

**Draft Report  
Checkpoint 1**

**Central Oregon Interagency  
Integrated Radio Pilot Project**

**USDA Forest Service  
and  
DOI Bureau of Land Management**

**February 8, 2011**

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## **1 INTRODUCTION**

### **1.1 PURPOSE**

The Central Oregon Interagency Integrated Radio Pilot Project consists of three phases known as Checkpoints. Checkpoint 1 consists of a description of the current radio network and assessment of user needs. Checkpoint 2 consists of the development of alternative radio networks that better provide interagency interoperability. Checkpoint 3 consists of final design of the selected alternative. This report documents the activities associated with Checkpoint 1 and provides a description of the current radio network and a summary of user needs.

### **1.2 BACKGROUND**

The Interagency Interoperability Oversight Group (IIOG) provides a well-defined, ongoing, interagency, interdisciplinary methodology for promoting and enabling radio communications interoperability. This includes Radio and Information Technology issues affecting public safety programs in the United States Department of the Interior (DOI) and U.S. Department of Agriculture (USDA) Forest Service. Membership includes Executive Level representation from USDA and DOI. In addition, there are advisors to the IIOG representing acquisition, property, budget and other stakeholder programs, such as the National Wildfire Coordinating Group (NWCG). Interagency cooperation exists in many functions among land management agencies.

Historically, communications between field personnel, to dispatch and/or regional centers was achieved through individual Land Mobile Radio systems, with each agency's infrastructure organically designed around that agency's needs and systems. The field personnel involved in this phase of the project are primarily in the Forest Service and the Bureau of Land Management (BLM). The opportunity now exists to join the various cooperating agency and stakeholder resources; to integrate communications systems; utilize new technology; reduce the costs of operating and maintaining these systems; and ultimately deliver an improved communication system and governance to field personnel and those who support them.

During the 2009 visit to Central Oregon, the IIOG learned about issues affecting interagency radio communications. At that time, they recognized the potential to design a seamless, integrated interagency radio system from a single service provider. This project is a result of the synergy from that meeting; to develop a methodology or template for similar implementation across the country. Central Oregon was chosen for this project, as they have demonstrated an impressive adoption of the "Service First" credo. Indeed, their adoption has already resulted in Vehicles and personnel shirts blazoned with both US Forest Service and Bureau of Land management logos impressed the visiting IIOG team.

The full scope of the project was provided to Management Analysis, Inc., (MAI) and AECOM Technical Services, Inc., (AECOM AND MAI Team). The scope of work requested vendors to define, through a series of checkpoints; a thorough, comprehensive business needs analysis of the users served by this radio communications system. Further, it includes the communication, governance, and human components necessary to create a seamless, single service provider interagency solution; design of a new system, analysis of policies, funding, governance, and services that support radio communications. The first analysis will result in a complete plan for a seamless radio system, specifically serving the Forest Service and BLM in Central Oregon. In addition, the analysis will provide feedback on the processes used in this effort for implementation in other parts of the country, where appropriate for affected DOI and USDA agencies.

### 1.3 METHODOLOGY

Management Analysis, Incorporated and AECOM assembled a Team to complete the surveys and interviews associated with Checkpoint 1. Table 1-1 shows the members of the Team.

This report presents Checkpoint One which identifies the current communication system equipment, radio sites, base station locations, and any documented policies and procedures. This report presents the results of interviews aimed at gathering information to support a needs assessment. The Team conducted the interviews with users from each agency in order to obtain a baseline for the Forest Service and BLM systems. The complete interview records can be found in Appendix A and summaries of these interviews are provided in Section 3.

Table 1-1, MAI/AECOM Team

Member	Affiliation
Clif Richardson	Lead, MAI
Reed Wilson	Lead, AECOM
Thomas R. Mitchell	Telecommunications Specialist, AECOM
Jeremiah Knowles	Telecommunications Specialist, AECOM

The Team visited the significant radio network sites and completed/updated detailed site surveys. The network sites included radio repeaters (transmitter/receiver), base or control stations (desktop stations, typically a mobile radio with a power supply) and dispatch centers supplied with radio consoles. The detailed site surveys can be found in Appendix B.1 for sites owned or operated by the Forest Service and B.2 for those owned or operated by BLM.

