and XPR 3000 SERIES RADIOS

To deploy IMPRES OTA Battery Management:

- **Download NNTN7676** IMPRES Battery Management Software
- **Purchase HKVN4036** Entitlement ID(s) for up to 20 PCs
- Upgrade radio software to 2.4 or later

IMPRES OTA Battery Management is supported by the following MOTOTRBO Systems:

- Direct Mode (12.5e and 6.25e)
- Single Site Repeater
- IP Site Connect
- Capacity Plus
- Linked Capacity Plus

NOTE: Not compatible with Connect Plus

CHARGER INTERFACE UNIT (CIU)

Purchase 1 CIU for each IMPRES charger you want to network into IMPRES Battery Management. The APX Dual Unit Charger and IMPRES Battery Reader do not require a CIU and can be networked into IMPRES Battery Management with a standard USB cable.

Multi-unit Charger Interface Unit	**NNTN7677**	**APX, XTS, HT, MOTOTRBO***
Single-unit Charger Interface Unit	**NNTN8045**	**APX, HT, MOTOTRBO***

- Each computer can have up to **25 devices connected** to it. These include: IMPRES Multi-Unit Chargers (APX, XTS, MOTOTRBO or HT Professional), IMPRES Single Unit Chargers (APX, MOTOTRBO or HT Professional), APX Dual Unit Chargers and one IMPRES Battery Reader. Please note, the XTS IMPRES single unit charger is **not** supported.
- A USB hub will be required when the number of devices that need to be connected to a single PC exceeds the available USB ports
- The maximum number of batteries IMPRES Battery Management can accommodate is 25,000

NOTE: Free 90 day trial version available at IMPRES Battery Management Software

*Only MOTOTRBO XPR 6000 Series radios require a CIU. XPR 7000 and XPR 3000 Series Radios support OTA Battery Management.

Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A.
800-367-2346 **motorolasolutions.com**

MOTOROLA

IMPRES 2
BATTERY DETAILS & COMPATIBILITY

BATTERIES

PART NO.	DESCRIPTION	RADIO COMPATIBILITY						HAZARDOUS LOCATION RATING
		APX 6000	APX 6000XE	APX 7000	APX 7000XE	APX 8000	APX 8000XE	
PMNN4486	IMPRES 2 Li-Ion 3400mAh Battery, IP68	•	•	⊙	•	⊙		N/A
PMNN4485	IMPRES 2 Li-Ion 2550mAh Battery, IP68	⊙	•	•	•	•		N/A
PMNN4487	IMPRES 2 Li-Ion 4850mAh Battery, IP68	•	•	•	•	•		N/A
PMNN4494	IMPRES 2 Li-Ion 5100mAh Battery, IP68	•	•	•	•	•		N/A
NNTN8930	IMPRES 2 Li-Ion 2650mAh Battery, IP68	•	⊙	•	⊙			TIA 4950*
NNTN8921	IMPRES 2 Li-Ion 4500mAh Battery, IP68	•	•	•	•			TIA 4950*
PMNN4504	IMPRES 2 Li-Ion 3400 mAh Battery, IP68						⊙	ISA 12.12.01*
PMNN4505	IMPRES 2 Li-Ion 4850 mAh Battery, IP68						•	ISA 12.12.01*

* For detailed hazardous rating see radio manual

⊙ **Standard Battery with Radio**

MOTOROLA SOLUTIONS RECOMMENDATIONS FOR NEW BATTERY USE, STORAGE AND CARE

IMPORTANT BATTERY STORAGE, HANDLING AND CARE TIPS – PLEASE READ

Battery capacity naturally decreases slowly over time and the MSI battery warranty begins when the battery is shipped, thus to take full advantage of your new battery's capacity and warranty, use batteries promptly after purchase.

Always charge your battery using the approved Motorola charger. Charging in non-Motorola chargers may lead to reduced performance and battery damage.

If you need to store your new batteries prior to use, please be aware that proper storage guidelines and time durations must be followed.

1. Do not store batteries with flammable materials.
2. Remove battery from radio to eliminate radio as a source of additional current drain. Do not replace the battery in any area labeled "Hazardous Atmosphere".
3. Store batteries in a well ventilated, temperature (68°F/20°C to 86°F/30°C) and humidity (30%-60%) controlled environment.
4. Optimal battery storage condition is 30%-50% charge state. New batteries should be stored as delivered from Motorola Solutions. Used batteries should be charged or discharged to approx 50%.
5. Batteries removed from storage may take several charge / discharge cycles to achieve their optimal capacity. One or two reconditioning cycles will accelerate capacity recovery.
6. Use the battery in accordance with its water and dust Ingress Protection (IP) rating.
7. Don't disassemble, crush, puncture, shred, or otherwise change the form of your battery. Don't discard your battery in a fire.
8. Don't dry a wet battery with an appliance or heat source, such as a hair dryer or microwave oven. If the radio battery contacts are wet, dry the battery contacts before attaching the battery to the radio.
9. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects such as jewelry, keys or coins.
10. For IMPRES batteries, the first battery charge should take place in an IMPRES desktop (not vehicular) charger for proper initialization of IMPRES data in battery memory. Allow the battery to be fully charged through a solid green LED charger status indication.

The batteries listed below contain additional active circuitry required to meet specific regulatory requirements. This circuitry increases the rate of self discharge. For best performance these batteries should be used within 1 month of receipt. However, if storage is required, the batteries should be charged to a 50% charge state every 6 months.

Active Circuitry Batteries

NNTN8287	Battery Li Ion IMPRES Intrinsically Safe CSA
NNTN8386	Battery Li Ion IMPRES Intrinsically Safe CSA
NNTN8359	Battery Li Ion IMPRES Intrinsically Safe IECEx/ATEX
NNTN5510	Battery Li Ion Intrinsically Safe IECEx/ATEX
NNTN7383	Battery Li Ion Intrinsically Safe IECEx/ATEX

MOTOROLA SOLUTIONS

IMPRES™ 2

A NEW GENERATION. COMPLETELY RE-ENERGIZED.

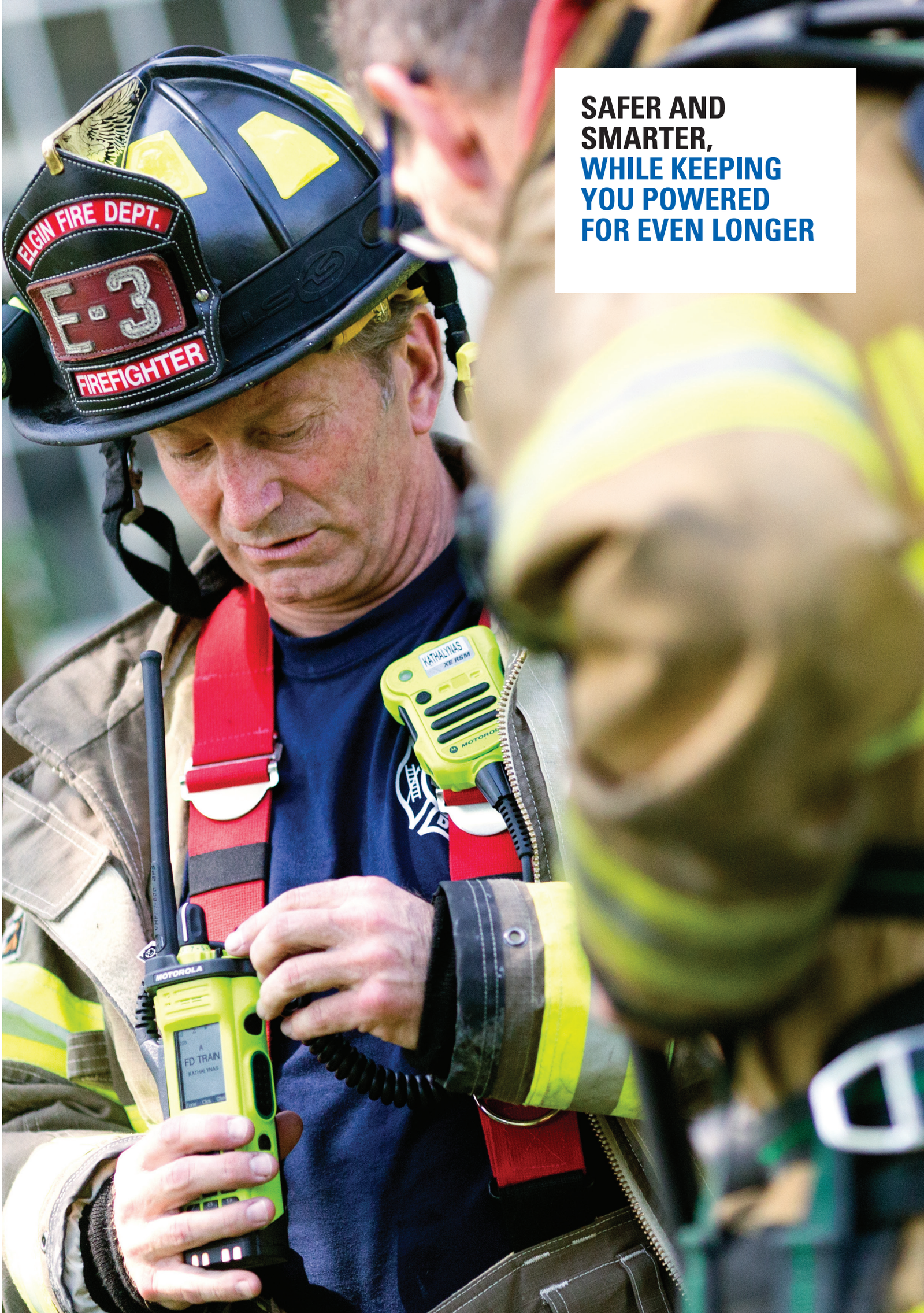
IMPRES 2

YOUR RADIO IS YOUR LIFELINE. IF YOUR BATTERY DIES, IT JEOPARDIZES EVERYTHING.

That's why we introduced the original IMPRES energy system. With automated power management, IMPRES chargers deliver accurate information on every IMPRES battery in your fleet, so you can be confident in your team's ability to communicate no matter what they're up against.

Now there's IMPRES 2 designed for APX™ series radios. It's a next-generation energy system that's safer and smarter, while keeping you powered for even longer. With IMPRES 2 chargers, you can charge IMPRES 2 batteries up to 40% faster. Customize your charging to extend the life of batteries in storage. And manage power more intelligently with enhanced diagnostics, so you get the most from each battery.

IMPRES 2 batteries have been improved inside and out, so your team can tackle whatever the day brings. With higher capacity, you'll get more talk time. With better water resistance, you'll never think twice about submersion. And with the ability to charge up to 60% more times than standard Lithium Ion batteries, you'll reduce costs.



SAFER AND SMARTER, WHILE KEEPING YOU POWERED FOR EVEN LONGER

YOU FACE CHALLENGES EVERY DAY BATTERY LIFE SHOULDN'T BE ONE OF THEM

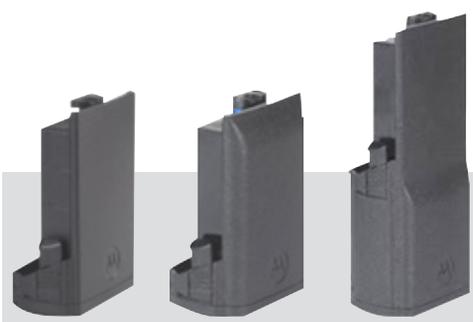
KEY FEATURES

IMPRES 2 MULTI-UNIT CHARGER

- Charge batteries up to 40% faster
- Disable calibration for greater control
- Optimize battery life in storage with customizable settings
- Enhanced, built-in charging diagnostics
- Six integrated USB charging ports
- Clip-on accessories shelf for an uncluttered workspace
- Read data quickly and easily with six integrated displays

IMPRES 2 SINGLE-UNIT CHARGER

- Charge batteries up to 40% faster
- Disable calibration for greater control
- Two integrated USB charging ports



IMPRES 2 BATTERIES

- Get up to 60% more charges than a standard Lithium Ion battery
- Higher capacity in the same size
- Extended talk time
- IP68 submersion (2 meters, 4 hours)
- 48-month workmanship warranty
- 24-month capacity warranty

FEATURES AND BENEFITS
CHARGERS

SINGLE AND MULTI-UNIT

FAST CHARGING

CHARGE FAST. RESPOND FASTER.

Emergencies don't wait for batteries to charge, so make sure you have fully charged batteries when you need them the most. New IMPRES 2 chargers charge IMPRES 2 batteries up to 40% faster than the originals.

MULTI-UNIT

CUSTOMIZABLE CHARGING

TAKE CONTROL.

No two organizations are alike when it comes to charging. That's why we help you customize the charging process to better suit your needs. Take battery storage, for example. With IMPRES 2, you can set charging percentages at 50% or 75% to optimize battery life while in storage, and at the same time keep spares ready for emergencies. But it's more than just storage. To make the most of your lifecycles, IMPRES chargers know when it's time to calibrate a battery. Now you can control the process by disabling this feature, and enabling it on your own schedule.

MULTI-UNIT

ENHANCED DIAGNOSTICS

STAY A STEP AHEAD.

Get a detailed look at performance while your batteries charge. A built-in diagnostic tool provides important usage data, such as a battery's ability to hold a charge and its time in service. Use the information to manage your fleet more efficiently, and replace low capacity batteries before it's too late.

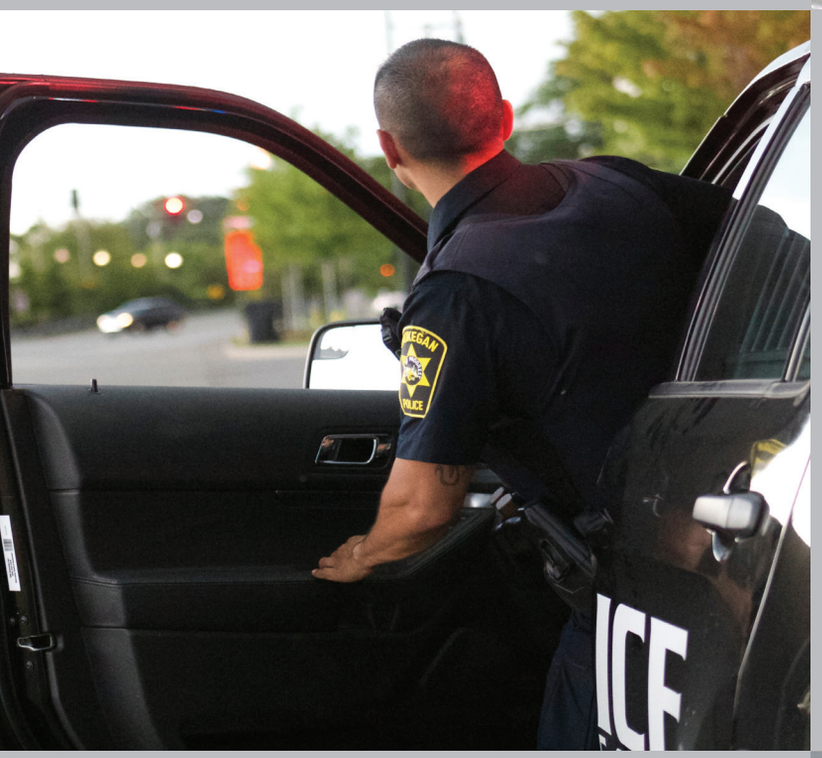
FEATURES AND BENEFITS

BATTERIES

INCREASED CAPACITY

DO MORE WITHOUT THE BULK.

First responders, public works employees, and other professionals know that shifts aren't getting any shorter. Thankfully, you can keep your people connected even longer. IMPRES 2 batteries deliver higher capacity without an increase in size.



DURABLE DESIGN

TACKLE THE TOUGHEST CONDITIONS.

Wherever the job takes you, be confident your battery will be up to the challenge. All IMPRES 2 batteries share the same IP68 rating as APX radios, which means they can be fully submersed in two meters of water for up to four hours. Designed with a rugged housing, they're as tough as the radios they charge. And in test after test, IMPRES 2 batteries continually withstand shocks, knocks, drops and shakes, outperforming the competition every time.

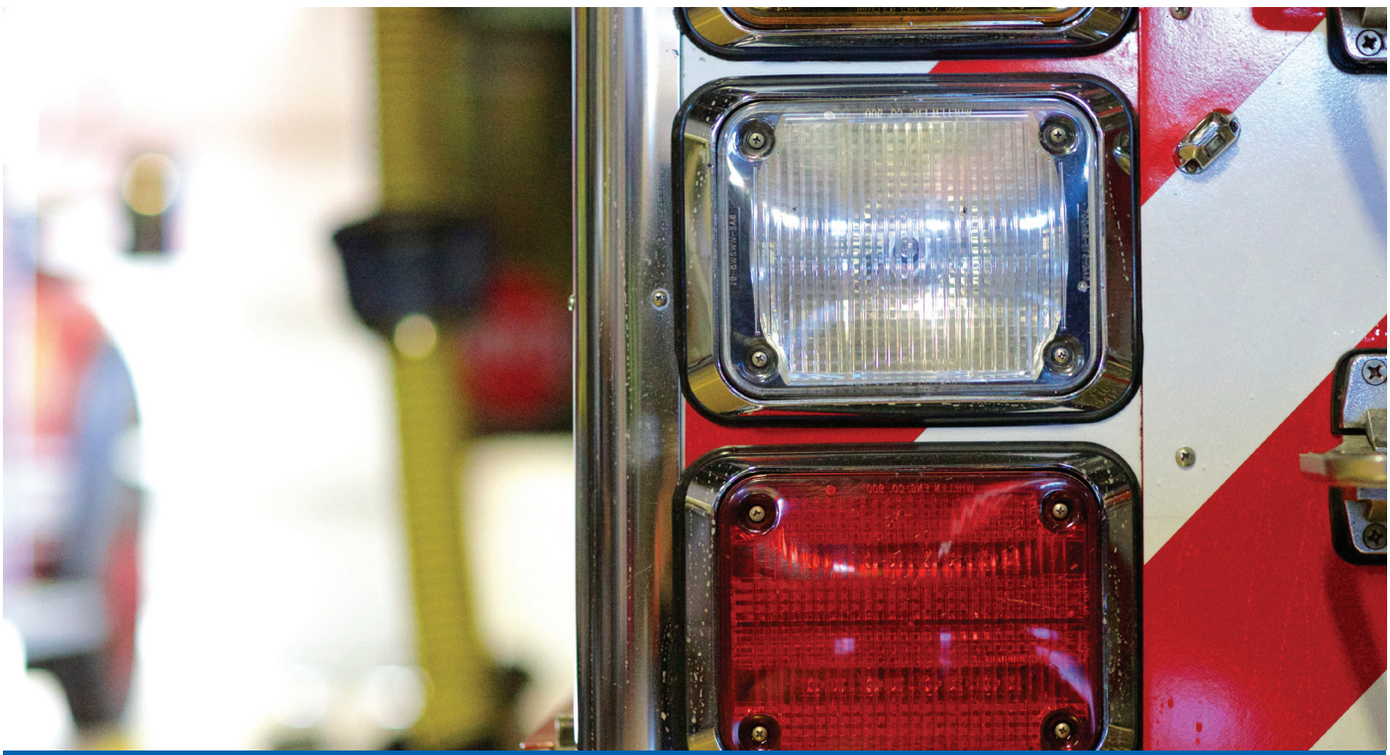
EXTENDED BATTERY LIFE

EXTENDED LIFE. BUILT TO LAST.

You face challenges every day. Battery life shouldn't be one of them. IMPRES 2 batteries, when combined with an IMPRES 2 charger, deliver up to 60% more charging cycles than traditional Lithium Ion batteries, so they're on the job longer. Which means you can stock fewer spares, and replace fewer batteries. We've also extended our capacity warranty from 18 to 24 months*, while backing all IMPRES batteries with a long 48 month workmanship warranty. IMPRES 2 batteries are compatible with all existing IMPRES chargers, so your upgrade will be a smooth one.

*IMPRES 2 batteries not charged exclusively in IMPRES 2 chargers receive a 6 month capacity warranty reduction to 18 months instead of 24 months.

SPECIFICATIONS



CHARGERS

Part Number	Description	Radio Compatibility					
		APX 6000, SRX 2200	APX 6000XE	APX 7000	APX 7000XE	APX 8000	APX 8000XE
NNTN8860	IMPRES 2 Single Unit Charger (115 vac)	•	•	•	•	•	•
NNTN8863	IMPRES 2 Single Unit Charger (100-240 vac)	•	•	•	•	•	•
NNTN8844	IMPRES 2 Multi Unit Charger	•	•	•	•	•	•

BATTERIES

Part Number	Description	Approximate Operating Time	Radio Compatibility						Hazardous Certification
		(hours) @ 5/5/90 duty cycle	APX 6000, SRX 2200	APX 6000XE	APX 7000	APX 7000XE	APX 8000	APX 8000XE	
PMNN4486	IMPRES 2 Li-Ion 3400 mAh Battery, Rugged IP68	15.5	•	•	•	•	•		N/A
PMNN4485	IMPRES 2 Li-Ion 2550 mAh Battery, Rugged IP68	11.5	•	•	•	•	•		N/A
PMNN4487	IMPRES 2 Li-Ion 4850 mAh Battery, Rugged IP68	21	•	•	•	•	•		N/A
PMNN4494	IMPRES 2 Li-Ion 5100 mAh Battery, Rugged IP68	21.5	•	•	•	•	•		N/A
NNTN8930	IMPRES 2 Li-Ion 2650 mAh Battery, Rugged IP68	13.5	•	•	•	•			TIA 4950*
NNTN8921	IMPRES 2 Li-Ion 4500 mAh Battery, Rugged IP68	18.5	•	•	•	•			TIA 4950*
PMNN4504	IMPRES 2 Li-Ion 3400 mAh Battery, Rugged IP68	10						•	ISA 12.12.01*
PMNN4505	IMPRES 2 Li-Ion 4850 mAh Battery, Rugged IP68	14.5						•	ISA 12.12.01 *

* For detailed hazardous rating see radio manual

MOTOROLA SOLUTIONS

IMPRES 2

A NEW GENERATION. COMPLETELY RE-ENERGIZED.

SPECIFICATIONS	IMPRES 2 Single Unit Chargers	IMPRES 2 Multi-Unit Chargers
Model # and Input Voltage	NNTN8863: 100-240 vac, NNTN8860: 115 vac	NNTN8844 100-240 vac
Dimensions (HxWxD):	44mm x 102mm x 126mm	197mm x 445mm x 262mm
Chraging Current (max):	3.0 Amps	3.0 Amps
Warranty	12 Months	12 Months
Operating Temperature	0°C to +50°C	0°C to +50°C
Charging Method	CCDT/Negative pulse (NiCd/NiMH) and CCCV(Li-ion) Capable of charging 8.4V Li Ion and 11V NiMH batteries.	CCDT/Negative pulse (NiCd/NiMH) and CCCV(Li-ion) Capable of charging 8.4V Li Ion and 11V NiMH batteries.
Regulatory Approvals	CEC, CE, UL Use only Motorola Solutions authorized power supplies with this charger.	CEC, CE, UL Use only Motorola Solutions authorized power supplies with this charger.

For more information, please visit: www.motorolasolutions.com/IMPRES2

MOTOROLA SOLUTIONS

MOTOROLA RAISES THE BAR ON P25 TWO-WAY RADIO SECURITY

APX™ SERIES AWARDED FIPS 140-2 LEVEL 3 VALIDATION

Validated at Federal Information Processing Standards (FIPS) 140-2 Level 3, our APX™ series of P25 two-way radios is the industry's first to offer government agencies this next level of information assurance.

WHY FIPS 140-2 LEVEL 3?

In today's world, the better question may be, why not? Over time, advances in technology have enhanced the ability for users to share sensitive information. However, these advances also introduced new threats and increased the ability for an attacker to gain access to this data. As a result, users demand higher security for their data, especially in federal law enforcement, military and other sensitive environments. In many cases, lives depend on it. Motorola has responded with the APX series of P25 portable and mobile radios validated at FIPS 140-2 Level 3 that protects information system (IS) resources from misuse and exploitation while ensuring the integrity and operational capabilities of its intended users.

FIPS 140-2 LEVEL 3 INCLUDES AND ENHANCES THE SECURITY MECHANISMS PROVIDED BY FIPS 140-2 LEVELS 1 AND 2.

Level 1 defines basic security requirements for cryptographic modules including the use of an approved algorithm and the use of production grade components for physical security.

Level 2 builds on the Level 1 requirements by adding features such as:

- Tamper Evidence: attempts to physically tamper with the encryption module will result in visible damage to the module.
- User Authentication: verifies the role of a user and what functions that role is allowed to perform with the module.

Level 3 encompasses Levels 1 and 2 while increasing security measures with:

- Tamper Detection and Response Mechanisms: detects an attack and provides an active response by preventing access to sensitive data.
- Secured Keyfill: improves protection of keys through encrypted keyfill.
- High Level Design Assurance: ensures high level design, deployment, and radio operation measures are met to deliver proper security implementation.
- Physical Port Separation: separate encryption module ports provide greater security to the keys as they are loaded.

Certificate (#1536) granted April 28, 2011

WHAT DOES LEVEL 3 VALIDATION MEAN TO YOU?

SIMPLY PUT: HIGHER SECURITY FOR YOUR VOICE AND DATA WHEN USING THE MOTOROLA APX SERIES RADIOS.

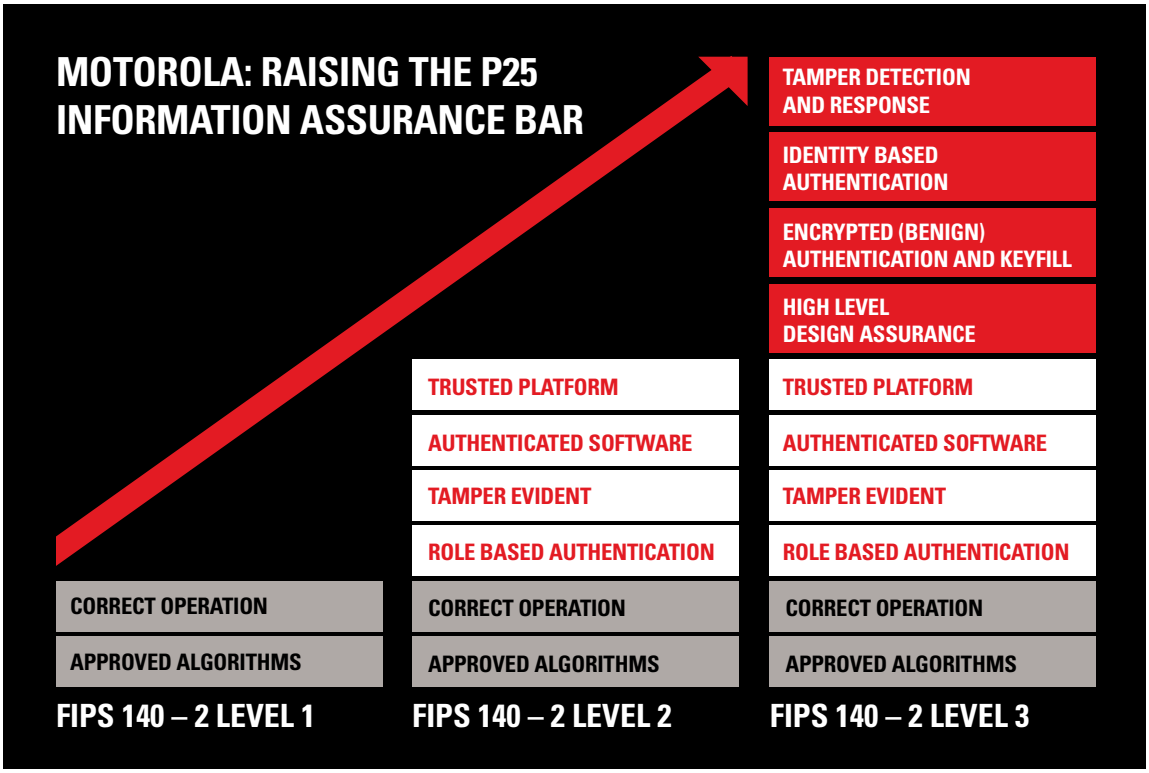
We are dedicated to providing increased security for P25 applications that are exposed to sophisticated adversaries every day. FIPS 140-2 Level 3 will not only detect that an attacker tried to gain access to critical security items, but it also prevents an attacker from gaining access to that data.

Having FIPS 140-2 Level 3 ensures that entry of critical security data is protected and only accessed by authorized personnel.

The APX series P25 radios validated at FIPS 140-2 Level 3 demonstrates our ongoing commitment to developing products that deliver quality, reliability and security for mission critical use.

We continue to be a leading manufacturer in two-way radio security and hold several FIPS 140 security certificates for cryptographic modules.

(See http://csrc.nist.gov/groups/STM/cmvp/)



Motorola Solutions, Inc. 1301 East Algonquin Road Schaumburg, Illinois 60196, U.S.A.
800-367-2346 **motorolasolutions.com**

MOTOROLA SOLUTIONS

THE INTELLIGENT WAY TO COMMUNICATE.

TALK LONGER. WORK SMARTER WITH IMPRES™ TECHNOLOGY.

We created our patented IMPRES technology as an integral part of our two-way radio batteries, and chargers. Users who rely on IMPRES call it innovative and indispensable. We call IMPRES the intelligent way to communicate – offering enhanced performance and exceptional capabilities for your radio, your battery and its charger, your workforce and workplace.

IMPRES SMART ENERGY SYSTEM

For the line worker on a long shift or the public works officer laboring overtime to restore power, the job stops when their radio stops operating. Our innovative IMPRES battery charging and reconditioning system streamlines and automates battery maintenance. It draws on our exclusive technology that enables communication between your battery and charger to help lengthen battery life and extend talk time.

AUTOMATES BATTERY MAINTENANCE

You want to be sure you get the most out of every battery by maximizing its life. With IMPRES you can, because it automates battery reconditioning, adapting the intervals to each battery's usage pattern. IMPRES batteries and chargers have the capability to exchange data. This allows the IMPRES charger to evaluate the usage pattern of an IMPRES battery and determine the optimum reconditioning interval, thus optimizing battery life.

ELIMINATES OVERCHARGING

IMPRES batteries can be left in their IMPRES chargers for extended periods without heat damage from the charger. If radios are accidentally left in the charger – overnight, over a weekend or longer – there shouldn't be any worry about shortening your battery's life. Because the IMPRES charger automatically monitors battery capacity, batteries are safely charged to the right capacity and always ready to go.

BETTER DATA FOR BETTER DECISIONS

IMPRES batteries store critical usage information so you don't have to. Each two-line IMPRES charger display presents data at a glance, so you can make informed decisions about battery replacement. Data includes key information such as: battery capacity, time remaining to complete charging, and each battery's unique serial number. If you're operating a large fleet of batteries, IMPRES Battery Data Reader is a valuable diagnostic tool to evaluate individual IMPRES batteries. Furthermore, IMPRES Battery Fleet Management collects and consolidates that data automatically, so you can quickly and easily identify when batteries need to replaced.

EXTENDED WARRANTY

When you use IMPRES batteries exclusively with IMPRES chargers, you can count on a 6-month extension to your capacity warranty coverage over Motorola standard batteries.

TESTED TOUGH AND PROVEN TOUGH

All Motorola IMPRES batteries are Proven Tough. Time after time, in lab test after test – for Drop, Vibration and ESD (Electrostatic Discharge) – they withstand shocks, knocks, drops and shakes and outperform the leading brands. If your radio gets banged on a ride, rattled by heavy equipment or shocked by static electricity, you can depend on IMPRES batteries to stay true and stand tough.

FACT SHEET
IMPRES TECHNOLOGY

RADIO MODELS AND COMPATIBLE IMPRES™ BATTERIES

APX™ 7000, APX 6000, APX 7000XE

Battery Part Number	Battery Description	Special Features
NNTN7037	2100 mAh NiMH	IP67[1]
NNTN7573	2100 mAh NiMH	Rugged[2]
NNTN7036	2000 mAh NiMH	IP67, Intrinsically Safe[3]
NNTN7035	2000 mAh NiMH	Rugged, Intrinsically Safe
PMNN4403	2150 mAh Li-Ion slim	IP67
NNTN8092	2300 mAh Li-Ion	Rugged, Intrinsically Safe
NNTN7038	2900 mAh Li-Ion	IP67
NNTN7034	4200 mAh Li-Ion high capacity	IP67
NNTN7033	4100 mAh Li-Ion high capacity	IP67, Intrinsically Safe

The batteries listed above can be used with the following IMPRES chargers
WPLN7080 – IMPRES Single-User Charger
NNTN7586 – IMPRES Dual-Unit Charger
NNTN7593 – IMPRES Dual-Unit Charger with Displays
NNTN7065 – IMPRES Multi-Unit Charger
NNTN7073 – IMPRES Multi-Unit Charger with Displays
NNTN7624 – IMPRES Vehicular Charger
RLN5382 – Individual IMPRES Display Module for NNTN7065

ASTRO® DIGITAL XTS® 5000, XTS 3500, XTS 3000

Battery Part Number	Battery Description	Special Features
NNTN4435	1800 mAh NiMH	
NNTN4436	1700 mAh NiMH	Intrinsically Safe
NNTN4437	1700 mAh NiMH	IP57, Intrinsically Safe
NTN9862	2750 mAh Li-Ion	
PMNN4093	3000 mAh high capacity NiMH	
NNTN6034	4150 mAh high capacity Li-Ion	
NNTN7453	3950 mAh high capacity Li-Ion	Rugged, Intrinsically Safe
HNN9031	1525 mAh NiCD	
HNN9032	1525 mAh NiCD	Intrinsically Safe

ASTRO DIGITAL XTS 2500, XTS 1500, MT 1500™, PR1500

Battery Part Number	Battery Description	Special Features
NTN9858	2100 mAh NiMH	
NTN9857	2000 mAh NiMH	Intrinsically Safe
NNTN6263	2000 mAH NiMH	IP67, Intrinsically Safe
NNTN7554	2050 mAh Li-Ion slim	
NNTN7335	2700 mAh Li-Ion	IP67

The batteries listed above can be used with the following IMPRES chargers
WPLN4111 – IMPRES Single-User Charger
WPLN4108 – IMPRES Multi-Unit Charger
WPLN4130 – IMPRES Multi-Unit Charger with Displays
WPLN4208 – IMPRES Vehicular Charger
(XTS radios, MT1500 and PR1500 only)
RLN5382 – Individual IMPRES Display Module for WPLN4108

MOTOTRBO™ (XPR™ 6500, XPR 6550, XPR 6580, XPR 6300, XPR 6350, XPR 6380)

Battery Part Number	Battery Description	Special Features
PMNN4066	1500 mAh Li-Ion	IP57
PMNN4069	1400 mAh Li-Ion	IP57, Intrinsically Safe
PMNN4077	2150 mAh Li-Ion	IP57

The batteries listed above can be used with the following IMPRES chargers
WPLN4232 – IMPRES Single-User Charger
WPLN4212 – IMPRES Multi-Unit Charger
WPLN4219 – IMPRES Multi-Unit Charger with Displays
NNTN7616 – IMPRES Vehicular Charger
RLN5382 – Individual IMPRES Display Module for WPLN4212

PROFESSIONAL SERIES (HT1250, HT1250.LS, HT1250.LS+, HT1550.XLS, MTX850, MTX850.LS, MTX8250, MTX950, MTX9250, PR860)

Battery Part Number	Battery Description	Special Features
HNN4001	1800 mAh NiMH	
HNN4002	1690 mAh NiMH	Intrinsically Safe
HNN4003	2000 mAh Li-Ion	

The batteries listed above can be used with the following IMPRES chargers
WPLN4182 – IMPRES Single-User Charger
WPLN4187 – IMPRES Multi-Unit Charger
WPLN4192 – IMPRES Multi-Unit Charger with Displays
NNTN7618 – IMPRES Vehicular Charger
RLN5382 – Individual IMPRES Display Module for WPLN4187

THE FOLLOWING HARDWARE AND SOFTWARE APPLICATIONS SUPPORT ALL IMPRES BATTERIES LISTED ABOVE

IMPRES Battery Fleet Management
NNTN7676 IMPRES Battery Fleet Management Software
HKVN4036 IMPRES Battery Fleet Management Entitlement Key
NNTN7677 Multi-Unit Charger Interface Unit (CIU)
NNTN8045 Single-Unit Charger Interface Unit (CIU) – not compatible with WPLN4108 (XTS Single Unit Charger)

IMPRES Battery Reader
NNTN7392 IMPRES Battery Reader Package – includes battery reader hardware, system software, USB cord, adapter inserts for MOTOTRBO, HT-series and APX.

[1] International Protection (IP) is a global standard for rating dust and water protection. The first digit IP5x or IP6x represents increased levels of dust protection, while the second digit, IPx7 represents withstanding submersion in 1 meter of fresh water for 30 minutes.

[2] Rugged batteries exceed industry standards (IPx7) for submergibility and provide a higher level of water protection – MIL-STD-810E, Method 512.3 (Immersion). These batteries meet the incremental requirement of submersion in 1 meter of fresh water that is 27C colder than the product for 2 hours.

