

Next Gen Radio System

Customer Design Review Submittal Analysis
Third Party Review

Marin Emergency Radio Authority (MERA)

May 18, 2020

Revision History

| Revision | Revision date | Details |
|----------|---------------|---------------|
| 0 | May 11, 2020 | Initial Draft |
| 1 | May 18, 2020 | Report |
| | | |
| | | |

Distribution List

| # Hard Copies | PDF Required | Association / Company Name |
|---------------|--------------|----------------------------|
| 0 | 1 | MERA |
| | | |
| | | |
| | | |

Copyright © 2020 by AECOM

All rights reserved. No part of this copyrighted work may be reproduced, distributed, or transmitted in any form or by any means without the prior written permission of AECOM.

Table of Contents

| | | |
|-----------|--|----|
| 1. | Introduction..... | 1 |
| 2. | About AECOM | 1 |
| 3. | Executive Summary..... | 2 |
| 4. | Review and Evaluation Process | 3 |
| 5. | Review of CDR Documents..... | 4 |
| CDR 02-01 | Updated Project Management Plan..... | 4 |
| CDR 02-02 | Project Schedule..... | 4 |
| CDR 02-03 | Radio System Description | 5 |
| CDR 02-04 | Microwave System Description..... | 5 |
| CDR 02-05 | Paging System Description..... | 6 |
| CDR 02-06 | Dispatch Consoles System Description | 6 |
| CDR 02-07 | System Block Diagrams..... | 7 |
| CDR 02-08 | Radio and Microwave Channel Plans | 7 |
| CDR 02-09 | Microwave Network Maps..... | 7 |
| CDR 02-10 | Microwave Path Analysis for Each Hop | 7 |
| CDR 02-11 | Backhaul Provisioning Plan / Network Requirements | 8 |
| CDR 02-12 | Backhaul Programming Templates | 9 |
| CDR 02-13 | Microwave Antenna Specifications and Mounting Heights..... | 9 |
| CDR 02-14 | Detailed Lists of Equipment for Each Site..... | 9 |
| CDR 02-15 | Specification Sheets for All Proposed Equipment | 10 |
| CDR 02-16 | Mean Time Between Failure (MTBF) of Equipment and Parts..... | 11 |
| CDR 02-17 | Ability to Replace Failed Units; Repair, Replace, Return Process | 11 |
| CDR 02-18 | Site Layout Drawings..... | 11 |
| CDR 02-19 | Shelter Floor Plan Drawings | 12 |
| CDR 02-20 | Tower Elevation / Equipment Placement Diagrams | 13 |
| CDR 02-21 | Antenna System Diagram, incl. Combiners, TTAs, Multicouplers | 15 |
| CDR 02-22 | Rack Elevation Drawings..... | 15 |
| CDR 02-23 | Termination Details | 16 |
| CDR 02-24 | Power Consumption Data..... | 16 |
| CDR 02-25 | Site Alarm Definition | 17 |
| CDR 02-26 | Coverage - Mobile Subscribers | 17 |
| CDR 02-27 | Coverage - Portable Subscribers On Street | 18 |
| CDR 02-28 | Coverage - Portable Subscribers In Building | 18 |
| CDR 02-29 | Link Budgets..... | 20 |
| CDR 02-30 | Intermodulation Analysis..... | 20 |
| CDR 02-31 | Maximum Permissible Exposure (MPE) Study | 20 |
| CDR 02-32 | NTIA Study Regarding Receiver Front End Overload..... | 20 |
| CDR 02-33 | Detailed Description of Failure Modes and Impact including GPS..... | 20 |
| CDR 02-35 | Radio System IP Plan..... | 20 |
| CDR 02-36 | Microwave System IP Plan | 20 |
| CDR 02-37 | Site Heat Output Data..... | 21 |
| CDR 02-38 | LMR System Site Inspection and Test Plan | 21 |
| CDR 02-39 | Microwave System Site Inspection and Test Plan..... | 21 |
| CDR 02-40 | Proposed Site Installation Check Sheets..... | 21 |
| CDR 02-41 | Preliminary LMR Staging Acceptance Test Procedure..... | 21 |

CDR 02-42 Preliminary Microwave Staging Acceptance Test Procedure22

CDR 02-43 Implementation Plan - Master Site FNE.....22

CDR 02-44 Implementation Plan - Dispatch FNE.....22

CDR 02-45 Implementation Plan - RF Site FNE.....22

CDR 02-46 Implementation Plan - Microwave FNE.....22

CDR 02-47 Implementation Plan - Mobile Subscribers22

CDR 02-48 Implementation Plan - Portable Subscribers.....23

CDR 02-49 Implementation Plan - Volunteer Fire Paging23

CDR 02-50 Implementation Plan - Jail DAS23

CDR 02-51 Preliminary LMR System Functional Acceptance Test Procedure24

CDR 02-52 Preliminary microwave Functional Acceptance Test Procedure.....24

CDR 02-53 Coverage Acceptance Test Procedure.....24

CDR 02-54 Preliminary Agency Migration/Cutover Plan.....25

CDR 02-55 Preliminary Microwave System Cutover Plan26

CDR 02-56 Preliminary Mobiles Cutover Plan.....26

CDR 02-57 Preliminary Control Stations Cutover Plan.....26

CDR 02-58 Preliminary paging cutover plan26

CDR 02-59 Preliminary dispatch console cutover plan.....26

CDR 02-60 Preliminary recording system cutover plan.....26

CDR 02-61 30-Day Operational Test plan26

CDR 02-62 Preliminary Training Schedule27

Appendix A – Recommended CATP revisions..... 28

Figures

Figure 1. Possible path interference issue 12

Figure 2. Problem areas still missing coverage..... 18

Figure 3. Recommended changes to Section 2.6 of the DAS CATP 24

Tables

Table 1 Service Area Reliability Numbers from Contract..... 19

1. Introduction

In March 2020, the Marin Emergency Radio Authority (MERA) requested support from AECOM Technical Services, Inc. (AECOM) to perform an independent 3rd party review of the Customer Design Review (CDR) documentation provided by Motorola Solutions, Inc. (Motorola) that details Motorola's design and plans for the implementation of MERA's Next Generation Radio System. AECOM previously supported MERA and the County of Marin in 2010 as a technical consultant to help assess and recommend long term solutions and future requirements for the new replacement radio system.

For MERA's Next Gen Radio System Project, Motorola is contracted to provide a 700 MHz simulcast P25 TDMA trunked radio system for public safety communications in Marin County, CA. This P25 system technology is the preferred standard for mission critical communications in use today throughout the U.S.

The detailed design review of the radio system being procured by MERA allows Motorola to present how their design and their implementation and testing plans meet all requirements for the Next Gen Radio System Project. Motorola's CDR documentation is the final product for MERA's milestone requirement that a detailed design review of the intended design and implementation and test plans of the system be conducted for MERA's approval prior to proceeding to the ordering and implementation phases of the project.

It should be noted that after the CDR is approved, changes to the agreed upon contract should be largely prevented (other than MERA electing to add options or to refine quantities or features of subscriber equipment, accessories, etc.). A project with a high number of change orders is not normal and can indicate that either the requirements were not sufficiently defined, or that the system design was not adequately detailed or understood.

For this review effort, AECOM was tasked with analyzing the CDR documentation, and comparing it to the requirements of MERA's Radio Communications System Contract with Motorola. The implementation of a state-of-the-art countywide radio system is very complex, requiring careful and detailed planning. The volume of documentation developed by Motorola to fully describe the complete system, the plans for the multi-year implementation and deployment effort, and the method to test the performance of the many subsystems was previously estimated to contain over 1,400 pages of highly technical information. As a result, the documentation requires reviews from sources that are knowledgeable about radio system implementations to ensure that the necessary details are covered, and to minimize changes later in the project that can increase costs or cause delays to the schedule.

2. About AECOM

AECOM Technical Services, Inc. is a corporation headquartered in the State of California and organized to do business as it now substantially exists on April 6, 1990. AECOM Technical Services, Inc. is a wholly owned indirect subsidiary of AECOM, a Delaware corporation whose stock is publicly traded on the New York Stock Exchange (ACM/NYSE).

AECOM's experience in providing radio communications consulting services for public safety and law enforcement clients began 36 years ago in 1984 as Communications Technology Associates, Inc. (CTA), and continues today as part of the Technology Solutions practice of AECOM. Our consulting services include, among many areas of expertise, providing communication and technology solutions for all stages of public safety radio communication projects.

AECOM has provided public safety land mobile radio system implementation services for county, municipal, and state government agencies, plus many other public and private clients. We understand the challenges of migrating legacy shared public safety radio systems to new P25 TDMA simulcast technology platforms, and have supported similar initiatives with systems supplied by Motorola Solutions, Inc. **AECOM provides independent consulting to our clients with no affiliation to the radio communications providers.**

3. Executive Summary

Mission critical radio communication systems are very complex, necessitating MERA's requirement that a detailed design review be performed prior to the ordering of equipment and development of sites. Careful planning to find the unknowns, identify and iron out the issues, and clearly present the detailed plans up front, reduces the risk of having unwanted surprises of costly changes and delays in getting the system completed and operational for its users.

Overall, AECOM believes in general that the architecture of the proposed system from Motorola is a feasible solution for a 700 MHz P25 Radio System that will work and meet the intent of MERA's functional requirements.

In our review of the design documentation, AECOM noted issues that we recommend should be cleared up or resolved to minimize risks that can cause increased costs or delays in schedule. While our comments are provided in further detail for each of the CDR documents in Section 5 of this report, the following are key areas of our concern from our review of the design documentation.

1. **Quality of the Documentation** - Because of the volume and technical complexity of the documents and drawings contained in a complete CDR package, good organization of the information and good quality of the documentation are essential to clearly communicating the design to the customer. When either organization or quality is lacking, it becomes more difficult to find or clearly understand what the customer will be getting. While occasional discrepancies can be expected, numerous suggested edits and changes require additional efforts (of both cost and time to the customer) to perform cross-checking of information and repeat reviews that should have been avoided. The organization and quality of the information in the design phase can also be an indication of how the implementation will be performed. Information that is clearly presented up front is necessary to develop a level of trust by the customer that the project is under control and will proceed with few unwanted surprises.