From this data, the Team was able to complete the sections in this report, which forms the baseline for radio needs as the project moves Checkpoint 2 which involves the development of three alternative radio networks and Checkpoint 3 which involves design of the selected alternative from Checkpoint 2. The Team will review the findings presented in this report with the IIOG project team, gather comments and feedback on the report during meetings, teleconferences and via email, and update the report as a final deliverable.

### 1.4 REPORT OVERVIEW

The report consists of this document and other supporting Appendices, Tables, Figures, and Files (e.g., site photographs). The tables appear in this document. The Appendices, Figures (except Figure 3-1 which appears in this document), and Files reside on a separate project repository. This document includes Section 1, Introduction; Section 2, Current System Descriptions; Section 3, Interview Findings; and Section 4, Conclusion and Next Steps.

Throughout the report, the Team has made a distinction between the radio system used and maintained by the Forest Service and by BLM. In some instances these radio systems share facilities, which can be confusing. In particular, the radio sites at Aldridge and Grizzly have both BLM and Forest Service repeaters. (Note: These two sites represent the only locations in the Central Oregon Region where the USFS and BLM share facilities). The Team listed these sites in the description of both systems so that each portion of the document can be viewed as standalone. The findings on the current systems are described in Section 2.

During the interviews, the Team heard several repeating themes. Section 3 begins with these overarching findings, and then provides a separate summary of comments for BLM and the Forest Service.

### 1.5 CROSSWALK

Table 1-2, provides a crosswalk from the Statement of Work to the applicable sections of the report.

Table 1-2, Crosswalk to Statement of Work to Report

Statement of Work Requirement	Report Section
3.1.1 Inventory	Section 2, Current System Descriptions Appendix B Site Surveys/Equipment Inventory
Site Access Method	Section 2, Current System Descriptions Appendix B Site Surveys/Equipment Inventory
Available Power	Table 2-1, Existing Forest Service and BLM Sites
Available Telecommunications	Table 2-1, Existing Forest Service and BLM Sites Appendix B Site Surveys/Equipment Inventory
Description of Complete Communication Site	Appendix B Site Surveys/Equipment Inventory Site Photographs
List of sites/facilities owned by involved agencies	Table 2-1 Existing Forest Service and BLM Sites Table 2-2 Additional Forest Service and BLM Monitoring and Dispatch Sites
Maps showing area of responsibility for each participant	Figure 2-1 & 2-36
LMR site connectivity (Government furnished)	To be added upon receipt.
LMR frequency usage—to include who it is authorized to and its function (Government furnished)	Appendix C Frequency Groups Maps Appendix D Frequency Groups
LMR current Memoranda of Understanding (MOU) agreements, with whom and for what (Government furnished)	Table 2-3 and Table 2-4
LMR site infrastructure equipment inventory and condition	Appendix B Site Surveys/Equipment Inventory
Inventory of LMR Dispatching Centers to include listing involved agencies and lines of business (e.g.; Fire or Law Enforcement)	Appendix B Site Surveys/Equipment Inventory
LMR Dispatch Center equipment inventory and condition	Appendix B Site Surveys/Equipment Inventory
3.1.2 Current Support and Management Structures for Radio Systems	USFS: Table 2-3 Forest Service Management Areas BLM: Table 2-4 BLM Management Areas
Trouble reporting methodology	Table 2-3 and Table 2-4 and Last Paragraph, 3.3 National Forest Service Interview Summary Last Paragraph, 3.4 Bureau of Land Management Interview Summary
Technicians with in support area	Table 2-3 and Table 2-4
Applicable service level agreements and memoranda of understanding	Table 2-3 and Table 2-4
Management structure	Table 2-3 and Table 2-4
Established radio repair standards	Table 2-3 and Table 2-4
List of commercially available support	Table 2-3 and Table 2-4