[3] Intrinsically Safe: Motorola approved batteries are a critical part of the specific radio and accessory system certified by a recognized testing organization as intrinsically safe. Use of non-Motorola approved batteries could result in equipment that is unapproved or unsafe in a hazardous environment.

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. **motorolasolutions.com**

MOTOROLA

VHF Omnidirectional Dipole Arrays

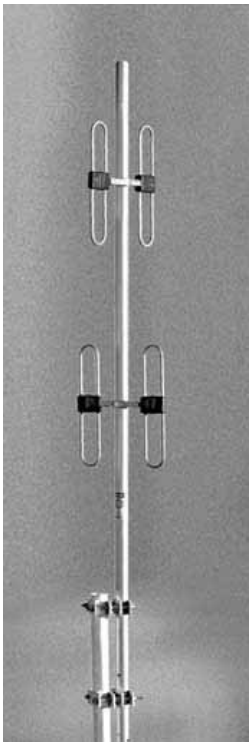
136-174 MHz

Binary Array Series

This high performance VHF dipole omnidirectional array is for use in highly populated radio sites requiring long haul omnidirectional coverage. The array feature high gain, low noise performance and enhanced null fill coverage with omnidirectional coverage characteristics.

Each of the dipoles are fed via an internal phasing harness in stable, PTFE based double-screened coaxial cable with PE jacket for optimum weatherproofing. These omnidirectional arrays incorporate extensive side lobe suppression and null fill, and the binary phasing arrangement ensures consistent omnidirectional coverage and vertical pattern control.

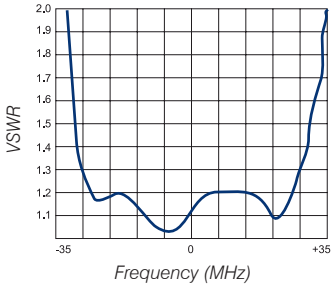
With all welded construction and superior internal harness construction, these antennas provide not only excellent pattern characteristics but also defined, high levels of intermodulation and noise suppression. The entire array rests at ground potential and offers the ultimate in lightning resistant antennas.



Features:

- High gain omnidirectional patterns
- Operate over entire 136-174 MHz VHF band without tuning or adjustment
- Inverted mounting version available
- Industry leading PIM ratings (-150dBc) providing low IM and low noise characteristics for optimum performance
- BA80-41 may be operational as 2 x3dBd arrays by removing external cables harness (BA4040-41)
- Hermetically sealed internal phasing harness

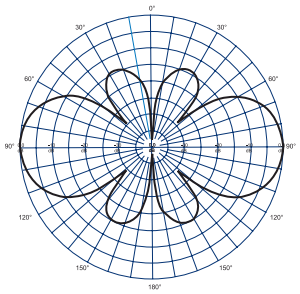
Typical VSWR Response (BA40-41)



Electrical Specifications

Model Number	BA40-41	BA80-41	BA4040-41
Nominal Gain *dBi (dBd)*	5 (3)	8 (6)	2 x 5 (3)
Frequency *MHz*	136 - 174		
Tuned Bandwidth	Entire Band		
VSWR *(Return Loss)*	<1.5 :1 (14dB)		
Nominal Impedance Ω	50		
Downtilt	Not offered	0° Std, -3°. See note (1)	Not offered
Vertical Beamwidth°	35	18	35
Horizontal Beamwidth°	Omni +/-0.5dB		
Input Power *W*	750		
Passive IM 3rd order *dBc*	-150		

BA40-41 - E Plane



Mechanical Specifications

Model Number		BA40-41	BA80-41	BA4040-41
Construction		All welded aluminium with alodined finish. See note (2)		
Length *m*		3.5	6.3	
Weight *kg*		14.5	31	
Termination		N female with 0.5m 9142 cable tail. See note (3)		
Mounting Area		500mm x 63mm diam. Aluminium	750mm x 76mm diam. Aluminium	
Suggested Clamps		2 x UC1		
Projected Area *cm²*	No Ice	4164	8294	
	With Ice	7117	13325	
Wind Load (Thrust) @ 160km/h *N*		494	983	
Wind Gust Rating *km/h*		240	184	
Torque @ 160km/h *Nm*		617	2605	

(1) Factory pre-set downtilt of 3° may be specified on BA80 series antennas using model no. trailer -T3

(2) BA40 series can be optionally supplied in all welded 316 grade stainless steel. Dimensions vary slightly

(3) Connector termination option available of 7/16 DIN female connector using model no. trailer -DIN

EA Series

VHF Eliptical Dipole Arrays

136 - 174 MHz

These high performance VHF phased elliptical arrays are ideal for the bidirectional coverage requirement of paging and VHF high band mobile “corridor” applications. The main lobe of these arrays is strong and highly controlled with extensive side lobe suppression ensuring the integrity of the pattern.

These antennas offer industry leading PIM ratings, essential for the latest digital radio systems. All welded alodined aluminum construction and new fabrication techniques in both the harness and dipole sections have proven to minimize intermodulation and noise generated within the antennas. The entire array rests at ground potential and offers the ultimate in lightning resistant antennas.

The folded dipoles utilize an internal phasing harness in stable, PTFE based double-shielded coaxial cable with PE Jacket for optimal weatherproofing. These elliptical arrays incorporate extensive side lobe suppression, null fill, and accommodate power input levels of 750 watts continuous.

- High gain elliptical pattern with 5dBd or 8dBd versions available
- Operate over entire 136-174 MHz band without tuning or adjustment
- EA80-41-DIN can be ordered as 2 x 5dBd arrays on one boom assembly. Specify model EA4040-41-DIN. Typical space isolation between the two arrays is 25dB.
- **Industry leading PIM ratings (-150dBc) providing low IM and low noise characteristics for optimum performance**

EA40-41-DIN

DIGITAL READY -150dBc(1) PIM RATING

RFI
9329 Ravena Rd.
Suite C
Twinsburg OH 44087 USA
Phone: 330 486 0706
Fax: 330 486 0705

EA Series

VHF Eliptical Dipole Arrays

136 - 174 MHz

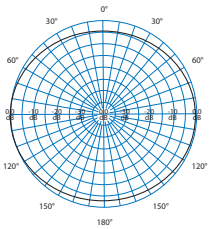
Electrical Specifications

Model Number	EA40-41-DIN	EA80-41-DIN
Nominal Gain *dBd*	5	8
Frequency *MHz*	136 - 174	
Tuned Bandwidth	Entire band	
VSWR (Return Loss)	<1.5 :1 (14dB)	
Nominal Impedance Ω	50	
Downtilt	Not offered	0° Std, -3°. See note (2)
Vertical Beamwidth	35°	17°
Horizontal Beamwidth	104°	128°
Input Power *(Watts)*	750	
Passive IM 3rd order *(2x20W) dBc*	-150	-140

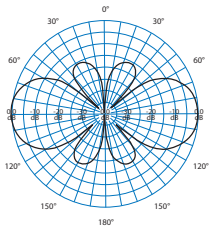
Mechanical Specifications

Model Number		EA40-41-DIN	EA80-41-DIN
Construction & Configuration		4 dipoles (2 bays) In-line stacked Single section support	8 dipoles (4 bays) In-line stacked Dual section support
Length ***inches***		138	248
Weight ***lbs***		32	68
Shipping Weight ***lbs***		192	288
Shipping Dimensions ***inches***	H	26	26
	W	26	32
	L	146	146
Termination		7/16” DIN female with 20” 9142 cable tail	
Mounting Area			
Suggested Clamps (not included)		UC12	UC13
Projected Area ***ft²***	No ice	5.2	10.2
	With ice	9.4	17.7
Lateral Thrust @ 100mph ***lbs***		128	253
Wind Gust Rating ***mph***	No ice	149	109
	With ice	111	82
Torque @100mph ***ft-lbs***		522	2204

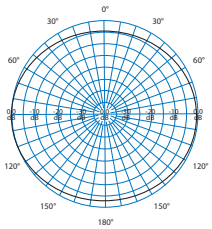
EA40-41-DIN - H Plane



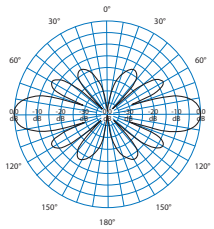
EA40-41-DIN - E Plane



EA80-41-DIN - H Plane



EA80-41-DIN - E Plane



(1) Single section arrays are rated to -150dBc PIM rating. Dual section (EA80-41-DIN) arrays are rated at -140dBc.
(2) Factory pre-set downtilt of 3° may be specified on EA80-41-DIN antennas by adding -T3 to the part number ordered e.g. EA80-41-DIN-T3

RFI
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Phone: 330 486 0706
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EA Series

VHF Eliptical Dipole Arrays

136 - 174 MHz

These high performance VHF phased elliptical arrays are ideal for the bidirectional coverage requirement of paging and VHF high band mobile “corridor” applications. The main lobe of these arrays is strong and highly controlled with extensive side lobe suppression ensuring the integrity of the pattern.

These antennas offer industry leading PIM ratings, essential for the latest digital radio systems. All welded alodined aluminum construction and new fabrication techniques in both the harness and dipole sections have proven to minimize intermodulation and noise generated within the antennas. The entire array rests at ground potential and offers the ultimate in lightning resistant antennas.

The folded dipoles utilize an internal phasing harness in stable, PTFE based double-shielded coaxial cable with PE Jacket for optimal weatherproofing. These elliptical arrays incorporate extensive side lobe suppression, null fill, and accommodate power input levels of 750 watts continuous.

- High gain elliptical pattern with 5dBd or 8dBd versions available
- Operate over entire 136-174 MHz band without tuning or adjustment
- EA80-41-DIN can be ordered as 2 x 5dBd arrays on one boom assembly. Specify model EA4040-41-DIN. Typical space isolation between the two arrays is 25dB.
- **Industry leading PIM ratings (-150dBc) providing low IM and low noise characteristics for optimum performance**

EA40-41-DIN

DIGITAL READY -150dBc(1) PIM RATING

RFI
9329 Ravena Rd.
Suite C
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Fax: 330 486 0705

EA Series

VHF Eliptical Dipole Arrays

136 - 174 MHz

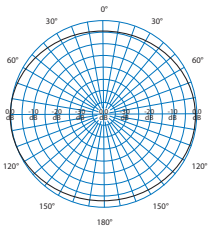
Electrical Specifications

Model Number	EA40-41-DIN	EA80-41-DIN
Nominal Gain *dBd*	5	8
Frequency *MHz*	136 - 174	
Tuned Bandwidth	Entire band	
VSWR (Return Loss)	<1.5 :1 (14dB)	
Nominal Impedance Ω	50	
Downtilt	Not offered	0° Std, -3°. See note (2)
Vertical Beamwidth	35°	17°
Horizontal Beamwidth	104°	128°
Input Power *(Watts)*	750	
Passive IM 3rd order *(2x20W) dBc*	-150	-140

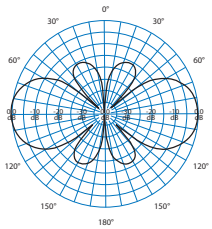
Mechanical Specifications

Model Number		EA40-41-DIN	EA80-41-DIN
Construction & Configuration		4 dipoles (2 bays) In-line stacked Single section support	8 dipoles (4 bays) In-line stacked Dual section support
Length ***inches***		138	248
Weight ***lbs***		32	68
Shipping Weight ***lbs***		192	288
Shipping Dimensions ***inches***	H	26	26
	W	26	32
	L	146	146
Termination		7/16” DIN female with 20” 9142 cable tail	
Mounting Area			
Suggested Clamps (not included)		UC12	UC13
Projected Area ***ft²***	No ice	5.2	10.2
	With ice	9.4	17.7
Lateral Thrust @ 100mph ***lbs***		128	253
Wind Gust Rating ***mph***	No ice	149	109
	With ice	111	82
Torque @100mph ***ft-lbs***		522	2204

EA40-41-DIN - H Plane



EA40-41-DIN - E Plane



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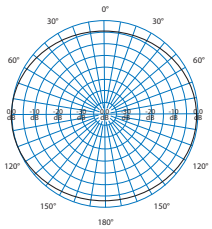
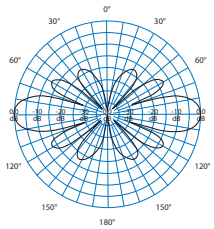


EA80-41-DIN - E Plane



(1) Single section arrays are rated to -150dBc PIM rating. Dual section (EA80-41-DIN) arrays are rated at -140dBc.
(2) Factory pre-set downtilt of 3° may be specified on EA80-41-DIN antennas by adding -T3 to the part number ordered e.g. EA80-41-DIN-T3

RFI
9329 Ravena Rd.
Suite C
Twinsburg OH 44087 USA
Phone: 330 486 0706
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OA Series

VHF Offset Dipole Arrays

136 - 174 MHz

These high performance VHF dipole offset arrays are ideal for use when a cardioid pattern is required. The arrays feature high gain, low noise performance and enhanced null fill coverage with typical cardioid coverage characteristics.

These antennas offer industry leading PIM ratings, essential for the latest digital radio systems. All welded alodined aluminum construction and new fabrication techniques in both the harness and dipole sections have proven to minimize intermodulation and noise generated within the antennas. The entire array rests at ground potential and offers the ultimate in lightning resistant antennas.

OA series arrays have an almost full 180° horizontal beamwidth. This eliminates the possibility of fading at the extremities of the target coverage area. Antenna gain is approximately unity at the rear of the antenna.

As would be expected from a cardioid array, the vertical beamwidth is slightly greater than its BA (omnidirectional) or EA (elliptical) pattern counterparts.

OA series arrays feature the same solid construction as the BA and EA Series. The folded dipoles utilize an internal phasing harness in stable, PTFE based double-shielded coaxial cable with PE jacket for optimum weatherproofing. The offset arrays incorporate extensive side lobe suppression, null fill, and power input levels of 750 watts continuous.

- High gain offset (cardioid) pattern. 5dBd or 9dBd versions available
- Operate over entire 136-174 MHz VHF band without tuning or adjustment
- 3° downtilt option available on OA40-41
- OA40-41-DIN may be ordered as 2 x 5dBd arrays on one boom assembly. Specify model OA2020-41-DIN. Typical space isolation between the two arrays is 25dB.
- **Industry leading PIM ratings providing low IM and low noise characteristics for optimum performance**

0A20-41-DIN

DIGITAL READY -150dBc(1) PIM RATING

RFI
9329 Ravena Rd.
Suite C
Twinsburg OH 44087 USA
Phone: 330 486 0706
Fax: 330 486 0705

OA Series

VHF Offset Dipole Arrays

136 - 174 MHz

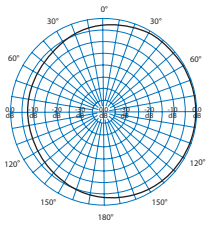
Electrical Specifications

Model Number	OA20-41-DIN	OA40-41-DIN
Nominal Gain *dBd*	5	9
Frequency *MHz*	136 - 174	
Tuned Bandwidth	Entire band	
VSWR (Return Loss)	<1.5 :1 (14dB)	
Nominal Impedance Ω	50	
Downtilt	Not offered	0° Std, -3°. See note (2)
Vertical Beamwidth	35°	17°
Horizontal Beamwidth	178°	176°
Input Power *(Watts)*	750	
Passive IM 3rd order *(2x20W) dBc*	-150	-140

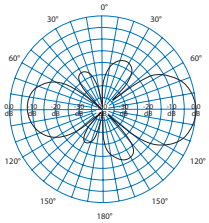
Mechanical Specifications

Model Number		OA20-41-DIN	OA40-41-DIN
Construction & Configuration		2 dipoles (2 bays) Single sided Single section support	4 dipoles (4 bays) Single sided Dual section support
Length ***inches***		138	248
Weight ***lbs***		28	64
Shipping Weight ***lbs***		188	282
Shipping Dimensions ***inches***	H	21	21
	W	8	12
	L	146	146
Termination		7/16” DIN female with 20” 9142 cable tail	
Mounting Area		20” x 2.5” diam. aluminum	
Suggested Clamps (not included)		UC12	UC13
Projected Area ***ft²***	No ice	4.0	8.0
	With ice	6.7	12.4
Lateral Thrust @ 100mph ***lbs***		99	197
Wind Gust Rating ***mph***	No ice	149	119
	With ice	117	95
Torque @100mph ***ft-lbs***		406	1713

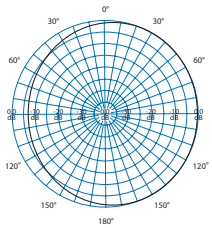
OA20-41-DIN - H Plane



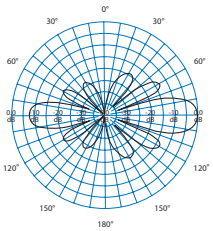
OA20-41-DIN - E Plane



OA40-41-DIN - H Plane



OA40-41-DIN - E Plane



(1) Single section arrays are rated to -150dBc PIM rating. Dual section (OA40-41-DIN) arrays are rated at -140dBc.
(2) Factory pre-set downtilt of 3° may be specified on OA40-41-DIN antennas by adding -T3 to the part number ordered e.g. OA40-41-DIN-T3

DIGITAL READY -150dBc PIM RATING

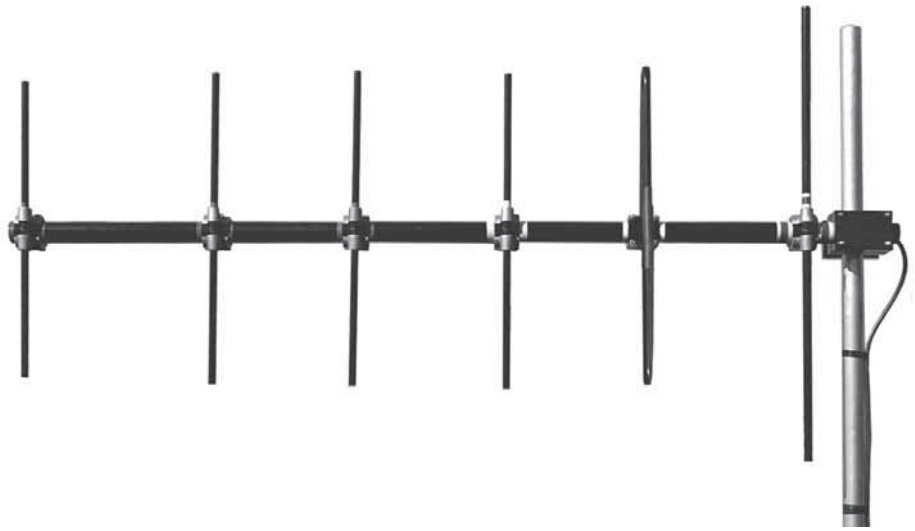
RFI
9329 Ravena Rd.
Suite C
Twinsburg OH 44087 USA
Phone: 330 486 0706
Fax: 330 486 0705

TELEWAVE, INC.

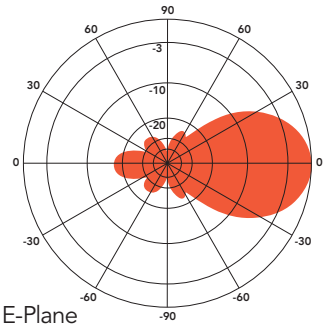
144 - 174 MHz

ANT150Y10H

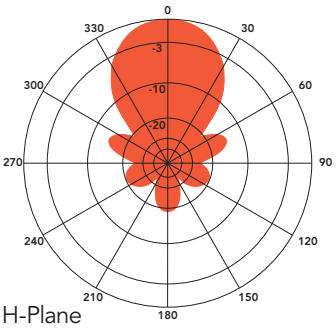
YAGI ANTENNA 10 dBd



ANT150Y10H at 156 MHz

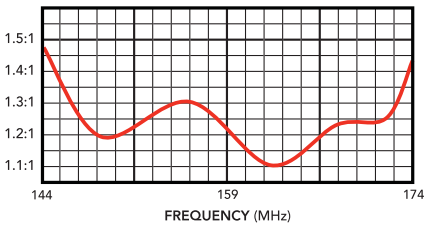


E-Plane
Gain: 10.1 dBd



H-Plane
Gain 10.1 dBd

TYPICAL VSWR RESPONSE



The Telewave ANT150Y10H is a very rugged, high performance directional antenna. Six elements provide a minimum of 10 dBd gain, high front-to-back ratio, and wide band capability. The elements are constructed from solid aluminum to prevent intermodulation and provide exceptional strength.

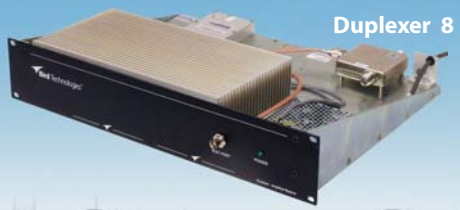
All antenna components are completely protected with our high-tech Txylan™ coating, which seals the antenna against corrosive gases, ultraviolet radiation, salt spray, acid rain, and windblown sand in desert environments. The coating also reduces ice buildup.

The active element connection is sealed within the element itself, eliminating a major failure point. All antenna components are at DC ground for lightning protection.

The ANT150Y10H includes a heavy duty clamp set, which allows the antenna boom to be rotated for polarization adjustment. (Consultation is required if horizontal operation is planned.) This clamp set secures the antenna to a vertical or horizontal mast or tower support from 1.5" - 3.5" O.D. The antenna is shipped unassembled to reduce cost, and is easily assembled in the field with color coded marks.

SPECIFICATIONS			
Frequency (continuous)	144-174 MHz	**Elements**	6
Gain (typ)	10 dBd	**Dimensions (L x H)**	96 x 40 in.
Power rating (typ)	500 watts	**Antenna weight**	33 lb.
Impedance / VSWR	50 ohms / 1.5:1 (max)	**Shipping weight**	37 lb.
Front to back ratio (min)	17 dB	**Wind rating / with 0.5" ice**	150 / 100 MPH
Beamwidth V / H	44° / 47°	**Exposed area (flat plate equiv.)**	1.7 ft.²
Pattern / Polarization	Directional / Vertical (Horizontal opt. if specified)	**Lateral thrust at 100 MPH** (40 psf - flat plate equiv.)	67 lb.
Termination	N Female or 7-16 DIN (opt)	**Bending moment at mast clamp**	222 ft. lb.

Duplexer 7



Duplexer 8

Bird Technologies®

Tx and Rx Duplexing 1 & 2 Channel Systems

26-36H Series (Duplex07, Duplex08)

(Motorola # DS2636H Series)

This product has been designed to simplify and standardize site installations, and to provide improved system performance through the reduction of system noise figure, as well as minimizing the risk for intermodulation. These performance enhancements are accomplished by providing the capability for up to two transmitters / receivers to share a common antenna. A high performance low noise amplifier is included in the receive signal path in order to improve system noise figure, with isolators placed at the transmit inputs to minimize the risk of intermodulation resulting from the presence of external signals. All of the above features are available in a self-contained, rack mounted package with significant advantages in size as compared to conventional solutions.

FEATURES

- Integrated duplexer allows sharing of single transmission line and antenna.
- Compact design - Uses a minimum amount of rack space.
- Integrated isolators on transmitter input ports.
- LNA reduces noise figure and improves sensitivity.
- Integrated Test Port
- Combines closely located transmit frequencies

Duplexer 7

Duplexer 8

INSTALLATION CHALLENGE	PRODUCT SOLUTION
Multiple repeater systems integration and startup time	The product provides a cost effective, consistent from site to site, plug and play solution to managing transmit and receive channel paths for any repeater installation.
Achieving proper antenna isolation between TX and RX antennas	The product has an integrated duplexer that allows sharing of a single antenna and assures proper antenna isolation. This exceeds the minimum isolation that is required for repeaters. The system designer does not have to be concerned about achieving minimum isolation by TX and RX antenna spacing.
Expense of antennas and feed-line	The product duplexes the TX and RX signals to share a common antenna and feed-line. Site leasing expenses, installation and maintenance expenses can be saved by avoiding the use of an extra antenna.
Utilization of installation rack and site space	The product only uses 4RU of rack space as opposed to much more for conventional products.
Transmitter intermodulation Issues	The product has isolators on the transmitter input ports which provide additional transmitter intermodulation attenuation and removes the risk of interference.
Easy system troubleshooting and signal monitoring	The product provides a BNC test port conveniently located on the front panel. This is a bi-directional 30 dB coupled port, allowing easy injection of test signals or monitoring of the actual received signals without interrupting system operation.
Combining closely located transmit channels	The product utilizes hybrid combining which requires no minimum transmit to transmit frequency separation.

Tx and Rx Duplexing 1 & 2 Channel Systems

26-36H Series (Duplex07, Duplex08) (Motorola # DS2636H Series)

DUPLEXER SPECIFICATIONS

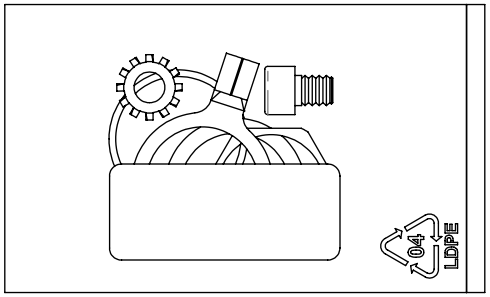
Model Number	26-36H-01-01	26-36H-01-02
Frequency band	133-174 MHz	133-174 MHz
Minimum T-T spacing	No minimum	No minimum
BW of passband (Tx and Rx)	1 MHz	1 MHz
Filter rejection @ 3 MHz from band edge	90 dB min	90 dB min
Filter rejection @ 4 MHz from band edge	100 dB min	100 dB min
Filter rejection @ 5 MHz from band edge	90 dB min	90 dB min
System Insertion Loss (Tx-Ant)	3.0 dB max	6.0 dB max
System Noise Figure (Ant-Rx)	5.0 dB max	5.0 dB max
Antenna Port RL	>14 dB min	>14 dB min
Tx and Rx Port RL	>14 dB min	>14 dB min
Net gain (Ant-Rx)	8 dB Typical	8 dB Typical
Amplifier Type	Quadrature coupled	Quadrature coupled
Amplifier Noise Figure	2.8 dB	2.8 dB
Amplifier OIP3	40 dBm min	40 dBm min
Number of Rx Ports	1	2
Number of Tx Ports	1	2
Maximum Transmit power	100 W Continuous	100 W Continuous
Rx - Rx Isolation	n/a	20 dB min
Tx - Tx Isolation	n/a	50 dB min
Test Port Connector	BNC-Female	BNC-Female
Tx Port Connector	N-Female	N-Female
Rx Port Connector	BNC-Female	BNC-Female
Antenna Port Connector	7-16 DIN Female	7-16 DIN Female
PIM Characteristics	Tolerant	Tolerant
Power supply voltage	90~240 VAC	90~240 VAC
Current draw	75 mA @ 110 VAC	75 mA @ 110 VAC
Dimensions	5 RU (H) x 19" (W) x 15" (D)	5 RU (H) x 19" (W) x 15" (D)

Model Numbers	Motorola Model Numbers	Description
26-36H-01-01	**DS2636H0101**	Duplexer System, Single Channel, 137-174 MHz, with isolators
26-36H-01-02	**DS2636H0102**	Duplexer System, Two Channel, 137-174 MHz, with isolators

Bird Technologies®

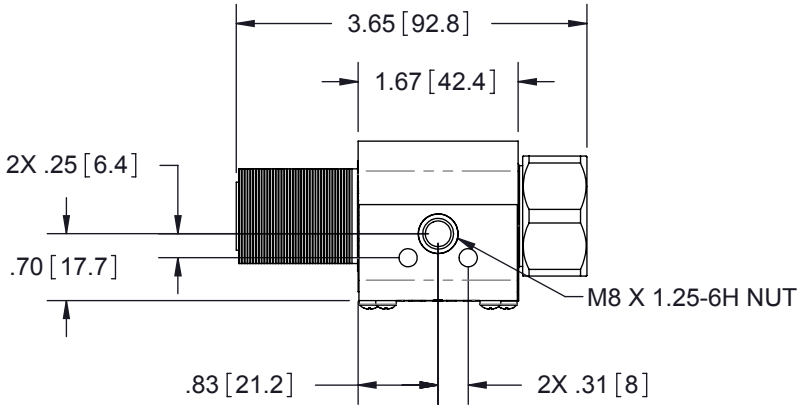
30303 Aurora Rd. | Solon, OH 44139 | 866.695.4569 | www.bird-technologies.com

REVISIONS				
REV.	DESCRIPTION	ECN	DATE	APPROVED
C	REFER TO ECN	11344	1/29/13	CAP



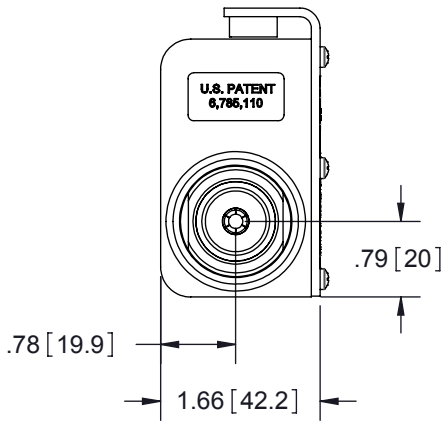
HARDWARE KIT

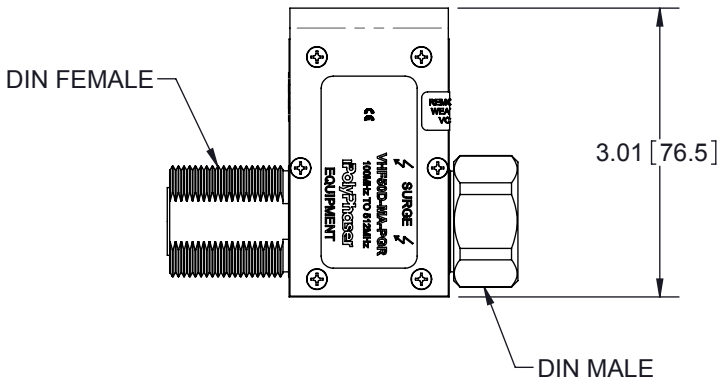
QTY	HARDWARE KIT DESCRIPTION
1	RING TERM 6AWG DIN 1.5" ID
1	WASHER 5/16 EXT 18-8 SS
1	SCREW CAP M8 X 1.25 X 10MM
1	O-RING 027 SILICONE
1	NUT M29 x 1.5 SST DIN
1	WASHER 1.15ID FLAT SST TYPE 304



MAXIMUM CHARACTERISTICS

APPLICATION:
WEATHERIZED, FLANGE OR BULKHEAD MOUNT
RoHS COMPLIANT
FREQUENCY RANGE:
100MHz TO 512MHz
VSWR:
≤1.1:1 OVER FREQUENCY RANGE
INSERTION LOSS:
≤0.1dB OVER FREQUENCY RANGE
MAX PEAK INSTANTANEOUS POWER (PIP):
27kW
RF POWER:
750W RMS AVERAGE
MAX. SURGE:
20kA IEC 61000-4-5 8/20µs WAVEFORM
THROUGHPUT ENERGY:
≤500nJ FOR 3kA, 8/20µs WAVEFORM
PIM SPEC:
<-155dBC (-112dBm); 2 X 20 W INPUT
RELATIVE HUMIDITY:
TO 95%
ENVIRONMENTAL:
MEETS IEC 60529 IPC67
MEETS BELLCORE #TA-NWT-000487
PROCEDURE 4.11, WIND DRIVEN (120MPH)
RAIN INTRUSION TEST.
TEMPERATURE:
-50°C TO +85°C STORAGE/OPERATING
CE COMPLIANT





CUSTOMER APPROVAL: _____ DATE: _____

ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

UNLESS OTHERWISE SPECIFIED
LEADING DIMENSIONS ARE INCHES
DIMENSIONS IN [ ] ARE MILLIMETERS

TOLERANCES:
FRACTIONS=± 1/32 .XX=± .01
ANGLES=± 1 ° .XXX=± .005

THIRD-ANGLE PROJECTION

DRAWN	HMB	3/17/11
ENG APPD	CAP	4/18/11
PRODUCT MGR	SD	4/18/11
MARKETING APPD	LJ	4/15/11
PROJECT NO.	DD70224	
DOCUMENT NAME	VHF50D-MA-PGR-C	

iPolyPhaser®

SHEET 1 OF 1
SCALE 1:2

TITLE
100-512MHz COMB 750W
FEM DIN MALE DIN PRESSFIT
CUSTOMER SPECIFICATION

SIZE	CAGE	PART NUMBER	REV
A	61114	VHF50D-MA-PGR	C

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AVA5-50

AVA5-50, HELIAX® Andrew Virtual Air™ Coaxial Cable, corrugated copper, 7/8 in, black PE jacket

Product Classification

Brand	HELIAX®
Product Series	AVA5-50
Product Type	Coaxial wireless cable

Standards And Qualifications

EN50575 CPR Cable EuroClass	Fca

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper tube
Jacket Color	Black

Dimensions

Nominal Size	7/8 in
Cable Weight	0.30 lb/ft | 0.45 kg/m
Diameter Over Dielectric	24.130 mm | 0.950 in
Diameter Over Jacket	27.991 mm | 1.102 in
Inner Conductor OD	9.4488 mm | 0.3720 in
Outer Conductor OD	25.400 mm | 1.000 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	22.0 pF/ft | 73.0 pF/m
dc Resistance, Inner Conductor	0.410 ohms/kft | 1.435 ohms/km
dc Resistance, Outer Conductor	0.340 ohms/kft | 1.116 ohms/km
dc Test Voltage	6000 V
Inductance	0.184 µH/m | 0.056 µH/ft
Insulation Resistance	100000 Mohms•km

Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 5000 MHz
Peak Power	91.0 kW
Velocity	91%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

General Specifications

Brand	HELIAX®
Ordering Note	CommScope® standard product (Global)
Specification Sheet Revision Level	B

Mechanical Specifications

Bending Moment	19.0 N-m | 14.0 ft lb
Flat Plate Crush Strength	75.0 lb/in
Minimum Bend Radius, Multiple Bends	254.00 mm | 10.00 in
Minimum Bend Radius, Single Bend	127.00 mm | 5.00 in
Number of Bends, minimum	15
Number of Bends, typical	30
Tensile Strength	159 kg | 350 lb

Note

Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
680–800 MHz	1.13	24.30
800–960 MHz	1.13	24.30
1700–2200 MHz	1.13	24.30

Attenuation

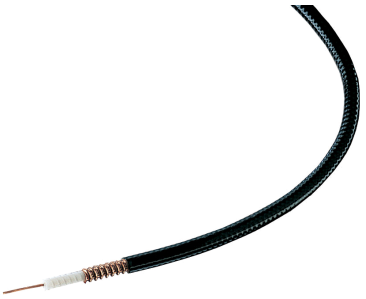
Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.08	0.024	91.00
1	0.113	0.034	74.43
1.5	0.138	0.042	60.73
2	0.16	0.049	52.56
10	0.359	0.11	23.37
20	0.51	0.156	16.46
30	0.627	0.191	13.39
50	0.814	0.248	10.32
85	1.068	0.326	7.86
88	1.088	0.332	7.72
100	1.162	0.354	7.23
108	1.209	0.368	6.95
150	1.433	0.437	5.86
174	1.548	0.472	5.43
200	1.665	0.507	5.05
204	1.682	0.513	4.99
300	2.059	0.628	4.08
400	2.398	0.731	3.50
450	2.553	0.778	3.29
500	2.7	0.823	3.11
512	2.735	0.834	3.07
600	2.977	0.907	2.82
700	3.235	0.986	2.60
800	3.478	1.06	2.42
824	3.534	1.077	2.38
894	3.694	1.126	2.27
960	3.841	1.171	2.19
1000	3.927	1.197	2.14
1218	4.377	1.334	1.92
1250	4.44	1.353	1.89
1500	4.912	1.497	1.71
1700	5.268	1.606	1.59
1794	5.429	1.655	1.55
1800	5.439	1.658	1.54
2000	5.771	1.759	1.46
2100	5.933	1.808	1.42
2200	6.091	1.856	1.38
2300	6.247	1.904	1.34
2500	6.551	1.996	1.28
2700	6.845	2.086	1.23
3000	7.273	2.217	1.15
3400	7.819	2.383	1.07
3700	8.213	2.503	1.02
4000	8.596	2.62	0.98
5000	9.807	2.989	0.86

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system
CENELEC	EN 50575 compliant, Declaration of Performance (DoP) available

FSJ1-50A



FSJ1-50A, HELIAX® Superflexible Low Density Foam Coaxial Cable, corrugated copper, 1/4 in, black PE jacket

Product Classification

Brand	HELIAX® | SureFlex®
Product Series	FSJ1-50A
Product Type	Coaxial wireless cable

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Superflexible
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/4 in
Cable Length	0 km
Cable Weight	0.05 lb/ft | 0.07 kg/m
Diameter Over Dielectric	4.826 mm | 0.190 in
Diameter Over Jacket	7.366 mm | 0.290 in
Inner Conductor OD	1.9050 mm | 0.0750 in
Outer Conductor OD	6.350 mm | 0.250 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	24.2 pF/ft | 79.4 pF/m
dc Resistance, Inner Conductor	3.000 ohms/kft | 9.843 ohms/km
dc Resistance, Outer Conductor	2.200 ohms/kft | 7.216 ohms/km
dc Test Voltage	1600 V
Inductance	0.200 µH/m | 0.061 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	5000 V