Some of the CDR documentation reviewed did not have the quality and/or organization to provide for a smooth review of the radio system design and implementation plans. Discrepancies with information between different sections of the CDR, differences in revision levels of documents, a lack of consistency among topics, and information that appeared to be misplaced or missing were noted which required additional review efforts to determine what was planned. During the implementation phase, this level of inconsistency will present a clear risk to the project.

For example, during the review of detailed equipment lists in the design review documents, it was sometimes difficult to determine what equipment is included or is missing due to inconsistencies with equipment drawings and system descriptions. Motorola should confirm that they are providing a completely functional system that meets the requirements, and that any omission of equipment from the design documents necessary to provide a fully functional system per the requirements, are the responsibility of Motorola.

Some of the information reviewed was deferred from being presented at the CDR. This can sometimes indicate that the unknowns or details have not yet been worked out. The above documentation issues can be and should be resolved for a clean project.

2. **Microwave System** - The microwave system presented in multiple CDR documents needs to be finalized so that there is a single design. Currently, there appears to be multiple designs in the documentation that conflict with each other. We understand from conversations that the design details regarding path clearance were field verified to ensure there are no obstructions on any path in 2017. However, we can find no evidence of this study nor confirmation that obstructions showing in the latest path engineering documentation have been verified to not be an issue. Consequently, we are recommending the validation be provided or redone to confirm there are no issues. Path obstructions are a significant risk to the project, both in time and cost, especially if alternative sites need to be obtained to achieve reliable network connectivity due to a blocked path. Reference comments on CDR 02-10 Microwave path analysis for each hop in this report for greater detail.

3. **Coverage** - It is AECOM's opinion that a radio coverage guarantee for any mission critical radio system should be balanced (both inbound and outbound). While balanced coverage is not currently guaranteed by Motorola for this system design, AECOM believes, however, that the proposed design approach appears to be one that would provide balanced coverage.

Motorola's proposed method of testing for coverage is weak or vague in some areas. This can lead to coverage testing that is less able to accurately determine or verify the coverage that was predicted or guaranteed. Reference comments on CDR 02-53 Coverage Acceptance Test Plan in this report for greater detail.

4. **Schedule** - Completion of site development is typically an area with the greatest schedule risk on radio projects such as this one. The process for acquisition and permitting can have timelines that are outside the customer's control. As a result, this is an area that should receive enhanced focus to prevent delays for the timely completion of the project.

4. Review and Evaluation Process

To begin the review of the CDR documentation for the Next Gen Radio Systems Project, MERA provided to AECOM the CDR documents that have been submitted to date from Motorola. Other information, such as MERA's Request for Proposals 5/6/2016 (RFP) and the Radio Communications System Agreement 3/7/2017 (Contract), could be accessed from MERA's website. Since AECOM's scope included the review of the CDR documents for the radio system only, site development and construction documentation for the planned RF sites and facilities was not provided for the review.

AECOM first performed an initial review of the RFP and Motorola's proposal to understand MERA's requirements for a new radio system, and the overall design of the system being proposed. After familiarization of the radio system requirements and proposed design, AECOM had initially scheduled on-site meetings with MERA staff, key County of Marin staff members on the project, and with MERA's consultant and project manager, Federal Engineering, to obtain a first-hand understanding of the important needs and constraints for the new system. Just prior to the scheduled on-site meetings, AECOM's travel was restricted due to the COVID-19 outbreak. As a result, AECOM scheduled conference calls with most of the key staff and stakeholders to gather the necessary background information to perform an informed analysis of the CDR documentation. The staff participants on the conference call meetings with AECOM were very knowledgeable of the project and forthcoming with answers to our questions. We were able to determine the priority areas of CDR documentation to be reviewed, which was one of the main goals of the visit.

After the first-hand information was gathered, AECOM began a detailed review process of the CDR documents and drawings. Regularly scheduled weekly meetings were held with senior MERA staff for AECOM to ask questions that were developed from our reviews each week, and to provide a status of our review progress to MERA.

AECOM's focus during the review of the CDR documents was to:

- identify items found from the review of the CDR material that do not conform to the requirements and intent of the RFP and the Contract.
- consider the input and understanding of the goals of the project gained from our meetings with the key stakeholders to identify any important areas that may not have been fully addressed in the RFP or Contract.
- look for any discrepancies, errors or omissions in the information that was presented in the CDR.
- identify potential issues or areas of concern that could result in delays, increased costs, or failure to meet the expected system performance.
- provide comments for each CDR document, if any, on findings from our review and/or suggestions or recommendations for resolution or improvement.

The following section of the report lists our comments to each of the CDR documents.

5. Review of CDR Documents

CDR 02-01 Updated Project Management Plan

This CDR document is an addendum to Section 6 “Project Management Plan” of the Radio Communications System Contract. Revision 3 of the CDR document, submitted on March 23, 2020, has not yet been approved.

RFP Section 2.5.A requested that the Project Management Plan include a Work Breakdown Structure (WBS). Motorola complied with this requirement. A WBS was not found in the CDR documentation. The preliminary project schedule (CDR 02-02), however, lists the specific work packages of the project scope in detail. As a result, the project schedule can serve as the WBS for the project.

CDR 02-02 Project Schedule

The preliminary project schedule that was reviewed for the CDR was dated 1/24/2020. It is understood that many of the dates in the preliminary schedule may change. Once it is finalized and approved, it can then be baselined for future project tracking. Below is the scope requirement in the Radio System Contract for the approval of the project schedule in the CDR.

Per Radio System Contract Section 5.14.4.6 Finalize Project Schedule and Implementation Plan:

“This task is considered complete upon mutual agreement of the parties to implement in accordance with the final Project Schedule that has been developed within the Design Review. The accepted Project Schedule will become the governing Project Schedule incorporated into the contract, and is subject to change only upon mutual agreement of Motorola and MERA. The acceptance of the project schedule will be the final activity of detailed design development and review process.”

Overall, the schedule looks reasonable in its steps, sequence, and level of detail. From past experience, AECOM has noted that site development is typically the area where there is the most risk to the project schedule.

1. The total duration for Site Development (project schedule line 515) is approximately 2 years. This is the most common area in a radio project such as this for the schedule to slip. Since 10 of the sites are existing sites requiring updates, and since much of the site acquisition and permitting process has been completed, the 2-year duration in the schedule for site development would seem reasonable. However, this is an area that should receive enhanced focus to prevent delays for the timely completion of the project.
2. The total duration for Site Installation (project schedule line 589), which is approximately 1.5 years, looks aggressive for 14 simulcast RF sites. The sites are installed sequentially. If Motorola gets behind in this task, they could accelerate it by adding installation teams and perform installation of sites in parallel.
3. Fleet Mapping (project schedule line 908) shows a start of 2/15/21. Discussions with MERA staff have indicated that with the purchase of dual band mobile radios (Contract Change Order #11), fleet mapping and code plug development will start much sooner after CDR approval in order to allow additional time to complete the mobile installations on schedule before final system cutover. The schedule should be adjusted to show the accelerated fleet mapping start date.
4. Mobile Installation (project schedule line 930) shows a start of 4/18/22. With the purchase of dual band mobile radios, and an accelerated start for fleet mapping and code plug development, the schedule should be adjusted to show new accelerated mobile subscriber order and installation start dates. This will allow for more time to ensure mobile installations are completed before final system cutover. To help clarify how the duration for this task is estimated, the task description could include the total number of mobile installations planned and the assumed mobile install daily rate (similar to the description for ‘Perform CATP’ tasks starting on project schedule line 1132).
5. Currently, the completion of mobile installations (project schedule line 933) is 12/26/22, which is after the scheduled date for the final system cutover event on 11/2/22. Unless some of the new mobile

subscribers will not be used during cutover to the new system, mobile installations should be completed prior to final system cutover.

6. Subscriber Programming and Installation / Migration is scheduled for completion (project schedule line 958 and line 1142) on 3/2/23, 4 months after the final system cutover event on 11/2/22. If this task includes the removal of legacy programming after system cutover, or the programming of subscribers that will not be used during cutover, then this makes sense. Otherwise, this should be completed prior to final system cutover. Also, Subscriber End User Training (project schedule line 1035) should ideally be completed prior to final system cutover.
7. The microwave system implementation has some faulty logic with Link Verification Testing occurring before path alignment and test and turn-up of microwave radios. Once the microwave system is operational and stable, then the link verification tests can be run.
We **Recommend** adding a task in project schedule line 1102 MW System and Ring Testing as a predecessor to any of the link verification tests that require microwave connectivity. It is technically feasible to do link verification between two points once enough of the network is built to provide connectivity between those two points, but if there is still network construction going on, it is likely the verification tests may suffer errors. For those links that are fiber based (connections to dispatch centers) and do not require microwave to establish, the link verification can be done as soon as the connections are provisioned with the provider.
8. Test and Acceptance (project schedule line 1060 thru 1136) assumes that everything goes perfectly. Insertion of a Punch List Resolution task with a duration of 15 to 30 days is **recommended** to allow time for correcting the inevitable unknowns.
9. After completing the performance of the CATP (project schedule line 1142), it is suggested that 2 additional tasks be added: one task for Motorola to prepare the final acceptance report and a second task for MERA to review and approve the report. Typically, 15 to 30 days is used for the duration of each of these two tasks.

CDR 02-03 Radio System Description

The RNI System Description provided for CDR 02-03 is not the latest version of this document. A later version of this same document is provided in CDR 02-06 Dispatch Console Systems. CDR 02-03 should be updated to the latest revision.

1. Section 2.7, page 2-30: Existing Quantar base stations, an aging product, remain in service. It should be confirmed if Motorola still provides support for these stations.
2. Section 2.1.4, page 2-4: In Figure 2-3, some redundant components should be identified as number 2.
3. Section 2.12.1, page 2-34: Please be aware: "MERA is responsible for obtaining and defining the low power 800 MHz frequency to be programmed into the radios."
4. Section 2.2.2.1.3 Identified Conventional Resources, page 2-17: In Table 2-3, a connection to Woodacre (CDF intercom) is shown as a location for CCGW. This site does not appear in the network diagrams (CDR 02-09) and is only showing site gateways in the block diagram. If this site needs analog connectivity, which is implied by Table 2-3, there needs to be connectivity to this location.
5. The fire station alerting system was added in Change Order #1. The FSA description in the change order presents a reasonable system concept, but it is not really a system design. Normally, the detailed design of major radio subsystems such as this are presented at the CDR. One reason for this is to ensure that the construction plans are compatible with the existing fire stations.
We **recommend** that MERA request a review of the fire station alerting design.
We also **recommend** requesting a test plan for the fire alerting system.