Statement of Work Requirement	Report Section
services (locally available and not sorted by agency)	
LMR Internal Standard Operating Procedures	Table 2-3 and Table 2-4
LMR internal agency policy and guidance	Table 2-3 and Table 2-4
LMR internal information security requirements	Table 2-3 and Table 2-4
3.1.3 Radio Frequency Coverage and Site Location Maps	2.1.4 Radio Frequency Coverage and Site Location Maps
3.1.3.1 Individual Site Maps	
Map showing where there is internal LMR talk back (5 watt) coverage	USFS: Figures 2-2 through 2-33 BLM: Figures 2-37 through 2-46
Map showing where there is internal LMR talk out (50 watt) coverage	ERP actual values vice LMR talk out (50 watt) USFS: Figures 2-2 through 2-33 BLM: Figures 2-37 through 2-46
Individual agency maps	USFS: Figures 2-2 through 2-33 BLM: Figures 2-37 through 2-46
Map showing all sites for each agency	USFS: Figure 2-2 BLM: Figure 2-38
Combined coverage map for all sites within each agency (talk back and talk out)	USFS: Figures 2-34 and 2-35 BLM: Figures 2-47 and 2-48
3.1.3.2 Combined Agency Maps	2.3 Composite Coverage Plot Figures 2-49 and 2-50
Map showing where there is internal LMR talk back (5 watt) coverage	2.3 Composite Coverage Plot Figures 2-49 and 2-50
Map showing where there is internal LMR talk out (50 watt) coverage	2.3 Composite Coverage Plot Figures 2-49 and 2-50
Map showing geographical limits of the project	2.3 Composite Coverage Plot Figures 2-49 and 2-50
Agency owned land shall be identified with in the area	2.3 Composite Coverage Plot Figures 2-49 and 2-50
3.1.3.3 External Organizations	
List of external organization LMR systems used by all internal organizations within each agency	Paragraph 7), 3.3 National Forest Service Interview Summary Paragraph 5), 3.4 Bureau of Land Management Interview Summary
List system similarities and differences between the agencies	Section 3.1
Detail the common external systems used for each agency as described above	3.3 Paragraph 2 and 3
3.2 Needs Assessment.	
Where radio coverage is required	Paragraph 1), 3.3 National Forest Service Interview Summary Paragraph 1), 3.4 Bureau of Land

Statement of Work Requirement	Report Section
	Management Interview Summary
When radio coverage is required	Paragraph 3), 3.3 National Forest Service Interview Summary Paragraph 3), 3.4 Bureau of Land Management Interview Summary
The number of concurrent operations that are required	Paragraph 5), 3.3 National Forest Service Interview Summary
What the training requirements are	3.1 Overview of Findings, Paragraph 5), Training Paragraph 6), 3.3 National Forest Service Interview Summary Paragraph 4), 3.4 Bureau of Land Management Interview Summary
Who the users and technical support personnel expect to talk to	Paragraph 7) through 10), 3.3 National Forest Service Interview Summary Paragraph 5), 3.4 Bureau of Land Management Interview Summary
Dispatch	Paragraphs 1) and 5), 3.3 National Forest Service Paragraphs 1) and 5), 3.4 Bureau of Land Management
Field or district offices	Table 2.2 National Forest Service Table 2.2 Bureau of Land Management
Other cooperators	Paragraphs 7), 3.3 National Forest Service Paragraph 5), 3.4 Bureau of Land Management
Other field users	Paragraphs 8) through 10), 3.3 National Forest Service Paragraphs 5) and 6), 3.4 Bureau of Land Management
The radio nets the users and technical support personnel need access to	Paragraphs 7) through 10), 3.3 National Forest Service Interview Summary Paragraphs 5) and 6), 3.4 Bureau of Land Management Interview Summary
Special Radio Needs:	Paragraph 9) through 11), 3.3 National Forest Service Paragraphs 7) and 12), 3.4 Bureau of Land Management
Encryption	Paragraph 11), 3.3 National Forest Service Interview Summary
Tactical channels	Paragraph 12), 3.3 National Forest Service Interview Summary Paragraph 8), 3.4 Bureau of Land Management Interview Summary
Dual band radios	Paragraph 13), 3.3 National Forest Service Interview Summary Paragraph 9), 3.4 Bureau of Land Management Interview Summary
Support Requirements Analysis	