Operating Frequency Band	1 – 18000 MHz
Peak Power	6.4 kW
Velocity	82%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

General Specifications

Brand	HELIAX®

Mechanical Specifications

Bending Moment	0.7 N-m | 0.5 ft lb
Flat Plate Crush Strength	100.0 lb/in | 1.8 kg/mm
Minimum Bend Radius, Multiple Bends	25.40 mm | 1.00 in
Minimum Bend Radius, Single Bend	25.40 mm | 1.00 in
Number of Bends, minimum	15
Number of Bends, typical	20
Tensile Strength	68 kg | 150 lb

Note

Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F

Return Loss/VSWR

Frequency Band	**VSWR**	**Return Loss (dB)**
680–960 MHz	1.2	20.80
1700–2200 MHz	1.2	20.80
2200–2700 MHz	1.43	15.00

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.407	0.124	6.40
1	0.577	0.176	6.40
1.5	0.707	0.215	6.40
2	0.816	0.249	6.40
10	1.833	0.559	3.99
20	2.6	0.792	2.81
30	3.192	0.973	2.29
50	4.136	1.261	1.77
85	5.419	1.652	1.35
88	5.516	1.681	1.33
100	5.889	1.795	1.24
108	6.125	1.867	1.19
150	7.25	2.21	1.01
174	7.825	2.385	0.93
200	8.408	2.563	0.87
204	8.495	2.589	0.86
300	10.373	3.162	0.71
400	12.051	3.673	0.61
450	12.817	3.906	0.57
500	13.545	4.128	0.54
512	13.715	4.18	0.53
600	14.909	4.544	0.49
700	16.175	4.93	0.45
800	17.362	5.292	0.42
824	17.637	5.376	0.41
894	18.42	5.614	0.40
960	19.134	5.832	0.38
1000	19.556	5.96	0.37
1218	21.738	6.626	0.34
1250	22.044	6.719	0.33
1500	24.326	7.414	0.30
1700	26.038	7.936	0.28
1794	26.813	8.172	0.27
1800	26.862	8.187	0.27
2000	28.455	8.673	0.26
2100	29.227	8.908	0.25
2200	29.984	9.139	0.24
2300	30.727	9.365	0.24
2500	32.174	9.806	0.23
2700	33.576	10.233	0.22
3000	35.602	10.851	0.21
3400	38.183	11.638	0.19
3700	40.041	12.204	0.18
4000	41.841	12.753	0.17
5000	47.5	14.477	0.15

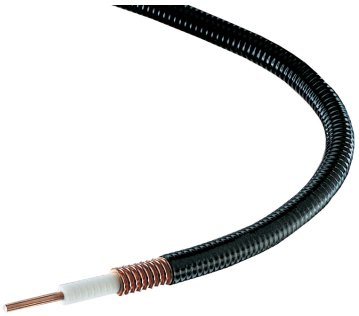
6000	52.747	16.077	0.14
8000	62.37	19.01	0.12
8800	65.974	20.108	0.11
10000	71.173	21.693	0.10
12000	79.393	24.198	0.09
14000	87.172	26.569	0.08
15800	93.872	28.611	0.08
16000	94.601	28.833	0.08
18000	101.745	31.01	0.07

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	**Classification**
UL/ETL Certification	Compliant
RoHS 2011/65/EU	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

FSJ4-50B



FSJ4-50B, HELIAX® Superflexible Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket

Product Classification

Brand	HELIAX® | SureFlex®
Product Series	FSJ4-50B
Product Type	Coaxial wireless cable

Standards And Qualifications

EN50575 CPR Cable EuroClass	Fca

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Superflexible
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/2 in
Cable Weight	0.14 lb/ft | 0.21 kg/m
Diameter Over Dielectric	8.890 mm | 0.350 in
Diameter Over Jacket	13.462 mm | 0.530 in
Inner Conductor OD	3.5560 mm | 0.1400 in
Outer Conductor OD	12.192 mm | 0.480 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	25.2 pF/ft | 82.7 pF/m
dc Resistance, Inner Conductor	0.820 ohms/kft | 2.690 ohms/km
dc Resistance, Outer Conductor	1.560 ohms/kft | 5.120 ohms/km
dc Test Voltage	2500 V

Inductance	0.207 µH/m | 0.063 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	5000 V
Operating Frequency Band	1 – 10200 MHz
Peak Power	15.6 kW
Velocity	81%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

General Specifications

Brand	HELIAX®
Ordering Note	CommScope® standard product (Global)

Mechanical Specifications

Bending Moment	2.7 N-m | 2.0 ft lb
Flat Plate Crush Strength	110.0 lb/in | 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	31.75 mm | 1.25 in
Minimum Bend Radius, Single Bend	31.75 mm | 1.25 in
Number of Bends, minimum	20
Tensile Strength	79 kg | 175 lb

Note

Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
680–800 MHz	1.2	20.80
800–960 MHz	1.2	20.80
1700–2200 MHz	1.2	20.80
2300–2700 MHz	1.2	20.80

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.231	0.07	15.60
1	0.327	0.1	15.60
1.5	0.401	0.122	15.60
2	0.463	0.141	15.60
10	1.044	0.318	10.14
20	1.485	0.453	7.12
30	1.828	0.557	5.79
50	2.377	0.724	4.45
85	3.13	0.954	3.38
88	3.187	0.971	3.32
100	3.406	1.038	3.11
108	3.546	1.081	2.98
150	4.214	1.285	2.51
174	4.558	1.389	2.32
200	4.908	1.496	2.16
204	4.96	1.512	2.13
300	6.095	1.858	1.74
400	7.121	2.17	1.49
450	7.592	2.314	1.39
500	8.042	2.451	1.32
512	8.148	2.483	1.30
600	8.891	2.71	1.19
700	9.683	2.951	1.09
800	10.431	3.179	1.01
824	10.605	3.232	1.00
894	11.101	3.383	0.95
960	11.555	3.522	0.92
1000	11.824	3.604	0.89
1218	13.226	4.031	0.80
1250	13.423	4.091	0.79
1500	14.906	4.543	0.71
1700	16.027	4.885	0.66
1794	16.537	5.04	0.64
1800	16.57	5.05	0.64
2000	17.624	5.371	0.60
2100	18.137	5.528	0.58
2200	18.641	5.682	0.57
2300	19.138	5.833	0.55
2500	20.11	6.129	0.53
2700	21.056	6.418	0.50
3000	22.432	6.837	0.47
3400	24.198	7.375	0.44
3700	25.478	7.765	0.42
4000	26.727	8.146	0.40
5000	30.693	9.355	0.34

6000	34.427	10.493	0.31
8000	41.403	12.619	0.26
8800	44.054	13.427	0.24
10000	47.914	14.604	0.22

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system
CENELEC	EN 50575 compliant, Declaration of Performance (DoP) available

LDF4-50A

LDF4-50A, HELIAX® Low Density Foam Coaxial Cable, corrugated copper, 1/2 in, black PE jacket

Product Classification

Brand	HELIAX®
Product Series	LDF4-50A
Product Type	Coaxial wireless cable

Standards And Qualifications

EN50575 CPR Cable EuroClass	Fca

Construction Materials

Jacket Material	PE
Outer Conductor Material	Corrugated copper
Dielectric Material	Foam PE
Flexibility	Standard
Inner Conductor Material	Copper-clad aluminum wire
Jacket Color	Black

Dimensions

Nominal Size	1/2 in
Cable Weight	0.15 lb/ft | 0.22 kg/m
Diameter Over Dielectric	12.954 mm | 0.510 in
Diameter Over Jacket	15.875 mm | 0.625 in
Inner Conductor OD	4.8260 mm | 0.1900 in
Outer Conductor OD	13.970 mm | 0.550 in

Electrical Specifications

Cable Impedance	50 ohm ±1 ohm
Capacitance	23.1 pF/ft | 75.8 pF/m
dc Resistance, Inner Conductor	0.450 ohms/kft | 1.480 ohms/km
dc Resistance, Outer Conductor	0.820 ohms/kft | 2.690 ohms/km
dc Test Voltage	4000 V
Inductance	0.190 µH/m | 0.058 µH/ft
Insulation Resistance	100000 Mohms•km
Jacket Spark Test Voltage (rms)	8000 V
Operating Frequency Band	1 – 8800 MHz
Peak Power	40.0 kW

Velocity	88%

Environmental Specifications

Installation Temperature	-40 °C to +60 °C (-40 °F to +140 °F)
Operating Temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Storage Temperature	-70 °C to +85 °C (-94 °F to +185 °F)

General Specifications

Brand	HELIAX®
Ordering Note	CommScope® standard product (Global)

Mechanical Specifications

Bending Moment	3.8 N-m | 2.8 ft lb
Flat Plate Crush Strength	110.0 lb/in | 2.0 kg/mm
Minimum Bend Radius, Multiple Bends	127.00 mm | 5.00 in
Minimum Bend Radius, Single Bend	50.80 mm | 2.00 in
Number of Bends, minimum	15
Number of Bends, typical	50
Tensile Strength	113 kg | 250 lb

Note

Performance Note	Values typical, unless otherwise stated

Standard Conditions

Attenuation, Ambient Temperature	20 °C | 68 °F
Average Power, Ambient Temperature	40 °C | 104 °F
Average Power, Inner Conductor Temperature	100 °C | 212 °F

Return Loss/VSWR

Frequency Band	VSWR	Return Loss (dB)
680–800 MHz	1.13	24.30
800–960 MHz	1.13	24.30
1700–2200 MHz	1.13	24.30
2300–2700 MHz	1.13	24.30

Attenuation

Frequency (MHz)	Attenuation (dB/100 m)	Attenuation (dB/100 ft)	Average Power (kW)
0.5	0.149	0.045	40.00
1	0.211	0.064	36.11
1.5	0.259	0.079	29.46
2	0.299	0.091	25.50
10	0.672	0.205	11.35
20	0.954	0.291	7.99
30	1.172	0.357	6.51
50	1.521	0.463	5.02
85	1.995	0.608	3.82
88	2.031	0.619	3.76
100	2.169	0.661	3.52
108	2.256	0.688	3.38
150	2.673	0.815	2.85
174	2.887	0.88	2.64
200	3.103	0.946	2.46
204	3.135	0.956	2.43
300	3.835	1.169	1.99
400	4.462	1.36	1.71
450	4.749	1.447	1.61
500	5.021	1.53	1.52
512	5.085	1.55	1.50
600	5.533	1.686	1.38
700	6.009	1.831	1.27
800	6.456	1.968	1.18
824	6.56	1.999	1.16
894	6.855	2.089	1.11
960	7.124	2.171	1.07
1000	7.284	2.22	1.05
1218	8.11	2.472	0.94
1250	8.226	2.507	0.93
1500	9.093	2.771	0.84
1700	9.744	2.97	0.78
1794	10.039	3.06	0.76
1800	10.058	3.066	0.76
2000	10.666	3.251	0.72
2100	10.961	3.341	0.70
2200	11.251	3.429	0.68
2300	11.535	3.516	0.66
2500	12.09	3.685	0.63
2700	12.627	3.849	0.60
3000	13.407	4.086	0.57
3400	14.401	4.389	0.53
3700	15.118	4.608	0.50
4000	15.815	4.82	0.48
5000	18.01	5.489	0.42

6000	20.055	6.113	0.38
8000	23.826	7.262	0.32
8800	25.244	7.694	0.30

** Values typical, guaranteed within 5%*

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant
China RoHS SJ/T 11364-2006	Below Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system
CENELEC	EN 50575 compliant, Declaration of Performance (DoP) available

Nokia Wavence

Microwave packet transport for shorthaul | Release 18 (ANSI)

The Nokia Wavence family includes a range of Microwave Packet Transport (MPT) units for shorthaul applications. These MPT units operate in the standard frequency bands and are designed to provide high-capacity reliable backhaul for wireless 3G and 4G macro cells and segments applications. The MPT-HC-HQAM units are integrated in the Nokia Network Services Platform for common management with the rest of the Wavence portfolio, enabling consistent operations across end-to-end packet microwave networks. Combined with the Wavence Microwave Service Switch (MSS), the MPT sets the standard for delivering fast, efficient wireless transmission links with flexible networking and simple operations.

MPT-HC-HQAM	
Application	• Macro cell backhaul (access and hub) • Split-mount or standalone configuration
Physical	• 235 mm x 235 mm x 130 mm (9.2 in. x 9.2 in. x 5.1 in.) with external diplexer • 235 mm x 235 mm x 150 mm (9.2 in. x 9.2 in. x 5.9 in.) with internal diplexer
Interfaces	• Two GE ports (RJ45 PfoE and SFP optical plug-in)
Radio	• 5.8 GHz to 38 GHz (FDD) • 470 Mb/s standard • Support for packet compression • Channels: 10 MHz to 60 MHz
Modulation	• 4 QAM to 2048 QAM
Weight	• 7.8 kg (1.2 lb) with external diplexer • 6 kg (13.2 lb) with internal diplexer
Power	• PfoE • -48 V +/-20%, +24V +/-20% optional • 36 W nominal (full-outdoor and split-mount modes)

MPT-HC-HQAM

Pole-mounted MPT-HC-HQAM

NOKIA

Technical specifications

Indoor/outdoor connections

- Maximum cable length
  - 100 m (328 ft) with Cat5e cable
  - 450 m (1476 ft) with optical connectivity

Radio

- 1+0/1+1 HSB/SD/FD
- N+0 LAG L1 with or without SD
- Integrated XPIC (greener and more reliable)
- Maximum Tx power: Up to 32 dBm
- Support for adaptive coding and modulation ACM)
- Duplex technology: FDD
- Encryption: AES-256
- Timing transport: IEEE 1588v2 PTP, SyncE
- ITU-T G.8264 support

Networking

- Ethernet interface: One electrical 100/1000BaseT, one optical SFP plug-in
- Advanced QoS: Support for IEEE 802.1p, Diffserv, TTL and strict priority
- Dynamic scheduling according to air interface changes
- VLAN: IEEE 802.1P, IEEE 802.1Q, Q-in-Q support
- ERPS: ITU-T G.8032
- Ethernet OAM (IEEE 802.1ag, ITU-T Y.1731 BNM, IEEE 802.3ah)

Environmental

- Operating temperature: -40°C to +46°C (-40°F to 115°F) plus solar loading

Standards compliance

Regulatory

- FCC Part 101/15, Industry Canada SRSP

Safety

- Telcordia® GR-1089

EMC

- GR-1089, GR-63
- Metro Ethernet Forum
- MEF 2.0, MEF 8, MEF 9, MEF 14, MEF 22

Services

- Architecture and design
- Network planning
- Equipment and site engineering
- Installation services
- Integration services
- Performance analysis, network assessment, DCN, synchronization and QoS assessment
- Migration to packet microwave management
- Maintenance
  - 24x7 technical support
  - Return for repair or advanced exchange

CE 2.0 MEF CERTIFIED

Nokia Oyj
Karaportti 3
FI-02610 Espoo
Finland
Tel. +358 (0) 10 44 88 000

Product code: SR1712019658EN

Nokia Wavence

Microwave Service Switch | Release 18 (ANSI)

The Nokia Wavence family includes a flexible range of Microwave Service Switch (MSS) indoor units that provide advanced Carrier Ethernet networking, aggregation and demarcation functions. Optimized to reduce space and power consumption, the MSS exists in different form factors to address all network sizes and locations, including tail, hub and backbone. The entire MSS family uses the same software and management systems, enabling consistent operations across end-to-end packet microwave networks. Combined with the Wavence UBT and MPT units, the MSS sets the standard for delivering fast, efficient wireless transmission links with flexible networking and simple operations.

	MSS-0	MSS-1	MSS-4	MSS-8
Chassis	• Fixed • Pole/Wall mount • Environmentally hardened for outdoor usage • IP67 compliant	• Fixed • Fanless	• Modular: four slots • Two core slots (1+1) • Two interface slots	• Modular: Eight slots • Two core slots (1+1) • Six interface slots
Dimensions	345 mm x 190 mm x 65 mm (13.6 in. x 7.5 in. x 2.6 in.)	½ RU	1 RU	2 RU
Nodal capability	Three radios	Six radios	Twelve radios	Twenty-four radios
Switching capability	16 Gb/s	16 Gb/s	100 Gb/s	100 Gb/s
Weight	4.2 kg (9.3 lb)	2 kg (4.4 lb)	Chassis: 1.8 Kg (4.0 lb)	Chassis: 3.6 kg (7.9 lb)
Interfaces	• 2 x 10/100/1000 RJ-45 with PoE support • 1 x 10/100/1000 RJ-45 • 1 x SFP	• 16 DS1 • 4 x 10/100/1000 RJ-45 • 2 x SFP	• 64 DS1, 4 DS3 or 4 OC-3 • 4 x 10 Gb/s SFP+ ports	• Up to 192 DS1, 12 DS3, 12 OC-3, 54 GE • 6 x 10 Gb/s SFP+ ports
Power supply	AC: 110 V to 230 V nominal DC: 48 V nominal	Dual feeds -48 V	-48 V DC or optional +24 V DC	Dual feeds: -48 V DC or optional +24 V DC
Temperature	-40°C to +46°C (-40°F to +115°F) with Solar Loading (per GR-3108 Class 4)	-40°C to +65°C (-40°F to +149°F)	-40°C to +50°C (-40°F to +122 °F)	-40°C to +65°C (-40°F to +149°F)

NOKIA

Technical specifications

Indoor/outdoor connections

- GE electrical or optical cable

Synchronization

- Performance according to ITU-T G.813, G.823, G.8264
- Clock distribution options
  - DS1/OC-3
  - External reference sync-in/ sync-out (2 MHz, 5 MHz, 10 MHz)
  - Sync E + SSM
  - ITU-T G.8264
  - Built-in Stratum 3 clock
  - OC-3 line clock
  - 1588 T-TC and T-BC on path support

Standards compliance

Environmental

- Telcordia® GR-63, GR-1089
- GR-3108
  - MSS-O: Class 4
  - MSS-1, MSS-8: Class 2
- EMC: EN 55022 Class B, EN 301 489-1, EN 301 489-4

Safety

- EN 60950-1, UL

Ecological

- ECMA TR/70

Networking and services

- IEEE 802.1p, 802.1Q: VLAN tagging
- IEEE 802.3: Ethernet
- IEEE 802.3u: 100Base-TX
- IEEE 802.3z: 1000Base-SX/LX
- IEEE 802.3ab: 1000Base-T
- IEEE 802.3x: Flow control
- IEEE 802.1D: MAC bridges
- IEEE 802.1AX-2008: Link aggregation
- IEEE 802.1ag: Ethernet OAM
- MEF CE 2.0: Carrier Ethernet
- MEF 8, MEF 9, MEF 14, MEF 22
- ITU-T G.7041: GFP
- ITU-T G.8032v2: ERPS
- ITU-T G.813: Timing characteristics
- ITU-T G.823: Control of jitter
- ITU-T G.8273.2, G.8273.3: Timing characteristics
- ITU-T Y.1731 BNM: OAM functions

Traffic management and QoS

- Marking based on:
  - Layer 2 (IEEE 802.1p)
  - Layer 3 (DiffServ)

Network and element management

- Console, management, alarm
- Optional 256-bit AES Encryption compliant with FIPS PUB 140-2
- Secure FTP for software download and backup
- IPv4/IPv6 management
- Integrated network management in a Microsoft® Windows® environment
- Embedded web browser for network element configuration and monitoring
- Intuitive supervision systems
- SNMP agent with TCP/IP rerouting capability
- Nokia 5620 Service Aware Manager
- Nokia TSM-8000 Fault Management System

Services

- Architecture and design
- Equipment and site engineering
- Installation services
- Integration services
- Performance analysis, network assessment, DCN, synchronization and QoS assessment
- Migration to packet microwave management
- Maintenance
  - 24x7 technical support
  - Return for repair or advanced exchange

CE 2.0 MEF CERTIFIED

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Tel. +358 (0) 10 44 88 000

Product code: SR1712019638EN

Bird®

SPECTRUM FINGERPRINTING

Proactively Optimize System Functionality and Control Risks

The **RF** Experts

DO YOU KNOW WHO YOUR NEIGHBORS ARE?

Spectrum management has proven to be key in the design of wireless communications systems as usable frequencies are not always available.

The effective design of advanced communications systems requires a keen awareness of spectrum usage. Spectrum Fingerprinting was developed to permit the engineer yo obtain the level of information required in today's RF environment. Spectrum Fingerprinting is the collecting of data that provides a direct representation of the spectrum as seen by the receiver on any frequency within a given bandwidth over a 24-hour period.

Spectrum Fingerprinting was designed for the disorganized VHF frequency bands and other high-risk RF environments. Intelligence gained through empirical data along with evaluation by knowledgeable RF engineers allows us to look more closely at potential sources of interference. It can identify situations that will impede coverage and operation, as well as pinpoint available frequencies that might otherwise be overlooked.. Spectrum Fingerprinting Provides valuable information that characterizes RF environment on any frequency within a specified frequency span.

Spectrum Fingerprinting is very useful in Pre-Sale applications. While the primary goal of Spectrum Fingerprinting is a better understanding of the risks of interference it is also utilized as a significant tool for interference mitigation, spectrum investigations, and in all phases of RF hardware and system design. Spectrum Fingerprinting is a process that provides the powerful tools needed for appropriate solutions.

WHY IS SPECTRUM FINGERPRINTING SO VALUABLE TO YOU?

RISK REDUCTION

Pre-design validation analyzes the impact of interference of an RF hardware design and identifies possible incompatibilities that may exist. In a shifting environment, system design should include a reasonable margin for maintaining "satisfactory" performance in the face of anticipated interference and system degradation over time.

IDENTIFICATION OF RADIO FREQUENCY HARDWARE DESIGN ISSUES

Identify RF hardware design issues caused by high-level carriers above -55 dBm, as well as occupied frequencies in close proximity to allow the effective design of receive preselectors and transmitter combiners.

INTERFERENCE MITIGATION

Identify sources of interference to assist in resolution.

SOUND PLANNING THROUGH FREQUENCY RE-FARMING

Enable valid assessment of both licensed and unlicensed compatible frequencies for use in frequency planning by evaluating actual spectrum data.

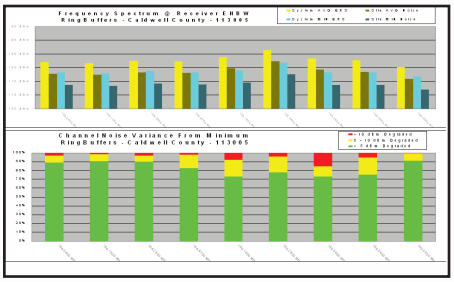
LOCATE AVAILABLE CHANNELS THROUGH FREQUENCY MINING

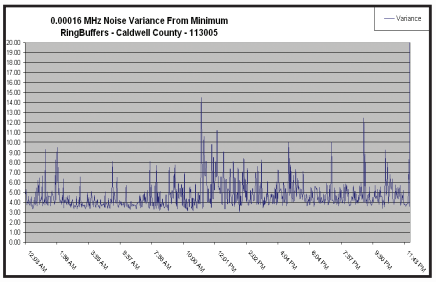
Identify usable unlicensed and inactive frequencies actual spectrum information and FCC data.

This end user driven technology delivers the information you need at the right time in a form that can be the most use to you.

Spectrum Fingerprinting

Proactively Optimize System Functionality and Control Risks





RAPID, RELIABLE AND COST-EFFECTIVE SPECTRUM MEASUREMENT

Spectrum Fingerprinting arms you with the invaluable information you need in as little as 24 hours. The appropriate management of spectrum, a crucial resource, cannot be stressed enough. We have gained practical experience in understanding the value and optimal use of RF spectrum as demand continually increases. Today, we extend to you an opportunity to ensure a reliable network and continual growth, particularly when it matters most.

HOW DOES IT WORK?

• STEP 1 – DATA COLLECTION

A technician is deployed to examine the spectrum during peak utilization periods. Over a 24-hour period at a site or location, using a computer running Windows-based spectrum monitoring software, a fingerprint of the local spectrum usage is taken - hence the origin of the name "Spectrum Fingerprinting".

• STEP 2 - ANALYZE DATA & GENERATE REPORTS

Analysis and Report Generation, including four types of reports: 1) Spectrum Report, 2) Frequency Report(s), 3) High Level Carrier Report by frequency, and 4) RF Hardware Impact Analysis Report. Professional reports (hardcopy and/or softcopy) are produced and reviewed by knowledgeable RF engineers for all identified customer frequencies.

Spectrum Reports

These reports display the spectrum activity over the specified frequency span and the frequency utilization (occupancy) the 24-hour test period.

Frequency Reports

These reports detail the activity on each customer frequency for the 24 hour monitoring period. Frequencies that have significant co-channel activity can be easily identified and may warrant a "further investigation" recommendation prior to utilization as system frequencies.

High-Level Carrier Reports by frequency

These reports detail frequencies where signals exceed certain thresholds of signal level and occupancy. Signals are evaluated that exceed -55 dBm, -35 dB and -20 dBm. This information is highly valuable in the design of the system receive network.

RF Hardware Impact Analysis Reports

Data is provided on such topics and transmit to receive separation that can be valuable in the design and optimization of the system. This information is also useful in mitigating any problems that are discovered during the optimization and post installation periods.

7.2 COVERAGE MAPS

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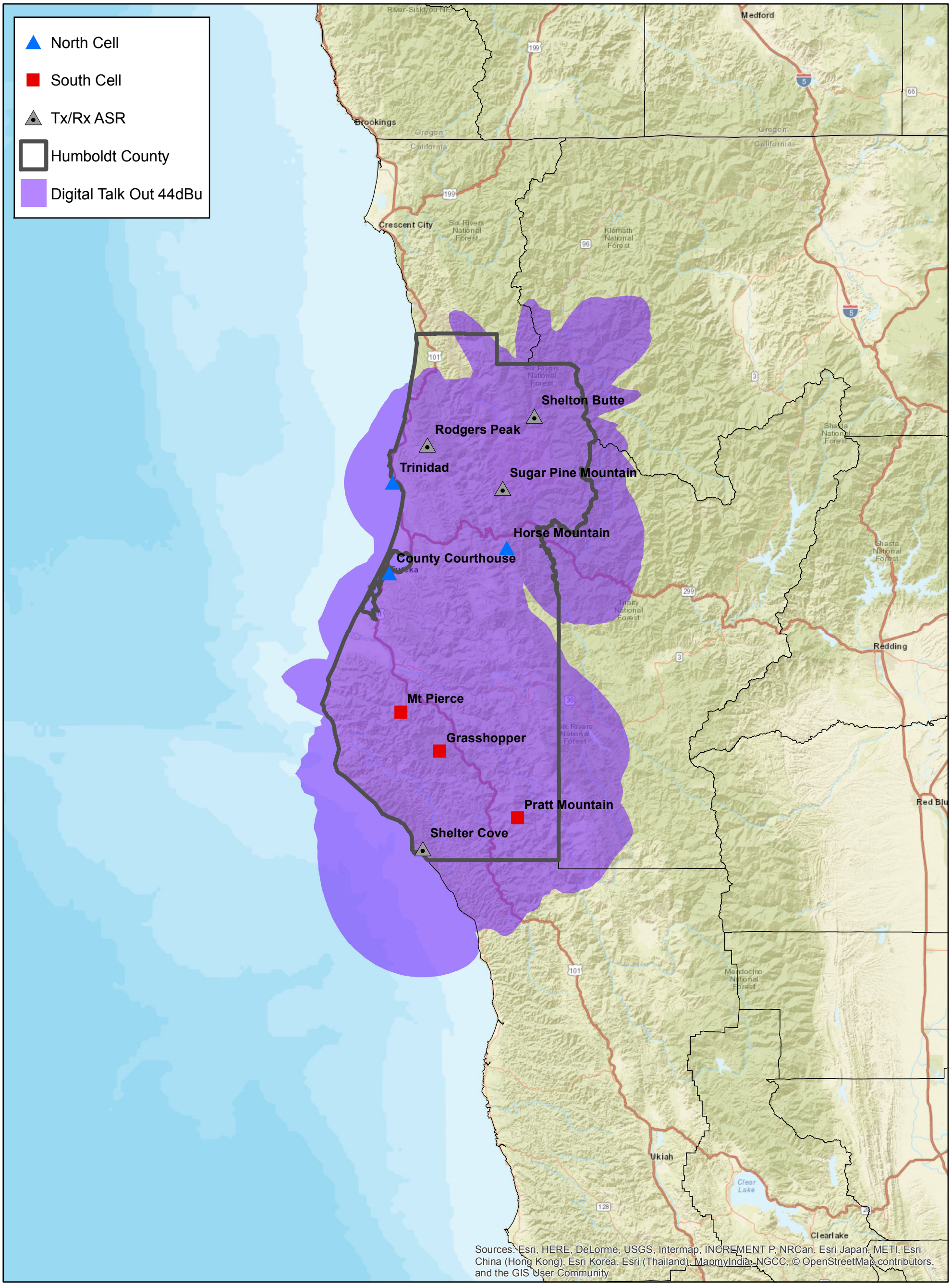
MOTOROLA SOLUTIONS

REFERENCE 1

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System



Adjacent Channel Signal Strength Digital Talk Out 44dBu

0 5 10 20 Miles

1 in = 19 mile

CA - Humboldt County
Proposed Sheriff Digital
Design 123
BJH376

8/17/2018 Hydra Stratus 2.3.1

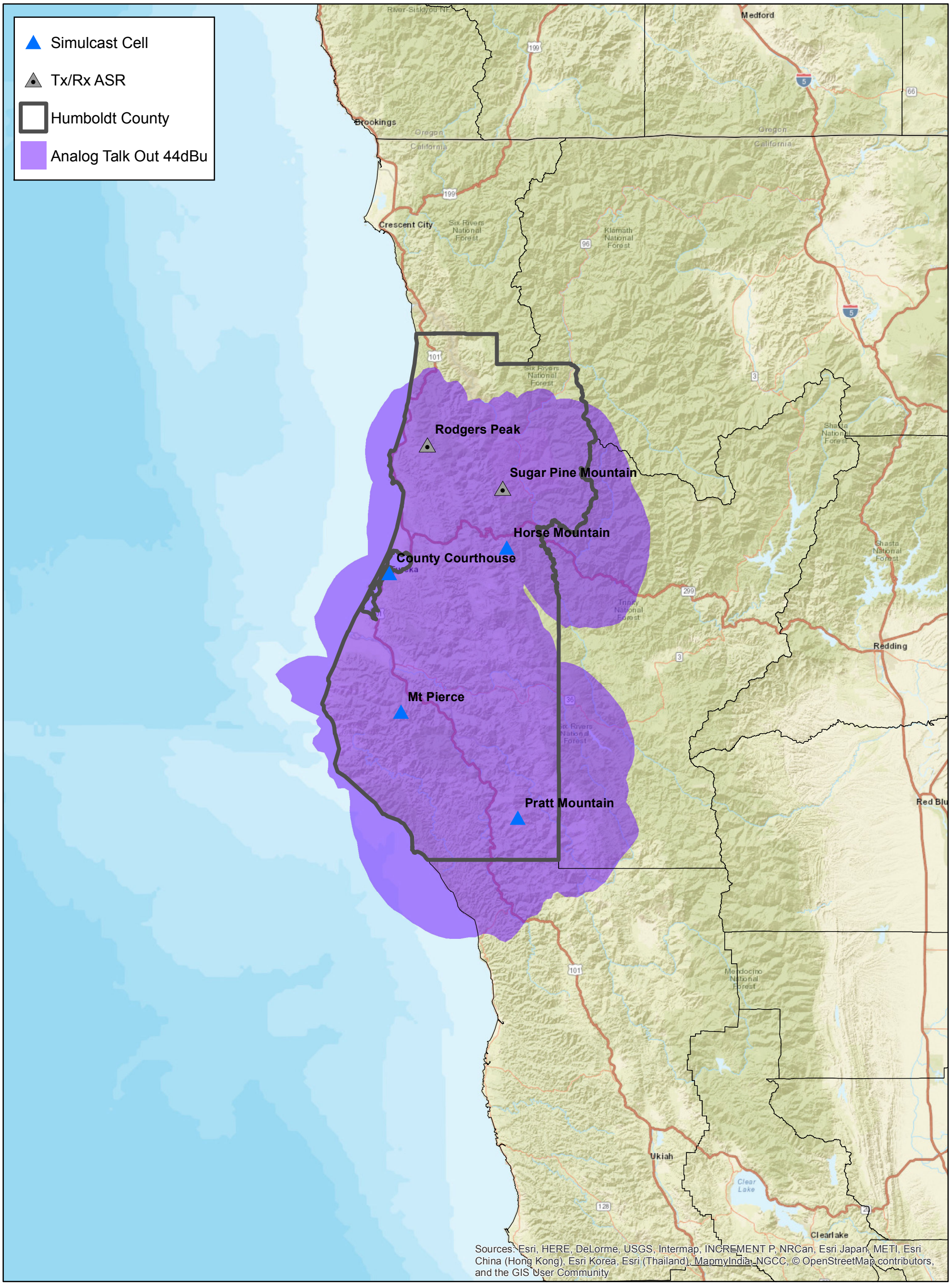
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 2

Humboldt County, CA

6-Site (Single Cell, 2-ASR) VHF Analog Simulcast System



Adjacent Channel Signal Strength Analog Talk Out 44dBu

0 5 10 20 Miles

1 in = 19 mile

CA - Humboldt County
Proposed PW Analog
Design 57
BJH376

8/17/2018 Hydra Stratus 2.3.1

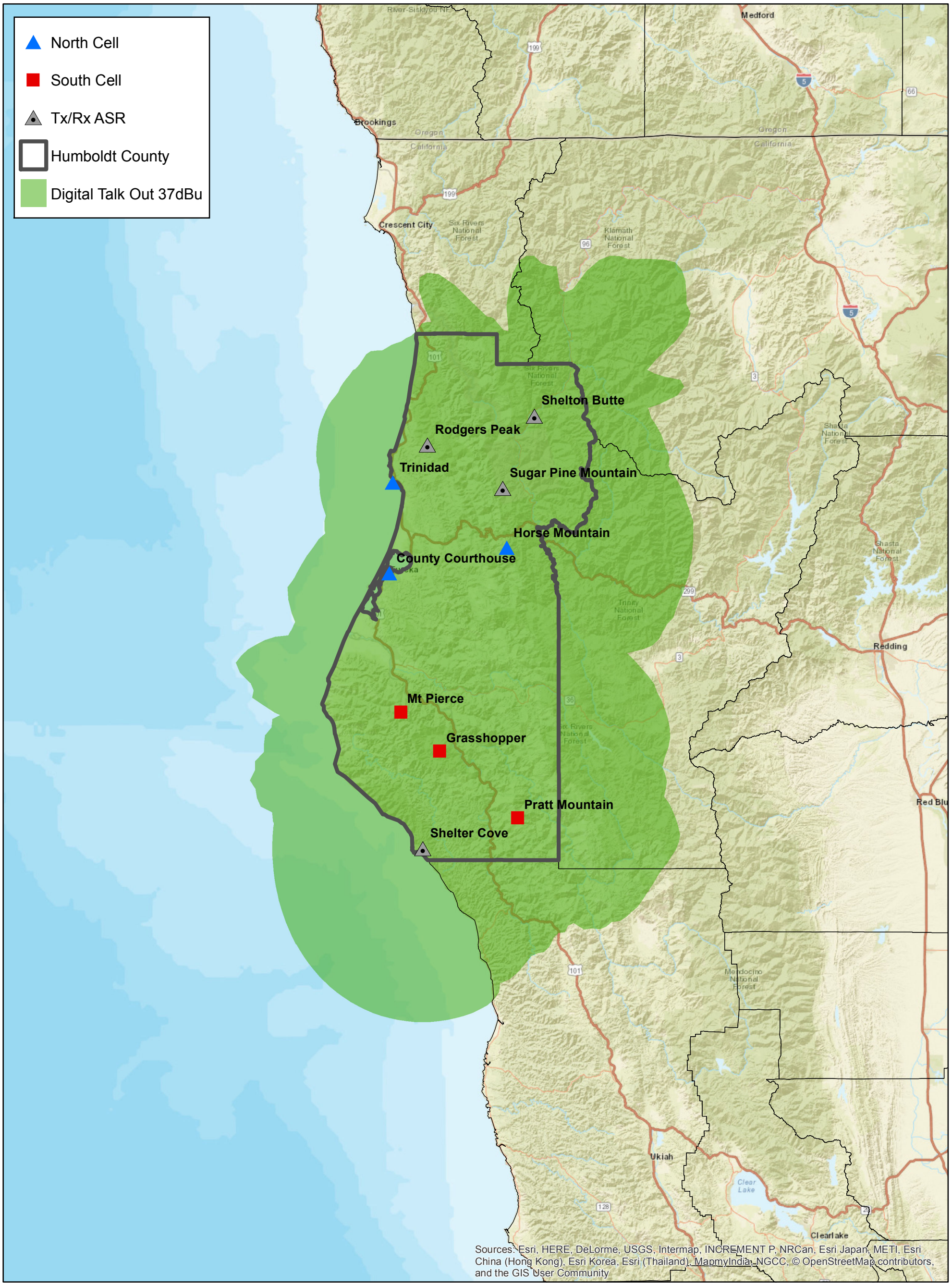
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 3