CDR 02-04 Microwave System Description

Issues identified:

1. The initial paragraph states that training courses are included per the training plan submittal. The training plan (CDR 02-62 Preliminary Training Schedule) was not provided.
2. In Figure 1, the frequency for Link 11 should be updated to the current PCN frequency.
3. The software release referenced in the Microwave System Description document is Release 8.0.R9 which is over two years old (release date: March 7, 2018). Perhaps a later release will be utilized at installation. We **recommend** verifying that what is implemented on the new system is the latest version compatible with the Motorola system and Nokia equipment.
4. Although the submitted Microwave System Description document advises that the ERPS feature will be utilized, the router configurations do not contain the basic configurations (control and data VPLS) for this implementation. The VLAN numbering should be assigned ahead of time to avoid any potential conflicts.

We **recommend** the above issues be addressed

Comments:

1. QoS
 - Quality of Service is described to be assigned by the network element. In addition, there are QoS profiles referenced in the router configuration files, however, they are not detailed enough to determine if there are conflicts or omissions.
2. Synchronization
 - While multiple methods for providing timing in the network are described, the router configurations depict reference clocks 1 and 2 as shutdown with an external 10 MHz output. It is assumed that the timing would be accomplished via external 10MHz GPS reference. If this is not accurate, then it needs to be defined.
We **recommend** documentation be updated to reflect external source.
3. Subnetting
 - There does not appear to be any subnetting conflicts with respect to the number of required hosts, invalid subnet masks, or overlapping subnets.
4. Regarding the security concern stated in the last paragraph of the summary, Nokia does offer secure transport if needed.

CDR 02-05 Paging System Description

1. The paging description is a section of the RNI System Description provided in CDR 02-03. A later revision of this document is found in CDR 02-06. It provides a concept description of the integrated Unication paging system and the pagers which operate on the 700 MHz P25 radio system.
2. MERA should review the operational scenario provided. MERA should have Motorola's recommended discussion on the number of talkgroups scanned by the pagers before finalizing the decision on FDMA or TDMA model pagers. Keeping in mind the traffic loading calculations are based on an all TDMA system, MERA has decided to go with TDMA pagers to minimize the impact to traffic loading. This decision was memorialized in Change Order 9.
We **recommend** this documentation be updated to reflect that decision.

CDR 02-06 Dispatch Consoles System Description

1. The dispatch console description is a section of a different revision of the RNI System Description provided in CDR 02-03.
2. It provides detailed information about the dispatching equipment included at each location. MERA should carefully review Tables 2-2 and 2-3 regarding the plans for interfacing conventional resources at various locations. For example, it was noted in Table 2-2 that Dollar Hill has a capacity for sixteen (16) inputs but Table 2-3 only identifies seven (7) inputs.

3. On page 2-17 in Table 2-3, a connection to Woodacre (CDF intercom) is shown as a location for CCGW. This site does not appear in the network diagrams (CDR 02-09) and is only showing site gateways in the block diagram. If this site needs analog connectivity, which is implied by Table 2-3, there needs to be connectivity to this location.

We **recommend** verifying the issues identified against operational requirements to determine if additional information is needed to be captured in this description.

CDR 02-07 System Block Diagrams

This CDR contains a useful, but very top-level diagram of the 700 MHz system. No issues were found with what was presented in the diagram.

CDR 02-08 Radio and Microwave Channel Plans

Issues identified:

1. The spelling of “combiner” in the heading of the LMR frequency plan table should be corrected.
2. Antenna mounting heights for Mount Tamalpais No. 15 and Big Rock Ridge are different from those shown in CDR 02-10. 12 ft. vs 15 ft. and 27 ft. vs. 16 ft. respectively. This discrepancy needs to be resolved and Frequency coordination revised.
3. Diversity was added to Link 14, Tomales – Sonoma Mtn. The frequency coordination will need to be revised to account for diversity receive antennas.

We **recommend** addressing issues identified and revising frequency coordination with final design data prior to approval.

CDR 02-09 Microwave Network Maps

Issues identified:

1. IP plan appears to have been revised to address a conflict with the County network. However, the last sheet in the package describing VLANs has not been updated to match the change. In addition, in CDR 02-11 a different IP plan is presented. IP plan should be consistent in documentation.
2. On the microwave system map in this CDR, the frequencies shown correspond to the PCNs that have been filed, except for Link 11 which shows Coyote Peak transmitter operating at 11355 MHz instead of 11365 MHz as it should be according to PCN data. The path length on Link 13 is shown incorrectly on the drawing as 7.2 miles instead of 13.713 miles per PCN and CDR 02-10.

We **recommend** completing updates before approving.

CDR 02-10 Microwave Path Analysis for Each Hop

Motorola has communicated that the microwave design documented in this CDR is the latest design and should be used as the master design. AECOM has identified several issues, described below.

Issues identified:

1. There appears to be an error in the documentation on Link 9, Mt. Tamalpais to EOF. Link 9 antenna models appear to be the wrong frequency band. In previous designs, PCNs equipment model number and frequency band in path calculations of this CDR indicate this link is in the lower 6 GHz band and antennas called for in the path design and path summary are in the upper 6 GHz band.
2. On the submittal cover sheet for CDR 02-13, MERA commented that flat fade margin (FFM) was too low and the response from Motorola was that the antenna gains and transmitter power levels were adjusted to improve FFM to be above 35 dB. The values for FFM in this documentation are less than what was shown in CDR 02-13 and there are two links, Link 4 Mt. Tamalpais – Stewart Pt. and Link 17 Mill Valley WT – Wolfback Ridge, that are below 35 dB FFM.

3. The antenna centerline at Mt. Tamalpais No. 15 on Link 1 has changed from 12 ft. to 15 ft. The path was coordinated at 12 ft. This difference in centerline would be considered a minor change and will need to be re-coordinated at the new height.
4. The antenna centerline at Big Rock Ridge on Link 15 has changed from 27 ft. to 16 ft. The path was coordinated at 27'. This is considered a minor change since the height has decreased and will need to be re-coordinated at the new height.
5. The antennas on Link 2, Point Reyes Hill – Coyote Peak and Link 3, Pt. Reyes Hill – Mt. Barnabe, have changed to cross polarized antennas. Frequencies for these paths were coordinated with vertical polarization. Switching to horizontal polarization is considered a major change and will require a re-coordination at the different polarization.
6. The EIRP levels documented in this design have a range of -0.39 to +2.4 dBm difference from levels that were coordinated. There are 18 sites between -0.39 and +0.3 dBm, 14 sites between + 0.3 and +0.9 dBm which is approximately 87% of the sites. The remaining 13% consist of, 1 site between +0.9 and +1.6 dBm, 3 sites between +1.6 and +2.2 dBm, and 1 site between +2.2 and +2.9 dBm.
7. The following paths appear to have obstructions on the path. Best practice is to have a completely unobstructed path for public safety systems.

Point Reyes Hill to Coyote Peak – near Point Reyes Hill

Point Reyes Hill to Mt. Barnabe – near Point Reyes Hill

Mt. Tamalpais to EOF – approx. 0.5 mi from EOF

Mt. Tamalpais to Muir Beach – near Muir Beach and approx. 0.1 mi from Mt. Tamalpais

Tomales to Coyote Peak – near Coyote Peak

Big Rock Ridge to Mt. Tiburon – near both ends

Mill Valley WT to Wolfback Ridge – near Mill Valley WT

San Pedro Ridge to Mt. Tiburon – near Mt. Tiburon

Recommendations:

1. For Item 1 - Resolve error in antenna model and rerun path calculations with proper antennas. Verify that the availability and FFM meet requirements.
2. For Item 2 - Adjust design to bring FFM on Links 4 and 17 above 35dB.
3. For Items 3 and 4 – Re-coordinate frequencies at the new heights
4. For Item 5 – If the addition of cross polarized antennas is for future use, note in the design and revise frequency coordination.
5. For Item 6 – If EIRP levels are final, revise frequency coordination or revise the design to match frequency coordination if not final.
6. For Item 7 – A transmission engineer should field verify obstructions identified in the model to determine if they are valid. This could be a significant risk if the paths are not viable.

CDR 02-11 Backhaul Provisioning Plan / Network Requirements

Issues identified:

1. The IP plan is different from that presented in CDR 02-09. Since this document has a later date, it is assumed that this IP plan is correct, and therefore IP plans in other documents should be updated to match.
 - The 9500 MPR configuration sheet for Mt. Tamalpais 1 is missing the protection port definitions for Stewart Pt. and Civic Center.

- The 9500 MPR configuration sheet for Mt. Tamalpais 2 is missing the protection port definitions for Wolfback Ridge and Muir Beach.

We **recommend** finalizing IP plan and updating all related documentation so there is a consistent plan.

CDR 02-12 Backhaul Programming Templates

Issues identified:

1. The configuration files supplied do not match the MPLS port assignment spreadsheet in CDR 02-11. It appears the configuration files were generated on Jan 30, 2020, but the port assignment spreadsheet is dated February 28, 2020. The documentation should match.

We **recommend** getting latest configuration files to correlate with port assignments to avoid confusion during installation.

CDR 02-13 Microwave Antenna Specifications and Mounting Heights

The document provided for this CDR has been confirmed by Motorola to be an older version and AECOM was asked to find this information in CDR 02-10 "Microwave Path Analysis".

The submittal coversheet for this CDR indicates that power levels and antenna sizes were changed to address flat fade margin issues. See Comments under CDR 02-10.

Issues identified:

1. The CDR does not provide the specific information as required for this CDR, which would be the detailed specification of the Microwave antennas that will be used for this project and a table with the information of the antennas being used for each site. For "Antenna Specification" AECOM was able to locate the specifications in CDR 02-15 "Specification sheets for all proposed equipment" and in CDR 02-10 "Microwave Path Analysis" for mounting height of Microwave antennas at each of the sites.
2. The antenna models in CDR 02-10 "Microwave Path Analysis" for path between Mt. Tamalpais (UXA6-65 B) and EOF (PAD6 – 65 B) does not match the frequencies (6175).