Statement of Work Requirement	Report Section
Help desk	Paragraph 14), 3.3 National Forest Service Interview Summary Paragraph 10), 3.4 Bureau of Land Management Interview Summary
Service level agreements	To be added
System problem resolution	Paragraphs 15), 3.3 National Forest Service Paragraph 11), 3.4 Bureau of Land Management
Queue management and ticket escalation	Paragraphs 15), 3.3 National Forest Service Interview Summary Paragraph 12), 3.4 Bureau of Land Management Interview Summary
Seasonal variability	Seasonal fluctuation parallel the periods of peak network utilization as explained in: Paragraphs 3), 3.3 National Forest Service Interview Summary Paragraph 3), 3.4 Bureau of Land Management Interview Summary
Response time	Paragraph 14), 3.3 National Forest Service To be added to Paragraph 11), 3.4 Bureau of Land Management
Similarities and differences among each participating agency	Sections 3.1, 3.3, 3.4 National Forest Service and Bureau of Land Management
Similarities and differences among organizations within the same agency	3.3 National Forest Service 3.4 Bureau of Land Management

## **2 CURRENT SYSTEM DESCRIPTIONS**

The Team performed sites surveys and collected inventory information on all radio repeater sites and radio controlled fixed base stations. The surveys were conducted from November 8<sup>th</sup> through November 17<sup>th</sup>, 2010. After a kickoff meeting at the Forest Service Telecommunications Office in Bend, Oregon, three teams were created by pairing a Team member with one of the three Radio Technicians (two from the Forest Service and one from Bureau of Land Management). The Team received previously completed inventory documents. These documents formed the capture document to confirm and/or correct equipment discovered at each survey location. The completed and/or updated survey forms are included as Appendix B.

At each of the radio sites, the Team's specialists and engineers measured the geographic location of the antennas with a standard GPS unit. The longitude, latitude and elevation data given in Tables 2-1 and 2-2 below were obtained via these GPS measurements made at the time of our visits in November 2010. It is possible that these data may differ from earlier surveyed data that the Government has on file.

The Team also documented the site visits with photographs of the location, facilities and equipment. These photographic records are organized by site location and appear in a separate electronic folder.

### **2.1 FOREST SERVICE**

#### **2.1.1 FOREST SERVICE RADIO SYSTEM DESCRIPTION**

The Forest Service employs a 16 site, Very High Frequency (VHF), analog, narrow-band (12.5 kHz), tone-controlled repeater system (radio net) to serve the Deschutes and Ochoco National Forests, as well as the Crooked River Grasslands. Table 2-1 contains a summary of the radio repeater sites. Normal daily communication occurs via portable radios. Fire technicians, environmental scientists, and telecommunication technicians encompass the regular users of the radio net. Up to 1500 volunteers throughout the U.S. Forest lands in central Oregon use portables During the summer season. The Forest Service area of responsibility is shown Figure 2-1.

Mobile radios are also installed in both fire and technician vehicles. Several Radio Control over Internet Protocol (RCoIP) stations and one fixed radio base station are used to facilitate communications between base personnel and field personnel. Some are used solely for monitoring, while others are used for command and control with the Deschutes/Ochoco NF personnel. Redmond Air Center allows airborne personnel to monitor and communicate, as needed, with the Deschutes/Ochoco NF personnel.

At the Redmond Air Center and Crescent Ranger, center base stations (Figure 2-2) are used as access points to the RCoIP backhaul network, allowing monitoring and communication with the Forest Service Radio net from these locations

Other dispatch and monitor locations, shown in Table 2-2, are now Radio Control over Internet Protocol (RCoIP). The RCoIP project represents part of an ongoing Forest Service plan to maximize use of available bandwidth and increase reliability.