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System



Signal Strength Digital Talk Out 37dBu

0 5 10 20 Miles

1 in = 19 mile

CA - Humboldt County
Proposed Sheriff Digital
Design 122
BJH376

8/17/2018 Hydra Stratus 2.3.1

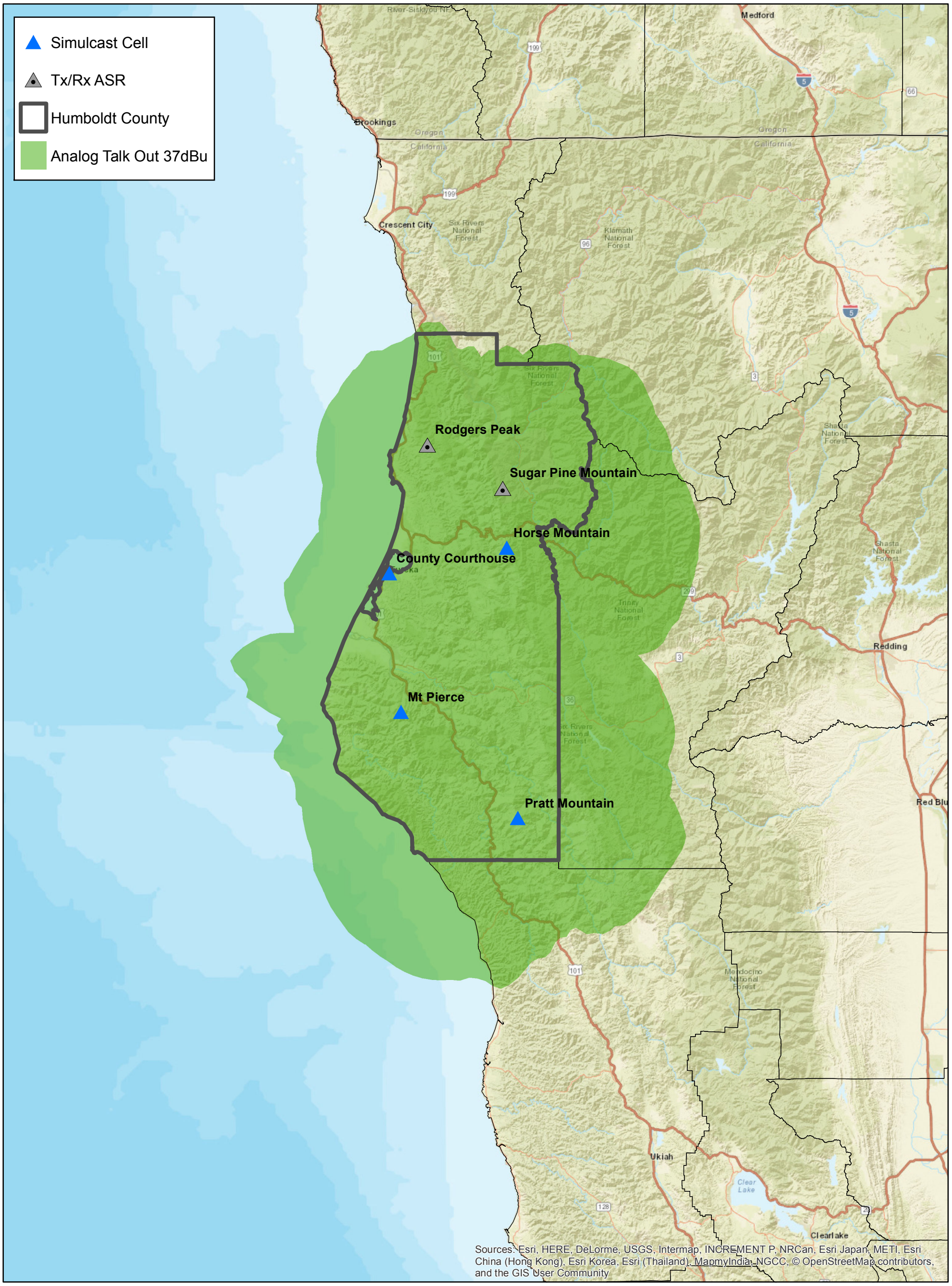
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 4

Humboldt County, CA

6-Site (Single Cell, 2-ASR) VHF Analog Simulcast System



Signal Strength Analog Talk Out 37dBu

0 5 10 20 Miles

1 in = 19 mile

CA - Humboldt County
Proposed PW Analog
Design 56
BJH376

8/17/2018 Hydra Stratus 2.3.1

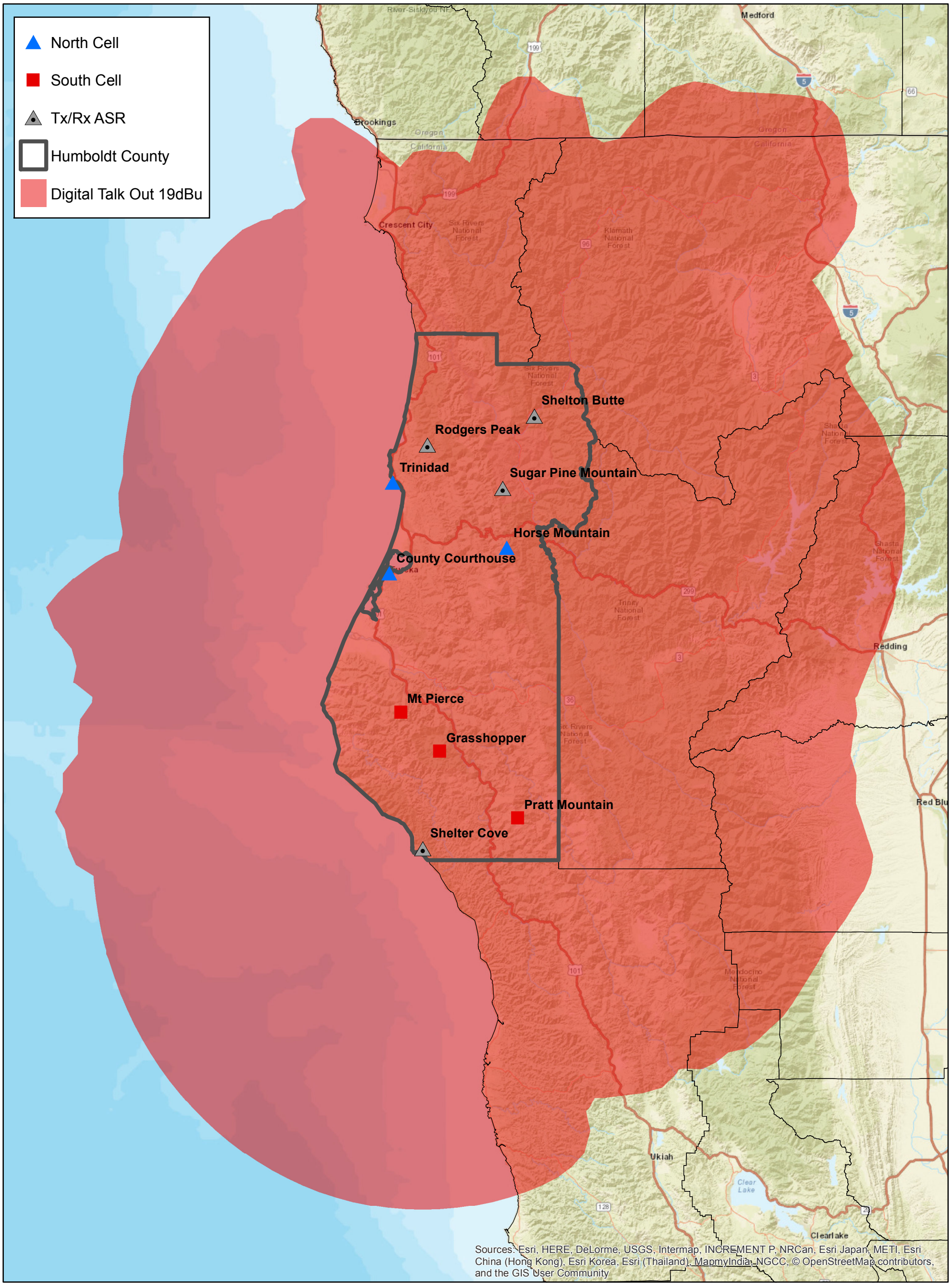
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 5

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System



Co-channel Signal Strength Digital Talk Out 19dBu

0 5 10 20 Miles

1 in = 19 mile

CA - Humboldt County
Proposed Sheriff Digital
Design 122
BJH376

8/17/2018 Hydra Stratus 2.3.1

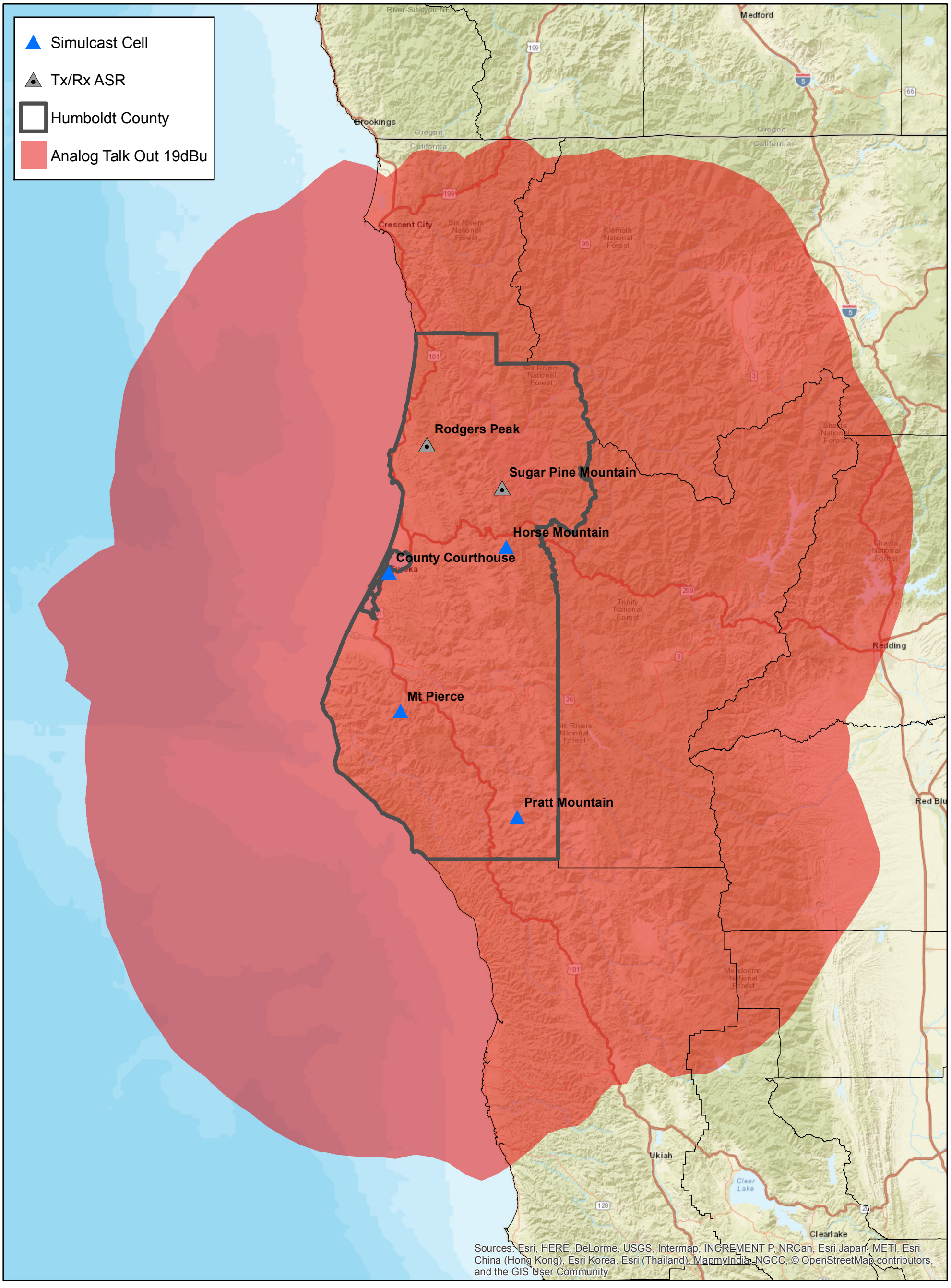
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 6

Humboldt County, CA

6-Site (Single Cell, 2-ASR) VHF Analog Simulcast System



0 5 10 20 Miles

1 in = 19 mile

Co-channel Signal Strength Analog Talk Out 19dBu

CA - Humboldt County
Proposed PW Analog
Design 56
BJH376

8/17/2018 Hydra Stratus 2.3.1

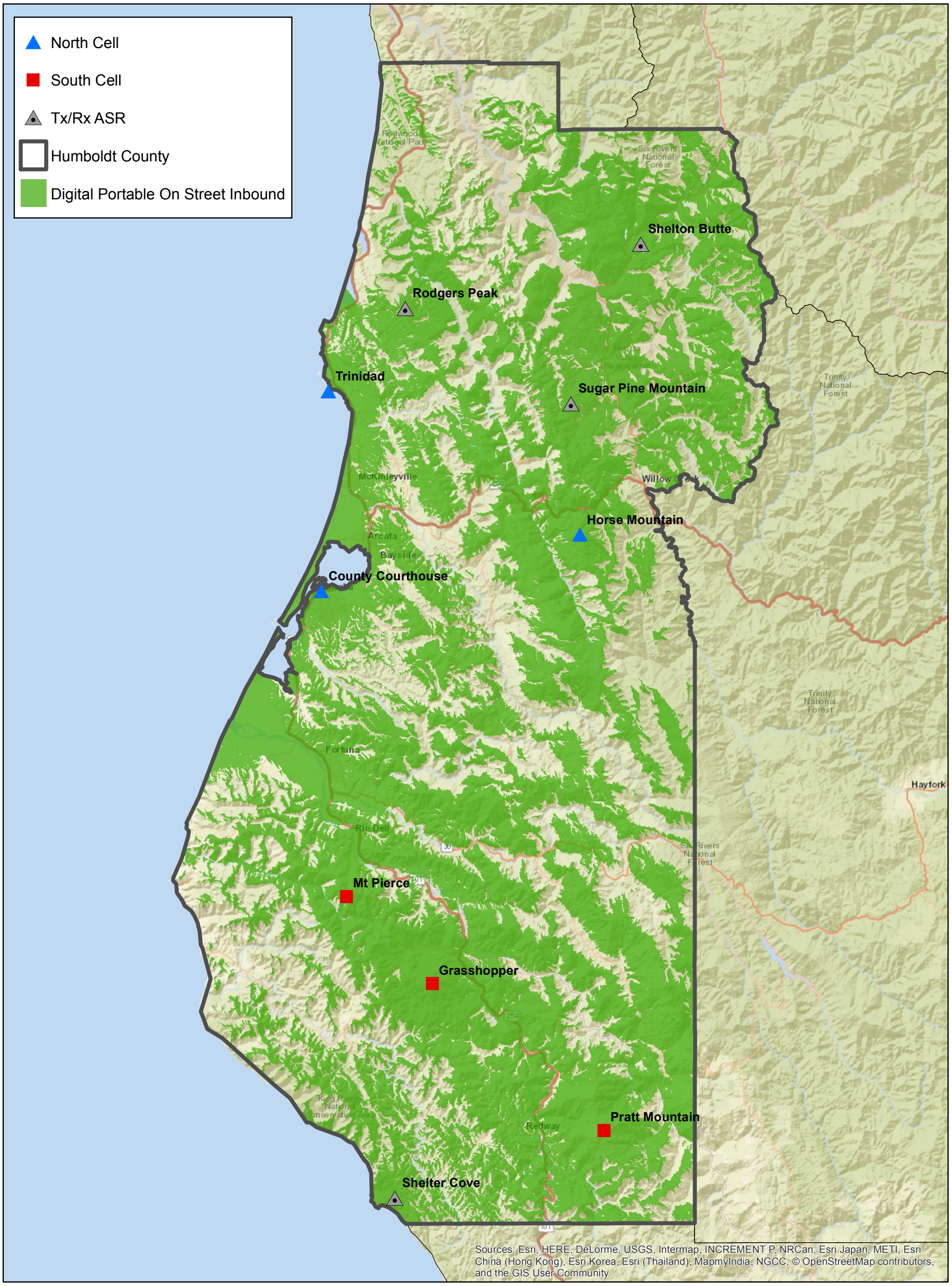
For Informational Purposes Only

MOTOROLA SOLUTIONS

REFERENCE 7

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.4



0 3.25 6.5 13 Miles

1 in = 8 mile

Portable Configuration:
APX 6000 Portable, 6W
Tx/Rx at Hip in Swivel Case with Remote Speaker Mic
Wideband Antenna

CA - Humboldt County
Proposed Sheriff Digital
Design 118
BJH376

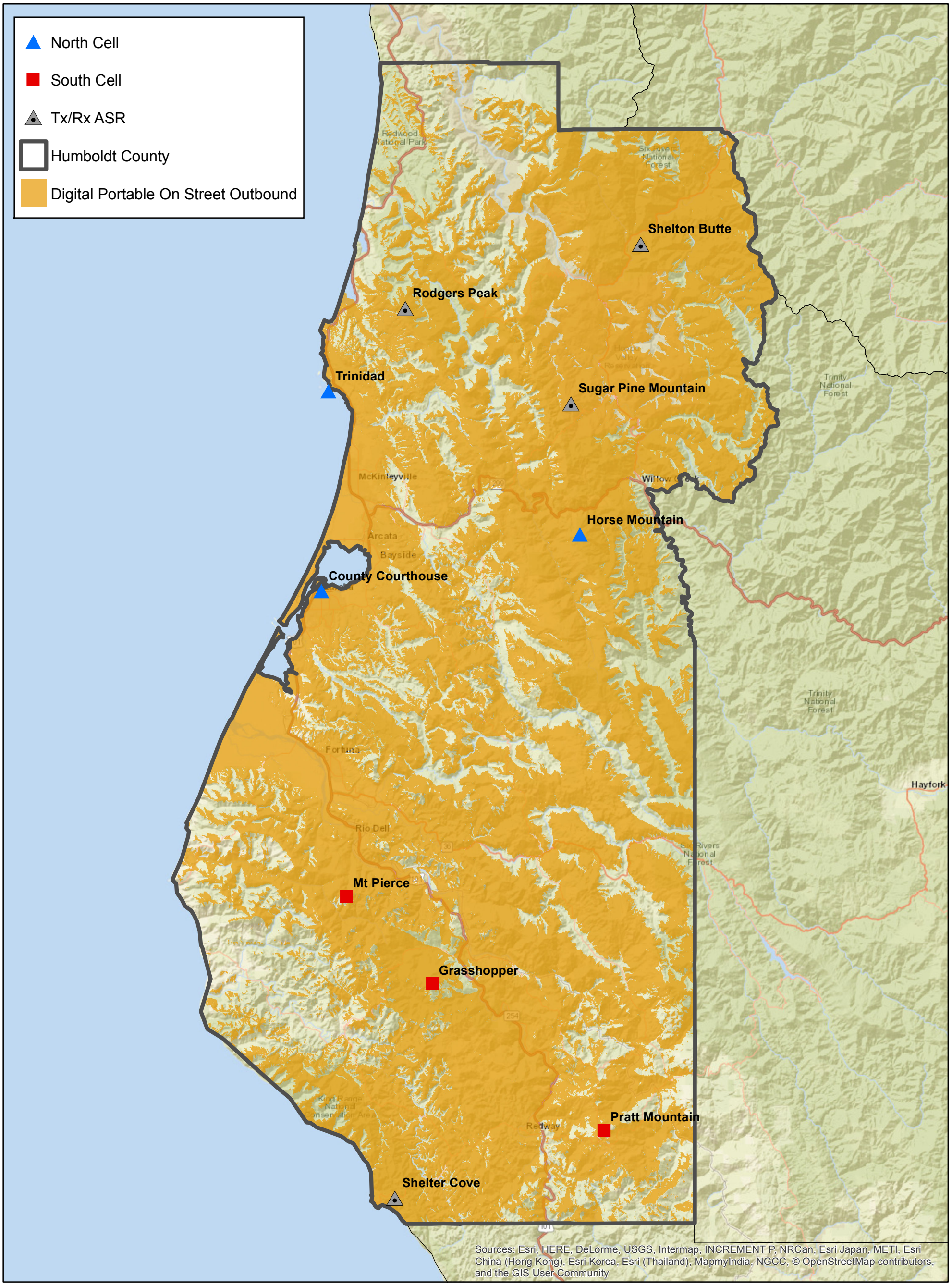
8/17/2018 Hydra Stratus 2.3.1

MOTOROLA SOLUTIONS

REFERENCE 8

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.4



0 3.25 6.5 13 Miles

1 in = 8 mile

Portable Configuration:
APX 6000 Portable, 6W
Tx/Rx at Hip in Swivel Case with Remote Speaker Mic
Wideband Antenna

CA - Humboldt County
Proposed Sheriff Digital
Design 118
BJH376

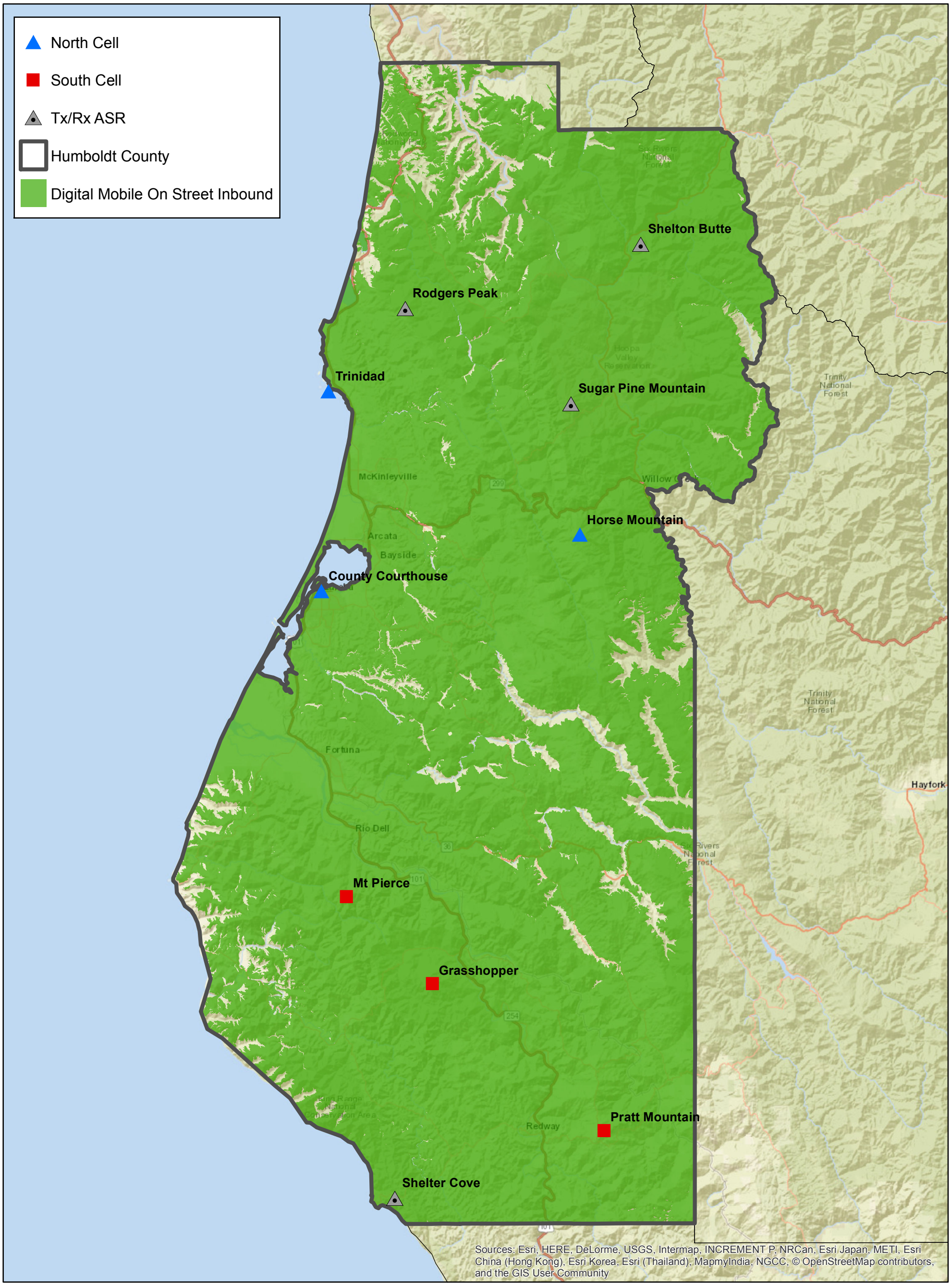
8/17/2018 Hydra Stratus 2.3.1

MOTOROLA SOLUTIONS

REFERENCE 9

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.4



0 3.25 6.5 13 Miles

1 in = 8 mile

Mobile Configuration:
APX 4500 Mobile, 10W
Tx/Rx Roof Center Mount
1/4-Wave Dipole

CA - Humboldt County
Proposed Sheriff Digital
Design 118
BJH376

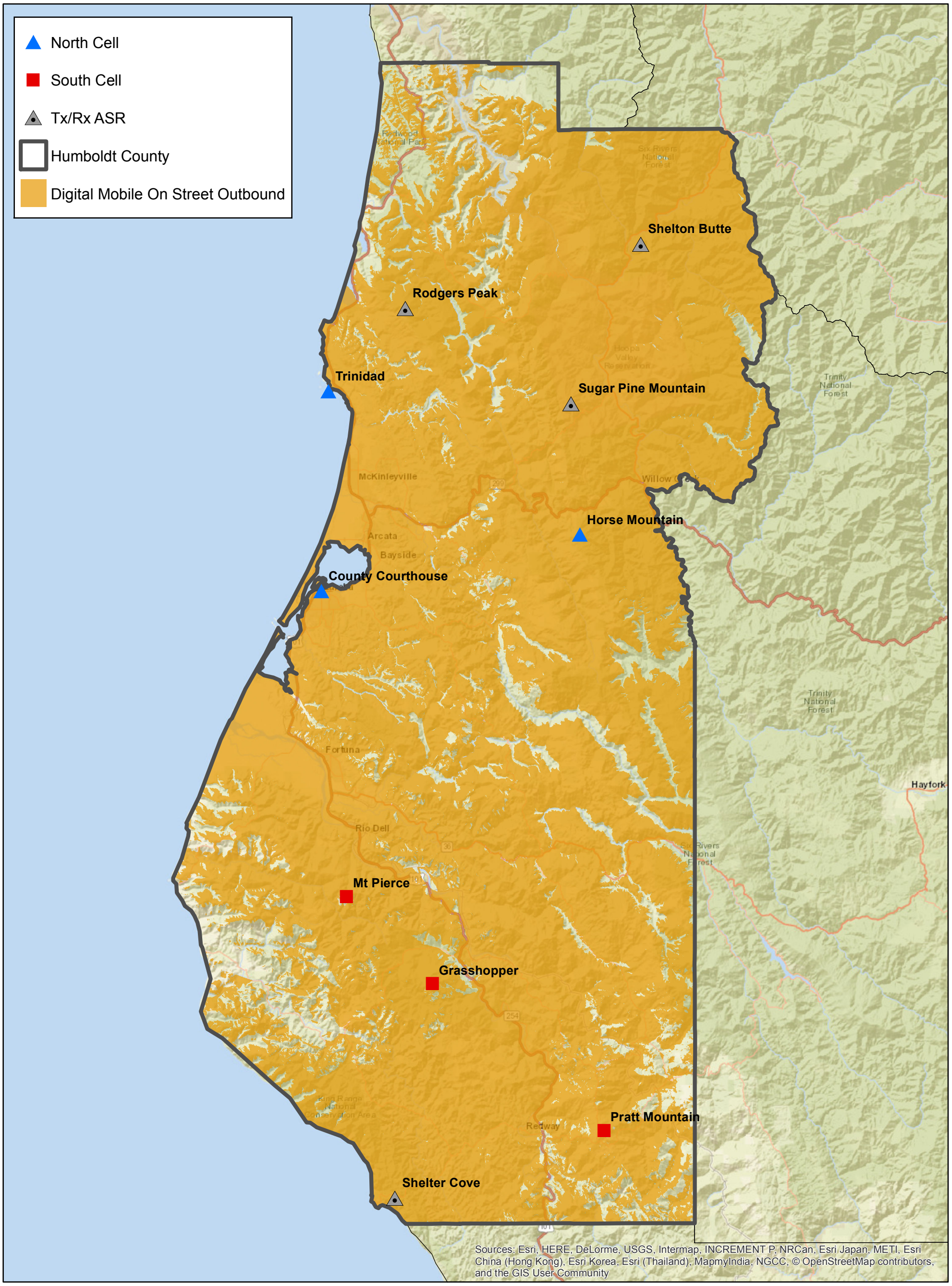
8/17/2018 Hydra Stratus 2.3.1

MOTOROLA SOLUTIONS

REFERENCE 10

Humboldt County, CA

10-Site (2-Cell, 4-ASR) VHF Phase 1 (FDMA) P25 Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.4



0 3.25 6.5 13 Miles

1 in = 8 mile

Mobile Configuration:
APX 4500 Mobile, 10W
Tx/Rx Roof Center Mount
1/4-Wave Dipole

CA - Humboldt County
Proposed Sheriff Digital
Design 118
BJH376

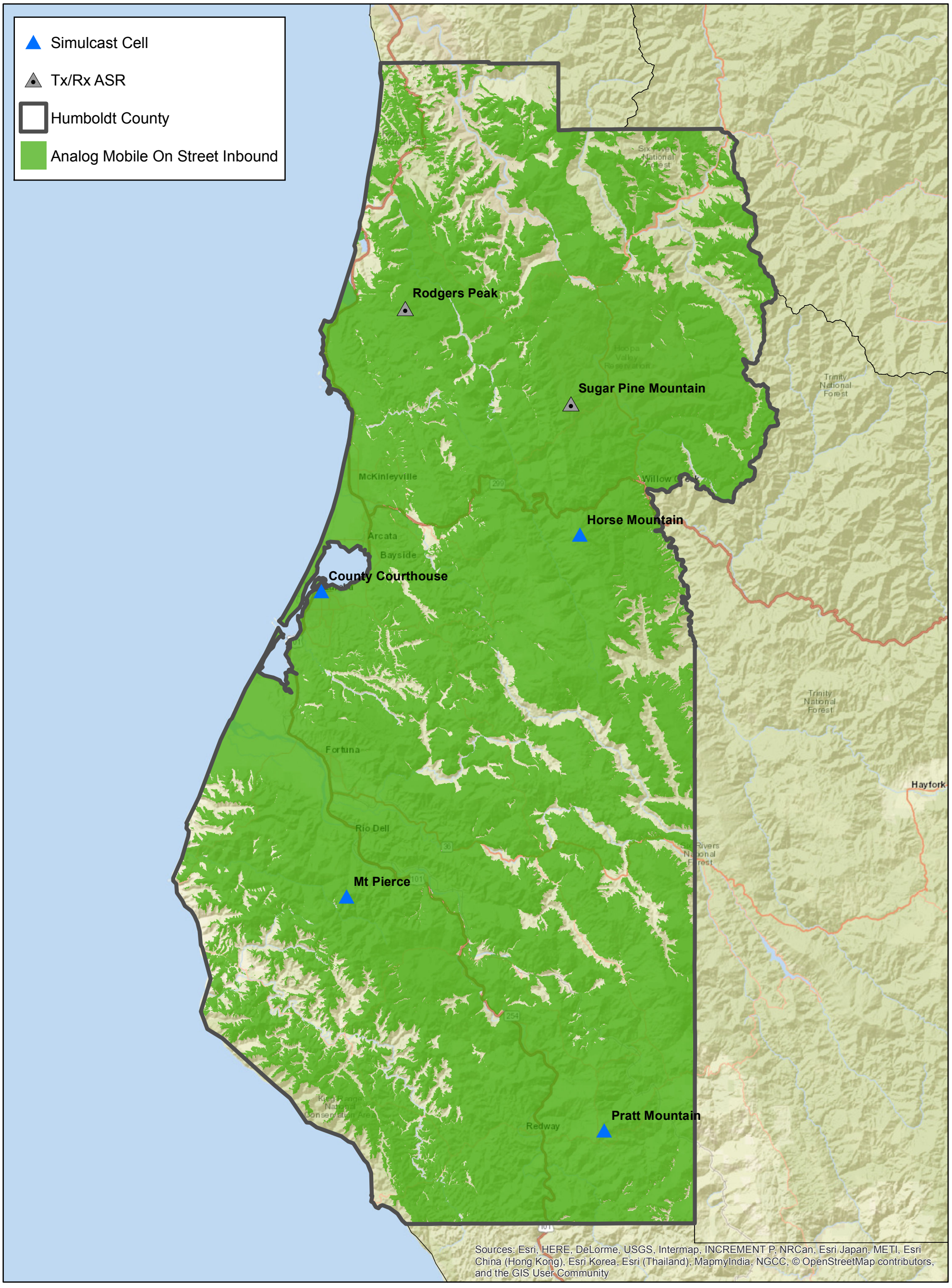
8/17/2018 Hydra Stratus 2.3.1

MOTOROLA SOLUTIONS

REFERENCE 11

Humboldt County, CA

6-Site (Single Cell, 2-ASR) VHF Analog Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.0



0 3.25 6.5 13 Miles

1 in = 8 mile

Mobile Configuration:
APX 4500 Mobile, 10W
Tx/Rx Roof Center Mount
1/4-Wave Dipole

CA - Humboldt County
Proposed PW Analog
Design 53
BJH376

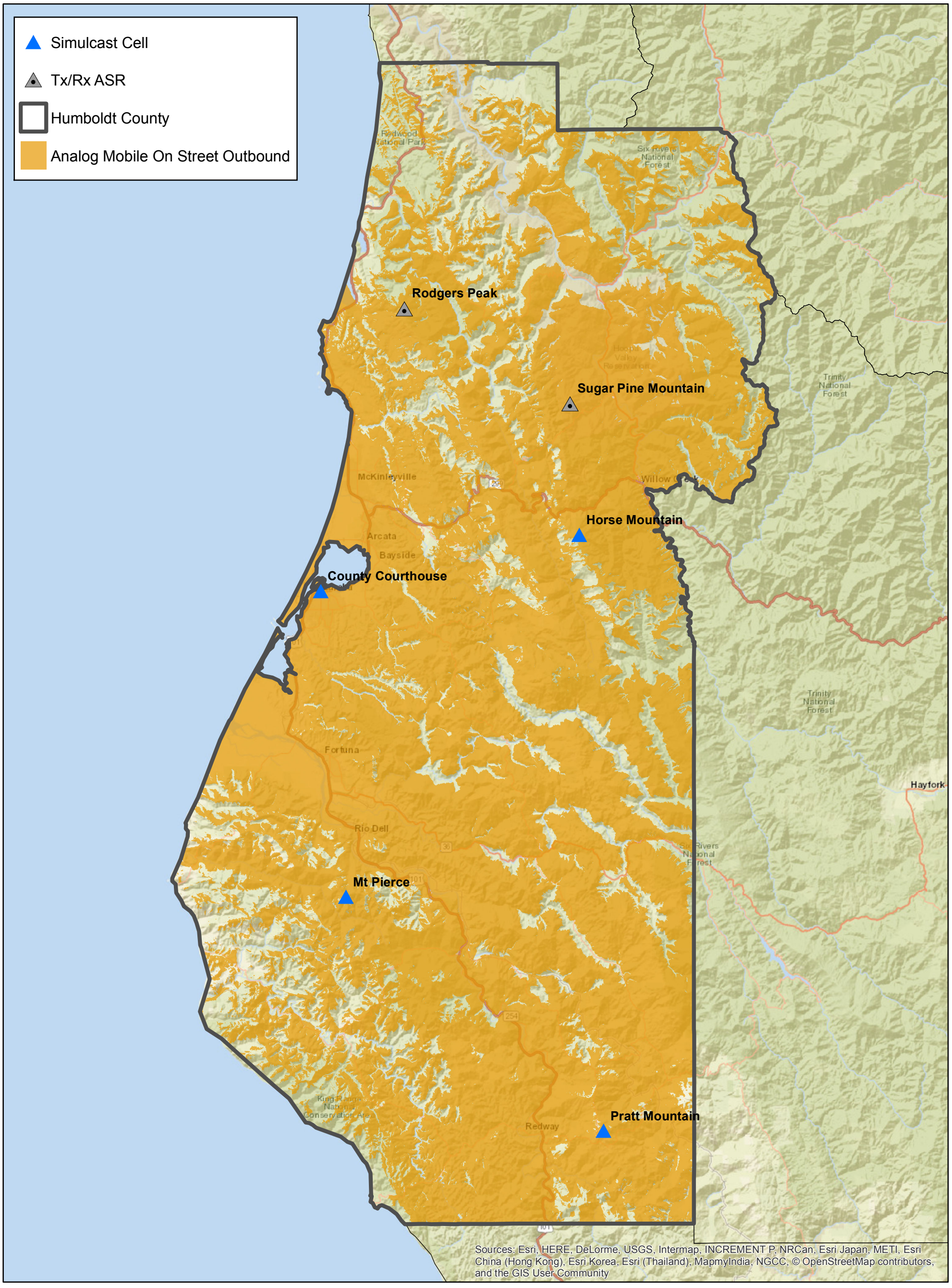
8/17/2018 Hydra Stratus 2.3.1

MOTOROLA SOLUTIONS

REFERENCE 12

Humboldt County, CA

6-Site (Single Cell, 2-ASR) VHF Analog Simulcast System
Painted Area Represents 95% or Better Average Tile Reliability at DAQ 3.0



0 3.25 6.5 13 Miles

1 in = 8 mile

Mobile Configuration:
APX 4500 Mobile, 10W
Tx/Rx Roof Center Mount
1/4-Wave Dipole

CA - Humboldt County
Proposed PW Analog
Design 67
BJH376

8/21/2018 Hydra Stratus 2.3.1

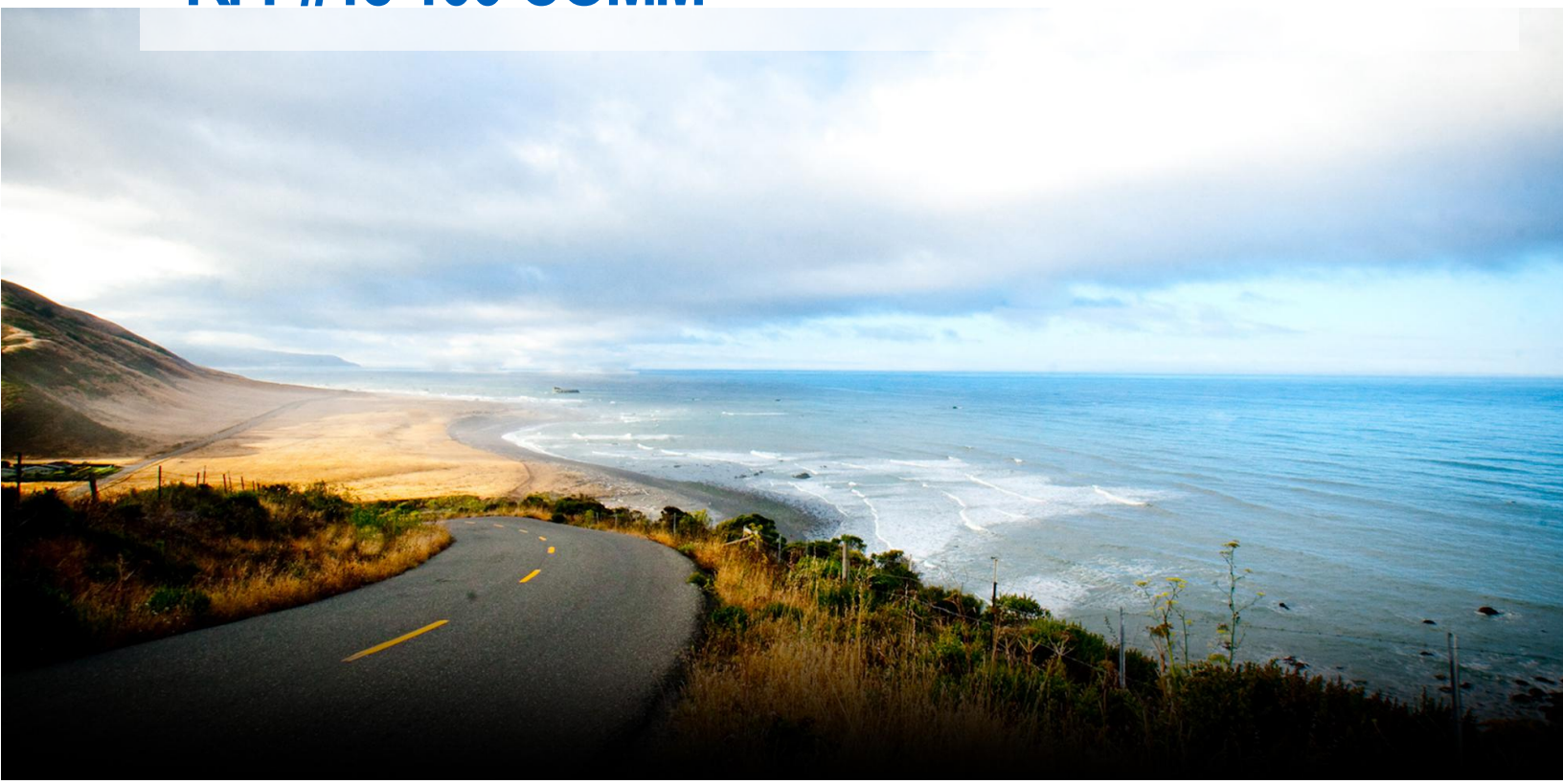
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 8
REFERENCES

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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SECTION 8

REFERENCES

A. Reference Data Sheet. Proposals shall include a completed reference list, which is attached hereto as Attachment E – Reference Data Sheet and incorporated herein by reference, containing present and past performance information from a minimum of three (3) clients, preferably government agencies, to whom the Proposer has provided Radio System Packages and related services equivalent to those set forth in this RFP within the past five (5) years.