CDR 02-14 Detailed Lists of Equipment for Each Site

1. General
 - a. The equipment list does not show the two (2) GGM 8000 required for the all the simulcast sites as per CDR 02-03 "RNI System Description" Section 2.1.5.
 - b. The equipment list only has three (3) Cabinet Receive Multicouplers for East simulcast site, but the CDR 02-03 "RNI System Description" Section 2.1.5 says there should be four (4) Cabinet Receive Multicouplers for East simulcast.
 - c. The equipment list has two (2) Cabinet Receive Multicouplers for West simulcast site, but the CDR 02-03 "RNI System Description" Section 2.1.5 shows none.
 - d. The equipment list is missing CCGW(GGM8000) for all the analog conventional sites.
2. Big Rock Ridge
 - a. CDR 02-10 "Microwave Path Analysis" shows Microwave Dish Antenna UHX6-59 to OTA Broadcasting, but this part number is not in the CDR 02-14 "Detailed equipment list". The "Detailed equipment list" has antenna USX6-6W-6GR which might be a substitute to UHX6-59. We **recommend** that the model number be verified, and the discrepancy be resolved.
 - b. CDR 02-10 "Microwave Path Analysis" shows Microwave Dish Antenna UHX6-107 to Mt. Tiburon but this part number is not in the CDR 02-14 "Detailed equipment list". The "Detailed equipment list" has antenna USX6-11W-6GR which might be a substitute to UHX6-107. We **recommend** that the model number be verified, and the discrepancy be resolved.
3. OTA Broadcasting

- a. CDR 02-10 “Microwave Path Analysis” shows Microwave Dish Antenna UHX6-59 to Big Rock Ridge, but this part number is not in the CDR 02-14 “Detailed equipment list”. The “Detailed equipment list” has antenna USX6-6W-6GR which might be a substitute to UHX6-59.
We **recommend** that the model number be verified, and the discrepancy be resolved.
 - b. CDR 02-10 “Microwave Path Analysis” shows Microwave Dish Antenna PAD 6 - 59 B to Sonoma Mtn., but is not shown in the equipment list for OTA Broadcasting. The equipment list has antenna USX6-6W-6GR.
We **recommend** that the model number be verified, and the discrepancy be resolved.
4. Point Reyes Hill
 - a. The Microwave Dish antenna to Coyote Peak and Mt. Barnabe in CDR 02-10 “Microwave Path Analysis” is SCX3 – W100A but the equipment list has antenna SC3 – W100A.
We **recommend** that the model number be verified, and the discrepancy be resolved.
 5. Mt. Barnabe
 - a. The Microwave Dish antenna to Point Reyes Hill in CDR 02-10 “Microwave Path Analysis” is SCX3 – W100A, but the equipment list has antenna SC3 – W100A.
We **recommend** that the model number be verified, and the discrepancy be resolved.
 6. Coyote Peak
 - a. The microwave dish antenna to Point Reyes Hill in CDR 02-10 “Microwave Path Analysis” is SCX3 – W100A, but the equipment list has antenna SC3 – W100A.
We **recommend** that the correct model number be verified, and the discrepancy be resolved.
 7. Mt. Tamalpais #4
 - a. The equipment list does not have Microwave Dish Antenna UHX6-65 as listed in CDR 02-10 “Microwave Path Analysis”.
We **recommend** the correct model number that will be used be verified and all corresponding CDRs updated accordingly.
 8. Mt. Tamalpais
 - a. There are seven (7) microwave paths from Mt. Tamalpais, but the equipment list has a total of eight (8) microwave dishes for Mt. Tamalpais site.
 9. Sonoma Mtn.
 - a. CDR 02-10 “Microwave Path Analysis” shows Microwave Dish Antenna UHX6-59 to OTA Broadcasting, but this part number is not in the equipment list. The equipment list has antenna PAD6-59BC.
 - b. The equipment list only has two (2) MPT-HCL. There should be a total of three (3) MPT-HCL. Two (2) for Sonoma Mtn. and one (1) for OTA Broadcasting.
 10. Tomales
 - a. The equipment list only has two (2) MPT-HCL assigned to Tomales. There should be a total of three (3) MPT-HCL. Two (2) for Sonoma Mtn. and one (1) for Coyote Peak.

We **recommend** addressing discrepancies between this document and CDR 02-10 and CDR 02-03.

CDR 02-15 Specification Sheets for All Proposed Equipment

Issues Identified:

1. UHX6-65 specification sheet not provided.
 - a. Does not have any information on the microwave sub parts i.e. MPT-HL, MPT-HLC, RTU, Diplexers, NFM-P, SFP, etc.
 - b. Missing Coax cable specification sheets.

- c. Missing radio transmit and receive antennas (CC807-08 and SC476-HF1LDF) specification sheets.
- d. Missing DC power plant equipment specification sheets i.e. rectifier, batteries etc.

We **recommend** missing specification sheets be supplied.

CDR 02-16 Mean Time Between Failure (MTBF) of Equipment and Parts

This CDR was waived on the claim that the information is Motorola proprietary data.

We **recommend** Motorola should confirm that the spare parts and quantities are correct and in agreement with Motorola's knowledge of the most frequent failures.

CDR 02-17 Ability to Replace Failed Units; Repair, Replace, Return Process

Issues Identified:

This CDR consists of the Motorola Customer Support Plan and the Infrastructure Repair Statement of Work.

1. The submittal coversheet for the Customer Support Plan indicates it is Revision 2. The CDR submittal tracking sheet, however, indicates that CDR 02-17 should be at Revision 3.
2. The dates on the pages start at 5 MAR 20 and then change to 14 FEB 20.
 - a. Nokia software updates do not appear to include services to install upgrades. Will MERA have technical resources to perform? **Potential future cost risk.**
 - b. Unication Pager warranty period is not specified.

CDR 02-18 Site Layout Drawings

The drawings provided in CDR 02-18 give an overview of the entire site with the location of existing and new equipment/structures. There are no detailed drawings for any changes to existing equipment/structure or for any new installs.

Issues Identified:

1. General
 - a. Most drawings refer to other sets of construction drawings for more information but were not provided as part of the design package for AECOM review. Comments provided are only for drawings received.
 - b. The Microwave Azimuth provided in each of the site plans is not consistent with CDR 02-10 "Microwave Path Analysis". Some match CDR 02-10, some are rounded to a single decimal and some are without any decimal information.
2. EOF
 - a. EOF-CD100s-Rev7_09162019 Site Plan is not a site plan. It is Equipment Room Layout (CDR 02-19).
3. Mt. Tamalpais
 - a. Site named is spelled wrong for the file: "Tamapais".
 - b. Microwave at ST# 16 to Stewart Point seems to be pointing too close to ST# 15. It should be verified if ST#16 will not have any interference. Alternatively, the microwave paths can be switched between ST#15 and ST#16. Figure 1 below shows line at 270 degrees and it is clear there is another antenna on ST#16 that could potentially interfere with path from ST#16.

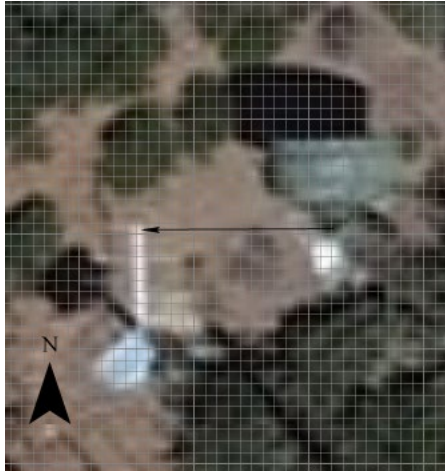


Figure 1. Possible path interference issue

4. Mt. Tiburon
 - a. Cable route to both the monopoles are not shown on the drawing.
5. Wolfback Ridge
 - a. Proposed equipment room dimensions (13'-7" x 11'-5") differ from CDR 02-19 "Shelter Floor Plan Drawings" (13'-7" x 12'-5").
6. Sonoma Mtn.
 - a. The drawing does not show label for the proposed antenna location.

CDR 02-19 Shelter Floor Plan Drawings

This CDR document provides rack layouts for equipment rooms for each of the sites. There are two drawings for each of the sites showing transitional and final layout, except for the equipment rooms that are new.

Issues Identified:

1. General
 - a. A note should be added that "California Code of Regulations (CCR) Title 24 should be adhered to for the installation of rack", as mentioned in the RFP.
 - b. The drawings are confusing in the description as there is no consistent labeling for racks shown in red, green and black. The drawings should explain what these colors stand for.
 - c. The "Description" shows some of the racks labeled as "new". Does the "new" stand for new rack or new equipment? An example is on the Big Rock Ridge drawing showing Row-2, Rack-1 as labeled "Conventional (new)". It is unclear if it means new equipment or new rack.
 - d. It would be helpful to have a drawing for the existing layout to verify the changes at each shelter.
 - e. Most drawings are not consistent in providing information on the "List of Equipment" for each of the shelters or showing where the basic equipment is located, such as Electrical Panel, Telco Board, Ground Bus Bar, HVAC Control etc.
 - f. Point Reyes Hill, Stewart Point and Muir Beach power racks dimensions are labeled as 25.5" x 24", while all other racks are either 25.5" x 26" or 20.5" x 24".
2. Muir Beach
 - a. Racks "Row" are labeled differently between CDR 02-19 "Shelter Floor Plan Drawings" and CDR 02-22 "Rack Elevation Drawings".
3. San Pedro Ridge

- a. The location of Row-1, Rack-1 and Rack-2 appears to have moved from the transition drawing.
 - b. DC power plant rack description shows dimensions as "20.5X24", but the Rack Elevation Drawing" CDR 02-22 says that it's a 23-inch rack. CDR 02-24 "Power Consumption Data" has North-Star 210FT batteries for the site which require a 23-inch rack.
 - c. The CDR 02-19 drawings do not match Contract Change Order #6.
- 4.. Stewart Point
- a. The final "Equipment Room Layout Drawing" shows Row-1, Rack-1 description as "Microwave/Conventional". The "Rack Elevation Drawing" CDR 02-22 only shows microwave equipment.
 - b. The CDR 02-19 drawings do not match Contract Change Order #6.
5. OTA Broadcasting
- a. Rack dimensions for the 23-inch racks do not seem to be depicted correctly on the drawings.
 - b. The description for Row-1, Rack-2 is for a 23-inch rack in the drawing. The "Rack Elevation Drawing" CDR 02-22 shows a 19-inch rack.
6. Mt. Tiburon
- a. The CDR 02-19 drawings do not match Contract Change Order #6.
7. Dollar Hill
- a. The CDR 02-19 drawings do not match Contract Change Order #6.
8. Mt. Barnabe
- a. The CDR 02-19 drawings do not match Contract Change Order #6.
9. Big Rock Ridge
- a. The CDR 02-19 drawings do not match Contract Change Order #6.
10. Sonoma Mtn.
- a. The drawings are not provided for Sonoma Mtn. in Contract Change Order #6.