Table 2-1, Existing Forest Service and BLM Sites

Site Name	Latitude	Longitude	Elevation (ft. AMSL)	Tx Antenna Height (ft. AGL)	ERP Antenna	Type
Forest Service						
Aldrich Mtn Rptr	44 22 38.1	-119 27 02	6939	25	24w	Omni
Awbrey Butte Rptr	44 04 38.6	-121 19 54.0	4226	199	36w	Omni
Black Butte Rptr	44 23 55.4	-121 38 05.5	6414	17	50w	Omni
Drake Mtn Rptr	44 02 34.5	-120 22 30.4	6239	20	50w	Omni
East Butte Rptr	43 40 02	-120 59 43	6385	37	128w	Directional
Green Ridge Rptr	44 36 05.2	-121 34 39.3	5110	40	229w	Directional
Grizzly Mtn Rptr	44 26 15.3	-120 57 15.8	5621	40	53w	Omni
Lookout Mtn Rptr	43 48 08	-121 41 46.9	6209	80	36w	Omni
Mt Bachelor Rptr	43 59 26.2	-121 41 12.8	7749	25	50w	Omni
Odell Butte Rptr	43 28 14.4	-121 51 48.6	6987	40	50w	Omni
Pisgah Rptr	44 27 25.7	-120 14 10.3	6812	30	48w	Omni
Round Mtn Rptr	44 23 31.9	-120 20 46.9	6737	40	43w	Omni
Stephenson Mtn Rptr	44 35 23.4	-120 30 06.2	5771	20	47w	Omni
View Point Rptr	44 29 38.6	-120 27 17.5	6193	20	48w	Omni
Walker Mtn Rptr	43 18 19.0	-121 43 00.6	7091	60	32w	Omni
Wolf Mtn Rptr	44 19 41.4	-119 42 56.8	6488	50	48w	Omni
BLM						
Aldrich Mtn.	44 22 39	-119 27 02	6939	35	107w	Omni
Grizzly Mtn.	44 26 15	-120 57 16 5621	60	107w	Omni	
Hampton Butte	43 46 28	-120 16 53	6313	40	107w	Omni
Rancheria Rock	44 53 54	-120 08 15	4886	40	107w	Omni
Tygh Ridge	45 18 43	-121 02 50	3024	40	107w	Omni

Table 2-2, Additional Forest Service and BLM Monitoring and Dispatch Sites

Additional Locations	Latitude	Longitude	Description
Dayville Guard Station	44 27 59	-119 31 06	BLM Fixed Base Station
GrassValley Guard Station	45 21 50	-120 47 06	BLM Fixed Base Station
Maupin Guard Station	45 10 31	-121 04 12	BLM Fixed Base Station
Paulina Guard Station	44 06 14	-120 06 24	BLM Fixed Base Station
Prineville Guard Station	44 18 29	-120 51 27	BLM Fixed Base Station
Prineville Dist. Office	44 18 06	-120 48 35	BLM Fixed Base Station / Some Dispatch
Rager Ranger Station	44 13 59.6	-119 44 10.0	Forest Service Base Station
Central Dispatch Center	44 16 47	-120 54 05	Forest Service Dispatch
Bend Office	44 02 54.59	-121 18 17.42	Forest Service Radio Control over IP
Big Summit	44 23 56.7	-120 25 29	Forest Service Radio Control over IP
Crescent R.S. Base Stx	43 27 38.8	-121 41 50.3	Forest Service Radio Control over IP
Lamonta Fire	44 18 35.4	-120 51 13.2	Forest Service Radio Control over IP
Redmond Air Cntr Base Stx	44 15 35.9	-121 08 51.4	Forest Service Radio Control over IP
Sisters Fire Office	44 17 31.8	-121 33 20.4	Forest Service Radio Control over IP
Sisters Fire Whse	44 17 41.6	-121 33 23	Forest Service Radio Control over IP

### 2.1.2 INVENTORY

An inventory of the equipment at all 16 sites, as shown in Table 2-1 and the additional sites in Table 2-2, was performed as a part of the site surveys. The equipment inventory data for the Forest Service is documented in Appendix B.1.