B. Required Information. The performance information provided with each reference must be clearly correlated to the Radio System Package and related services set forth in this RFP. Each reference must include, at a minimum, all of the following information:

1. The name, title, physical address, email address and telephone number for the current contact person of each referenced client.

2. The dates of project commencement, completion and acceptance for each referenced client.

3. A detailed description of the Radio System Package and related services provided to each referenced client, including, without limitation, the amount of time it took to complete delivery of any and all products and services.

4. A detailed description of how the services rendered by the Proposer led to accomplishment of each referenced client's project objectives.

5. A detailed description of the contract amount and outcome of each referenced client's project.

6. A verification that all information provided in the Reference Data Sheet is true and correct to the best of the Proposer's knowledge.

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8.1 ATTACHMENT E – REFERENCE DATA SHEETS

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REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	Butte County	
STREET ADDRESS:	308 Nelson Ave	
CITY, STATE, ZIP:	Oroville, CA 95965	
CONTACT PERSON:	Weedy Hannibal	**EMAIL:** whannibal@buttecounty.net
PHONE #:	530-552-3276	**FAX #:**
Department Name:	Information Systems	
Approximate County (Agency) Population:	225,564	
Number of Departments:	9 – Sheriff, District Attorney, Probation, OEM, Public Works, Government Services, Public Health and Communications Departments	
General Description of Scope of Work:	• One (1) Motorola M2 Fully-Redundant Master Site (also referred to as the Core). • Nine (9) MCC7500 IP-based Operator Positions. • Seven (7) at the Butte County Sheriff's Office Dispatch. • One (1) Optional at the Sheriff's Office Dispatch. • One (1) at the Oaks Master Site, functioning as a test console. • One (1) ASTRO Site Repeater (ASR). • One (1) Optional ASTRO Site Repeater (ASR) • Seven (7) Simulcast sites connected via two (2) Simulcast Prime Sites. • Loop and spur Ethernet Microwave Backhaul. • Fleet of over 500 APX mobile, portable radios and control stations. • Radio Management System with 959 radio user licenses • UPS and DC Power System	

	Project start: December 2016 Project completion: Est. Mid-2019 Contract amount: $ 7,351,620.00 The Motorola team consisting of but not limited to Project Manager, Systems Integration, Systems Engineer, Systems Technologist and Customer Service Manager are currently working on implementing the customers goals of schedule, budget and functionality to deliver the system with an expected completion of mid-2019.

REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	Monterey County	
STREET ADDRESS:	855 E. Laurel Drive	
CITY, STATE, ZIP:	Salinas, CA 93906	
CONTACT PERSON:	Steve Paxton	**EMAIL:** paxtons@co.monterey.ca.us
PHONE #:	831-796-1463	**FAX #:**
Department Name:	Department of Information Technology	
Approximate County (Agency) Population:	435,000	
Number of Departments:	Over 14 departments/agencies including: City of Salinas Police City of Salinas Fire City of Marina Police City of Marina Fire City of Marina Public Works Monterey County District Attorney Monterey County Bailiffs City of Sand City Police City of Soledad Police City of Carmel Fire City of Carmel Ambulance City of Pacific Grove Fire City of Monterey Fire City of Monterey Police	
General Description of Scope of Work:	Evaluation and recommendation of Motorola P25 APX subscriber radios to operate on the Next Generation P25 radio network in Monterey County replacing competitive product. Value: $3,400,000.00	

REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	City of Clovis	
STREET ADDRESS:	1233 Fifth Street	
CITY, STATE, ZIP:	Clovis, CA 93612	
CONTACT PERSON:	Sergeant Jim Munro	**EMAIL:** jamesm@ci.clovis.ca.us
PHONE #:	559-234-2594	**FAX #:**
Department Name:	Police and Fire Department	
Approximate County (Agency) Population:	109,691	
Number of Departments:	2	
General Description of Scope of Work:	P25 Digital Conventional Mixed Mode UHF\VHF System Police 5 Mixed Mode Channels-7 sites system Fire 2 Analog Conventional Voting Channels-2 sites 258 APX Radios Connected to Zetron Consoles Project commencement: May 2015 Project completion: February 22, 2016 Project acceptance: February 22, 2016 Value of project: $ 1,577,250.00 The Motorola team consisting of but not limited to Project Manager, Systems Integration Specialist, Systems Engineer, Systems Technologist and Customer Service Manager worked to implement the customers goals on schedule and on budget to provide an updated system and improve coverage within the City of Clovis.	

REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	Placer County	
STREET ADDRESS:	2986 Richardson Drive	
CITY, STATE, ZIP:	Auburn, CA, 95603	
CONTACT PERSON:	Aaron Miller IT Supervisor	**EMAIL:**Admiller@placer.ca.gov
PHONE #:	Office: 530-889-7743 Mobile: 530-305-2230	**FAX #:**
Department Name:	Information Technology Services	
Approximate County (Agency) Population:	375, 391	
Number of Departments:	7 - Sheriff's Department, District Attorney, Probation, Health and Human Services, EOS, Transit and Animal Control.	
General Description of Scope of Work:	VHF P25 Trunking System • 2 cell simulcast with 6 sites and 3 sites respectively and a single 4 channel ASR site • 8 position MCC 7500 consoles w\M-Core • 1300 total radios made up mostly of APX subscribers. The Motorola Project Team was able to offer a Phased Approach for this customer. The customer implemented their next generation radio system over a period of time as funding became available as a part of this phased approach. Motorola's equipment met and exceeded the customers' goals and objectives of system reliability, increased and more reliable coverage as well as the equipment being durable enough to withstand the elements of the Sierra Nevada and surrounding foothills. Project commencement: 2014 Project completion: 2016 Project acceptance: County has accepted all installed equipment and continues to expand on their site build out plans. Total Value: $ 7,000,000.00	

REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	City of Visalia Police Department	
STREET ADDRESS:	420 West Burke Street	
CITY, STATE, ZIP:	Visalia, CA 93292	
CONTACT PERSON:	Veronica McDermott	**EMAIL:** Veronica.Mcdermott@visalia.city
PHONE #:	559-713-4230	**FAX #:**
Department Name:	Police & Fire Departments	
Approximate County (Agency) Population:	130,000	
Number of Departments:	2	
General Description of Scope of Work:	Upgraded existing Motorola legacy analog conventional system to P25 Mixed Mode Conventional Standalone UHF/VHF w/MCC 7500 consoles. • ASTRO25 K-core, three channel, mixed-mode K-core master site with a prime site. • The remote sites consist of two transmit/receive sites and five receive-only sites. • 9 MCC7500 dispatch console positions and a K core. Project commencement: 8-4-2015 Project completion: 12-13-2017 Project acceptance: 12-13-2017 Contract amount: $ 1,905,335.00 The Motorola team consisting of but not limited to Project Manager, Systems Integration Specialist, Systems Engineer, Systems Technologist and Customer Service Manager worked to implement the customers	

	goals on schedule and on budget to provide an updated system and improve coverage within the City of Visalia.

REQUEST FOR PROPOSALS – NO. 18-100-COMM
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT E – REFERENCE DATA SHEET
(Submit with Proposal)

REQUEST FOR PROPOSALS – NO. 18-100-COMM REFERENCE DATA SHEET 4-5		
Provide a minimum of three (3) references with name, address, contact person, and telephone number whose scope of business or services is similar to those of the County of Humboldt (preferably in California). Previous business with the County of Humboldt does not qualify.		
NAME OF AGENCY:	Pierce County	
STREET ADDRESS:	2501 S. 35th Street	
CITY, STATE, ZIP:	Tacoma, WA 98409-7405	
CONTACT PERSON:	Tim Lenk	**EMAIL:** Tlenk@co.pierce.wa.us
PHONE #:	Office - 253-798-7011 Cell – 253-377-2670	**FAX #:**
Department Name:	Emergency Management	
Approximate County (Agency) Population:	843, 954	
Number of Departments:	Pierce County Sheriff, Pierce County Fire, Department of Emergency Management and multiple rural departments	
General Description of Scope of Work:	Pierce County has implemented a Motorola VHF conventional simulcast overlay system in the County consisting of 4 VHF Channels and a total of 10 RF sites. Contract value: $ 3.5 million Project start: 2015 Project completion: May 2018 Project Acceptance: May 2018 In addition, this customer had purchased and implemented a County-wide 700 MHz P25 Phase II TDMA Motorola trunked system. This system consists of 3 simulcast cells and multiple repeater sites totaling approximately 16 RF tower sites. They have 20 Motorola MCC7500 dispatch consoles and over 2000 Motorola APX subscribers. Contract value: $26 million	

	For both systems, a detailed design review was done to ensure that project implemented would cover project needs. Best practices were discussed and lessons learned from other local systems were applied. Extensive training was provided to the end users and system administration team to ensure their operational needs and expectations were being addressed. Motorola provided the installation, programming, optimization and testing of the network. The Motorola team consisting of but not limited to Project Manager, Systems Integration, Systems Engineer, Systems Technologist and Customer Service Manager worked to implement the customers goals of schedule, budget and functionality to deliver the system.

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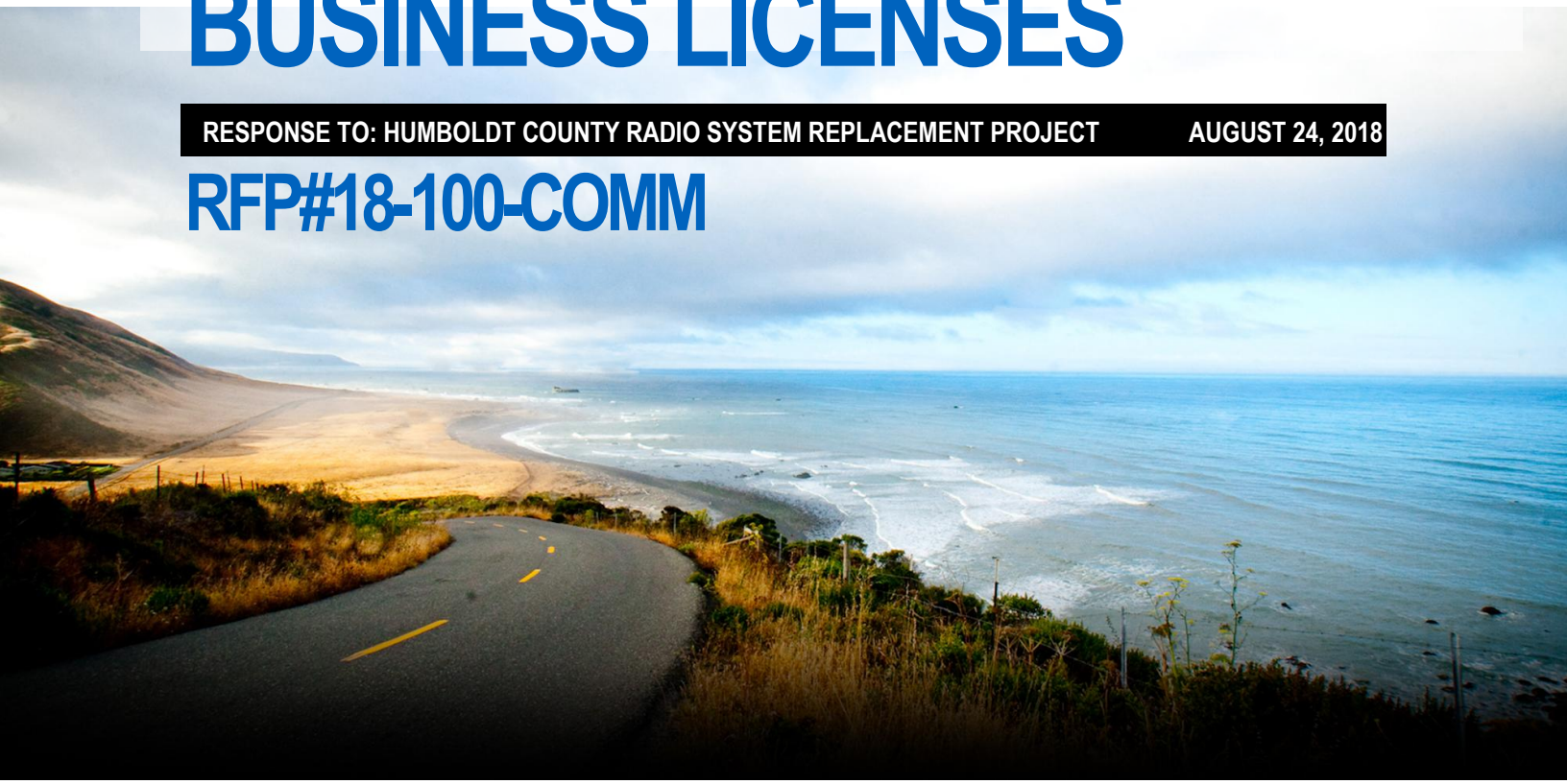
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 9
EVIDENCE OF INSURABILITY AND BUSINESS LICENSES

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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SECTION 9

EVIDENCE OF INSURABILITY AND BUSINESS LICENSES

All Proposers shall submit evidence of eligibility for all insurances set forth in Attachment H – Sample Professional Services Agreement, which is attached hereto and incorporated herein by reference. Upon award of a final Professional Services Agreement, the Successful Proposer will have ten (10) calendar days to produce certificates of the required insurance, including a certified endorsement naming the County as an additional insured. Additional insurance should not be purchased until a final Professional Services Agreement has been awarded; however, proof that the Proposer can obtain the required insurance must be provided with the Proposal. In addition, all Proposers shall certify the possession of any and all licenses and/or certifications applicable to the provision of the Radio System Package and related services set forth in this RFP.

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9.1 PROOF OF INSURANCE

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CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY) 06/07/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

Holder Identifier :

PRODUCER	CONTACT NAME:	
Aon Risk Services Central, Inc. Chicago IL Office 200 East Randolph Chicago IL 60601 USA	PHONE (A/C. No. Ext): (866) 283-7122	FAX (A/C. No.): (800) 363-0105
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Motorola Solutions, Inc. Attn: Karen Napier 500 West Monroe Chicago IL 60661 USA	INSURER A: Liberty Mutual Fire Ins Co	23035
	INSURER B: Liberty Insurance Corporation	42404
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** 570071597638 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. **Limits shown are as requested**

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY / PRO-JECT / LOC OTHER:			TB2641005169078	07/01/2018	07/01/2019	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$2,000,000 $250,000 $10,000 $2,000,000 $3,000,000 $2,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY			AS2-641-005169-018	07/01/2018	07/01/2019	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$1,000,000
	UMBRELLA LIAB / OCCUR EXCESS LIAB / CLAIMS-MADE DED / RETENTION						EACH OCCURRENCE AGGREGATE	
B B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N / N/A If yes, describe under DESCRIPTION OF OPERATIONS below			WA764D005169088 All Other States WC7641005169098 WI	07/01/2018 07/01/2018	07/01/2019 07/01/2019	X PER STATUTE / OTH-ER E.L. EACH ACCIDENT E.L. DISEASE-EA EMPLOYEE E.L. DISEASE-POLICY LIMIT	 $1,000,000 $1,000,000 $1,000,000

Certificate No : 570071597638

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Evidence of Insurance.

CERTIFICATE HOLDER	CANCELLATION
Motorola Solutions, Inc. 500 West Monroe Chicago IL 60661 USA	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Aon Risk Services Central, Inc.

ACORD 25 (2016/03)

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9.2 BUSINESS LICENSE

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Business License
County of Humboldt
Eureka, California

LICENSE NUMBER
10871

MOTOROLA SOLUTIONS, INC.
BILL VLAHANDREAS
1001 BAYHILL DR STE 261
SAN BRUNO CA 94066-3062

This License is issued to:

Business Name: **MOTOROLA SOLUTIONS, INC.**

Owner Name(s): Contact - BILL VLAHANDREAS

This License Valid Only at the Following Locations(s)

500 W MONROE ST FL 44TAX
CHICAGO, IL 60661-3671

Type of business activity to be transacted:

LAND MOBILE RADIO, PUBLIC SAFETY APPLICATIONS & SERVICES

TYPE	ISSUED	EXPIRES
Special	08/16/2018	08/01/2019

JOHN BARTHOLOMEW, License Collector

CHERYL DILLINGHAM, Interim Auditor - Controller

This License Must Be Displayed in Public View

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MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 10
EXCEPTIONS, OBJECTIONS AND REQUESTED CHANGES

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM

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SECTION 10

EXCEPTIONS, OBJECTIONS AND REQUESTED CHANGES

In this section of Motorola's proposal, we have included:

- A list of our exceptions in the compliance matrix
- Redline to Humboldt County's Professional Services Agreement.
- Motorola's Communications System and Services Agreement (CSSA).

Motorola would like to suggest that the CSSA be an Exhibit to Humboldt County's Professional Services Agreement.

10.1 LIST OF EXCEPTIONS IN COMPLIANCE MATRIX

Motorola's completed compliance matrix is included in Section 11, and a detailed description of our proposed solution is included in Section 5. Below are Motorola's exceptions from the compliance matrix.

Sec	Section Description	Priority	Proposer Response	Comments
2.7.3	Accounting Management	Low	1	An application for user radios statistics is not included, and user radios can be monitored via a communications service monitor.
2.7.4	Performance Management	Low	1	With conventional, subscribers are not enabled or affiliated to a radio system database to perform the described performance management.

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10.2 REDLINED ATTACHMENT F - SAMPLE PROFESSIONAL SERVICES AGREEMENT- HUMBOLDT CO.

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REQUEST FOR PROPOSALS – NO. 18-100-COMM]
HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT

ATTACHMENT F – SAMPLE PROFESSIONAL SERVICES AGREEMENT

PROFESSIONAL SERVICES AGREEMENT
BY AND BETWEEN
COUNTY OF HUMBOLDT
AND
[NAME OF CONTRACTOR]
FOR FISCAL YEARS [20__-20__] THROUGH [20__-20__]

This Agreement, entered into this ____ day of _____, 20[__], by and between the County of Humboldt, a political subdivision of the State of California, hereinafter referred to as "COUNTY," and [Name of Contractor], a [Name of State] [type of business], hereinafter referred to as "CONTRACTOR," is made upon the following considerations:

WHEREAS, COUNTY, by and through its [Name of Department] – [Name of Division], desires to retain the services of a qualified professional to [general description of the services being provided]; and

WHEREAS, such work involves the performance of professional, expert and technical services of a temporary and occasional character; and

WHEREAS, COUNTY has no employees available to perform such services and is unable to hire employees for the performance thereof for the temporary period; and

WHEREAS, CONTRACTOR represents that it is adequately trained, skilled, experienced and qualified to perform the services required by COUNTY.

NOW THEREFORE, the parties hereto mutually agree as follows:

1. DESCRIPTION OF SERVICES:

   CONTRACTOR agrees to furnish the services described in Exhibit A – Scope of Services, which is attached hereto and incorporated herein by reference. In providing such services, CONTRACTOR agrees to fully cooperate with the [Title of Department Head or Division Director] or designee thereof, hereinafter referred to as ["Short Title for Department Head or Division Director"].

2. TERM:

   This Agreement shall begin upon execution by both parties and shall remain in full force and effect until [_____ __, 20__], unless sooner terminated as provided herein.

OR

2. TERM:

This Agreement shall begin on [_____ __, 20__] and shall remain in full force and effect until [_____ __, 20__], unless sooner terminated as provided herein.

/ / / /

3. TERMINATION:

A. Breach of Contract. If, in the opinion of COUNTY, CONTRACTOR fails to adequately perform the services required hereunder within the time limits specified herein, or otherwise fails to comply with the terms of this Agreement, or violates any ordinance, regulation or other law applicable to its performance herein, COUNTY may terminate this Agreement ~~immediately, upon notice.~~, upon thirty days' written notice outlining the alleged breach or violations. If the alleged breach is not reasonably curable within thirty (30) days, CONTRACTOR will provide a mutually agreeable written cure plan and COUNTY may not terminate the Agreement during the cure plan unless CONTRACTOR fails to timely perform the cure plan.

B. Without Cause. COUNTY may terminate this Agreement without cause upon thirty (30) days advance written notice. Such notice shall state the effective date of the termination.

C. Insufficient Funding. COUNTY's obligations under this Agreement are contingent upon the availability of local, state and/or federal funds. In the event such funding is reduced or eliminated, COUNTY shall, at its sole discretion, determine whether this Agreement shall be terminated. COUNTY shall provide CONTRACTOR seven (7) days advance written notice of its intent to terminate this Agreement due to insufficient funding.

D. Compensation Upon Termination. In the event this Agreement is terminated, CONTRACTOR shall be entitled to compensation for uncompensated services rendered pursuant to the terms and conditions of this Agreement through and including the effective date of such termination. However, this provision shall not limit or reduce any damages owed to COUNTY due to a breach of this Agreement by CONTRACTOR.

4. COMPENSATION:

A. Maximum Amount Payable. The maximum amount payable by COUNTY for services rendered, and costs and expenses incurred, pursuant to the terms and conditions of this Agreement is [_____] Dollars ($__,___.__). CONTRACTOR agrees to perform all services required by this Agreement for an amount not to exceed such maximum dollar amount. However, if local, state or federal funding or allowance rates are reduced or eliminated, COUNTY may, by amendment, revise the Scope of Services and reduce the maximum amount

payable for services provided hereunder, or terminate this Agreement as provided herein.

B. Schedule of Rates. The specific rates and costs applicable to this Agreement are set forth in Exhibit B – Schedule of Rates, which is attached hereto and incorporated herein by reference.

C. Additional Services. Any additional services not otherwise provided for herein shall not be provided by CONTRACTOR, or compensated by COUNTY, without written authorization by COUNTY. All unauthorized costs and expenses incurred above the maximum payable amount set forth herein shall be the responsibility of CONTRACTOR. CONTRACTOR shall notify COUNTY, in writing, at least six (6) weeks prior to the date upon which CONTRACTOR estimates that the maximum payable amount will be reached.

5. PAYMENT:

CONTRACTOR shall submit to COUNTY [annual/quarterly/monthly] invoices itemizing all services rendered, and costs and expenses incurred, pursuant to the terms and conditions of this Agreement. Invoices shall be in a format approved by, and shall include backup documentation as specified by, [Short title of Department Head or Division Director] and the Humboldt County Auditor-Controller. CONTRACTOR shall submit a final invoice for payment within thirty (30) days following the expiration or termination date of this Agreement. Payment for services rendered, and costs and expenses incurred, pursuant to the terms and conditions of this Agreement will be made within thirty (30) days after the receipt of approved invoices. All invoices shall be sent to COUNTY at the following address:

COUNTY: [Name of Department] – [Name of Division]
Attention: [Name of Contact Person], [Job Title]
[Street Address]
[City, State Zip Code]

6. NOTICES:

Any and all notices required to be given pursuant to the terms of this Agreement shall be in writing and either served personally or sent by certified mail, return receipt requested, to the respective addresses set forth below. Notice shall be effective upon actual receipt or refusal as shown on the receipt obtained pursuant to the foregoing.

COUNTY: [Name of Department] – [Name of Division]
Attention: [Name of Contact Person], [Job Title]
[Street Address]
[City, State Zip Code]

CONTRACTOR: [Name of Contractor]
Attention: [Name of Contact Person], [Job Title]

[Street Address]
[City, State Zip Code]

7. REPORTS:

CONTRACTOR agrees to provide COUNTY with any and all reports that may be required by local, state and/or federal agencies for compliance with this Agreement. Reports shall be submitted no later than fifteen (15) days after the end of each calendar quarter using the format required by the State of California as appropriate.

8. RECORD RETENTION AND INSPECTION:

A. Maintenance and Preservation of Records. CONTRACTOR agrees to timely prepare accurate and complete financial, performance and payroll records, documents and other evidence relating to the services provided pursuant to the terms and conditions of this Agreement, and to maintain and preserve said records for at least three (3) years from the date of final payment hereunder, except that if any litigation, claim, negotiation, audit or other action is pending, the records shall be retained until completion and resolution of all issues arising therefrom. Such records shall be original entry books with a general ledger itemizing all debits and credits for the services provided pursuant to the terms and conditions of this Agreement.

B. Inspection of Records. Pursuant to California Government Code Section 8546.7, all pertinent records, documents, conditions and activities of CONTRACTOR, and its subcontractors, related to the services provided pursuant to the terms and conditions of this Agreement, shall be subject to the examination and audit of the California State Auditor and any other duly authorized agents of the State of California for a period of three (3) years after the date of final payment hereunder. CONTRACTOR hereby agrees to make all such records available during normal business hours to inspection, audit and reproduction by COUNTY and any other duly authorized local, state and/or federal agencies. CONTRACTOR further agrees to allow interviews of any of its employees who might reasonably have information related to such records by COUNTY and any other duly authorized local, state and/or federal agencies. All examinations and audits conducted hereunder shall be strictly confined to those matters connected with the performance of this Agreement, including, without limitation, the costs of administering this Agreement.

C. Audit Costs. In the event of an audit exception or exceptions related to the services provided pursuant to the terms and conditions of this Agreement, the party responsible for not meeting the requirements set forth herein shall be responsible for the deficiency and for the cost of the audit. If the allowable expenditures cannot be determined because CONTRACTOR's documentation is nonexistent or inadequate, according to generally accepted accounting practices, the questionable cost shall be disallowed by COUNTY.

9. MONITORING:

CONTRACTOR agrees that COUNTY has the right to monitor all activities related to this Agreement, including, without limitation, the right to review and monitor CONTRACTOR's records, programs or procedures, at any time, as well as the overall operation of CONTRACTOR's programs, in order to ensure compliance with the terms and conditions of this Agreement. CONTRACTOR will cooperate with a corrective action plan, if deficiencies in CONTRACTOR's records, programs or procedures are identified by COUNTY. However, COUNTY is not responsible, and will not be held accountable, for overseeing or evaluating the adequacy of CONTRACTOR's performance hereunder.

10. CONFIDENTIAL INFORMATION:

A. Disclosure of Confidential Information. In the performance of this Agreement, CONTRACTOR may receive information that is confidential under local, state or federal law. CONTRACTOR hereby agrees to protect all confidential information in conformance with any and all applicable local, state and federal laws, regulations, policies, procedures and standards, including, but not limited to: California Welfare and Institutions Code Sections 827, 5328, 10850 and 14100.2; California Health and Safety Code Sections 1280.15 and 1280.18; the California Information Practices Act of 1977; the California Confidentiality of Medical Information Act ("CMIA"); the United States Health Information Technology for Economic and Clinical Health Act ("HITECH Act"); the United States Health Insurance Portability and Accountability Act of 1996 ("HIPAA") and any current and future implementing regulations promulgated thereunder, including, without limitation, the Federal Privacy Regulations contained in Title 45 of the Code of Federal Regulations ("C.F.R.") Parts 160 and 164, the Federal Security Standards contained in 45 C.F.R. Parts 160, 162 and 164 and the Federal Standards for Electronic Transactions contained in 45 C.F.R. Parts 160 and 162, all as may be amended from time to time.

B. Continuing Compliance with Confidentiality Laws. The parties acknowledge that local, state and federal laws, regulations and standards pertaining to confidentiality, electronic data security and privacy are rapidly evolving and that amendment of this Agreement may be required to ensure compliance with such developments. Each party agrees to promptly enter into negotiations concerning an amendment to this Agreement embodying written assurances consistent with the standards and requirements of HIPAA, the HITECH Act, the CMIA and any other applicable local, state and federal laws, regulations or standards.

11. NON-DISCRIMINATION COMPLIANCE:

A. Professional Services and Employment. In connection with the execution of this Agreement, CONTRACTOR, and its subcontractors, shall not unlawfully discriminate in the provision of professional services or against any employee or applicant for employment because of race, religion or religious creed, color, age (over forty (40) years of age), sex (including gender identity and expression, pregnancy, childbirth and related medical conditions), sexual orientation (including heterosexuality, homosexuality and bisexuality), national origin, ancestry, marital status, medical

condition (including cancer and genetic characteristics), mental or physical disability (including HIV status and AIDS), political affiliation, military service, denial of family care leave or any other classifications protected by local, state or federal laws or regulations. Nothing herein shall be construed to require the employment of unqualified persons.

B. Compliance with Anti-Discrimination Laws. CONTRACTOR further assures that it, and its subcontractors, will abide by the applicable provisions of: Title VI and Title VII of the Civil Rights Act of 1964; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975; the Food Stamp Act of 1977; Title II of the Americans with Disabilities Act of 1990; the California Fair Employment and Housing Act; California Civil Code Sections 51, et seq.; California Government Code Sections 4450, et seq.; California Welfare and Institutions Code Section 10000; Division 21 of the California Department of Social Services Manual of Policies and Procedures; United States Executive Order 11246, as amended and supplemented by United States Executive Order 11375 and 41 C.F.R. Part 60; and any other applicable local, state and/or federal laws and regulations, all as may be amended from time to time. The applicable regulations of the California Fair Employment and Housing Commission implementing California Government Code Section 12990, set forth in Chapter 5, Division 4 of Title 2 of the California Code of Regulations are incorporated into this Agreement by reference and made a part hereof as if set forth in full.

12. NUCLEAR FREE HUMBOLDT COUNTY ORDINANCE COMPLIANCE:

CONTRACTOR certifies by its signature below that it is not a Nuclear Weapons Contractor, in that CONTRACTOR is not knowingly or intentionally engaged in the research, development, production or testing of nuclear warheads, nuclear weapons systems or nuclear weapons components, as defined by the Nuclear Free Humboldt County Ordinance. CONTRACTOR agrees to notify COUNTY immediately if it becomes a Nuclear Weapons Contractor as defined above. COUNTY may immediately terminate this Agreement if it determines that the foregoing certification is false or if CONTRACTOR subsequently becomes a Nuclear Weapons Contractor.

13. DRUG-FREE WORKPLACE CERTIFICATION:

By executing this Agreement, CONTRACTOR certifies that it will comply with the requirements of the Drug-Free Workplace Act of 1990 (California Government Code Sections 8350, et seq.) and will provide a drug-free workplace by doing all of the following:

A. Drug-Free Policy Statement. Publish, as required by California Government Code Section 8355(a)(1), a Drug-Free Policy Statement which notifies employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited, and specifies the actions to be taken against employees for violations.

B. Drug-Free Awareness Program. Establish, as required by California Government Code Section 8355(a)(2), a Drug-Free Awareness Program which informs employees about the following:

1. The dangers of drug abuse in the workplace;

2. CONTRACTOR's policy of maintaining a drug-free workplace;

3. Any available counseling, rehabilitation and employee assistance programs; and

4. Penalties that may be imposed upon employees for drug abuse violations.

C. Drug-Free Employment Agreement. Ensure, as required by California Government Code Section 8355(a)(3), that every employee who provides services pursuant to the terms and conditions of this Agreement will:

1. Receive a copy of CONTRACTOR's Drug-Free Policy Statement; and

2. Agree to abide by CONTRACTOR's Drug-Free Policy as a condition of employment.

D. Effect of Noncompliance. Failure to comply with the above-referenced requirements may result in suspension of payments under this Agreement and/or termination thereof, and CONTRACTOR may be ineligible for award of future contracts if COUNTY determines that the foregoing certification is false or if CONTRACTOR violates the certification by failing to carry out the above-referenced requirements.

14. INDEMNIFICATION:

A. Hold Harmless, Defense and Indemnification. CONTRACTOR shall hold harmless, defend and indemnify COUNTY and its agents, officers, officials, employees and volunteers from and against any and all claims, demands, losses, damages, liabilities, expenses and costs of any kind or nature, including, without limitation, attorney's fees and other costs of litigation, to the extent arising out of, or in connection with, CONTRACTOR's negligent performance of, or failure to comply with, any of the duties and/or obligations contained herein, except such loss or damage which was caused by the sole negligence or willful misconduct of COUNTY.

B. Effect of Insurance. Acceptance of the insurance required by this Agreement shall not relieve CONTRACTOR from liability under this provision. This provision shall apply to all claims for damages related to CONTRACTOR's performance hereunder regardless of whether any insurance is applicable or not. The insurance policy limits set forth herein shall not act as a limitation upon the amount of indemnification or defense to be provided hereunder.