We **recommend** that the discrepancies mentioned be addressed and corrected.

CDR 02-20 Tower Elevation / Equipment Placement Diagrams

The CDR provides tower elevation drawings for each site showing the location of existing equipment and a second drawing showing the addition of new equipment placement. It also provides a table for existing equipment, equipment to be removed and proposed new equipment.

Issues Identified:

1. General
 - a. The drawings are not consistent. Big Rock Ridge provides two drawings for the tower view, a West View and a South View. Most other drawings do not provide two different views.
2. Big Rock Ridge
 - a. The Microwave height to Mt. Tiburon (27') does not match CDR 02-10 "Microwave Path Analysis" (16').
3. Coyote Peak
 - a. Microwave antenna part number to Point Reyes Hill (SC3 - W100 AC) does not match CDR 02-10 "Microwave Path Analysis" (SCX3 - W100 A).
4. Point Reyes Hill

- a. Microwave antenna part number to Coyote Peak (SC3 - W100 AC) does not match CDR 02-10 "Microwave Path Analysis" (SCX3 - W100 A).
 - b. Microwave antenna part number to Mt. Barnabe (SC3 - W100 AC) does not match CDR 02-10 "Microwave Path Analysis" (SCX3 - W100 A).
5. Dollar Hill
- a. Microwave antenna part number to Mt. Tamalpais (PAD6-59B) does not match CDR 02-10 "Microwave Path Analysis" (PAD-65B).
 - b. The Tower Loading Table does not provide information on which leg the existing equipment is installed, or on which leg the new equipment will be installed.
6. Mt. Barnabe
- a. Microwave antenna part number to Point Reyes Hill (SC3 - W100 AC) does not match CDR 02-10 "Microwave Path Analysis" (SCX3 - W100 A).
 - b. The Tower Loading Table does not provide information on which leg the existing equipment is installed, or on which leg the new equipment will be installed.
7. Mt. Tamalpais
- a. The Mt. Tamalpais drawings only show one tower elevation drawing for the P25 antennas, which does not have any new MW antennas. The rest of the towers/poles do not have any drawings and only provide information in table form.
 - b. The proposed new microwave antenna on Mt. Tamalpais #22 (P5) to connect to EOF is to be at the centerline 10'-5" at azimuth 21.7 degrees. Mounting at this location will likely be too close to existing microwave antenna E6 centerline at 10' at azimuth 10 degrees, which is required to remain operational for the existing MERA radio system.
We **recommend** verifying that this will not be an issue, or developing a remediation approach if it will be an issue. The model number for the antenna shown in the table (PAD-59B) is not correct. It should be PAD6 – 59B.
 - c. Microwave antenna from Mt. Tamalpais #15 to Mt. Barnabe height (12') does not match CDR 02-10 "Microwave Path Analysis" (15').
 - d. Microwave antenna part number from Mt. Tamalpais #22 (PAD6-59B) to EOF does not match CDR 02-10 "Microwave Path Analysis" (PAD-65B).
8. OTA Broadcasting
- a. Microwave antenna part number to Sonoma Mtn. (UHX6-59L) does not match CDR 02-10 "Microwave Path Analysis" (PAD 6 - 59 B).
9. San Pedro Ridge
- a. The Tower Loading Table does not provide information on which leg the existing equipment is installed, or on which leg the new equipment will be installed.
10. Sonoma Mtn.
- a. Microwave antenna part number to OTA Broadcasting (PAD 6 - 59 B) does not match CDR 02-10 "Microwave Path Analysis" (UHX6-59L). Please verify and update.
 - b. The drawing does not show the microwave antenna for the second path to Tomales, and the information is not included in the table either. This needs to be verified for the antenna location and if there is space on the tower to install the second microwave antenna.
11. Tomales

- a. The drawing does not show the microwave antenna for the second path to Sonoma Mtn., and the information is not included in the table either. This needs to be verified for the antenna location and if there is space on the tower to install the second microwave antenna.
12. Wolfback Ridge
- a. The drawing does not show the second monopole for the microwave antennas as shown in the CDR 02-18 "Site Layout Drawings". The drawing needs to show a view of the second monopole for the microwave antenna.

We **recommend** that the discrepancies mentioned be addressed and corrected.

CDR 02-21 Antenna System Diagram, incl. Combiners, TTAs, Multicouplers

The LMR antenna diagrams are typical and what we would expect. The diagrams show the channel expansion capacity requested in the RFP.

CDR 02-22 Rack Elevation Drawings

The rack elevation drawings provide the information on the placement/location of each of the equipment in the racks for each of the sites.

Issues Identified:

1. General
 - a. In the Notes section, should add "California Code of Regulations (CCR) Title 24 should be adhered to for the equipment installation on the rack", as mentioned in the RFP.
 - b. All sites show three (3) Site Gateways. To our understanding there should only be two (2) Site Gateways (GGM 8000) per CDR 02-03 "Radio System Description" Section 2.1.5.
 - c. The rack elevation drawings for the East Simulcast Sites do not match CDR 02-03 "Radio System Description" Section 2.1.5 which describes the equipment per each rack. From our understanding, the rack elevation drawings only show one (1) 700 MHz Site Receiver Multicoupler (it should be two according to CDR 02-03) and three (3) 700 MHz Cabinet Receiver Multicouplers (it should be six according to CDR 02-03).
 - d. The rack elevation drawings for West Simulcast Sites do not match CDR 02-03 "Radio System Description" Section 2.1.5 which describes the equipment per each rack. From our understanding, the rack elevation drawings only show one (1) 700 MHz Site Receiver Multicoupler (it should be two according to CDR 02-03) and two (2) 700 MHz Cabinet Receiver Multicouplers (it should be four according to CDR 02-03). Note: the description in Section 2.1.5 for the East simulcast systems does not include any Cabinet Receiver Multicouplers, but the diagram in the same section clearly shows there should be two per cabinet since the system is using diversity receive antennas. We agree with the diagram and **recommend** that the description in CDR 02-03 be corrected and that the rack elevation drawings be updated to show the correct numbers.
2. Dollar Hill
 - a. The drawing shows only one CCGW, while there are 16 conventional channels supported according to CDR 02-06, Table 2-2. Each CCGW can only handle 8 analog channels. We **recommend** documentation be updated to reflect there should be two CCGW's to handle 16 channels at Dollar Hill.
3. Coyote Peak
 - a. The drawing shows one (1) MPT-HL Dual Shelf, but CDR 02-14 "Detailed lists of equipment for each site" has two (2) MPT-HL Single Shelves. We **recommend** this information be verified and corrected.

- b. The drawings show ESS Rack-1 with 6 channels GTR8000 and ESS Rack-2 as 1 channel GTR8000. We believe Rack-2 should be 4 channels.
 - c. CDR 02-24 "Power consumption data" has 3 strings of 210A/H batteries, but the rack drawing is only showing 2 battery racks.
4. EOF
 - a. EOF drawing "1_MARI1_EOF_09_02 Model.pdf" has many errors and needs to be updated. For example; it does not show microwave equipment, racks are labeled incorrectly, etc. This drawing should be updated to the latest configuration.
 - b. EOF drawing "1_MARI1_EOF_09_03 Model.pdf" does not show the Rectifier Equipment.
5. Muir Beach
 - a. Rack Row is labeled differently from CDR 02-19 "Shelter floor plan drawings".
 - b. The drawing shows ESS Rack-1 with 6 channels GTR8000 and ESS Rack-2 as 1 channel GTR8000. We believe Rack-2 should be 4 channels.
 - c. CDR 02-24 "Power consumption data" has 3 strings of 210A/H batteries, but the rack drawing is only showing 2 battery shelves.
6. Mt. Barnabe
 - a. The drawing shows ESS Rack-1 with 6 channels GTR8000 and ESS Rack-2 as 1 channel GTR8000. We believe Rack-2 should be 4 channels.
7. Sonoma Mtn.
 - a. Does not show MPT-HLC for the diversity path to Tomales.
 - b. CDR 02-24 "Power consumption data" has 2 strings of 125A/H batteries, but the rack drawing is only showing 1 battery shelf.
8. Tomales
 - a. Does not show MPT-HLC for the diversity path to Sonoma Mtn.
9. Stewart Point
 - a. CDR 02-24 "Power consumption data" calls for 125A/H batteries, which is supposed to be installed on a 19-inch rack, but the rack diagram shows a 23-inch rack for the power equipment.

We **recommend** that the discrepancies mentioned be addressed and corrected.

CDR 02-23 Termination Details

No document is provided. This will be needed before construction. RFP Section 2.8 Sub-section B requires patching schedule and termination details for all cabling 90 days after award.

We **recommend** that this information be provided so proper pathways can be specified during construction of sites.

CDR 02-24 Power Consumption Data

Section 8.3, page 3. Only information about rectifier and battery loads is provided. Normally in the power consumption design, major vendors provide complete power and heat load information. This allows the buyer to verify these designs: commercial power size, power distribution panels, battery size and run time, backup generator size and fuel run time, equipment heat load and HVAC size.

We **recommend** requesting this information.

The CDR should explain how the proposed solution meets all the requirements of the RFP 4.9.8 A, B, C, D and E by addressing each item in the document.

We **recommend** this document be updated with that information.