### 2.1.3 CURRENT SUPPORT MANAGEMENT STRUCTURES FOR THE RADIO SYSTEM

Portable and mobile operations, maintenance, repair, and programming is accomplished by three full-time technicians based in the Bend, Oregon telecommunications shop. Additionally, these personnel maintain radio stores for seasonal issuance to volunteers. A programming archive for all radios is maintained by this group. In informal instances, they may provide user training.

Less visible is the repair, maintenance and continuing upgrades to all repeater sites. Regular site maintenance is essential to ensure optimum operational experience to users, and if maintenance is not performed, increased site equipment failure could result. The technicians have recently completed conversion to VHF narrow-band operation as required by the National Telecommunications and Information Administration (NTIA) for all VHF frequency users in DOI and USDA.

Table 2-3, lists the capability associated with the identified management areas shown.

Table 2-3, Forest Service Management Areas

Management Areas	Forest Service Regional Capability
Trouble reporting methodology	Online Reporting System through the National IT Help Desk using RightNow software. Trouble Tickets are assigned to each incident.
Technicians within support area	Three Technicians based in Bend, OR
Applicable service level agreements and MOA	Individually created SLA's and Informal verbally agreed to SLA's
Management structure	Technicians in Bend, OR report to the Regional Operations Center in Portland, OR
Established radio repair standards	Follow manufacturer's specifications. Test equipment is routinely calibrated.
List of commercially available support services	Radio shops in Bend and Redman with limited capability: Bend Wireless, Day Wireless, Slater Communications Inc.
LMR Internal Standard Operating Procedures	Informal Descriptions from Interviews.
LMR internal agency policy and guidance	NTIA and NRCD policies and procedures
LMR internal information security requirements	Informal Descriptions from Interviews.

### 2.1.4 RADIO COVERAGE AND SITE LOCATION MAPS

The Team completed maps showing estimates of existing radio coverage based on the data gathered during the site surveys and interviews, from data provided by the Government, topographic data from the U. S. Geological Survey (USGS), and through the use of standard analytical radio propagation computer models. The results of these calculations are displayed on maps centered on each site, and correspond to both the talk-out and talk-back directions. The Team also compiled the coverage into two composite maps showing radio coverage for the Forest Service – one showing talk-out to a mobile radio and the other talk-back from a portable radio transmitting at 5 Watts.

The Team included 5 Watt Talk Back coverage (from a portable radio in the field to the repeater) for each of the sites shown in Table 2-1. In addition, the Team included Talk Out coverage (from the repeater to a mobile radio in the field). The Talk Out coverage was based on actual ERP values provided by Forest Service technicians, and listed in Table 2-1 above. The scope of work suggested that an ERP of 50 watts be used for all sites; however, the actual ERP value provides a more accurate view of existing coverage.

The individual coverage maps (Talk Back and Talk Out) for each Forest Service site are shown in Figures 2-2 through 2-33. A Forest Service composite coverage map for the entire Forest Service system is shown in Figures 2-34 (5 W Talk-Back) and 2-35 (Talk-Out).

The coverage maps were created using the Longley Rice propagation model (referenced by National Bureau of Standards Note 102), with a 90/90 confidence factor. Areas on the maps with coloring (blue for 5 W portable talk-back, and green for talk-out to mobile) indicate that the predicted signal level meets or exceeds the target value (listed in the legend of each figure in dBu) over 90% of the incremental tile area (0.25 x 0.25 mile) in the grid, and that this performance would be expected over 90% of the time. If one were to measure the performance over the colored area at some random time, the Team would expect that the target signal level (TSL) would be met over 95% of the area (termed "area availability"). These computer-generated coverage estimates are based on proper installation, alignment and maintenance of site equipment, antennas, transmission lines and transmitter power. Actual coverage as experienced by users in the field may vary due to interference, multipath fading and other random effects, including degradation due to aging, weathering and general deterioration of equipment.

The displayed coverage may show an abrupt line of demarcation between coverage and "no coverage". This is illustrated in Figure 2-19, Forest Service Mount Bachelor Talk Out, where there is an area devoid of color south of the site. This does not mean that there is not at least marginal coverage south of Mount Bachelor, but indicates that this area has less than a 90% probability of coverage. Note that "less than 90% probability" is not the same as "no coverage".