15. INSURANCE REQUIREMENTS:

~~This Agreement shall not be executed by COUNTY, and CONTRACTOR is not entitled to any rights hereunder~~Work Performance shall not commence, unless certificates of insurance, or other proof that the following provisions have been complied with, are filed with the Clerk of the Humboldt County Board of Supervisors.

A. General Insurance Requirements. Without limiting CONTRACTOR's indemnification obligations provided for herein, CONTRACTOR shall, and similarly shall require that all subcontractors hereunder, take out and maintain, throughout the entire period of this Agreement, and any extended term thereof, the following policies of insurance, placed with insurers authorized to do business in the State of California with a current A.M. Bests rating of no less than A: VII or its equivalent against personal injury, death and property damage which may arise from, or in connection with, the activities of CONTRACTOR and its agents, officers, directors, employees, licensees, invitees, assignees or subcontractors:

1. Comprehensive or Commercial General Liability Insurance at least as broad as Insurance Services Office Commercial General Liability Coverage (occurrence form CG 0001), in an amount of Two Million Dollars ($2,000,000.00) per occurrence for any one (1) incident, including, but not limited to, personal injury, death and property damage. If a general aggregate limit is used, such limit shall apply separately hereto or shall be twice the required occurrence limit.

2. Automobile/Motor Liability Insurance with a limit of liability ~~not less than~~of One Million Dollars ($1,000,000.00) combined single limit coverage. Such insurance shall include coverage of all owned, hired and non-owned vehicles. Said coverage shall be at least as broad as Insurance Service Offices Form Code 1 (any auto).

3. Workers' Compensation Insurance, as required by the Labor Code of the State of California, with statutory limits, and Employers Liability Insurance with a limit of ~~no less than~~ One Million Dollars ($1,000,000.00) per accident for bodily injury or disease. Said policy shall contain, or be endorsed to contain, a waiver of subrogation against COUNTY and its agents, officers, officials, employees and volunteers.

4. Professional Liability Insurance – Error and Omission Coverage including coverage in an amount ~~no less than~~of Two Million Dollars ($2,000,000.00) for each ~~occurrence~~ claim(Four Million Dollars ($4,000,000.00) general aggregate). Said insurance shall be maintained for the statutory period during which CONTRACTOR may be exposed to liability. CONTRACTOR shall require that such coverage be incorporated into its professional services agreements with any other entities.

B. Special Insurance Requirements. Said policies shall, unless otherwise specified herein, be endorsed with the following provisions:

1. The Comprehensive or Commercial General Liability Policy shall provide that COUNTY, and its agents, officers, officials, employees and volunteers, are covered as additional insured for liability arising out of the operations performed by, or on behalf of, CONTRACTOR. The coverage shall contain no special limitations on the scope of protection afforded to COUNTY or its agents, officers, officials, employees and volunteers. Said policy shall also contain a provision stating that such coverage:

    a. Includes contractual liability.

    b. Does not contain exclusions as to loss or damage to property caused by explosion or resulting from collapse of buildings or structures or damage to property underground, commonly referred to as "XCU Hazards."

    c. Is the primary insurance with regard to COUNTY.

    d. Does not contain a pro-rata, excess only and/or escape clause.

    e. Contains a cross liability, severability of interest or separation of insureds clause.

2. The above-referenced policies shall not be canceled, non-renewed or materially reduced in coverage without thirty (30) days prior written notice being provided to COUNTY in accordance with the notice provisions set forth herein. It is further understood that CONTRACTOR shall not terminate such coverage until COUNTY receives adequate proof that equal or better insurance has been secured.

3. The inclusion of more than one (1) insured shall not operate to impair the rights of one (1) insured against another insured, and the coverage afforded shall apply as though separate policies had been issued to each insured, but the inclusion of more than one (1) insured shall not operate to increase the limits of the insurer's liability.

4. For claims related to this Agreement, CONTRACTOR's insurance is the primary coverage to COUNTY~~, and any insurance or self-insurance programs maintained thereby are excess to CONTRACTOR's insurance and will not be used to contribute therewith~~.

5. Any failure to comply with the provisions of this Agreement shall not affect coverage provided to COUNTY or its agents, officers, officials, employees and volunteers.

6. CONTRACTOR shall furnish COUNTY with certificates and ~~original~~blanket endorsements effecting the required coverage prior to execution of this Agreement. The endorsements shall be on ~~forms approved by the Humboldt~~

~~County Risk Manager or County Counsel. Any deductible or self-insured retention over One Hundred Thousand Dollars ($100,000.00) shall be disclosed to, and approved by, COUNTY. If CONTRACTOR does not keep all required policies in full force and effect, COUNTY may, in addition to other available remedies, take out the necessary insurance, and CONTRACTOR agrees to pay the cost thereof. COUNTY is also hereby authorized with the discretion to deduct the cost of said insurance from the monies owed to CONTRACTOR under this Agreement.~~industry standard forms. Any deductible shall be responsibility of Contractor.

7. COUNTY is to be notified immediately if twenty-five percent (25%) or more of any required insurance aggregate limit is encumbered, and CONTRACTOR shall be required to purchase additional coverage to meet the above-referenced aggregate limits.

C. Insurance Notices. Any and all insurance notices required to be given pursuant to the terms of this Agreement shall be sent to the addresses set forth below in accordance with the notice provisions described herein.

COUNTY: County of Humboldt
Attention: Risk Management
825 Fifth Street, Room 131
Eureka, California 95501

CONTRACTOR: [Name of Contractor]
Attention: [Name of Contact Person], [Job Title]
[Street Address]
[City, State Zip Code]

16. RELATIONSHIP OF PARTIES:

It is understood that this Agreement is by and between two (2) independent entities and is not intended to, and shall not be construed to, create the relationship of agent, servant, employee, partnership, joint venture or any other similar association. Both parties further agree that CONTRACTOR shall not be entitled to any benefits to which COUNTY employees are entitled, including, but not limited to, overtime, retirement benefits, leave benefits or workers' compensation. CONTRACTOR shall be solely responsible for the acts or omissions of its agents, officers, employees, assignees and subcontractors.

17. COMPLIANCE WITH APPLICABLE LAWS AND LICENSURE REQUIREMENTS:

CONTRACTOR agrees to comply with any and all local, state and federal laws, regulations, policies and procedures applicable to the services provided pursuant to the terms and conditions of this Agreement. CONTRACTOR further agrees to comply with any and all applicable local, state and federal licensure and certification requirements. CONTRACTOR will be entitled to seek a change order to the extent CONTRACTOR

provides documentary evidence that any change in federal or state constitutions, laws, rules, codes, orders, and regulations, including applicable licensure and certification requirements, increases the cost to perform this Agreement.

18. PROVISIONS REQUIRED BY LAW:

This Agreement is subject to any additional local, state and federal restrictions, limitations, or conditions that may affect the provisions, terms or funding of this Agreement. This Agreement shall be read and enforced as though all legally required provisions are included herein, and if for any reason any such provision is not included, or is not correctly stated, the parties agree to amend the pertinent section to make such insertion or correction.

19. REFERENCE TO LAWS AND RULES:

In the event any law, regulation or standard referred to in this Agreement is amended during the term hereof, the parties agree to comply with the amended provision as of the effective date thereof.

20. SEVERABILITY:

If any provision of this Agreement, or any portion thereof, is found by any court of competent jurisdiction to be unenforceable or invalid for any reason, such provision shall be severable and shall not in any way impair the enforceability of any other provision of this Agreement.

21. ASSIGNMENT:

Neither party shall delegate its duties nor assign its rights hereunder, either in whole or in part, without the other party's prior written consent. Any assignment by CONTRACTOR in violation of this provision shall be void, and shall be cause for immediate termination of this Agreement. This provision shall not be applicable to service agreements or other arrangements usually or customarily entered into by either party to obtain supplies, technical support or professional services.

22. AGREEMENT SHALL BIND SUCCESSORS:

All provisions of this Agreement shall be fully binding upon, and inure to the benefit of, the parties and to each of their heirs, executors, administrators, successors and permitted assigns.

23. WAIVER OF DEFAULT:

The waiver by either party of any breach or violation of any requirement of this Agreement shall not be deemed to be a waiver of any such breach in the future, or of the breach of any other requirement of this Agreement. In no event shall any payment by COUNTY constitute a waiver of any breach of this Agreement or any default which may then exist on

the part of CONTRACTOR. Nor shall such payment impair or prejudice any remedy available to COUNTY with respect to any breach or default. COUNTY shall have the right to demand repayment of, and CONTRACTOR shall promptly refund, any funds disbursed to CONTRACTOR which COUNTY determines were not expended in accordance with the terms of this Agreement.

24. NON-LIABILITY OF COUNTY OFFICIALS AND EMPLOYEES:

No official or employee of COUNTY shall be personally liable for any default or liability under this Agreement.

25. AMENDMENT:

This Agreement may be amended at any time during the term of this Agreement upon the mutual consent of both parties. No addition to, or alteration of, the terms of this Agreement shall be valid unless made in writing and signed by the parties hereto.

26. STANDARD OF PRACTICE:

CONTRACTOR warrants that it has the degree of learning and skill ordinarily possessed by reputable professionals practicing in similar localities in the same profession and under similar circumstances. CONTRACTOR's duty is to exercise such care, skill and diligence as professionals engaged in the same profession ordinarily exercise under like circumstances.

27. TITLE TO INFORMATION AND DOCUMENTS:

It is understood that any and all documents, information and reports concerning the subject matter of this Agreement prepared and/or submitted by CONTRACTOR shall become the property of COUNTY. However, CONTRACTOR may retain copies of such documents and information for its records. In the event this Agreement is terminated, for any reason whatsoever, CONTRACTOR shall promptly turn over all such information, writings and documents to COUNTY without exception or reservation. Notwithstanding the foregoing, CONTRACTOR shall retain all ownership rights to its Proprietary Materials. "Proprietary Materials" means certain software tools and/or other technical materials, including, but not limited to, data, modules, components, designs, utilities, subsets, objects, program listings, models, methodologies, programs, systems, analysis frameworks, leading practices and specifications which CONTRACTOR has developed prior to, or independently from, the provision of the services under this Agreement and/or which CONTRACTOR licenses from third parties.

28. JURISDICTION AND VENUE:

This Agreement shall be construed in accordance with the laws of the State of California. Any dispute arising hereunder, or relating hereto, shall be litigated in the State of California and venue shall lie in the County of Humboldt unless transferred by court order pursuant to

California Code of Civil Procedure Sections 394 or 395.

29. ADVERTISING AND MEDIA RELEASE:

All informational material related to this Agreement shall receive approval from COUNTY prior to being used as advertising or released to the media, including, but not limited to, television, radio, newspapers and internet. CONTRACTOR shall inform COUNTY of all requests for interviews by the media related to this Agreement before such interviews take place; and COUNTY shall be entitled to have a representative present at such interviews. All notices required by this provision shall be given to [Short title of Department Head or Division Director].

30. SUBCONTRACTS:

CONTRACTOR shall obtain prior written approval from COUNTY before subcontracting any of the services to be provided pursuant to the terms and conditions of this Agreement. Any and all subcontracts shall be subject to all applicable terms and conditions of this Agreement, including, without limitation, the licensing, certification and confidentiality requirements set forth herein. CONTRACTOR shall remain legally responsible for the performance of all terms and conditions of this Agreement, including work performed by third parties under subcontracts, whether approved by COUNTY or not.

31. ATTORNEYS' FEES:

If either party shall commence any legal action or proceeding, including an action for declaratory relief, against the other by reason of the alleged failure of the other to perform or keep any provision of this Agreement to be performed or kept, the party prevailing in said action or proceeding shall be entitled to recover court costs and reasonable attorneys' fees, including the reasonable value of services rendered by the Humboldt County Counsel's Office, to be fixed by the court, and such recovery shall include court costs and attorneys' fees on appeal, if applicable. As used herein, "prevailing party" means the party who dismisses an action or proceeding in exchange for payment of substantially all sums allegedly due, performance of provisions allegedly breached, or other considerations substantially equal to the relief sought by said party, as well as the party in whose favor final judgment is rendered.

32. SURVIVAL:

The duties and obligations of the parties set forth in Section [__] – Compensation Upon Termination, Section [__] – Record Retention and Inspection, Section [__] – Confidential Information and Section [__] – Indemnification shall survive the expiration or termination of this Agreement.

////

33. CONFLICTING TERMS OR CONDITIONS:

In the event of any conflict in the terms or conditions set forth in any other agreements in place between the parties hereto and the terms and conditions set forth in this Agreement, the terms and conditions set forth herein shall have priority.

34. INTERPRETATION:

This Agreement, as well as its individual provisions, shall be deemed to have been prepared equally by both of the parties hereto, and shall not be construed or interpreted more favorably for one (1) party on the basis that the other party prepared it.

35. INDEPENDENT CONSTRUCTION:

The titles of the sections and subsections set forth herein are inserted for convenience of reference only, and shall be disregarded in construing or interpreting any of the provisions of this Agreement.

36. FORCE MAJEURE:

Neither party hereto shall be liable or responsible for delays or failures in performance resulting from events beyond the reasonable control of such party and without fault or negligence of such party. Such events shall include, without limitation, acts of God, strikes, lockouts, riots, acts of war, epidemics, acts of government, fire, power failures, nuclear accidents, earthquakes, unusually severe weather, acts of terrorism or other disasters, whether or not similar to the foregoing.

37. ENTIRE AGREEMENT:

~~This Agreement~~This Agreement, in addition to terms and conditions set forth in CONTRACTOR's Communications System and Services Agreement, contains all of the terms and conditions agreed upon by the parties hereto and no other agreements, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind either of the parties hereto. In addition, this Agreement shall supersede in their entirety any and all prior agreements, promises, representations, understandings and negotiations of the parties, whether oral or written, concerning the same subject matter. Any and all acts which may have already been consummated pursuant to the terms and conditions of this Agreement ~~are hereby~~arehereby ratified.

County: Because the County contract is limited to Professional Services, Motorola has included its CSSA which is specific to the sale of communication systems and software.

38. AUTHORITY TO EXECUTE:

Each person executing this Agreement represents and warrants that he or she is duly authorized and has legal authority to execute and deliver this Agreement. Each party represents and warrants to the other that the execution and delivery of this Agreement and the performance of such party's obligations hereunder have been duly authorized.

[Signatures of Following Page]

IN WITNESS WHEREOF, the parties have entered into this Agreement as of the first date written above.

TWO SIGNATURES ARE REQUIRED FOR CORPORATIONS:
(1) CHAIRPERSON OF THE BOARD, PRESIDENT, OR VICE PRESIDENT; AND
(2) SECRETARY, ASSISTANT SECRETARY, CHIEF FINANCIAL OFFICER OR TREASURER.

[CONTRACTOR'S NAME]:

By: _____ Date: _____

Name: _____

Title: _____

By: _____ Date: _____

Name: _____

Title: _____

COUNTY OF HUMBOLDT:

By: _____ Date: _____

[Ryan Sundberg]
Chair, Humboldt County Board of Supervisors

INSURANCE AND INDEMNIFICATION REQUIREMENTS APPROVED:

By: _____ Date: _____

Risk Management

LIST OF EXHIBITS:

Exhibit A – Scope of Services
Exhibit B – Schedule of Rates

10.3 MOTOROLA SOLUTIONS COMMUNICATIONS SYSTEM AND SERVICES AGREEMENT

Communications System And Services Agreement

(Lease)

Motorola Solutions, Inc. ("Motorola") and _____ ("Customer") enter into this "Agreement," pursuant to which Customer will purchase and Motorola will sell the System and Services, as described below. Motorola and Customer may be referred to individually as a "Party" and collectively as the "Parties." For good and valuable consideration, the Parties agree as follows:

Section 1 ATTACHMENTS

1.1. EXHIBITS. The Exhibits listed below are exhibits related to the System sale and implementation. These Exhibits are incorporated into and made a part of this Agreement.

Exhibit A "Motorola Software License Agreement"
Exhibit B "Payment"
Exhibit C Technical and Implementation Documents
- C-1 "System Description" dated _____
- C-2 "Pricing Summary & Equipment List" dated _____
- C-3 "Implementation Statement of Work" dated _____
- C-4 "Acceptance Test Plan" or "ATP" dated _____
- C-5 "Performance Schedule" dated _____

Exhibit D "System Acceptance Certificate"
Exhibit E "Equipment Lease Purchase Agreement Delivery and Acceptance Certificate"

1.2. ADDENDUM (ADDENDA). Customer may elect to purchase professional or subscription services in addition to the System and related services. Any such services will be governed by the terms in the main body of the Agreement and an applicable Addendum containing terms specific to such service. Such Addendums will be labeled with the name of the service being purchased.

1.3 ORDER OF PRECEDENCE. In interpreting this Agreement and resolving any ambiguities: 1) the main body of this Agreement takes precedence over the exhibits (unless otherwise specified in an exhibit), and any inconsistency between Exhibits A through E will be resolved in their listed order, and 2) The applicable service Addendum will take precedence over the main body of the Agreement and the Exhibits.

Section 2 DEFINITIONS

Capitalized terms used in this Agreement have the following meanings:

"Acceptance Tests" means those tests described in the Acceptance Test Plan.

"Addendum (Addenda)" is the title of the document(s) containing a specific set of terms and conditions applicable to a particular service or other offering beyond the Communication System and System implementation services. The terms in the Addendum are applicable only to the specific service or offering described therein.

"Administrative User Credentials" means an account that has total access over the operating system, files, end user accounts and passwords at either the System level or box level. Customer's personnel with access to the Administrative User Credentials may be referred to as the Administrative User.

"Beneficial Use" means when Customer first uses the System or a Subsystem for operational purposes (excluding training or testing).

"Confidential Information" means all information consistent with the fulfillment of this Agreement that is (i) disclosed under this Agreement in oral, written, graphic, machine recognizable, and/or sample form, being clearly designated, labeled or marked as confidential or its equivalent or (ii) obtained by examination, testing or analysis of any hardware, software or any component part thereof provided by discloser to recipient. The nature and existence of this Agreement are considered Confidential Information. Confidential Information that is disclosed orally must be identified as confidential at the time of disclosure and confirmed by the discloser by submitting a written document to the recipient within thirty (30) days after such disclosure. The written document must contain a summary of the Confidential Information disclosed with enough specificity for identification purpose and must be labeled or marked as confidential or its equivalent.

"Contract Price" means the price for the System and implementation Services, excluding applicable sales or similar taxes and freight charges. Further, unless otherwise stated in Exhibit B, "Payment" or the pricing pages of the proposal, recurring fees for maintenance, SUA, or subscription services are not included in the Contract Price.

"Deliverables" means all written information (such as reports, specifications, designs, plans, drawings, analytics, Solution Data, or other technical or business information) that Motorola prepares for Customer in the performance of the Services and is obligated to provide to Customer under this Agreement. The Deliverables, if any, are more fully described in the Statement of Work.

"**Derivative Proprietary Materials**" means derivatives of the Proprietary Materials that Motorola may from time to time, including during the course of providing the Services, develop and/or use and/or to which Motorola provides Customer access.

"Effective Date" means that date upon which the last Party executes this Agreement.

"Equipment" means the hardware components of the Solution that Customer purchases from Motorola under this Agreement. Equipment that is part of the System is described in the Equipment List.

"Equipment Lease-Purchase Agreement" means the agreement by which Customer finances all or a portion of the Contract Price.

"**Feedback"** means comments or information, in oral or written form, given to Motorola by Customer in connection with or relating to Equipment or Services, during the term of this Agreement.

"Force Majeure" means an event, circumstance, or act that is beyond a Party's reasonable control, such as an act of God, an act of the public enemy, an act of a government entity, strikes, other labor disturbances, supplier performance, hurricanes, earthquakes, fires, floods, epidemics, embargoes, war, riots, or any other similar cause.

"Motorola Software" means software that Motorola or its affiliated companies owns.

"Non-Motorola Software" means software that a party other than Motorola or its affiliated companies owns.

"Open Source Software" (also called "freeware" or "shareware") means software with either freely obtainable source code, license for modification, or permission for free distribution.

"Proprietary Materials" means certain software tools and/or other technical materials, including, but not limited to, data, modules, components, designs, utilities, subsets, objects, program listings, models, methodologies, programs, systems, analysis frameworks, leading practices and specifications which Motorola has developed prior to, or independently from, the provision of the Services and/or which Motorola licenses from third parties.

"Proprietary Rights" means the patents, patent applications, inventions, copyrights, trade secrets, trademarks, trade names, mask works, know-how, and other intellectual property rights in and to the Equipment and Software, including those created or produced by Motorola under this Agreement and any corrections, bug fixes, enhancements, updates or modifications to or derivative works from the Software whether made by Motorola or another party.

"Services" means system implementation, maintenance, support, subscription, or other professional services provided under this Agreement, which may be further described in the applicable Addendum and/or SOW.

"Software" (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Motorola; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

"Software Support Policy" ("SwSP") means the policy set forth at http://www.motorolasolutions.com/softwarepolicy describing the specific technical support that will be provided to Customers under the Warranty Period and during any paid maintenance

support period for Motorola Software. This policy may be modified from time to time at Motorola's discretion.

"Solution" means the combination of the System(s) and Services provided by Motorola under this Agreement.

"Solution Data" means Customer data that is transformed, altered, processed, aggregated, correlated or operated on by Motorola, its vendors or other data sources and data that has been manipulated or retrieved using Motorola know-how to produce value-added content to data consumers, including customers or citizens which is made available to Customer with the Solution and Services.

"Specifications" means the functionality and performance requirements that are described in the Technical and Implementation Documents.

"SUA" means Motorola's Software Upgrade Agreement program.

"Subsystem" means a major part of the System that performs specific functions or operations. Subsystems are described in the Technical and Implementation Documents.

"System" means the Equipment, including incidental hardware and materials, Software, and design, installation and implementation services that are combined together into an integrated system; the System(s) is (are) described in the Technical and Implementation Documents.

"System Acceptance" means the Acceptance Tests have been successfully completed.

"**System Data**" means data created by, in connection with or in relation to Equipment or the performance of Services under this Agreement.

"Warranty Period" for System Hardware, Software, or services related to system implementation means one (1) year from the date of System Acceptance or Beneficial Use, whichever occurs first. Unless otherwise stated in the applicable Addendum, Warranty Period for other Services means ninety (90) days from performance of the Service.

Section 3 SCOPE OF AGREEMENT AND TERM

3.1. SCOPE OF WORK. Motorola will provide, install and test the System(s), and perform its other contractual responsibilities to provide the Solution, all in accordance with this Agreement. Customer will perform its contractual responsibilities in accordance with this Agreement.

3.2. CHANGE ORDERS. Either Party may request changes within the general scope of this Agreement. If a requested change causes an increase or decrease in the cost or time required to perform this Agreement, the Parties will agree to an equitable adjustment of the Contract Price or applicable subscription fees, Performance Schedule, or both, and will reflect the adjustment in a

change order or Addendum. Neither Party is obligated to perform requested changes unless both Parties execute a written change order.

3.3. TERM. Unless terminated in accordance with other provisions of this Agreement or extended by mutual agreement of the Parties, the term of this Agreement begins on the Effective Date and continues until the date of Final Project Acceptance or expiration of the Warranty Period, or completion of the Services, whichever occurs last. The term and the effective date of recurring Services will be set forth in the applicable Addendum.

3.4. ADDITIONAL EQUIPMENT OR SOFTWARE. For three (3) years after the expiration date of the Agreement, Customer may order additional Equipment or Software, if it is then available. Each purchase order must refer to this Agreement, the expiration date of the Agreement, and must specify the pricing and delivery terms. The Parties agree that, notwithstanding expiration of the Agreement, the applicable provisions of this Agreement (except for pricing, delivery, passage of title and risk of loss to Equipment, warranty commencement, and payment terms) will govern the purchase and sale of the additional Equipment or Software. Additional or contrary terms in the purchase order will be inapplicable, unless signed by both parties. Title and risk of loss to additional Equipment will pass at shipment, warranty will commence upon delivery, and payment is due within thirty (30) days after the invoice date. Motorola will send Customer an invoice as the additional Equipment is shipped or Software is licensed. Alternatively, Customer may register with and place orders through Motorola Online ("MOL"), and this Agreement will be the "Underlying Agreement" for those MOL transactions rather than the MOL On-Line Terms and Conditions of Sale. MOL registration and other information may be found at https://businessonline.motorolasolutions.com and the MOL telephone number is (800) 814-0601.

3.5. Motorola SOFTWARE. Any Motorola Software, including subsequent releases, is licensed to Customer solely in accordance with the Motorola Software License Agreement in Exhibit A ("Software License Agreement"). Customer hereby accepts and agrees to abide by all of the terms and restrictions of the Software License Agreement.

3.6. NON-Motorola SOFTWARE. Any Non-Motorola Software is licensed to Customer in accordance with the standard license, terms, and restrictions of the copyright owner on the Effective Date unless the copyright owner has granted to Motorola the right to sublicense the Non-Motorola Software pursuant to the Software License Agreement, in which case it applies and the copyright owner will have all of Licensor's rights and protections under the Software License Agreement. Motorola makes no representations or warranties of any kind regarding Non-Motorola Software. Non-Motorola Software may include Open Source Software.

3.7. SUBSTITUTIONS. At no additional cost to Customer, Motorola may substitute any Equipment, Software, or services to be provided by Motorola, if the substitute meets or exceeds the Specifications and is of equivalent or better quality to the Customer. Any substitution will be reflected in a change order.

3.8. OPTIONAL EQUIPMENT OR SOFTWARE. This paragraph applies only if a "Priced Options" exhibit is shown in Section 1, or if the parties amend this Agreement to add a Priced

Options exhibit. During the term of the option as stated in the Priced Options exhibit (or if no term is stated, then for one (1) year after the Effective Date), Customer has the right and option to purchase the equipment, software, and related services that are described in the Priced Options exhibit. Customer may exercise this option by giving written notice to Seller which must designate what equipment, software, and related services Customer is selecting (including quantities, if applicable). To the extent they apply, the terms and conditions of this Agreement will govern the transaction; however, the parties acknowledge that certain provisions must be agreed upon, and they agree to negotiate those in good faith promptly after Customer delivers the option exercise notice. Examples of provisions that may need to be negotiated are: specific lists of deliverables, statements of work, acceptance test plans, delivery and implementation schedules, payment terms, maintenance and support provisions, additions to or modifications of the Software License Agreement, hosting terms, and modifications to the acceptance and warranty provisions.

Section 4 SERVICES

4.1. If Customer desires and Motorola agrees to continue Services beyond the Term, Customer's issuance and Motorola's acceptance of a purchase order for Services will serve as an automatic extension of the Agreement for purposes of the continuing Services. Only the terms and conditions applicable to the performance of Services will apply to the extended Agreement.

4.2. During the Warranty Period, in addition to warranty services, Motorola will provide maintenance Services for the Equipment and support for the Motorola Software pursuant to the applicable maintenance and support Statements of Work. Support for the Motorola Software will be in accordance with Motorola's established Software Support Policy. Copies of the SwSP can be found at http://www.motorolasolutions.com/softwarepolicy and will be sent by mail, email or fax to Customer upon written request. Maintenance Services and support during the Warranty Period are included in the Contract Price. Unless already included in the Contract Price, if Customer wishes to purchase 1) additional maintenance or software support services during the Warranty Period; or 2) continue or expand maintenance, software support, installation, and/or SUA services after the Warranty Period, Motorola will provide the description of and pricing for such services in a separate proposal document. Unless otherwise agreed by the parties in writing, the terms and conditions in this Agreement applicable to maintenance, support, installation, and/or SUA Services, will be included in the Maintenance and Support Addendum, SUA Addendum, the applicable Statements of Work, and the proposal, (if applicable). These collective terms will govern the provision of such Services.

To obtain any such additional Services, Customer will issue a purchase order referring to this Agreement and the separate proposal document. Omission of reference to this Agreement in Customer's purchase order will not affect the applicability of this Agreement. Motorola's proposal may include a cover page entitled "Service Agreement" or "Installation Agreement", as applicable, and other attachments. These cover pages and other attachments are incorporated into this Agreement by this reference

4.3. PROFESSIONAL AND SUBSCRIPTION SERVICES. If Customer purchases professional or subscription Services as part of the Solution, additional or different terms specific

to such Service will be included in the applicable Addendum and will apply to those Services. Customer may purchase additional professional or subscription services by issuing a purchase order referencing this Agreement and Motorola's proposal for such additional services.

4.4. Any information in the form of specifications, drawings, reprints, technical information or otherwise furnished to Customer in providing Services under this Agreement or data viewed, accessed, will remain Motorola's property, will be deemed proprietary, Confidential Information. This Confidential Information will be promptly returned at Motorola's request.

4.5. TOOLS. All tools, equipment, dies, gauges, models, drawings or other materials paid for or furnished by Motorola for the purpose of providing Services under this Agreement will be and remain the sole property of Motorola. Customer will safeguard all such property while it is in Customer's custody or control, be liable for any loss or damage to this property, and return it to Motorola upon request. This property will be held by Customer for Motorola's use without charge and may be removed from Customer's premises by Motorola at any time without restriction. Upon termination of the contract for any reason, Customer shall return to Motorola all equipment delivered to Customer.

4.6. COVENANT NOT TO EMPLOY. During the term of this Agreement and continuing for a period of two (2) years thereafter, Customer will not hire, engage on contract, solicit the employment of, or recommend employment to any third party of any employee of Motorola or its subcontractors without the prior written authorization of Motorola. This provision applies only to those employees of Motorola or its subcontractors who are responsible for rendering Services under this Agreement. If this provision is found to be overly broad under applicable law, it will be modified as necessary to conform to applicable law.

4.7. CUSTOMER OBLIGATIONS. If the applicable Statement of Work or Addendum contains assumptions that affect the Services or Deliverables, Customer will verify that they are accurate and complete. Any information that Customer provides to Motorola concerning the Services or Deliverables will be accurate and complete in all material respects. Customer will make timely decisions and obtain any required management approvals that are reasonably necessary for Motorola to perform the Services and its other duties under this Agreement. Unless the Statement of Work states the contrary, Motorola may rely upon and is not required to evaluate, confirm, reject, modify, or provide advice concerning any assumptions and Customer-provided information, decisions and approvals described in this paragraph.

4.8. ASSUMPTIONS. If any assumptions or conditions contained in this Agreement, applicable Addenda or Statements of Work prove to be incorrect or if Customer's obligations are not performed, Motorola's ability to perform under this Agreement may be impacted and changes to the Contract Price, subscription fees, project schedule, Deliverables, or other changes may be necessary.

4.9. NON-PRECLUSION. If, as a result of the Services performed under this Agreement, Motorola recommends that Customer purchase products or other services, nothing in this Agreement precludes Motorola from participating in a future competitive bidding process or otherwise offering or selling the recommended products or other services to Customer.

Customer represents that this paragraph does not violate its procurement or other laws, regulations, or policies.

4.10. PROPRIETARY MATERIALS. Customer acknowledges that Motorola may use and/or provide Customer with access to Proprietary Materials and Derivative Proprietary Materials. The Proprietary Materials and the Derivative Proprietary Materials are the sole and exclusive property of Motorola and Motorola retains all right, title and interest in and to the Proprietary Materials and Derivative Proprietary Materials.

4.11. ADDITIONAL SERVICES. Any services performed by Motorola outside the scope of this Agreement at the direction of Customer will be considered to be additional Services which are subject to additional charges. Any agreement to perform additional Services will be reflected in a written and executed change order, Addendum or amendment to this Agreement.

Section 5 PERFORMANCE SCHEDULE

The Parties will perform their respective responsibilities in accordance with the Performance Schedule. By executing this Agreement, Customer authorizes Motorola to proceed with contract performance.

Section 6 CONTRACT PRICE, PAYMENT AND INVOICING

6.1. Customer affirms that a purchase order or notice to proceed is not required for contract performance or for subsequent years of service, if any, and that sufficient funds have been appropriated in accordance with applicable law. The Customer will pay all invoices as received from Motorola and any changes in scope will be subject to the change order process as described in this Agreement. At the time of execution of this Agreement, the Customer will provide all necessary reference information to include on invoices for payment in accordance with this Agreement.

6.2. CONTRACT PRICE. The Contract Price in U.S. dollars is $_____. The Contract Price will be paid via the disbursement of the financing proceeds pursuant to the Equipment Lease-Purchase Agreement executed between the parties. If applicable, a pricing summary is included with the Payment schedule. Motorola has priced the Services, Software, and Equipment as an integrated System. A change in Software or Equipment quantities, or Services, may affect the overall Contract Price, including discounts if applicable. Fees for professional, SUA, and/or subscription services which are not included in the Contract Price may be listed and invoiced according to the pricing pages of the proposal, Exhibit B, or the applicable Addendum. For Customer's reference, the Federal Tax Identification Number for Motorola Solutions, Inc. is 36-1115800.

6.3. FREIGHT, TITLE, AND RISK OF LOSS. Motorola will pre-pay and add all freight charges to the invoices. Unless otherwise stated in the Equipment Lease-Purchase Agreement, title and risk of loss to the Equipment will pass to Customer upon shipment. Title to Software will not pass to Customer at any time. Motorola will pack and ship all Equipment in accordance with good commercial practices.

6.5. INVOICING AND SHIPPING ADDRESSES. Invoices will be sent to the Customer at the following address:
Name:_____
_____
Address:_____
_____
Phone:_____
_____
Email:_____
_____

The address which is the ultimate destination where the Equipment will be delivered to Customer is:
Name:_____
_____
Address:_____
_____

The Equipment will be shipped to the Customer at the following address (insert if this information is known):
Name:_____
_____
Address:_____
_____
Phone:_____
_____

Customer may change this information by giving written notice to Motorola.

Section 7 SITES AND SITE CONDITIONS

7.1. ACCESS TO SITES. In addition to its responsibilities described elsewhere in this Agreement, Customer will provide a designated project manager; all necessary construction and building permits, zoning variances, licenses, and any other approvals that are necessary to develop or use the sites and mounting locations; and access to the worksites or vehicles identified in the Technical and Implementation Documents as reasonably requested by Motorola so that it may perform its duties in accordance with the Performance Schedule and Statement of Work. If the Statement of Work so indicates, Motorola may assist Customer in the local building permit process.

7.2. SITE CONDITIONS. Customer will ensure that all work sites it provides will be safe, secure, and in compliance with all applicable industry and OSHA standards. To the extent applicable and unless the Statement of Work states to the contrary, Customer will ensure that these work sites have adequate: physical space; air conditioning and other environmental conditions; adequate and appropriate electrical power outlets, distribution, equipment and

connections; and adequate telephone or other communication lines (including modem access and adequate interfacing networking capabilities), all for the installation, use and maintenance of the System. Before installing the Equipment or Software at a work site, Motorola may inspect the work site and advise Customer of any apparent deficiencies or non-conformities with the requirements of this Section. This Agreement is predicated upon normal soil conditions as defined by the version of E.I.A. standard RS-222 in effect on the Effective Date.

7.3. SITE ISSUES. If a Party determines that the sites identified in the Technical and Implementation Documents are no longer available or desired, or if subsurface, structural, adverse environmental or latent conditions at any site differ from those indicated in the Technical and Implementation Documents, the Parties will promptly investigate the conditions and will select replacement sites or adjust the installation plans and specifications as necessary. If change in sites or adjustment to the installation plans and specifications causes a change in the cost or time to perform, the Parties will equitably amend the Contract Price, Performance Schedule, or both, by a change order.

Section 8 TRAINING

Any training to be provided by Motorola to Customer will be described in the applicable Statement of Work. Customer will notify Motorola immediately if a date change for a scheduled training program is required. If Motorola incurs additional costs because Customer reschedules a training program less than thirty (30) days before its scheduled start date, Motorola may recover these additional costs.

Section 9 SYSTEM ACCEPTANCE

9.1. COMMENCEMENT OF ACCEPTANCE TESTING. Motorola will provide to Customer at least ten (10) days notice before the Acceptance Tests commence. System testing will occur only in accordance with the Acceptance Test Plan.

9.2. SYSTEM ACCEPTANCE. System Acceptance will occur upon successful completion of the Acceptance Tests. Upon System Acceptance, the Parties will memorialize this event by promptly executing a System Acceptance Certificate. If the Acceptance Test Plan includes separate tests for individual Subsystems or phases of the System, acceptance of the individual Subsystem or phase will occur upon the successful completion of the Acceptance Tests for the Subsystem or phase, and the Parties will promptly execute an acceptance certificate for the Subsystem or phase. If Customer believes the System has failed the completed Acceptance Tests, Customer will provide to Motorola a written notice that includes the specific details of the failure. If Customer does not provide to Motorola a failure notice within thirty (30) days after completion of the Acceptance Tests, System Acceptance will be deemed to have occurred as of the completion of the Acceptance Tests. Minor omissions or variances in the System that do not materially impair the operation of the System as a whole will not postpone System Acceptance or Subsystem acceptance, but will be corrected according to a mutually agreed schedule.