Issues Identified:

1. The document does not provide any information for the EOF site.
We **recommend** the additional power consumption loads be communicated to Building Owner to ensure there is adequate capacity available.
2. The load calculation for GTR8000 BR is being considered at 5% duty cycle for all the sites. While this is a typical approach for repeater load calculation, the RFP requirement was for all equipment to be at 100% while calculating. Note: changing at this point may result in larger backup power systems at some sites.
We **recommend** the additional load be considered to determine if battery plants are sized correctly.
3. "The rectifiers have sufficient reserve capacity to fully recharge the battery plant within 10 to 24 hours in all three scenarios"
We **recommend** the document be updated to explain which three scenarios.
4. Dollar Hill, Mill Valley WT, OTA Broadcasting, San Pedro, Tiburon, Wolfback Ridge, Mt. Barnabe, Point Reyes, and Tomales all have an error in the W/H capacity shown for the 3 strings of 210A/H batteries. The capacity shown (30,0096W/H capacity) has an extra "0" after the comma and it should be 30,096 W/H.
We **recommend** these values be corrected
5. Coyote Peak and Muir Beach each have 3 strings of 210A/H batteries, but the rack drawing for each site is only showing 2 battery racks, while all other sites have one battery rack for each battery string.
We **recommend** the number of racks be verified for these two sites.
6. Muir Beach battery plant capacity appears to be incorrect (20,064W/H capacity) (note: this is 2 strings of 210A/H batteries). The demand calculation shows 21,349 W/H is needed to meet 8-hour requirement. 3 strings of 210A/H batteries will result in a capacity 30,096 W/H which is more than needed for 8 hours runtime and will match the calculated runtime shown in the document.
We **recommend** this value be corrected.
7. Stewart Point has 125A/H batteries, which is supposed to be installed on a 19-inch rack, but the rack diagram shows 23" rack.
We **recommend** verifying proper rack size is shown on diagram.
8. Sonoma Mtn. battery plant capacity calculation is not clearly stated. It appears that the demand calculation is more than the capacity shown in the proposed battery plant to meet the 8 hour runtime requirement. (7808 W/H vs. 6002 W/H) We believe the intention was to state that the two strings of 125 A/H batteries will EACH provide 6002 W/H which would result in a total capacity of 12,004W/H that will provide more than enough capacity to meet the 8 hour runtime requirement. Using this capacity matches the 12.3 hours of runtime shown in the document.
We **recommend** total battery plant capacity be shown for clarity.

CDR 02-25 Site Alarm Definition

Issues found:

1. Correct spelling of "Skyview" in Table of Contents (spelled "Skylawn")
2. Correct spelling of "backup" in title block of sheet 1 "BAKUP CENTER DISPATCH SITE"
3. Dispatch locations missing alarm definitions

We **recommend** incorporating spelling corrections and adding alarm definitions for dispatch locations.

CDR 02-26 Coverage - Mobile Subscribers

A series of five Google Earth maps were provided to describe the coverage being delivered. We learned through a series of questions that three of the files now serve the purpose of documenting the "what-if" scenarios reviewed earlier in the project. Mobile coverage guarantees were neither requested nor provided. But the mobile coverage illustrated in the series of maps looks robust.

CDR 02-27 Coverage - Portable Subscribers On Street

1. AECOM was informed through questions answered by Motorola that this file illustrates the portable on-street coverage. "Motorola_MERA_CA_Marin_Post-sale Design_CountyWide_30MAR18_V1.0_SG.kmz".
2. Please see our coverage **recommendation** in CDR 02-28 on how to further understand and solidify the coverage commitment conveyed in this map.
3. Note: The Portable on the street coverage shown in the kmz file still has some gaps in the known problem areas identified in the RFP. These gaps are shown in Figure 2 below by red outlines within the light blue shape representing the problem areas from the RFP. We **recommend** these potential gaps be reviewed carefully to verify they will not cause operational issues.

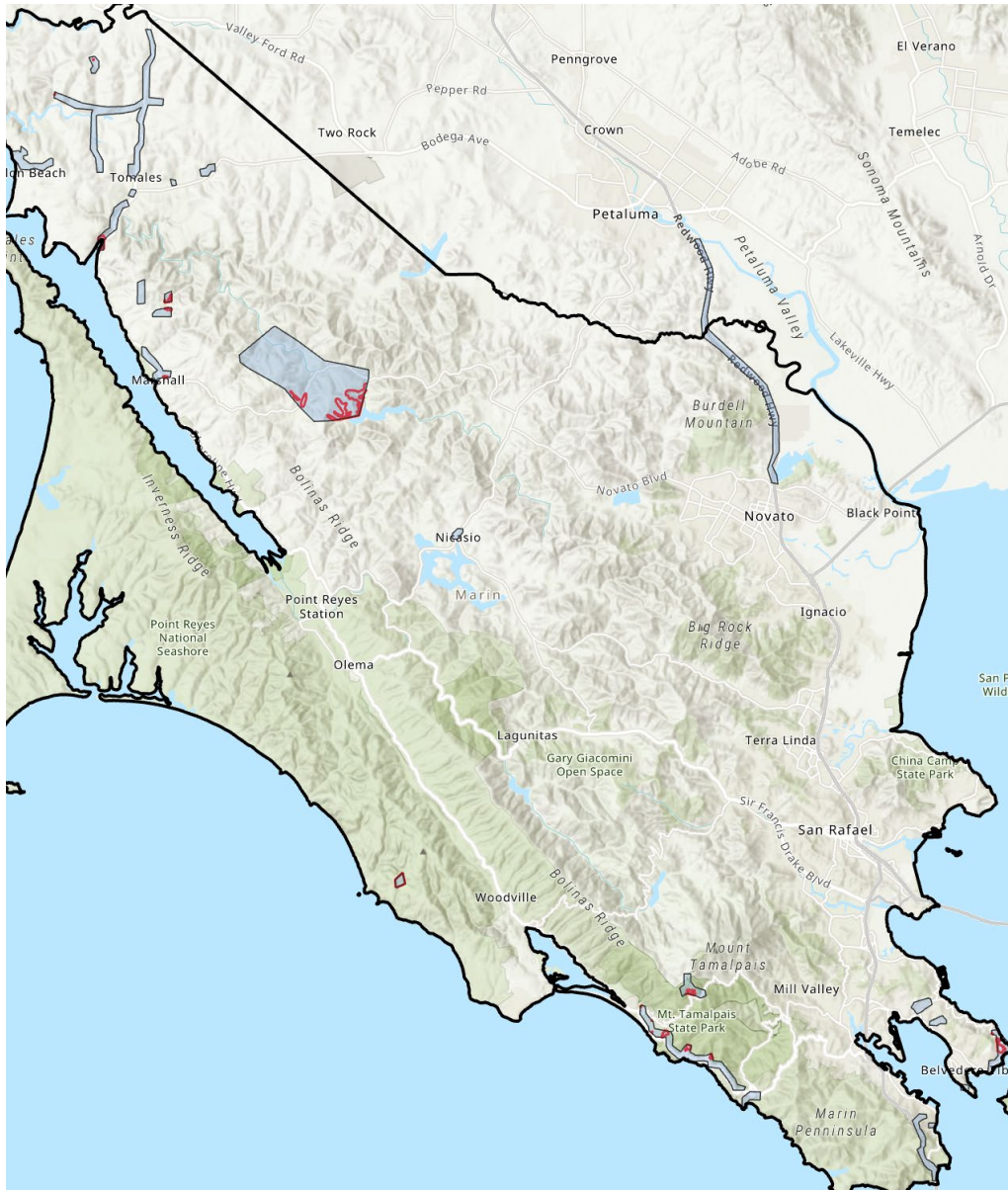


Figure 2. Problem areas still missing coverage

CDR 02-28 Coverage - Portable Subscribers In Building

AECOM was informed through questions answered by Motorola that this file illustrates the portable in-building coverage. "Motorola_MERA_CA_Marin_Post-sale Design_Urban Areas_30MAR18_V1.0_SG.kmz"

You have received countywide and urban area coverage guarantees as per the following table below. In the submittal review section of your CATP you have successfully equated Motorola's term Service Area Reliability to your intended term Defined Test Area, of which you have two; countywide and urban. The percentages in the table equate to the physical percentage of area coverage.

Motorola has designed the radio system with balanced RF link budgets. This means that by employing 700 MHz tower top amplifier (TTA) technology, Motorola is balancing the inbound and outbound RF paths. Specifically, this means the TTAs boost the inbound path to match the outbound path. This technique is almost universal in the world of modern 700/800 MHz radio system design. This enables a field officer who can hear a call from dispatch, to also respond to that call and expect to be heard by dispatch.

We **recommend** that the inbound percentage guarantees be increased to match the outbound guarantees. For example, the first line in Table 5-11 from CDR 2-5 below, in the "proposed 700 MHz column", should be changed to read "Meet or Exceed 88.80%". Each inbound line should match the same percentage as the corresponding outbound line. This is not at all unreasonable since the balanced system will naturally operate this way.

Table 1 Service Area Reliability Numbers from Contract

Table 5-11: Service Area Reliability Numbers

| Test Type | Subscriber Configuration | Direction | Existing UHF System Service Area Reliability @ DAQ 3.0 | Proposed 700MHz P25 TDMA System Service Area Reliability @ DAQ 3.4 Pass/Fail CPC | Number of Tiles |
|---------------------------|--------------------------------|-----------|--|--|-----------------|
| Automated BER | Portable On-Street | Inbound | 73.89% | Meet or Exceed 73.89% | 1505 |
| Automated BER | Portable On-Street | Outbound | 88.80% | Meet or Exceed 88.80% | 1505 |
| Automated Signal Strength | Portable On-Street | Inbound | n/a* | n/a* | 1505 |
| Automated Signal Strength | Portable On-Street | Outbound | n/a* | n/a* | 1505 |
| Manual Subjective DAQ | Portable On-Street | Inbound | 73.89% | Meet or Exceed 73.89% | 1505 |
| Manual Subjective DAQ | Portable On-Street | Outbound | 88.80% | Meet or Exceed 88.80% | 1505 |
| Automated BER | Portable w/ 18dB Building Loss | Inbound | n/a** | 57.39% | 300 |
| Automated BER | Portable w/ 18dB Building Loss | Outbound | n/a** | 72.51% | 300 |
| Automated Signal Strength | Portable w/ 18dB Building Loss | Inbound | n/a* | n/a* | 300 |
| Automated Signal Strength | Portable w/ 18dB Building Loss | Outbound | n/a* | n/a* | 300 |
| Manual Subjective DAQ | Portable w/ 18dB Building Loss | Inbound | n/a** | 57.39% | 300 |
| Manual Subjective DAQ | Portable w/ 18dB Building Loss | Outbound | n/a** | 72.51% | 300 |

CDR 02-29 Link Budgets

The Link Budgets CDR has been deferred. We were told that Motorola will share the as-built budgets after construction.