## **2.2 BUREAU OF LAND MANAGEMENT**

### **2.2.1 RADIO SYSTEM DESCRIPTION**

Bureau of Land Management employs a 5 site, Very High Frequency (VHF), analog, narrow-band (12.5 kHz), tone-controlled repeater system (radio net) to serve the Lower John Day and Deschutes River, as well as the Badlands Grassland areas. Normal daily communication occurs via portable radios. Table 2-1 contains a summary of the sites in the BLM radio system. The BLM area of responsibility is shown in Figure 2-36.

Mobile radios are also installed in the technician vehicles. Fixed radio base stations communicate with local VHF repeaters via a radio uplink/downlink in the wideband Ultra High Frequency (UHF) radio communications band. Dispatching occurs from the COIDC office adjacent to the airfield above Prineville, Oregon. Fixed UHF base stations also exist at the Prineville BLM office, and Wareyard. Additionally, the manned sites and offices in the John Day, Lower Deschutes, and Grass Valley locations employ similar fixed base stations. Lastly, one fixed base station exists at the Rancheria Rock Lookout facility which is a few feet above the repeater communication building. Fixed base stations, both for dispatch and monitoring, employ either a magnetic mount, omni-directional antenna or a fixed Yagi (highly directional) antenna to reach the nearest mountaintop base station. Table 2-2 contains a list of other dispatch and monitor locations, including the fixed base station sites.

### **2.2.2 INVENTORY**

An inventory of the equipment at all 5 sites, as shown in Table 2-1 and the additional sites in Table 2-2, was performed as a part of the site surveys. The equipment inventory data for BLM is documented in Appendix B.2.

**2.2.3 CURRENT SUPPORT MANAGEMENT STRUCTURES FOR THE RADIO SYSTEM**

Portable and Mobile operations maintenance, repair, and programming is accomplished by a full-time technician based in the Prineville, Oregon District Headquarters. Additionally, the radio technician maintains radio stores for seasonal issuance to volunteers. A programming archive for all radios is maintained by this individual. In informal instances, the technician may provide user training. Less visible, the technician provides repair, maintenance and continuing upgrades to all repeater sites, ensuring optimum operational experience to users. In addition, the technician is presently completing conversion to VHF narrow-band operation as required by the National Telecommunications and Information Administration (NTIA) for all VHF frequency users in DOI and USDA.

Table 2-4, lists the capability associated with the identified management areas shown.

Table 2-4, BLM Management Areas

Management Areas	BLM Regional Capability
Trouble reporting methodology	Online Reporting System through the National IT Help Desk using Remedy Software. Trouble Tickets are assigned to each incident.
Technicians within support area	One Technician based in Prineville, OR
Applicable service level agreements and MOA	Individually created SLA's and Informal verbally agreed to SLA's
Management structure	Technician in Prineville, OR reports to an engineering manager in Portland, OR
Established radio repair standards	Follow manufacturer's specifications. Test equipment is routinely calibrated.
List of commercially available support services	Radio shops in Bend and Redman with limited capability: Bend Wireless, Day Wireless, Slater Communications Inc.
LMR Internal Standard Operating Procedures	Radio User Guide produced by the BLM District
LMR internal agency policy and guidance	DOI Radio Communications Handbook (377 DM), and NTIA and NRCD policies and procedures
LMR internal information security requirements	DOI online training through Federal Information System Security Awareness and Privacy and Records Management.

**2.2.4 RADIO COVERAGE AND SITE LOCATION MAPS**

The Team completed maps showing estimates of existing radio coverage based on the data gathered during the site surveys and interviews, from data provided by the Government, topographic data from the U. S. Geological Survey (USGS), and through the use of standard analytical radio propagation computer models. The results of these calculations are displayed on maps centered on each site, and correspond to both the talk-out and talk-back directions. The Team also compiled the coverage into two composite maps showing radio coverage for BLM – one showing talk-out to a mobile radio and the other talk-back from a portable radio transmitting at 5 Watts.