9.3. BENEFICIAL USE. Customer acknowledges that Motorola's ability to perform its implementation and testing responsibilities may be impeded if Customer begins using the System

before System Acceptance. Therefore, Customer will not commence Beneficial Use before System Acceptance without Motorola's prior written authorization, which will not be unreasonably withheld. Motorola is not responsible for System performance deficiencies that occur during unauthorized Beneficial Use. Upon commencement of Beneficial Use, Customer assumes responsibility for the use and operation of the System.

9.4. FINAL PROJECT ACCEPTANCE. Final Project Acceptance will occur after System Acceptance when all deliverables and other work have been completed. When Final Project Acceptance occurs, the parties will promptly memorialize this final event by so indicating on the System Acceptance Certificate (Exhibit D) and the Equipment Lease Purchase Agreement Delivery and Acceptance Certificate (Exhibit E).

Section 10 REPRESENTATIONS AND WARRANTIES

10.1. SYSTEM FUNCTIONALITY. Motorola represents that the System will perform in accordance with the Specifications in all material respects. Upon System Acceptance or Beneficial Use, whichever occurs first, this System functionality representation is fulfilled. Motorola is not responsible for System performance deficiencies that are caused by ancillary equipment not furnished by Motorola which is attached to or used in connection with the System or for reasons or parties beyond Motorola's control, such as natural causes; the construction of a building that adversely affects the microwave path reliability or radio frequency (RF) coverage; the addition of frequencies at System sites that cause RF interference or intermodulation; or Customer changes to load usage or configuration outside the Specifications.

10.2. EQUIPMENT WARRANTY. During the Warranty Period, Motorola warrants that the Equipment under normal use and service will be free from material defects in materials and workmanship. If System Acceptance is delayed beyond six (6) months after shipment of the Equipment by events or causes beyond Motorola's control, this warranty expires eighteen (18) months after the shipment of the Equipment.

10.3. SOFTWARE WARRANTY. Except as described in the SwSP and unless otherwise stated in the Software License Agreement, during the Warranty Period, Motorola warrants the Software in accordance with the warranty terms set forth in the Software License Agreement and the provisions of this Section that are applicable to the Software. If System Acceptance is delayed beyond six (6) months after shipment of the Motorola Software by events or causes beyond Motorola's control, this warranty expires eighteen (18) months after the shipment of the Motorola Software. **Nothing in this Warranty provision is intended to conflict or modify the Software Support Policy. In the event of an ambiguity or conflict between the Software Warranty and Software Support Policy, the Software Support Policy governs.**

10.4. EXCLUSIONS TO EQUIPMENT AND SOFTWARE WARRANTIES. These warranties do not apply to: (i) defects or damage resulting from: use of the Equipment or Software in other than its normal, customary, and authorized manner; accident, liquids, neglect, or acts of God; testing, maintenance, disassembly, repair, installation, alteration, modification, or adjustment not provided or authorized in writing by Motorola; Customer's failure to comply with all applicable industry and OSHA standards; (ii) breakage of or damage to antennas unless

caused directly by defects in material or workmanship; (iii) Equipment that has had the serial number removed or made illegible; (iv) batteries (because they carry their own separate limited warranty) or consumables; (v) freight costs to ship Equipment to the repair depot; (vi) scratches or other cosmetic damage to Equipment surfaces that does not affect the operation of the Equipment; and (vii) normal or customary wear and tear.

10.5. SERVICE WARRANTY. During the Warranty Period, Motorola warrants that the Services will be provided in a good and workmanlike manner and will conform in all material respects to the applicable Statement of Work. Services will be free of defects in materials and workmanship for a period of ninety (90) days from the date the performance of the Services are completed. Customer acknowledges that the Deliverables may contain recommendations, suggestions or advice from Motorola to Customer (collectively, "recommendations"). Motorola makes no warranties concerning those recommendations, and Customer alone accepts responsibility for choosing whether and how to implement the recommendations and the results to be realized from implementing them.

10.6. WARRANTY CLAIMS. To assert a warranty claim, Customer must notify Motorola in writing of the claim before the expiration of the Warranty Period. Upon receipt of this notice, Motorola will investigate the warranty claim. If this investigation confirms a valid Equipment or Software warranty claim, Motorola will (at its option and at no additional charge to Customer) repair the defective Equipment or Motorola Software, replace it with the same or equivalent product, or refund the price of the defective Equipment or Motorola Software. These actions will be the full extent of Motorola's liability for the warranty claim. In the event of a valid Services warranty claim, Customer's sole remedy is to require Motorola to re-perform the non-conforming Service or to refund, on a pro-rata basis, the fees paid for the non-conforming Service. If this investigation indicates the warranty claim is not valid, then Motorola may invoice Customer for responding to the claim on a time and materials basis using Motorola's then current labor rates. Repaired or replaced product is warranted for the balance of the original applicable warranty period. All replaced products or parts will become the property of Motorola.

10.7. ORIGINAL END USER IS COVERED. These express limited warranties are extended by Motorola to the original user purchasing the System or Services for commercial, industrial, or governmental use only, and are not assignable or transferable.

10.8. DISCLAIMER OF OTHER WARRANTIES. THESE WARRANTIES ARE THE COMPLETE WARRANTIES FOR THE EQUIPMENT AND MOTOROLA SOFTWARE PROVIDED UNDER THIS AGREEMENT AND ARE GIVEN IN LIEU OF ALL OTHER WARRANTIES. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

Section 11 DELAYS

11.1. FORCE MAJEURE. Neither Party will be liable for its non-performance or delayed performance if caused by a Force Majeure. A Party that becomes aware of a Force Majeure that

will significantly delay performance will notify the other Party promptly (but in no event later than fifteen days) after it discovers the Force Majeure. If a Force Majeure occurs, the Parties will execute a change order to extend the Performance Schedule or applicable Addenda for a time period that is reasonable under the circumstances.

11.2. PERFORMANCE SCHEDULE DELAYS CAUSED BY CUSTOMER. If Customer (including its other contractors) delays the Performance Schedule, it will make the promised payments according to the Payment schedule as if no delay occurred; and the Parties will execute a change order to extend the Performance Schedule and, if requested, compensate Motorola for all reasonable charges incurred because of the delay. Delay charges may include costs incurred by Motorola or its subcontractors for additional freight, warehousing and handling of Equipment; extension of the warranties; travel; suspending and re-mobilizing the work; additional engineering, project management, and standby time calculated at then current rates; and preparing and implementing an alternative implementation plan.

Section 12 DISPUTES

The Parties will use the following procedure to address any dispute arising under this Agreement (a "Dispute").

12.1. GOVERNING LAW. This Agreement will be governed by and construed in accordance with the laws of the State in which the System is installed.

12.2. NEGOTIATION. Either Party may initiate the Dispute resolution procedures by sending a notice of Dispute ("Notice of Dispute"). The Parties will attempt to resolve the Dispute promptly through good faith negotiations including 1) timely escalation of the Dispute to executives who have authority to settle the Dispute and who are at a higher level of management than the persons with direct responsibility for the matter and 2) direct communication between the executives. If the Dispute has not been resolved within ten (10) days from the Notice of Dispute, the Parties will proceed to mediation.

12.3. MEDIATION. The Parties will choose an independent mediator within thirty (30) days of a notice to mediate from either Party ("Notice of Mediation"). Neither Party may unreasonably withhold consent to the selection of a mediator. If the Parties are unable to agree upon a mediator, either Party may request that American Arbitration Association nominate a mediator. Each Party will bear its own costs of mediation, but the Parties will share the cost of the mediator equally. Each Party will participate in the mediation in good faith and will be represented at the mediation by a business executive with authority to settle the Dispute.

12.4. LITIGATION, VENUE and JURISDICTION. If a Dispute remains unresolved for sixty (60) days after receipt of the Notice of Mediation, either Party may then submit the Dispute to a court of competent jurisdiction in the state in which the System is installed. Each Party irrevocably agrees to submit to the exclusive jurisdiction of the courts in such state over any claim or matter arising under or in connection with this Agreement.

12.5. CONFIDENTIALITY. All communications pursuant to subsections 12.2 and 12.3 will be treated as compromise and settlement negotiations for purposes of applicable rules of evidence and any additional confidentiality protections provided by applicable law. The use of these Dispute resolution procedures will not be construed under the doctrines of laches, waiver or estoppel to affect adversely the rights of either Party.

Section 13 DEFAULT AND TERMINATION

13.1. DEFAULT BY A PARTY. If either Party fails to perform a material obligation under this Agreement, the other Party may consider the non-performing Party to be in default (unless a Force Majeure causes the failure) and may assert a default claim by giving the non-performing Party a written and detailed notice of default. Except for a default by Customer for failing to pay any amount when due under this Agreement which must be cured immediately, the defaulting Party will have thirty (30) days after receipt of the notice of default to either cure the default or, if the default is not curable within thirty (30) days, provide a written cure plan. The defaulting Party will begin implementing the cure plan immediately after receipt of notice by the other Party that it approves the plan. If Customer is the defaulting Party, Motorola may stop work on the project until it approves the Customer's cure plan.

13.2. FAILURE TO CURE. If a defaulting Party fails to cure the default as provided above in Section 13.1, unless otherwise agreed in writing, the non-defaulting Party may terminate any unfulfilled portion of this Agreement. In the event of termination for default, the defaulting Party will promptly return to the non-defaulting Party any of its Confidential Information. If Customer is the non-defaulting Party, terminates this Agreement as permitted by this Section, and completes the System through a third Party, Customer may as its exclusive remedy recover from Motorola reasonable costs incurred to complete the System to a capability not exceeding that specified in this Agreement less the unpaid portion of the Contract Price. Customer will mitigate damages and provide Motorola with detailed invoices substantiating the charges. In the event Customer elects to terminate this Agreement for any reason other than default, Customer shall pay Motorola for the conforming Equipment and/or Software delivered and all services performed.

Section 14 INDEMNIFICATION

14.1. GENERAL INDEMNITY BY Motorola. Motorola will indemnify and hold Customer harmless from any and all liability, expense, judgment, suit, cause of action, or demand for personal injury, death, or direct damage to tangible property which may accrue against Customer to the extent it is caused by the negligence of Motorola, its subcontractors, or their employees or agents, while performing their duties under this Agreement, if Customer gives Motorola prompt, written notice of any claim or suit. Customer will cooperate with Motorola in its defense or settlement of the claim or suit. This Section sets forth the full extent of Motorola's general indemnification of Customer from liabilities that are in any way related to Motorola's performance under this Agreement.

14.2. GENERAL INDEMNITY BY CUSTOMER. Customer will indemnify and hold Motorola harmless from any and all liability, expense, judgment, suit, cause of action, or demand

for personal injury, death, or direct damage to tangible property which may accrue against Motorola to the extent it is caused by the negligence of Customer, its other contractors, or their employees or agents, while performing their duties under this Agreement, if Motorola gives Customer prompt, written notice of any the claim or suit. Motorola will cooperate with Customer in its defense or settlement of the claim or suit. This Section sets forth the full extent of Customer's general indemnification of Motorola from liabilities that are in any way related to Customer's performance under this Agreement.

14.3. PATENT AND COPYRIGHT INFRINGEMENT.

14.3.1. Motorola will defend at its expense any suit brought against Customer to the extent it is based on a third-party claim alleging that the Equipment manufactured by Motorola or the Motorola Software ("Motorola Product") directly infringes a United States patent or copyright ("Infringement Claim"). Motorola's duties to defend and indemnify are conditioned upon: Customer promptly notifying Motorola in writing of the Infringement Claim; Motorola having sole control of the defense of the suit and all negotiations for its settlement or compromise; and Customer providing to Motorola cooperation and, if requested by Motorola, reasonable assistance in the defense of the Infringement Claim. In addition to Motorola's obligation to defend, and subject to the same conditions, Motorola will pay all damages finally awarded against Customer by a court of competent jurisdiction for an Infringement Claim or agreed to, in writing, by Motorola in settlement of an Infringement Claim.

14.3.2 If an Infringement Claim occurs, or in Motorola's opinion is likely to occur, Motorola may at its option and expense: (a) procure for Customer the right to continue using the Motorola Product; (b) replace or modify the Motorola Product so that it becomes non-infringing while providing functionally equivalent performance; or (c) accept the return of the Motorola Product and grant Customer a credit for the Motorola Product, less a reasonable charge for depreciation. The depreciation amount will be calculated based upon generally accepted accounting standards.

14.3.3 Motorola will have no duty to defend or indemnify for any Infringement Claim that is based upon: (a) the combination of the Motorola Product with any software, apparatus or device not furnished by Motorola; (b) the use of ancillary equipment or software not furnished by Motorola and that is attached to or used in connection with the Motorola Product; (c) Motorola Product designed or manufactured in accordance with Customer's designs, specifications, guidelines or instructions, if the alleged infringement would not have occurred without such designs, specifications, guidelines or instructions; (d) a modification of the Motorola Product by a party other than Motorola; (e) use of the Motorola Product in a manner for which the Motorola Product was not designed or that is inconsistent with the terms of this Agreement; or (f) the failure by Customer to install an enhancement release to the Motorola Software that is intended to correct the claimed infringement. In no event will Motorola's liability resulting from its indemnity obligation to Customer extend in any way to royalties payable on a per use basis or the Customer's revenues, or any royalty basis other than a reasonable royalty based upon revenue derived by Motorola from Customer from sales or license of the infringing Motorola Product.

14.3.4. This Section 14 provides Customer's sole and exclusive remedies and Motorola's entire liability in the event of an Infringement Claim. Customer has no right to recover and Motorola has no obligation to provide any other or further remedies, whether under another provision of this Agreement or any other legal theory or principle, in connection with an Infringement Claim. In addition, the rights and remedies provided in this Section 14 are subject to and limited by the restrictions set forth in Section 15.

Section 15 LIMITATION OF LIABILITY

Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, indemnification, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the price of the Equipment, Software, or implementation and other one time Services with respect to which losses or damages are claimed. With respect to all subscription or other ongoing Services and unless as otherwise provided under the applicable Addenda, Motorola's total liability will be limited to the direct damages recoverable under law, but not to exceed the price of twelve (12) months of Services preceding the incident giving rise to the claim. ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS, INCONVENIENCE, LOSS OF USE, LOSS TIME, DATA, GOODWILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT, THE SALE OR USE OF THE EQUIPMENT OR SOFTWARE, OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT. This limitation of liability provision survives the expiration or termination of the Agreement and applies notwithstanding any contrary provision. No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account.

Section 16 CONFIDENTIALITY AND PROPRIETARY RIGHTS

16.1. CONFIDENTIAL INFORMATION.

16.1.1. Each party is a disclosing party ("Discloser") and a receiving party ("Recipient") under this Agreement. All Deliverables will be deemed to be Motorola's Confidential Information. During the term of this Agreement and for a period of three (3) years from the expiration or termination of this Agreement, Recipient will (i) not disclose Confidential Information to any third party; (ii) restrict disclosure of Confidential Information to only those employees (including, but not limited to, employees of any wholly owned subsidiary, a parent company, any other wholly owned subsidiaries of the same parent company), agents or consultants who must be directly involved with the Confidential Information for the purpose and who are bound by confidentiality terms substantially similar to those in this Agreement; (iii) not copy, reproduce, reverse engineer, de-compile or disassemble any Confidential Information; (iv) use the same degree of care as for its own information of like importance, but at least use reasonable care, in safeguarding against disclosure of Confidential Information; (v) promptly notify Discloser upon

discovery of any unauthorized use or disclosure of the Confidential Information and take reasonable steps to regain possession of the Confidential Information and prevent further unauthorized actions or other breach of this Agreement; and (vi) only use the Confidential Information as needed to fulfill this Agreement.

16.1.2. Recipient is not obligated to maintain as confidential, Confidential Information that Recipient can demonstrate by documentation (i) is now available or becomes available to the public without breach of this agreement; (ii) is explicitly approved for release by written authorization of Discloser; (iii) is lawfully obtained from a third party or parties without a duty of confidentiality; (iv) is known to the Recipient prior to such disclosure; or (v) is independently developed by Recipient without the use of any of Discloser's Confidential Information or any breach of this Agreement.

16.1.3. All Confidential Information remains the property of the Discloser and will not be copied or reproduced without the express written permission of the Discloser, except for copies that are absolutely necessary in order to fulfill this Agreement. Within ten (10) days of receipt of Discloser's written request, Recipient will return all Confidential Information to Discloser along with all copies and portions thereof, or certify in writing that all such Confidential Information has been destroyed. However, Recipient may retain one (1) archival copy of the Confidential Information that it may use only in case of a dispute concerning this Agreement. No license, express or implied, in the Confidential Information is granted other than to use the Confidential Information in the manner and to the extent authorized by this Agreement. The Discloser warrants that it is authorized to disclose any Confidential Information it discloses pursuant to this Agreement.

16.2. PRESERVATION OF MOTOROLA'S PROPRIETARY RIGHTS. Motorola, the third party manufacturer of any Equipment, and the copyright owner of any Non-Motorola Software own and retain all of their respective Proprietary Rights in the Equipment and Software, and nothing in this Agreement is intended to restrict their Proprietary Rights. All intellectual property developed, originated, or prepared by Motorola in connection with providing to Customer the Equipment, Software, or related services remain vested exclusively in Motorola, and this Agreement does not grant to Customer any shared development rights of intellectual property. Except as explicitly provided in the Software License Agreement, Motorola does not grant to Customer, either directly or by implication, estoppel, or otherwise, any right, title or interest in Motorola's Proprietary Rights. Customer will not modify, disassemble, peel components, decompile, otherwise reverse engineer or attempt to reverse engineer, derive source code or create derivative works from, adapt, translate, merge with other software, reproduce, distribute, sublicense, sell or export the Software, or permit or encourage any third party to do so. The preceding sentence does not apply to Open Source Software which is governed by the standard license of the copyright owner.

16.3 VOLUNTARY DISCLOSURE. Except as required to fulfill its obligations under this Agreement, Motorola will have no obligation to provide Customer with access to its Confidential Information and/or proprietary information. Under no circumstances will Motorola be required to provide any data related to cost and pricing.

16.4 DATA AND FEEDBACK.

16.4.1 To the extent permitted by law, Customer owns all right, title and interest in System Data created solely by it or its agents (hereafter, "Customer Data"), and grants to Motorola the right to use, host, cache, store, reproduce, copy, modify, combine, analyze, create derivatives from, communicate, transmit, publish, display, and distribute such Customer Data.

16.4.2 Motorola owns all right, title and interest in data resulting from System Data that is or has been transformed, altered, processed, aggregated, correlated or operated on (hereafter, "Derivative Data").

16.4.3 Any Feedback given by Customer is and will be entirely voluntary and, even if designated as confidential, will not create any confidentiality obligation for Motorola. Motorola will be free to use, reproduce, license or otherwise distribute and exploit the Feedback without any obligation to Customer. Customer acknowledges that Motorola's receipt of the Feedback does not imply or create recognition by Motorola of either the novelty or originality of any idea. The parties further agree that all fixes, modifications and improvements made to Motorola products or services conceived of or made by Motorola that are based, either in whole or in part, on the Feedback are the exclusive property of Motorola and all right, title and interest in and to such fixes, modifications or improvements to the Motorola product or service will vest solely in Motorola.

Section 17 GENERAL

17.1. TAXES. The Contract Price does not include any excise, sales, lease, use, property, or other taxes, assessments or duties, all of which will be paid by Customer except as exempt by law. If Motorola is required to pay any of these taxes, Motorola will send an invoice to Customer and Customer will pay to Motorola the amount of the taxes (including any interest and penalties) within thirty (30) days after the date of the invoice. Customer will be solely responsible for reporting the Equipment for personal property tax purposes, and Motorola will be solely responsible for reporting taxes on its income or net worth.

17.2. ASSIGNABILITY AND SUBCONTRACTING. Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Customer. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event. Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

17.3. WAIVER. Failure or delay by either Party to exercise a right or power under this Agreement will not be a waiver of the right or power. For a waiver of a right or power to be effective, it must be in a writing signed by the waiving Party. An effective waiver of a right or power will not be construed as either a future or continuing waiver of that same right or power, or the waiver of any other right or power.

17.4. SEVERABILITY. If a court of competent jurisdiction renders any part of this Agreement invalid or unenforceable, that part will be severed and the remainder of this Agreement will continue in full force and effect.

17.5. INDEPENDENT CONTRACTORS. Each Party will perform its duties under this Agreement as an independent contractor. The Parties and their personnel will not be considered to be employees or agents of the other Party. Nothing in this Agreement will be interpreted as granting either Party the right or authority to make commitments of any kind for the other. This Agreement will not constitute, create, or be interpreted as a joint venture, partnership or formal business organization of any kind.

17.6. HEADINGS AND SECTION REFERENCES. The section headings in this Agreement are inserted only for convenience and are not to be construed as part of this Agreement or as a limitation of the scope of the particular section to which the heading refers. This Agreement will be fairly interpreted in accordance with its terms and conditions and not for or against either Party.

17.7. NOTICES. Notices required under this Agreement to be given by one Party to the other must be in writing and either personally delivered or sent to the address provided by the other Party by certified mail, return receipt requested and postage prepaid (or by a recognized courier service, such as Federal Express, UPS, or DHL), or by facsimile with correct answerback received, and will be effective upon receipt

17.8. COMPLIANCE WITH APPLICABLE LAWS. Each Party will comply with all applicable federal, state, and local laws, regulations and rules concerning the performance of this Agreement or use of the System. Customer will obtain and comply with all Federal Communications Commission ("FCC") licenses and authorizations required for the installation, operation and use of the System before the scheduled installation of the Equipment. Although Motorola might assist Customer in the preparation of its FCC license applications, neither Motorola nor any of its employees is an agent or representative of Customer in FCC or other matters.

17.9. AUTHORITY TO EXECUTE AGREEMENT. Each Party represents that it has obtained all necessary approvals, consents and authorizations to enter into this Agreement and to perform its duties under this Agreement; the person executing this Agreement on its behalf has the authority to do so; upon execution and delivery of this Agreement by the Parties, it is a valid and binding contract, enforceable in accordance with its terms; and the execution, delivery, and performance of this Agreement does not violate any bylaw, charter, regulation, law or any other governing authority of the Party.

17.10. ADMINISTRATOR LEVEL ACCOUNT ACCESS. If applicable to the type of System purchased by Customer, Motorola will provide Customer with Administrative User Credentials. Customer agrees to only grant access to the Administrative User Credentials to those personnel with the training and experience to correctly use them. Customer is responsible for protecting Administrative User Credentials from disclosure and maintaining Credential validity by, among other things, updating passwords when required. Customer may be asked to provide valid Administrative User Credentials when in contact with Motorola System support personnel. Customer understands that changes made as the Administrative User can significantly impact the performance of the System. Customer agrees that it will be solely responsible for any negative impact on the System or its users by any such changes. System issues occurring as a result of changes made using the Administrative User Credentials may impact Motorola's ability to perform Services or other obligations under the Agreement. In such cases, a revision to the appropriate provisions of the Agreement, including the Statement of Work, may be necessary. To the extent Motorola provides assistance to correct any issues caused by or arising out of the use of or failure to maintain Administrative User Credentials, Motorola will be entitled to bill Customer and Customer will pay Motorola on a time and materials basis for resolving the issue.

17.11. SURVIVAL OF TERMS. The following provisions will survive the expiration or termination of this Agreement for any reason: Section 3.5 (Motorola Software); Section 3.6 (Non-Motorola Software); if any payment obligations exist, Sections 6.2 and 6.3 (Contract Price and Invoicing and Payment); Subsection 10.8 (Disclaimer of Implied Warranties); Section 12 (Disputes); Section 15 (Limitation of Liability); and Section 16 (Confidentiality and Proprietary Rights); and all of the General provisions in Section 17.

17.12. ENTIRE AGREEMENT. This Agreement, including all Exhibits, constitutes the entire agreement of the Parties regarding the subject matter of the Agreement and supersedes all previous agreements, proposals, and understandings, whether written or oral, relating to this subject matter. This Agreement may be executed in multiple counterparts, and shall have the same legal force and effect as if the Parties had executed it as a single document. The Parties may sign in writing, or by electronic signature, including by email. An electronic signature, or a facsimile copy or computer image, such as a PDF or tiff image, of a signature, shall be treated as and shall have the same effect as an original signature. In addition, an electronic signature, a true and correct facsimile copy or computer image of this Agreement shall be treated as and shall have the same effect as an original signed copy of this document. This Agreement may be amended or modified only by a written instrument signed by authorized representatives of both Parties. The preprinted terms and conditions found on any Customer purchase or purchase order, acknowledgment or other form will not be considered an amendment or modification of this Agreement, even if a representative of each Party signs that document.

The Parties hereby enter into this Agreement as of the Effective Date.

Motorola Solutions, Inc.	**Customer**
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

Exhibit A

MOTOROLA SOFTWARE LICENSE AGREEMENT

This Exhibit A Motorola Software License Agreement ("Agreement") is between Motorola Solutions, Inc., ("Motorola"), and _____ ("Licensee").

For good and valuable consideration, the parties agree as follows:

Section 1 DEFINITIONS

1.1 "Designated Products" means products provided by Motorola to Licensee with which or for which the Software and Documentation is licensed for use.

1.2 "Documentation" means product and software documentation that specifies technical and performance features and capabilities, and the user, operation and training manuals for the Software (including all physical or electronic media upon which such information is provided).

1.3 "Open Source Software" means software with either freely obtainable source code, license for modification, or permission for free distribution.

1.4 "Open Source Software License" means the terms or conditions under which the Open Source Software is licensed.

1.5 "Primary Agreement" means the agreement to which this exhibit is attached.

1.6 "Security Vulnerability" means a flaw or weakness in system security procedures, design, implementation, or internal controls that could be exercised (accidentally triggered or intentionally exploited) and result in a security breach such that data is compromised, manipulated or stolen or the system damaged.

1.7 "Software" (i) means proprietary software in object code format, and adaptations, translations, de-compilations, disassemblies, emulations, or derivative works of such software; (ii) means any modifications, enhancements, new versions and new releases of the software provided by Motorola; and (iii) may contain one or more items of software owned by a third party supplier. The term "Software" does not include any third party software provided under separate license or third party software not licensable under the terms of this Agreement.

Section 2 SCOPE

Motorola and Licensee enter into this Agreement in connection with Motorola's delivery of certain proprietary software or products containing embedded or pre-loaded proprietary software, or both. This Agreement contains the terms and conditions of the license Motorola is providing to Licensee, and Licensee's use of the proprietary software and affiliated documentation.

Section 3 GRANT OF LICENSE

3.1. Subject to the provisions of this Agreement and the payment of applicable license fees, Motorola grants to Licensee a personal, limited, non-transferable (except as permitted in Section 7) and non-exclusive license under Motorola's copyrights and Confidential Information (as defined in the Primary Agreement) embodied in the Software to use the Software, in object code form, and the Documentation solely in connection with Licensee's use of the Designated Products. This Agreement does not grant any rights to source code.

3.2. If the Software licensed under this Agreement contains or is derived from Open Source Software, the terms and conditions governing the use of such Open Source Software are in the Open Source Software Licenses of the copyright owner and not this Agreement. If there is a conflict between the terms and conditions of this Agreement and the terms and conditions of the Open Source Software Licenses governing Licensee's use of the Open Source Software, the terms and conditions of the license grant of the applicable Open Source Software Licenses will take precedence over the license grants in this Agreement. If requested by Licensee, Motorola will use commercially reasonable efforts to: (i) determine whether any Open Source Software is provided under this Agreement; and (ii) identify the Open Source Software (or specify where that license may be found).

3.4 TO THE EXTENT, IF ANY, THAT THERE IS A SEPARATE LICENSE AGREEMENT PACKAGED WITH, OR PROVIDED ELECTRONICALLY WITH, A PARTICULAR PRODUCT THAT BECOMES EFFECTIVE ON AN ACT OF ACCEPTANCE BY THE END USER, THEN THAT AGREEMENT SUPERSEDES THE SOFTWARE LICENSE AGREEMENT AS TO THE END USER OF EACH SUCH PRODUCT.

Section 4 LIMITATIONS ON USE

4.1. Licensee may use the Software only for Licensee's internal business purposes and only in accordance with the Documentation. Any other use of the Software is strictly prohibited. Without limiting the general nature of these restrictions, Licensee will not make the Software available for use by third parties on a "time sharing," "application service provider," or "service bureau" basis or for any other similar commercial rental or sharing arrangement.

4.2. Licensee will not, and will not allow or enable any third party to: (i) reverse engineer, disassemble, peel components, decompile, reprogram or otherwise reduce the Software or any portion to a human perceptible form or otherwise attempt to recreate the source code; (ii) modify, adapt, create derivative works of, or merge the Software; (iii) copy, reproduce, distribute, lend, or lease the Software or Documentation to any third party, grant any sublicense or other rights in the Software or Documentation to any third party, or take any action that would cause the Software or Documentation to be placed in the public domain; (iv) remove, or in any way alter or obscure, any copyright notice or other notice of Motorola's proprietary rights; (v) provide, copy, transmit, disclose, divulge or make the Software or Documentation available to, or permit the use of the Software by any third party or on any machine except as expressly authorized by this Agreement; or (vi) use, or permit the use of, the Software in a manner that would result in the production of a copy of the Software solely by activating a machine containing the Software. Licensee may make one copy of Software to be used solely for archival, back-up, or disaster

recovery purposes; *provided* that Licensee may not operate that copy of the Software at the same time as the original Software is being operated. Licensee may make as many copies of the Documentation as it may reasonably require for the internal use of the Software.

4.3. Unless otherwise authorized by Motorola in writing, Licensee will not, and will not enable or allow any third party to: (i) install a licensed copy of the Software on more than one unit of a Designated Product; or (ii) copy onto or transfer Software installed in one unit of a Designated Product onto one other device. Licensee may temporarily transfer Software installed on a Designated Product to another device if the Designated Product is inoperable or malfunctioning, if Licensee provides written notice to Motorola of the temporary transfer and identifies the device on which the Software is transferred. Temporary transfer of the Software to another device must be discontinued when the original Designated Product is returned to operation and the Software must be removed from the other device. Licensee must provide prompt written notice to Motorola at the time temporary transfer is discontinued.

4.4 Licensee will maintain, during the term of this Agreement and for a period of two years thereafter, accurate records relating to this license grant to verify compliance with this Agreement. Motorola or an independent third party ("Auditor") may inspect Licensee's premises, books and records, upon reasonable prior notice to Licensee, during Licensee's normal business hours and subject to Licensee's facility and security regulations. Motorola is responsible for the payment of all expenses and costs of the Auditor. Any information obtained by Motorola and the Auditor will be kept in strict confidence by Motorola and the Auditor and used solely for the purpose of verifying Licensee's compliance with the terms of this Agreement.

Section 5 OWNERSHIP AND TITLE

Motorola, its licensors, and its suppliers retain all of their proprietary rights in any form in and to the Software and Documentation, including, but not limited to, all rights in patents, patent applications, inventions, copyrights, trademarks, trade secrets, trade names, and other proprietary rights in or relating to the Software and Documentation (including any corrections, bug fixes, enhancements, updates, modifications, adaptations, translations, de-compilations, disassemblies, emulations to or derivative works from the Software or Documentation, whether made by Motorola or another party, or any improvements that result from Motorola's processes or, provision of information services). No rights are granted to Licensee under this Agreement by implication, estoppel or otherwise, except for those rights which are expressly granted to Licensee in this Agreement. All intellectual property developed, originated, or prepared by Motorola in connection with providing the Software, Designated Products, Documentation or related services, remains vested exclusively in Motorola, and Licensee will not have any shared development or other intellectual property rights.

Section 6 LIMITED WARRANTY; DISCLAIMER OF WARRANTY

6.1. Unless otherwise stated in the Primary Agreement, the commencement date and the term of the Software warranty will be a period of ninety (90) days from Motorola's shipment of the Software (the "Warranty Period"). If Licensee is not in breach of any of its obligations under this Agreement, Motorola warrants that the unmodified Software, when used properly and in

accordance with the Documentation and this Agreement, will be free from a reproducible defect that eliminates the functionality or successful operation of a feature critical to the primary functionality or successful operation of the Software. Whether a defect occurs will be determined by Motorola solely with reference to the Documentation. Motorola does not warrant that Licensee's use of the Software or the Designated Products will be uninterrupted, error-free, completely free of Security Vulnerabilities, or that the Software or the Designated Products will meet Licensee's particular requirements. Motorola makes no representations or warranties with respect to any third party software included in the Software. Notwithstanding, any warranty provided by a copyright owner in its standard license terms will flow through to Licensee for third party software provided by Motorola.

6.2 Motorola's sole obligation to Licensee and Licensee's exclusive remedy under this warranty is to use reasonable efforts to remedy any material Software defect covered by this warranty. These efforts will involve either replacing the media or attempting to correct significant, demonstrable program or documentation errors or Security Vulnerabilities. If Motorola cannot correct the defect within a reasonable time, then at Motorola's option, Motorola will replace the defective Software with functionally-equivalent Software, license to Licensee substitute Software which will accomplish the same objective, or terminate the license and refund the Licensee's paid license fee.

6.3. Warranty claims are described in the Primary Agreement.

6.4. The express warranties set forth in this Section 6 are in lieu of, and Motorola disclaims, any and all other warranties (express or implied, oral or written) with respect to the Software or Documentation, including, without limitation, any and all implied warranties of condition, title, non-infringement, merchantability, or fitness for a particular purpose or use by Licensee (whether or not Motorola knows, has reason to know, has been advised, or is otherwise aware of any such purpose or use), whether arising by law, by reason of custom or usage of trade, or by course of dealing. In addition, Motorola disclaims any warranty to any person other than Licensee with respect to the Software or Documentation.

Section 7 TRANSFERS

Licensee will not transfer the Software or Documentation to any third party without Motorola's prior written consent. Motorola's consent may be withheld at its discretion and may be conditioned upon transferee paying all applicable license fees and agreeing to be bound by this Agreement. If the Designated Products are Motorola's radio products and Licensee transfers ownership of the Motorola radio products to a third party, Licensee may assign its right to use the Software (other than CPS and Motorola's FLASHport® software) which is embedded in or furnished for use with the radio products and the related Documentation; *provided* that Licensee transfers all copies of the Software and Documentation to the transferee, and Licensee and the transferee sign a transfer form to be provided by Motorola upon request, obligating the transferee to be bound by this Agreement.

Section 8 TERM AND TERMINATION

8.1 Licensee's right to use the Software and Documentation will begin when the Primary Agreement is signed by both parties and will continue for the life of the Designated Products with which or for which the Software and Documentation have been provided by Motorola, unless Licensee breaches this Agreement, in which case this Agreement and Licensee's right to use the Software and Documentation may be terminated immediately upon notice by Motorola.

8.2 Within thirty (30) days after termination of this Agreement, Licensee must certify in writing to Motorola that all copies of the Software have been removed or deleted from the Designated Products and that all copies of the Software and Documentation have been returned to Motorola or destroyed by Licensee and are no longer in use by Licensee.

8.3 Licensee acknowledges that Motorola made a considerable investment of resources in the development, marketing, and distribution of the Software and Documentation and that Licensee's breach of this Agreement will result in irreparable harm to Motorola for which monetary damages would be inadequate. If Licensee breaches this Agreement, Motorola may terminate this Agreement and be entitled to all available remedies at law or in equity (including immediate injunctive relief and repossession of all non-embedded Software and associated Documentation unless Licensee is a Federal agency of the United States Government).

Section 9 Commercial Computer Software

9.1 *This Section 9 only applies to U.S. Government end users.* The Software, Documentation and updates are commercial items as that term is defined at 48 C.F.R. Part 2.101, consisting of "commercial computer software" and "computer software documentation" as such terms are defined in 48 C.F.R. Part 252.227-7014(a)(1) and 48 C.F.R. Part 252.227-7014(a)(5), and used in 48 C.F.R. Part 12.212 and 48 C.F.R. Part 227.7202, as applicable. Consistent with 48 C.F.R. Part 12.212, 48 C.F.R. Part 252.227-7015, 48 C.F.R. Part 227.7202-1 through 227.7202-4, 48 C.F.R. Part 52.227-19, and other relevant sections of the Code of Federal Regulations, as applicable, the Software, Documentation and Updates are distributed and licensed to U.S. Government end users: (i) only as commercial items, and (ii) with only those rights as are granted to all other end users pursuant to the terms and conditions contained herein.

9.2 If Licensee is licensing Software for end use by the United States Government or a United States Government agency, Licensee may transfer such Software license, but only if: (i) Licensee transfers all copies of such Software and Documentation to such United States Government entity or interim transferee, and (ii) Licensee has first obtained from the transferee (if applicable) and ultimate end user an enforceable end user license agreement containing restrictions substantially identical to the ones contained in this Agreement. Except as stated in the foregoing, Licensee and any transferee(s) authorized by this subsection 9.2 may not otherwise use or transfer or make available any Motorola software to any third party nor permit any party to do so.

Section 10 CONFIDENTIALITY

Licensee acknowledges that the Software and Documentation contain Motorola's valuable proprietary and Confidential Information and are Motorola's trade secrets, and that the provisions in the Primary Agreement concerning Confidential Information apply.

Section 11 LIMITATION OF LIABILITY

The Limitation of Liability provision is described in the Primary Agreement.

Section 12 NOTICES

Notices are described in the Primary Agreement.