We **recommend** that MERA request that Motorola share the link budgets used in their LMR RF designs. MERA should ensure they have a solid performance agreement including a defined timeframe for resolving problems.

CDR 02-30 Intermodulation Analysis

We have been told that Motorola will not share a preliminary IM study and that Motorola will address any problems after construction if they arise. This approach could cost MERA time and money later in the project. MERA should at least ensure they have a solid performance agreement including a defined timeframe for resolving problems.

CDR 02-31 Maximum Permissible Exposure (MPE) Study

This study was performed as part of CEQA permitting procedure and is considered accepted.

CDR 02-32 NTIA Study Regarding Receiver Front End Overload

There is no response to this requirement.

We **recommend** Motorola at least address how their equipment or RF engineering will mitigate this issue should it be a problem at any of the sites where there are a number of other users. Not addressing this could be a significant issue if there is a case where an un-wanted high level signal blocks the P25 system receiver on one or more channels. Developing a response during the design phase is critical.

CDR 02-33 Detailed Description of Failure Modes and Impact including GPS

Section 18.1.24, page 25. The non-redundant logging recorder information is out of date considering one of the change orders that adds redundancy to the Logging recorder.

We **recommend** updating the documentation.

CDR 02-35 Radio System IP Plan

IP plan for both radio and microwave system (CDR 02-35 and CDR 02-36) are consolidated into one submission. Issues for both are contained in this section. The documentation needs to be updated with final agreed upon plan, so users will know which ports to connect to specific equipment.

Issues identified:

1. Verify all sites have corresponding configuration files.
2. What appears to be the same port definitions table from CDR 02-11 is appended to the end of CDR 02-35 as a pdf starting at page 90. The table has references to Baltimore County that have been changed to Marin County in the excel version contained in CDR 02-11, however, the rest of the port definitions appear to match between CDR 02-11 and CDR 02-35-36 documents. There are inconsistencies between the 7705 port definitions in the configuration files contained in CDR 02-12 and the Port assignment definitions in CDR 02-11. For example, on Big Rock site, port 1/1/4 is defined as "to-uwave" in configuration file and defined as "O Port Open/Available without SFP" in the port assignment table with date "28Feb20" in the document name from CDR 02-35-36 documents. There are multiple instances of this type of discrepancy at nearly every site.

We **recommend** coordinating the documents to harmonize IP port definitions, configuration files, and IP plan documents to final agreed upon IP plan

CDR 02-36 Microwave System IP Plan

Combined with CDR 02-35, see comments above.

CDR 02-37 Site Heat Output Data

The document provided for this CDR is the same as CDR 02-24 "Power Consumption Data". The document does not provide information for the heat output for each of the sites. This information is important so that MERA can verify that the HVAC has enough capacity for the entire site.

We **recommend** heat loads be provided for new equipment so HVAC load calculations can be verified.

CDR 02-38 LMR System Site Inspection and Test Plan

CDR 02-38 and 02-39 were merged together and submitted as a single document. The stated purpose in the document is to demonstrate the new radio system and microwave system were properly installed per the scope of work.

Issues Identified:

1. Under test procedure and criteria, the document identifies site development activities as a criterion of passing a test. These activities are not part of Motorola's scope and are not appropriate to be included in this document.
2. There are no test methods described nor pass/fail criteria listed.
3. The R56 Audit sheet is for grounding and cabling installation primarily and does not include any FNE optimization tests or criteria for passing.
4. This document appears to be primarily a milestone deliverable check point.

We **recommend** adding FNE optimization testing to plan unless intention of this plan is to be part of Final field acceptance testing.

CDR 02-39 Microwave System Site Inspection and Test Plan

This CDR was merged with CDR 02-38 and only contains a cold installation check list to verify site equipment was placed and connected properly. While useful for LMR equipment cold installs, microwave equipment needs to be operational to perform proper path alignment of the antennas. There are no test plans included in this document.

Issues identified with Microwave check sheet portion:

1. The check sheet included in this CDR from Nokia is designed to be a final inspection check sheet to document all equipment was installed properly and antennas were torqued properly after final alignment and testing to confirm Received Signal Levels are at path design levels.
2. The equipment check sheet needs to be modified to match the equipment configurations to be supplied to MERA. There are no multiplexers or DSX panels in the microwave radio racks, the functionality that equipment would have provided is now provided by the 7705 MPLS router hardware.
3. MPLS router hardware needs to be added to installation check sheet with appropriate wiring check lists.

We **recommend** separating this CDR from LMR CDR and updating to show appropriate tests and check lists.

CDR 02-40 Proposed Site Installation Check Sheets

The one-sheet checklist is very basic and high level. (Duplicate of readiness checklist in CDR 38/39)

We **recommend** MERA confirm with Motorola that they will be using their comprehensive site optimization forms. Confirm that you will be provided the results. These results document final adjustment and settings of everything in the RF sites and are used to determine readiness for acceptance testing.

CDR 02-41 Preliminary LMR Staging Acceptance Test Procedure

This preliminary LMR staging ATP is ok with no issues found.

CDR 02-42 Preliminary Microwave Staging Acceptance Test Procedure

In general, OK.

We **recommend** the following changes be considered.

1. We would like to see RFS 2544 test replaced by ITU-T-REC-Y.1564-201602 as ITU test is proper service activation test based on RFS 2544 lab test that has appropriate test parameters defined. What is proposed is not a full RFS 2544 test plan and does not provide network performance information.
2. Suggest MPLS routers should be added to Staging acceptance test for microwave

CDR 02-43 Implementation Plan - Master Site FNE

This CDR document has been merged into the Radio System Implementation Plan.

1. The "Agency Migration Flow Chart, Dual Band Subscribers" in Appendix A of the Radio System Implementation Plan shows the performing of the Functional ATP, Coverage ATP and P25 simulcast subsystems acceptance prior to programming and installing mobile subscribers. This flow chart should be updated to reflect Contract Change Order #11 which enables an earlier deployment of mobile radios.
2. For clarity, the "Agency Migration Flow Chart, Dual Band Subscribers" in Appendix A of the Radio System Implementation Plan should show the 30-Day Operational Test being performed after the "Cutover Event – All Users on 700 MHz System".

We **recommend** the above changes be incorporated into implementation plan

CDR 02-44 Implementation Plan - Dispatch FNE

This CDR document has been merged into the Radio System Implementation Plan.

CDR 02-45 Implementation Plan - RF Site FNE

This CDR document has been merged into the Radio System Implementation Plan.

For clarity so that Motorola can begin installing equipment at a radio site as each site development is completed (and not wait until all sites are completed), we **recommend** that the wording in Section 11.4 Cold Installation be changed to read as follows: "Prior to mobilizing installation crews, Motorola PM will require a Notice to Proceed (NTP) from MERA PM for each radio site in order to ensure that each site is ready for cold installation."

CDR 02-46 Implementation Plan - Microwave FNE

This CDR document has been merged into the Radio System Implementation Plan.

1. Section 11.2.1 states that Nokia will stage the microwave system and perform a Customer Witness Test (CWT). The customer is expected to attend this microwave stage testing, but the section does not state where the CWT will be performed.
2. Section 11.4.1 (Microwave Installation) states installation will be done sequentially. Since there are two rings and a number of spurs there are opportunities to install multiple paths in parallel by using multiple tower crews to reduce overall implementation time.
3. Section 11.6.1 should also include Field Network Acceptance test plan in process.

We **recommend** suggestions be considered for incorporation into plan.

CDR 02-47 Implementation Plan - Mobile Subscribers

This CDR document has been merged into the Radio System Implementation Plan.

1. The Radio System Contract Section 5.14.7.1 states that the schedule for installing mobile radios is "baselined by a requirement that MERA supply 10 vehicles per day." There is no mention in the mobile subscriber implementation plan about the number of mobile installations planned per day. A search of the RFP and the updated System Description CDR 02-03 also do not mention any requirements for number of

vehicle installations per day. This throughput requirement was developed when the mobile installation was planned to be performed after FATP and CATP, and it should be updated to reflect CCO #11 which enables an earlier deployment of mobile radios.

We **recommend** an updated mobile installation plan should be developed to meet the mutually agreed upon schedule.

2. The organization of the mobile implementation plan description in 11.9.2 Mobile Subscribers is not consistent with the implementation plan descriptions for portable subscribers (Section 11.9.3) and for control stations (Section 11.9.4).

We **recommend** as a minimum, the following statements should be added to the mobile implementation plan description:

- a. Section 11.9.2.2 Programming should include language that is included in the portable subscriber programming section: "A MERA representative shall verify and confirm that the code plug for each user group is ready for mass cloning."
 - b. Section 11.9.2.4 Installation Acceptance should include language that is similar to the language included in the portable subscriber acceptance section: "A MERA representative shall check at least one mobile from each user group to verify the code plug is correctly programmed into the subscriber."
3. For consistency in Section 11.9 Subscribers, an Implementation Flow Diagram should have been provided for control stations (Section 11.9.4) as was provided for the other subscriber sections.
We **recommend** adding control station flow diagram.

CDR 02-48 Implementation Plan - Portable Subscribers

This CDR document has been merged into the Radio System Implementation Plan.

We **recommend** the title of the diagram in Section 11.9.3.6 Mobile Implementation Flow Diagram should be changed to "Portable Implementation Flow Diagram"

CDR 02-49 Implementation Plan - Volunteer Fire Paging

This CDR document has been merged into the Radio System Implementation Plan. The paging rollout looks straightforward and low risk because it's a new and separate system from what is used today.

CDR 02-50 Implementation Plan - Jail DAS

This CDR describes the process that Motorola's partner, Commdex will use to implement the jail DAS. We view it as a solid plan describing the project goals, the commissioning steps and the testing procedures. It does not provide any visibility into the partnership's intent for the design of the DAS. Normally, the detailed design of major radio subsystems such as this are presented at the CDR for the buyer's approval. One reason is to ensure that the construction plans are compatible with the jail building complex.

We **recommend** that MERA request a review of the DAS design before approving CDR. Alternately, MERA would accept that Motorola plans a DAS design review per the project schedule, later in the project.

1. Section 1.3 of the DAS implementation plan incorrectly states that "Upon approval of the implementation plan, equipment will be purchased according to the schedule." This should state that ordering will occur after approval of the Jail DAS design review.
2. Radio coverage in the jail is a crucial deliverable of the DAS subproject. Motorola's plan for proving that deliverable is given in Section 2.6 of this plan.
We **recommend** that you request the following edits to the coverage acceptance test part of this DAS plan.

2.6 COVERAGE ACCEPTANCE TEST PLAN¶

The detailed acceptance test plan will outline the physical testing that will be performed to validate coverage and operation and will be in accordance with current TSB-88 test procedures. The final test plan will include a grid of the area as well as a detailed explanation of the testing procedure. A map of the building floor plans with the test path, grid, and the collected data for all test locations will be required for final acceptance. Formal testing for acceptance will not commence until the wide area system is considered stable and ready for operational use. ¶

The test plan shall ensure testing throughout the building. Testing shall be performed on a grid system. A grid is overlaid onto a floor area to provide a minimum of 20 grid cells per floor in each building. Grid cells will be defined with definite dimensions for each building. For most buildings, this will be a minimum grid dimension of 20'x20'. Grid sizes can be adjusted up to a maximum of 80'x80' (if agreed to by Motorola and the County) to reasonably accommodate building structure (walls, mechanical areas, etc.) and still allow for movement through the grid cell. Final grid size will be reviewed and approved with Motorola and MERA before finalizing test procedures. Signal strength measurements and voice test samples shall be taken as close to the center of each grid as possible. ¶

A grid map of each building will be generated and overlaid on the provided floorplan for testing. Tests will be taken as close to the center of the test grid as possible. Testing will include RSSI and DAQ information for each grid to capture both objective and subjective performance of the system. A Pass/Fail will be determined of Signal Strength and then by DAQ testing. Measurements will be recorded using a calibrated spectrum analyzer measuring Received Signal Strength in dBm. ¶

Motorola, and the County/MERA, and the County's representative may attend all testing at their discretion, but All test procedures will be performed by CommDEX personnel unless otherwise agreed to prior to test commencement. A three-party team of voice quality evaluators, including the County/MERA, and the County's representative, shall be in the jail and in dispatch during the voice quality test. The team shall vote and record the pass/fail result of each voice test call. ¶

Signal strength System acceptance is achieved when 97% of the averaged data points for each building meet or exceed the requirements of -86 dBm. System acceptance All passed test results also should require passing a voice quality test consisting of one round of two calls per grid, one inbound and one outbound. A passing voice test call is one that meets or exceeds a DAQ of 3.4 which is defined as "Speech understandable with repetition only rarely required." If system acceptance indicates less than the required reliability the relationship of Host signal and DAS signal will be collected for each failed grid. This will be used to validate overlap and simulcast distortion. ¶

Figure 3. Recommended changes to Section 2.6 of the DAS CATP

CDR 02-51 Preliminary LMR System Functional Acceptance Test Procedure

No issues were found with the Field Functional Acceptance Test Plan.

CDR 02-52 Preliminary microwave Functional Acceptance Test Procedure

Issues identified:

1. Y.1564 criteria not specified in test plan.

We **recommend** adding appropriate criteria.

CDR 02-53 Coverage Acceptance Test Procedure

The Coverage Acceptance Test Procedure is the method used to demonstrate the Radio Coverage Delivery of the overall radio system

Radio coverage is arguably the most important attribute to be delivered in your project. We believe the agreement on coverage delivery can be significantly improved over what is provided in CDR 02-53. Should MERA decide to take improvement actions, those actions will:

1. Clarify the methods and procedures used to verify that coverage has been delivered,

2. Strengthen MERA's position should difficulties be encountered, and
3. Reduce the risk of misunderstandings to the stakeholders

Contract Summary:

Below are the important points from the requirements:

1. Guaranteed area percentage coverages, meeting or exceeding the existing portable coverage in defined test areas (county and urban).
2. Verification tests are based on bit error rate (BER), subjective delivered audio quality (DAQ), and Signal Strength (Motorola is providing this for information only).
3. TSB-88 based design and test methods.
4. Note: Motorola took exception to Section 4.8.E regarding large uncovered areas and no uncovered areas in highly populated areas.

Recommendation: Coverage Test Plan Revisions

We **recommend** improvements and clarifications to the CATP in order to establish a clear plan that protects MERA's and Motorola's interests. These improvements and clarifications are contained in Appendix A as recommended edits to the CATP (shown as track changes). Below is a summary list of our **recommended** improvements.

1. Adjust the coverage test drive route to include ALL grids accessible via 2-wheel drive TIGER database streets (10.2.2.1).
2. Infrastructure design changes allow coverage prediction changes, but not changes to the tiles to be tested (10.3).
3. Request inbound service area reliability percentages that match the outbound percentages (10.3, Table 10-3).
4. MERA/County can inspect/verify/approve the physical test setup (10.3.4).
5. The subjective DAQ voice quality test made more definitive using 3-party voice judging at both inbound at dispatch and outbound in the field (10.3.4).
6. Recorded DAQ voice samples with location information (10.3.4).
7. DAQ voice test using all channels in P25 Phase 2 mode (channel rotation) (10.3.4).
8. Utilize training for DAQ voice test scoring (10.3.4).
9. MERA will receive full test documentation including the recorded subjective voice tests, correlated to location, as part of the test results (10.3.6).

Coverage **Recommendations** Summary

Assuming the coverage agreement recommendation changes offered in this report are achieved, the coverage agreement will now be based on 1) an agreed upon set of baseline maps, 2) a performance verification suitable for a balanced radio system design, and 3) a coverage verification test (CATP) based on real-world DAQ voice quality, and executed jointly by three separate project parties. This will help to arrive at a predictable and successful project outcome.

CDR 02-54 Preliminary Agency Migration/Cutover Plan

This CDR is merged into the LMR System Cutover Plan.

For clarity, the "Agency Migration Flow Chart, Dual Band Subscribers" in the LMR System Cutover Plan should show the 30-Day Operational Test being performed after the "Cutover Event – All Users on 700 MHz System" both in the flow chart in Section 13.1.1 and in Appendix A of the "LMR System Cutover Plan" contained in CDR 02-54.

We **recommend** adding these clarifications

CDR 02-55 Preliminary Microwave System Cutover Plan

This CDR is merged into the LMR System Cutover Plan, submitted under CDR 02-54. There is no cutover plan described for microwave. The only mention is to deploy the microwave in parallel with the existing microwave.

Issues identified:

1. Deploying the new microwave system in parallel with the existing microwave may not be possible at all sites since some sites require the removal of the existing system microwave antennas to install the new system antennas. If that is the case, this will impact the performance of the existing radio system
2. If the existing system traffic will need to be moved to the new microwave system, a traffic cutover plan will need to be developed along with re-optimization of the current simulcast system.

We **recommend** adjusting microwave antenna mounting locations to avoid conflicts with existing system microwave so there will be no impact to existing system.

CDR 02-56 Preliminary Mobiles Cutover Plan

This CDR is merged into the LMR System Cutover Plan.

1. Section 13.1.12 Mobile Subscriber Installations states for the mobile subscribers, "the timing of the deployment will occur after the Field Acceptance plan is accepted." It is not clearly defined as to what the "Field Acceptance plan" is. This should be defined and be also updated to reflect CCO #11 which enables an earlier deployment of mobile radios.
2. The "Agency Migration Flow Chart, Dual Band Subscribers" in the LMR System Cutover Plan shows the performing of the Functional ATP, Coverage ATP and P25 simulcast subsystems acceptance prior to programming and installing mobile subscribers. This flow chart should be updated to reflect CCO #11 which enables an earlier deployment of mobile radios. The flow chart requiring this change appears both in Section 13.1.1 and in greater detail in Appendix A of the "LMR System Cutover Plan" contained in CDR 02-54.

CDR 02-57 Preliminary Control Stations Cutover Plan

This CDR is merged into the LMR System Cutover Plan.

The "Agency Migration Flow Chart, Dual Band Subscribers" in Appendix A in the LMR System Cutover Plan shows the performing of the Functional ATP, Coverage ATP and P25 simulcast subsystems acceptance prior to deploying and programming control stations. To allow sufficient time for control station deployment prior to cutover, this could be performed at an earlier time.

CDR 02-58 Preliminary paging cutover plan

A paging cutover plan was not found in the cutover documentation.

CDR 02-59 Preliminary dispatch console cutover plan

This CDR is merged into the LMR System Cutover Plan.

CDR 02-60 Preliminary recording system cutover plan

This CDR is merged into the LMR System Cutover Plan.

CDR 02-61 30-Day Operational Test plan

Discrepancies were noted in the requirements for the 30-Day Operation Test in different sections of the Radio System contract. This CDR 02-61 '30-Day Operational Test Plan' correctly pulls together and resolves the discrepancies in the areas of a) when the test is performed, b) what is considered to be a critical failure, and c) whether the test would resume or be restarted if it is stopped due to a critical failure.

This revision of the 30-Day Operational Test Plan correctly addresses these areas as follows:

1. Section 10.1 states “the 30-Day Operational Test will occur upon successful completion of system acceptance testing and completion of cutover, and must be completed prior to system acceptance.”
2. Section 10.2.1 defines what a critical failure is for the LMR subsystem and the Microwave subsystem.
3. Section 10.2.2 states that in the event the test is stopped due to a critical failure of Motorola’s equipment or software, “the system will be repaired by Motorola Solutions, and the 30-day test will be restarted for an additional 30 days.” (MERA requested this requirement to be changed in their Submittal Response of a previous revision).

We **recommend** the following changes be made to the 30-Day Operational Test plan document:

1. Section 10.2.1 Critical Failure LMR Subsystem – change the end of the 1st bulleted failure definition from “2 or more simulcast channels at all sites” to “2 or more simulcast channels at all sites in a simulcast cell”.
2. Change the title of the document (for consistency with the contents inside the document and with the project schedule) from “30 Day Burn In Reliability Test Plan” to “30-Day Operational Test Plan”

CDR 02-62 Preliminary Training Schedule

This document has not been provided. Per Radio System Contract Section 5.14.4, a Finalized Training Plan should be provided as part of the detailed design review along with an agreed upon Project Schedule.

We **recommend** a training schedule be provided.

Appendix A – Recommended CATP revisions

See attached pdf document “CDR 02-53 CATP – AECOM edits.pdf”