Section 13 GENERAL

13.1. COPYRIGHT NOTICES. The existence of a copyright notice on the Software will not be construed as an admission or presumption of publication of the Software or public disclosure of any trade secrets associated with the Software.

13.2. COMPLIANCE WITH LAWS. Licensee acknowledges that the Software is subject to the laws and regulations of the United States and Licensee will comply with all applicable laws and regulations, including export laws and regulations of the United States. Licensee will not, without the prior authorization of Motorola and the appropriate governmental authority of the United States, in any form export or re-export, sell or resell, ship or reship, or divert, through direct or indirect means, any item or technical data or direct or indirect products sold or otherwise furnished to any person within any territory for which the United States Government or any of its agencies at the time of the action, requires an export license or other governmental approval. Violation of this provision is a material breach of this Agreement.

13.3. ASSIGNMENTS AND SUBCONTRACTING. Motorola may assign its rights or subcontract its obligations under this Agreement, or encumber or sell its rights in any Software, without prior notice to or consent of Licensee.

13.4. GOVERNING LAW. This Agreement is governed by the laws of the United States to the extent that they apply and otherwise by the internal substantive laws of the State to which the Software is shipped if Licensee is a sovereign government entity, or the internal substantive laws of the State of Illinois if Licensee is not a sovereign government entity. The terms of the U.N. Convention on Contracts for the International Sale of Goods do not apply. In the event that the Uniform Computer Information Transaction Act, any version of this Act, or a substantially similar law (collectively "UCITA") becomes applicable to a party's performance under this Agreement, UCITA does not govern any aspect of this Agreement or any license granted under this Agreement, or any of the parties' rights or obligations under this Agreement. The governing law will be that in effect prior to the applicability of UCITA.

13.5. THIRD PARTY BENEFICIARIES. This Agreement is entered into solely for the benefit of Motorola and Licensee. No third party has the right to make any claim or assert any right under this Agreement, and no third party is deemed a beneficiary of this Agreement. Notwithstanding the foregoing, any licensor or supplier of third party software included in the Software will be a direct and intended third party beneficiary of this Agreement.

13.6. SURVIVAL. Sections 4, 5, 6.4, 7, 8, 9, 10, 11 and 13 survive the termination of this Agreement.

13.7. ORDER OF PRECEDENCE. In the event of inconsistencies between this Exhibit and the Primary Agreement, the parties agree that this Exhibit prevails, only with respect to the specific subject matter of this Exhibit, and not the Primary Agreement or any other exhibit as it applies to any other subject matter.

13.8 SECURITY. Motorola uses reasonable means in the design and writing of its own Software and the acquisition of third party Software to limit Security Vulnerabilities. While no software can be guaranteed to be free from Security Vulnerabilities, if a Security Vulnerability is discovered, Motorola will take the steps set forth in Section 6 of this Agreement.

Exhibit B
For the System purchase financed through Motorola Solutions, please refer to the Payment schedule included in the Equipment Lease-Purchase Agreement

If Customer has purchased additional Professional or Subscription services, payment will be in accordance with the applicable addenda.

For Lifecycle Support Plan and Subscription Based Services:
Motorola will invoice Customer annually in advance of each year of the plan, or as otherwise stated in the applicable addenda.

The chart below outlines the hourly labor rates for Motorola System Integration resources to be used. The staffing requirements shall be multiplied by the appropriate rate per resource in the table below. The hourly labor rates are fully burdened. The hourly rates per resource type and level are listed in Table 1.

	Resource Types			
Levels	Project Management	System Engineering	System Technologist	Project Administration
4	$ 290.00	$ 300.00	$ 280.00	$ 200.00
3	$ 240.00	$ 250.00	$ 240.00	$ 180.00
2	$ 220.00	$ 220.00	$ 220.00	$ 170.00
1	$ 190.00	$ 210.00	$ 210.00	$ 160.00

Table 1 - Hourly Rates

These rates apply to ordinary days and times (Monday to Friday during the hours 8am to 5pm). Additional surcharges may apply to work done outside these timeframes. The minimum charge for any resource will be 4 hours. Travel expenses are not included in these rates and may be charged separately.
The qualifications of each type and level of resource are defined in the tables found at https://www.motorolasolutions.com/content/dam/msi/secure/services/labor-rates-exhibit-160408.pdf.. All Motorola System Integration personnel assigned to this project will be classified according these levels. Project Administrative roles are varied and their specific duties and qualifications will be determined by the complexity and requirements of each project.

EXHIBIT D

System Acceptance Certificate

Customer Name: _____

Project Name: _____

This System Acceptance Certificate memorializes the occurrence of System Acceptance. Motorola and Customer acknowledge that:

1. The Acceptance Tests set forth in the Acceptance Test Plan have been successfully completed.

2. The System is accepted.

Customer Representative:	Motorola Representative:
Signature: _____	Signature:
Print Name: _____	Print Name:
Title: _____	Title:
Date: _____	Date:

FINAL PROJECT ACCEPTANCE:
Motorola has provided and Customer has received all deliverables, and Motorola has performed all other work required for Final Project Acceptance.

Customer Representative:	Motorola Representative:
Signature: _____	Signature:
Print Name: _____	Print Name:
Title: _____	Title:
Date: _____	Date:

Exhibit E
EQUIPMENT LEASE PURCHASE AGREEMENT DELIVERY AND ACCEPTANCE CERTIFICATE

The undersigned Lessee hereby acknowledges receipt of the Equipment described below ("Equipment") and Lessee hereby accepts the Equipment after full inspection thereof as satisfactory for all purposes of lease Schedule A to the Equipment Lease Purchase Agreement executed by Lessee (Customer) and Lessor.

Equipment Lease Purchase Agreement No.: _____

Lease Schedule A No. : _____

EQUIPMENT INFORMATION

QUANTITY	MODEL NUMBER	EQUIPMENT DESCRIPTION
		Equipment referenced in lease Schedule A# _____. See Schedule A for a detailed Equipment List.

LESSEE/CUSTOMER:

By: _____

Title:_____

Date: _____

Please complete this form and send a copy via US mail or email to:
Motorola Solutions Credit Company LLC
Attn: Bill Stancik, Finance Manager | 500 W. Monroe, 44th Floor | Chicago, IL 60661

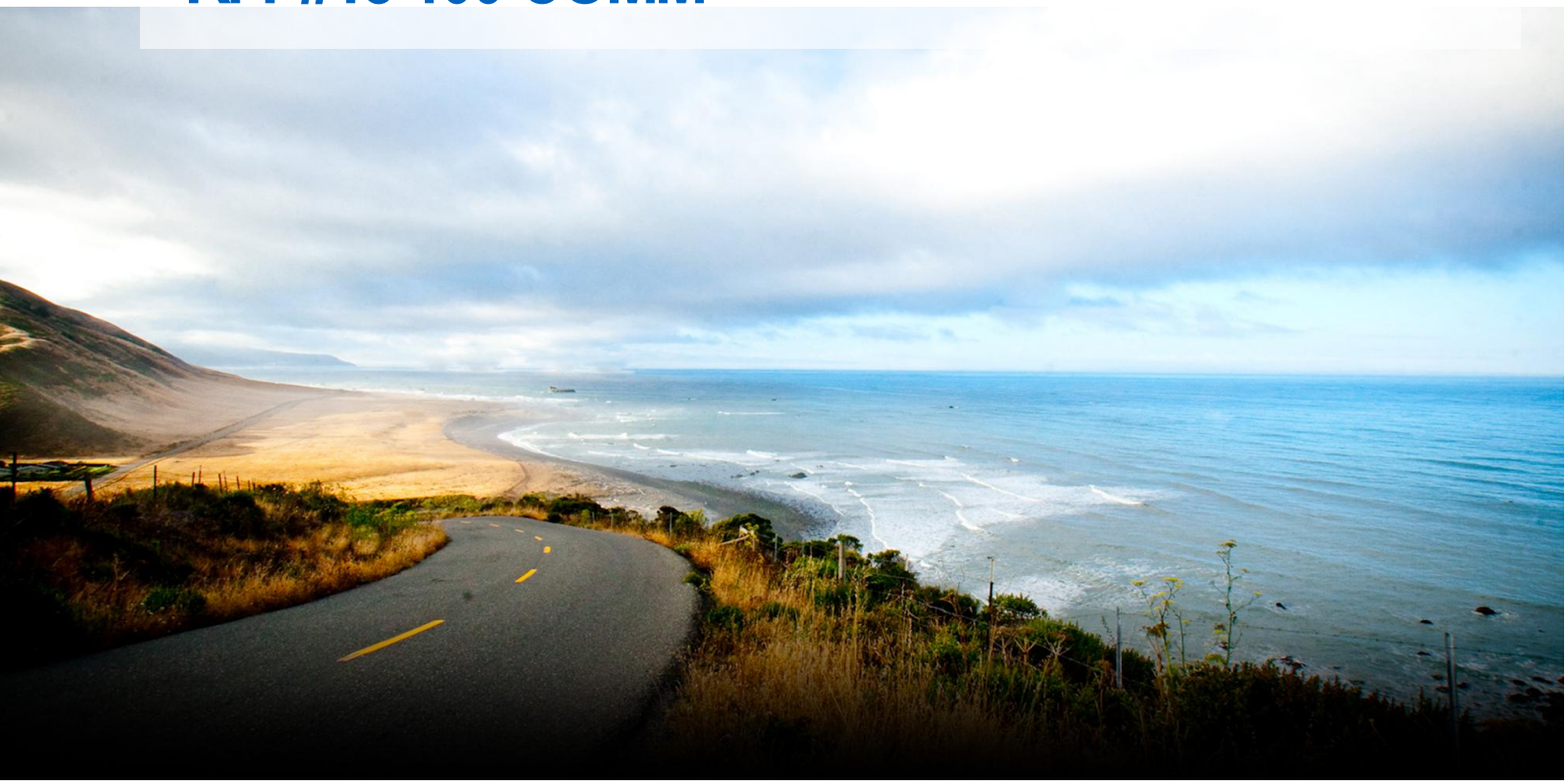
MOTOROLA SOLUTIONS

PROPOSAL TO
COUNTY OF HUMBOLDT, CALIFORNIA

SECTION 11
REQUIRED ATTACHMENTS

RESPONSE TO: HUMBOLDT COUNTY RADIO SYSTEM REPLACEMENT PROJECT **AUGUST 24, 2018**

RFP#18-100-COMM



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SECTION 11

REQUIRED ATTACHMENTS

Proposals that do not contain each of the following attachments may be rejected by the County:

Attachment	Proposal Location
Attachment 1 – Signature Affidavit (see Section 7.3)	Proposal Section 2 - SIGNATURE AFFIDAVIT
Attachment 2 – Staff Resumés for Key Personnel [See Section 7.5(B)(5)]	Proposal Section 4 – Business Profile
Attachment 3 – Project Management Plan [see Sections 7.6(B)(1)(a)-(j)]	Proposal Section 5 Quality Assurance Capabilities
Attachment 4 – Radio Coverage Plan [see Sections 7.6(B)(2)(a)-(h)]	Proposal Section 5 Quality Assurance Capabilities
Attachment 5 – Microwave Network Plan [see Sections 7.6(B)(3)(a)-(c)]	Proposal Section 5 Quality Assurance Capabilities
Attachment 6 – Subscriber Radio Network Plan [see Sections 7.6(B)(4)(a)-(c)]	Proposal Section 5 Quality Assurance Capabilities
Attachment 7 – Point-by-Point Compliance Matrix [see Section 7.6(B)(5)]	Proposal Section 11.1 Required Attachments herein
Attachment 8 – Cost Proposal [see Section 7.7]	Proposal Section 6 Cost Proposal
Attachment 9 – Additional Documentation [See Section 7.8]	Proposal Section 7 Additional Documentation
Attachment 10 – Reference Data Sheet [see Section 7.9]	Proposal Section 8 References

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11.1 ATTACHMENT 7 – POINT-BY-POINT COMPLIANCE MATRIX

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Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
1.0	DEFINITIONS	Informational	3	
1.1	Terms	Informational	3	
1.2	Abbreviations	Informational	3	
2.0	INTRODUCTION	Informational	3	
2.1	Statement of Purpose	Informational	3	
2.2	Project Overview	Informational	3	
3.0	PRELIMINARY SCOPE OF PRODUCTS AND SERVICES	Informational	3	
3.1	Outline of Anticipated Product Features and Services	Mandatory	Comply	Equipment and services are provided as described in our proposal.
3.2	Project Development	Mandatory	Comply	
4.0	REQUIREMENTS STATEMENT	Informational	3	
4.1	Eligibility Requirements	Mandatory	Comply	
4.2	Licensure, Certification and Accreditation Requirements	Mandatory	Comply	
4.3	Warranty Requirements	Mandatory	Comply	
5.0	SCHEDULE OF EVENTS	Informational	3	
6.0	GENERAL INFORMATION REGARDING PROPOSALS	Informational	3	
6.1	Submission of Proposals	Informational	3	
6.2	Withdrawal of Submitted Proposals	Informational	3	
6.3	Modification of Submitted Proposals	Informational	3	
6.4	Proposer Investigations	Informational	3	
6.5	Expenses Incurred in Preparing Proposals	Informational	3	
6.6	Right to Reject Proposals	Informational	3	
6.7	Public Records and Trade Secrets	Informational	3	
6.8	Conflict of Interest	Informational	3	

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
7.0	REQUIRED FORMAT OF PROPOSALS	Informational	3	
7.1	General Instructions and Information	Mandatory	Comply	
7.2	Introductory Letter	Mandatory	Comply	
7.3	Signature Affidavit	Mandatory	Comply	
7.4	Table of Contents	Mandatory	Comply	
7.5	Business Profile	Mandatory	Comply	
7.6	Quality Assurance Capabilities	Mandatory	Comply	The requested detailed description is included in Section 5 of the proposal.
7.7	Cost Proposal	Mandatory	Comply	
7.8	Additional Documentation	Mandatory	Comply	
7.9	References	Mandatory	Comply	
7.1	Evidence of Insurability and Business Licenses	Mandatory	Comply	
7.11	Exceptions, Objections and Requested Changes	Mandatory	Comply	
7.12	Required Attachments	Mandatory	Comply	
8.0	EVALUATION CRITERIA AND SELECTION PROCESS	Informational	3	
9.0	CONTRACT DEVELOPMENT	Informational	3	
9.1	Contract Negotiation Process	Informational	3	
9.2	Scoping Meetings	Informational	3	
9.3	Award of Professional Services Agreement	Informational	3	
9.4	Contractual Requirements	Mandatory	Comply	
10.0	MODIFICATION AND CORRECTION	Informational	3	
10.1	Requests for Clarification or Correction	Informational	3	
10.2	Addenda	Informational	3	

Vendor Name:		Motorola Solutions		
Sec	**Section Description**	**Priority**	**Proposer Response**	**Comments**
11.0	CANCELLATION OF THE REQUEST FOR PROPOSALS PROCESS	Informational	3	
	ATTACHMENT B – PRODUCT FEATURES AND REQUIREMENTS			
1.0	INTRODUCTION	Informational	3	
2.0	SIMULCAST CONTROL SUBSYSTEM SPECIFICATIONS AND REQUIREMENTS	Medium	2	Motorola has proposed a digital system with 5 transmit frequencies and 3 transmit frequencies for the analog system. Motorola performed a preliminary frequency search, and identified candidate frequencies for the County to license for the proposed design.
2.1	Required Components	Medium	3	
2.1.1	Subsystem Control	Medium	3	Motorola has provided a dispatch console upgrade option.
2.1.2	Network Management	Medium	3	
2.1.3	Interconnection	Medium	3	
2.1.4	Spare Equipment	Medium	3	
2.2	Simulcast Operation Requirements	Medium	3	
2.2.1	Non-Captured Delay Areas	Medium	3	
2.2.2	Signal Processing	Medium	3	
2.2.3	System Optimization	Medium	3	
2.3	P25 Conventional Feature Requirements	Medium	3	
2.3.1	Group Voice Call	Medium	2	The proposed equipment is capable of conventional talkgroup operation with the addition of core equipment. Conventional talkgroup operation is not recommended with a single channel conventional system due to channel contention issues. Users are not able to monitor the channel to know it is busy, and contention can occur as users attempt to communicate while the channel is busy.
2.3.2	Emergency Alarm	Medium	3	In addition to Project 25 emergency, Motorola exceeds with the ability to provide Push-To-Talk ID and emergency on the analog channels via MDC1200. User radios will receive an emergency alarm. The console needs to be equipped to receive an emergency alarm.

Vendor Name:		Motorola Solutions		
Sec	**Section Description**	**Priority**	**Proposer Response**	**Comments**
2.3.3	Emergency Group Call	Medium	3	In addition to Project 25 emergency, Motorola exceeds with the ability to provide Push-To-Talk ID and emergency on the analog channels via MDC1200. User radios will receive an emergency call. The console needs to be equipped to receive an indication that a call is an emergency group.
2.3.4	Individual Voice Call	Medium	3	User radios can communicate with an individual call. The console needs to be equipped with individual call.
2.3.5	Radio Check	Medium	3	
2.3.6	Call Alert	Medium	3	User radios can call alert each other. Consoles need to be equipped for call alert.
2.3.7	Inhibit and Uninhibit	Medium	3	The console needs to be equipped with this feature. Due to backhaul constraints, stand-alone sites do not support inhibit.
2.3.8	Encryption	Medium	3	
2.3.9	GPS Location (Optional)	Low	3	The proposed solution is capable of GPS. Due to backhaul constraints, stand-alone sites do not support GPS. With a single frequency per site per layer, GPS is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for GPS with Humboldt County.
2.4	Non-P25 Conventional Feature Requirements	Low	3	
2.4.1	Over-The-Air Programming (Optional)	Low	3	The proposed solution is capable of OTAP. Due to backhaul constraints, stand-alone sites do not support OTAP. With a single frequency per site per layer, OTAP is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for OTAP with Humboldt County.
2.5	Expansion Requirements	Low	3	
2.6	Reliability Requirements	High	3	
2.6.1	System Reliability	High	3	
2.6.2	Equipment Reliability	High	3	

Vendor Name:	Motorola Solutions			
Sec	Section Description	Priority	Proposer Response	Comments
2.6.3	Points of Failure	High	2	Motorola complies with providing protection against a single point failure and level of redundancy described in our proposal and tested as part of the Acceptance Test prior to going live, however Motorola does not comply with protecting against any failure point identified by the County during the warranty period.
2.7	P25 Network Management Feature Requirements	Low	3	
2.7.1	Fault Management	Low	3	
2.7.2	Configuration Management	Low	2	Dispatch console configuration management is considered existing. Radio Management can be provided as an option.
2.7.3	Accounting Management	Low	1	An application for user radios statistics is not included, and user radios can be monitored via a communications service monitor.
2.7.4	Performance Management	Low	1	With conventional, subscribers are not enabled or affiliated to a radio system database to perform the described performance management.
2.7.5	Security Management	Low	3	The proposed system is capable of radio inhibit. The console needs to be equipped with radio inhibit. Due to backhaul constraints, stand-alone sites do not support inhibit.
2.8	Network Management Architecture Requirements	Low	3	
2.8.1	Network Management Design	Low	3	
2.8.2	Administrative Access	Low	3	
2.8.3	Data Recovery	Low	3	Unified Event Manager is the only database in the conventional system. The UEM is not typically backed up. Generally, the system is rediscovered in the event of failure.
2.8.4	Monitoring	Low	3	
3.0	RF SUBSYSTEM SPECIFICATIONS AND REQUIREMENTS	Low	3	
3.1	Required Components	Medium	3	
3.1.1	Digital RF Subsystem	Medium	3	Duplexers are utilized in lieu of combiner/multicouplers to mitigate tower loading.
3.1.2	Analog RF Subsystem	Medium	3	Duplexers are utilized in lieu of combiner/multicouplers to mitigate tower loading.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
3.2	P25 and Non-P25 Conventional and Network Management Feature Requirements	Medium	3	Equipment and services are provided as described in our proposal.
3.3	Antenna System Requirements	Medium	3	
3.3.1	Required Equipment	Medium	2	Motorola has not planned to incorporate the existing frequencies in the proposed antenna system to mitigate the potential of negatively impacting the existing system, and only a single antenna is being added to the towers.
3.3.2	Quality Control	Medium	3	
3.4	Coverage Requirements	High	3	
3.4.1	Coverage Areas	Critical	3	Motorola exceeds the coverage requirement and BAPC percentages as described in the system description.
3.4.2	Coverage Reliability	High	3	
3.4.3	Radio Configuration	Medium	3	
3.4.4	TSB-88 Compliance	High	3	
3.4.5	Regulatory Compliance	High	3	
3.4.6	Coverage Testing Criteria and Specifications	Medium	3	
3.5	Expansion Requirements	Medium	3	
3.6	Reliability Requirements	High	3	
3.6.1	System Reliability Requirements	High	3	
3.6.2	Equipment Reliability Requirements	High	3	
3.6.3	Points of Failure	High	3	
3.7	Equipment Requirements	Medium	3	
3.7.1	Radio Repeaters	Medium	3	
3.7.2	Spare Equipment	Medium	3	
4.0	MICROWAVE BACKHAUL SUBSYSTEM SPECIFICATIONS AND REQUIREMENTS	Low	3	Motorola complies as described in our proposal.

Vendor Name:	Motorola Solutions			
Sec	**Section Description**	**Priority**	**Proposer Response**	**Comments**
4.1	Network Microwave Link Requirements	Medium	3	
4.1.1	Frequency Band Coverage	Low	3	
4.1.2	Modulation	Medium	3	
4.1.3	Adaptive Modulation	Medium	3	
4.1.4	Radio Transmitter Performance	Medium	3	
4.1.5	Synchronization	Medium	3	
4.1.6	System Protection Features	Medium	2	
4.2	Equipment Requirements	Medium	2	
4.2.1	Radio Units	Medium	3	To reach lengths up to 950ft would require a combination cable & fiber solution. However for this application the requirement is satisfied with one cable.
4.2.2	Antennas	Medium	3	
4.2.3	Power Supply and Power Consumption	Medium	3	
4.2.4	Regulatory Compliance	Medium	3	
4.2.5	Spare Equipment	Medium	3	
4.3	System Management Requirements	Medium	3	
4.3.1	Network Management	Medium	3	
4.3.2	Security Management	Medium	3	
5.0	PORTABLE SUBSCRIBER RADIO SPECIFICATIONS AND REQUIREMENTS	Low	3	
5.1	P25 Conventional Feature Requirements	Medium	3	
5.1.1	Group Voice and Broadcast Group Call	Medium	3	

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
5.1.2	Emergency Alarm	Medium	3	Motorola exceeds with the proposed APX6000 able to generate an emergency alarm with hot mic, silent/surveillance. The APX radios can be programmed to revert to a common emergency channel (revert) or remain on the current channel (tactical). APX radios are capable of adjusting the length of time the emergency button must be depressed before an emergency alarm is generated from 50 ms (milliseconds) to 6200 ms in 50 ms increments. The amount of time required to clear the emergency can also be set. Additionally the APX 6000 has the ability to transmit its emergency alarm via Bluetooth to other nearby APX portable radios.
5.1.3	Emergency Group Call	Medium	3	Motorola exceeds with APX radios that can initiate a emergency group call by pressing the radio's emergency button and then using the PTT button or Hot Mic capability to transmit audio. The radio user can also manually switch to the emergency channel and use the PTT button to communicate on that channel. Emergency call capabilities are configurable on a radio by radio basis. The emergency alarms can be set for silent notification or provide user-notification of the emergency activation. The APX radios also have the ability of having "Hot Mic" enabled or disabled per user preference.
5.1.4	Individual Voice Call	Medium	3	Motorola exceeds with a unified call list in the radio. APX radios support a Selective Call feature when operating on a P25 conventional system. This allows radio-users to selectively call a radio or group of radios based on Radio IDs. Radio IDs can be selected for use in the radio's Call Hot Lists or entered directly by the radio-user. The receiving radio responds with an alert-tone, and shows evidence of a call through the intelligent lighting feature and / or lighting the radio's call light. The response will be to only the initiating radio.
5.1.5	Radio Check	Medium	3	The proposed system is capable of radio check. A console needs to be equipped for radio check. Due to backhaul constraints, stand-alone sites do not support radio check.
5.1.6	Call Alert	Medium	3	Motorola exceeds with a unified call list in the radio. A transmitting radio would select the receiving radio ID and page the unit. The receiving unit will get an audio and visual alert containing the ID of the transmitting radio. A dispatch console needs to be equipped for call alert.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
5.1.7	Inhibit and Uninhibit	Medium	3	The proposed system is capable of inhibit. A console needs to be equipped for radio inhibit. Due to backhaul constraints, stand-alone sites do not support radio inhibit.
5.1.8	Encryption (Optional)	Low	3	Motorola exceeds with the Motorola's APX subscribers that can support the AES Type 3 encryption algorithm. When the APX radio is loaded with an AES 256 bit key it is rated FIPS 140.2 Level 3. This rating is unique to Motorola among other P25 manufacturers as the Motorola Advanced Cryptographic Engine (MACE) where the AES keys are stored has the ability to prevent the unauthorized access of the encryption key and will zeorize itself if it detects a mechanical, electrical, or software based attempt to access the encryption keys. All APX Public Safety Grade have the capability of supporting a variety of encryption options and features. These can be added as an option or in the field as required by the county.
5.1.9	GPS Location (Optional)	Low	3	All APX subscribers support GPS location as a standard feature. Due to backhaul constraints, stand-alone sites do not support GPS. With a single frequency per site per layer, GPS is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for GPS with Humboldt County. The GPS capabilities of the APX radios are integral to the radio and do not require an additional accessory or product to function. The APX portable antenna includes the GPS antenna.
5.2	Non-P25 Conventional Feature Requirements	Low	3	
5.2.1	Over-The-Air Programming (Optional)	Low	3	The proposed solution is capable of OTAP. Due to backhaul constraints, stand-alone sites do not support OTAP. With a single frequency per site per layer, OTAP is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for OTAP with Humboldt County.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
5.2.2	Man-down functionality (Optional)	Low	3	Motorola's public safety grade APX portables can be equipped with an accelerometer man down sensor to detect if the user has become incapacitated and is non-vertical and motionless. The mandown sensor will activate the radios' emergency alert if initiated.
5.3	Operational Requirements	Medium	3	Motorola exceeds the requirement with channel announcement and intelligent lighting.
5.3.1	Mode of Operation Requirements	Medium	3	
5.3.2	Vote Scan Requirements	Medium	3	The proposed radios support votes can and uses RSSI Voting Threshold to determine when to unmute the radio. Due to backhaul constraints, stand-alone sites do not support votescan.
5.3.3	Vocoder Requirements	Medium	3	Motorola's APX radios use the AMBE vocoder to support voice operations on the proposed network.
5.3.4	Performance Requirements	Medium	3	Motorola exceeds requirements with the APX6000: loud, clear audio that is 3000 mW (vs. 1000mW required). The APX6000 is designed to operate in harsh environments with IP68 2M water for 2 hour and a rugged endoskelton. In addition, the portables come standard with features that improve user operation such as radio profiles, intelligent lighting, and channel announcement.
5.3.5	Programming Requirements	Medium	3	Motorola exceeds with the APX 6000 portables that support 1000 individual modes (channels or Talk Groups) as standard and can be upgraded to 3000 modes. Channels in Zones in excess of 16 modes are accessible through a menu item.
5.4	Auxiliary Equipment Requirements	Medium	3	
5.4.1	Connectors	Medium	3	
5.4.2	Batteries	Medium	3	Motorola exceeds with the APX 6000 batteries and chargers that will recharge a depleted battery within 2 hrs.
5.4.3	Battery Charger Units	Medium	3	
5.4.4	Accessory and Programming Equipment	Medium	3	Motorola exceeds with speaker microphone options that have the same environmental specifications as the radio. In addition, Motorola has noise reduction microphones that operate optimally in wind and other high noise environments.

Vendor Name:		Motorola Solutions		
Sec	**Section Description**	**Priority**	**Proposer Response**	**Comments**
6.0	MOBILE SUBSCRIBER RADIO SPECIFICATIONS AND REQUIREMENTS	Low	3	
6.1	P25 Conventional Feature Requirements	Medium	3	
6.1.1	Group Voice and Broadcast Group Calls	Medium	3	
6.1.2	Emergency Alarm	Medium	3	Motorola exceeds with the proposed APX 4500 able to generate an emergency alarm with hot mic, silent/surveillance. The APX radios can be programmed to revert to a common emergency channel (revert) or remain on the current channel (tactical). APX radios are capable of adjusting the length of time the emergency button must be depressed before an emergency alarm is generated from 50 ms (milliseconds) to 6200 ms in 50 ms increments
6.1.3	Emergency Group Call	Medium	3	Motorola exceeds with APX radios that can initiate a emergency group call by pressing the radio's emergency button and then using the PTT button or Hot Mic capability to transmit audio. The radio user can also manually switch to the emergency channel and use the PTT button to communicate on that channel. Emergency call capabilities are configurable on a radio by radio basis. The emergency alarms can be set for silent notification or provide user-notification of the emergency activation. The APX radios also have the ability of having "Hot Mic" enabled or disabled per user preference. The console needs to be equipped for emergency.
6.1.4	Individual Voice Call	Medium	3	Motorola exceeds with a unified call list. APX radios support a Selective Call feature when operating on a P25 conventional system. This allows radio-users to selectively call a radio or group of radios based on Radio IDs. Radio IDs can be selected for use in the radio's Call Hot Lists or entered directly by the radio-user. The receiving radio responds with an alert-tone, and shows evidence of a call through the intelligent lighting feature and / or lighting the radio's call light. The response will be to only the initiating radio. The console needs to be equipped for individual call.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
6.1.5	Radio Check	Medium	3	The proposed system is capable of radio check. A console needs for radio check. Due to backhaul constraints, stand-alone sites do not support radio check.
6.1.6	Call Alert	Medium	3	APX radios comply with this requirement for a Call Alert or Pages. The console needs to be equipped for call alert.
6.1.7	Inhibit and Uninhibit	Medium	3	The proposed system is capable of inhibit. A console needs to be equipped for radio inhibit. Due to backhaul constraints, stand-alone sites do not support radio inhibit.
6.1.8	Encryption (Optional)	Low	3	Motorola exceeds with APX subscribers that can support the AES Type 3 encryption algorithm. When the APX radio is loaded with an AES 256 bit key it is rated FIPS 140.2 Level 3. This rating is unique to Motorola among other P25 manufacturers as the Motorola Advanced Cryptographic Engine (MACE) where the AES keys are stored has the ability to prevent the unauthorized access of the encryption key and will zeorize itself if it detects a mechanical, electrical, or software based attempt to access the encryption keys. All APX Public Safety Grade have the capability of supporting a variety of encryption options and features. These can be added as an option or in the field as required by the county.
6.1.9	GPS Location (Optional)	Low	3	All APX subscribers support GPS location as a standard feature. Due to backhaul constraints, stand-alone sites do not support GPS. With a single frequency per site per layer, GPS is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for GPS with Humboldt County.
6.2	Non-P25 Conventional Feature Requirements	Low	3	
6.2.1	Over-The-Air Programming (Optional)	Low	3	The proposed solution is capable of OTAP. Due to backhaul constraints, stand-alone sites do not support OTAP. With a single frequency per site per layer, OTAP is not recommended with the proposed design due to the loading constraints. If desired, Motorola would like to explore other options for OTAP with Humboldt County.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
6.2.2	Mobile Scanning	Low	3	Motorola exceeds with the APX 4500 that allows for mixed mode scanning with priority. Scan functionality can be enabled or disabled with a menu/button press. The APX 4500 will provide an audible alert or beep when the priority 1 or priority 2 channel is landed on. APX 4500 users are also able to use a menu-selection to view individual Scan List members in the Scan List and also places the radio in a 'Scan List Edit' mode. While in this edit mode the radio-user is able to add / remove scan list members and modify the scan priority of any member.
6.3	Operational Requirements	Medium	3	
6.3.1	Mode of Operation Requirements	Medium	3	
6.3.2	Vote Scan Requirements	Medium	3	The proposed radios support votescan and uses RSSI Voting Threshold to determine when to unmute the radio. Due to backhaul constraints, stand-alone sites do not support votescan.
6.3.3	Vocoder Requirements	Medium	3	Motorola's APX radios use the AMBE +2 vocoder to support voice operations on the proposed network.
6.3.4	Performance Requirements	Medium	3	Motorola exceeds with APX4500 loud, clear audio with 7500 mW using the built in speaker, and optional louder speakers are available. Motorola exceeds with APX4500 mobiles built to performance specifications that improve coverage such as receiver hum and noise ratio of -53 dB/-52 dB (25 kHz/12.5kHz), spurious rejection of -95 dB, reference sensitivity of-119 dBm (0.251 µV) in analog mode and -119 dBm (0.251 µV) in digital mode (five percent (5%) bit error rate), -123 dBm (0.158 µV) in digital, selectivity of -89 dB/-77 dB/ -90 dB (25. kHz/12.5 kHz/30 kHz) when measured in the analog mode per TIA / EIA 603 under nominal conditions, receiver spurious response of -95 dB, and Intermodulation value of 84 dB/85 db in 25 kHz and 12.5 kHz. APX 4500 exceeds with features that improve user operation such as a large color display and intelligent lighting for use in night or bright sunlight operations. The screen supports 3 lines of text (14 characters max), 1 line of icons, and 1 line of menus. It also has a Night/Day mode button to allow users to quickly switch between screen brightness settings.
6.3.5	Programming Requirements	Medium		Motorola exceeds with the proposed APX4500 supporting 1000 modes.

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
6.4	Auxiliary Equipment Requirements	Medium	3	
6.4.1	Physical Component Requirements	Medium	3	
6.4.2	Connector Requirements	Medium	3	
6.4.3	Programming Equipment and Software Specifications	Low	3	
7.0	RADIO CONTROL STATION SPECIFICATIONS AND REQUIREMENTS	Low	3	
7.1	Desktop Mobile Control Stations	Medium	3	
7.2	Console Backup Control Stations	Medium	3	The APX 4500 can use tone remote control to support remote operations from the desk top.
8.0	GENERAL EQUIPMENT SPECIFICATIONS AND REQUIREMENTS	Low	3	
8.1	Electrical Requirements	Medium	3	
8.1.1	Radio Equipment	Medium	3	
8.1.2	Non-Radio Equipment	Medium	3	
8.2	Storage, Mounting and Access Requirements	Medium	3	
8.2.1	Storage Requirements	Medium	3	
8.2.2	Mounting Requirements	Medium	3	
8.2.3	Access Requirements	Medium	3	
8.3	Cabling Requirements	Medium	3	
8.3.1	Connection Requirements	Medium	3	Motorola has provided an upgrade of the existing console as an option.
8.3.2	Punch Block Requirements	Medium	3	
8.3.3	Labeling Requirements	Medium	3	
8.3.4	Routing Requirements	Medium	3	
8.4	Grounding Requirements	Medium	3	

Vendor Name:		Motorola Solutions		
Sec	Section Description	Priority	Proposer Response	Comments
8.4.1	Antenna Line Requirements	Medium	3	
8.4.2	Transmission Line Requirements	Medium	3	
8.4.3	Ground Bus Bar Requirements	Medium	3	
8.4.4	Equipment Rack Grounding Requirements	Medium	3	
8.5	Transient Voltage Surge Suppression Requirements	Medium	3	
8.5.1	Lightning Arrestor Requirements	Medium	3	
8.5.2	Surge Protective Device Requirements	Medium	3	
8.5.3	Transmission Line Entrance Panel Requirements	Medium	3	
9.0	MAINTENANCE AND SUPPORT SPECIFICATIONS AND REQUIREMENTS	Low	3	
9.1	Parts and Service Availability Requirements	Medium	2	Motorola has proposed parts support for proposed equipment. There are no anticipated or foreseeable cancellation dates for the APX subscribers included in this proposal. Since the cancellations of these products have not been identified, we are unable to speculate on timing for parts availability. Typical product lifecycle is at least 10 years with an additional 5 years of parts and support following cancelation. The proposed radios include: • APX 4500 mobile radios - started shipping 4Q2012, still updating features • APX 6000 portable radios - refreshed model in 2016
9.2	Priority Requirements	Medium	3	

Vendor Name:		Motorola Solutions		
Sec	**Section Description**	**Priority**	**Proposer Response**	**Comments**
9.2.1	System Failure	Medium	2	Motorola has proposed on-site response for the proposed equipment. Motorola's premier partner, Day Wireless, has trained resources and a depth of personnel to provide the best service available. Day wireless will provide a technician in Humboldt County, however, does not currently employ a technician within Humboldt county. Additional resources are located in Chico, CA, Grants Pass and Medford, OR. There may be instances when certain failures, such as catastrophic loss of a tower, where a repair cannot be made within 5 hours.
9.2.2	Component Failure	Medium	2	Motorola has proposed on-site response for the proposed equipment. Spares are included to expedite repairs. There may be instances when certain failures, such as catastrophic loss of a building and equipment inside, that cannot be repaired within 1 business day.
9.2.3	Minor Service Interruptions	Medium	2	Motorola has proposed on-site response for proposed equipment. Spares are included to expedite repairs. There may be instances when certain failures, such as catastrophic loss of a building and equipment inside, that cannot be repaired within 2 business days.