The Team included 5 Watt Talk back coverage (from a portable radio in the field to the repeater) for each of the sites shown in Table 2-1. In addition, the Team included Talk Out coverage (from the repeater to a mobile radio in the field). The Talk Out coverage was based on actual ERP values provided by the BLM technician, and listed in Table 2-1 above. The scope of work suggested that an ERP of 50 watts be used for all sites; however, the actual ERP value provides a more accurate view of existing coverage.

The individual coverage maps (Talk Back and Talk Out) for each BLM site are shown in Figures 2-37 through 2-46. A BLM composite coverage map for the entire BLM system is shown in Figures 2-47 (5 W Talk-Back) and 2-48 (Talk-Out).

The coverage maps were created using the Longley Rice propagation model (referenced by National Bureau of Standards Note 120), with a 90/90 confidence factor. Areas on the maps with coloring (blue for 5 W portable talk-back, and green for talk-out to mobile) indicate that the predicted signal level meets or exceeds the target value (listed in the legend of each figure in dBu) over 90% of the incremental tile area (0.25 x 0.25 mile) in the grid, and that this performance would be expected over 90% of the time. If one were to measure the performance over the colored area at some random time, the Team would expect that the target signal level (TSL) would be met over 95% of the area (termed "area availability"). These computer-generated coverage estimates are based on proper installation, alignment and maintenance of site equipment, antennas, transmission lines and transmitter power. Actual coverage as experienced by users in the field may vary due to interference, multipath fading and other random effects, including degradation due to aging, weathering and general deterioration of equipment.

The displayed coverage may show an abrupt line of demarcation between coverage and "no coverage". This is illustrated in Figure 2-45, BLM Tygh Ridge 5 Watt Talk Back, where there is an area devoid of color southwest of the site. This does not mean that there is not at least marginal coverage southwest of Tygh Ridge, but indicates that this area has less than a 90% probability of coverage. Note that "less than 90% probability" is not the same as "no coverage".

### **2.3 COMPOSITE COVERAGE PLOT**

A snapshot of a combined FS/BLM radio system coverage plot is included in Figures 2-49 (5 W Talk-Back) and 2-50 (Talk-Out) to give the reader an understanding of what performance might look like if the two systems were combined. The Team cautions that the composite plot is just that - an overlay of both the Forest Service and Bureau of Land Management coverage based on current transmission designs and Effective Radiated Power (ERP). No analysis of frequency use, overlap, and other issues associated with a full design has been considered.

### 3 INTERVIEW FINDINGS

A series of group interviews were conducted in Bend, Oregon, Redmond Air Center, and Prineville BLM office during the period December 6 through December 15, 2010. Each meeting was designed with a specific user discipline (Engineering, Dispatch, Fire, etc) in mind. This approach ensured specific stakeholders had an open and effective opportunity to share their use and issues with the existing radio net. Table 3-1 provides a summary of the interview schedule.

Table 3-1, Business Needs Discussion and Interview Meeting Schedule

Central Oregon Interagency Integrated Radio Pilot Project				
Stakeholder Business Needs Discussion and Interview Meeting Schedule				
Date	Time	Town	Location	Who
Mon. Dec. 6	1300-1500	Bend	Deschutes SO - Upper Deschutes Conf. Rm *	Natural Resources and Recreation
Tue. Dec. 7	0900-1100	Redmond	Smoke Jumper Training Room	Engineering
	1300-1500	Redmond	Smoke Jumper Training Room	Blended non-fire Organizations
Wed. Dec. 8	0900-1100	Redmond	Smoke Jumper Training Room	Law Enforcement & investi.
	1300-1500	Redmond	Smoke Jumper Training Room	County Sheriff Offices
Thur. Dec. 9	0900-1100	Prineville	Prineville BLM Large Conference Room *	Dispatchers & Aviation
	1300-1500	Prineville	Prineville BLM Large Conference Room *	Fire Leadership
Fri. Dec. 10	0900-1100	Prineville	Prineville BLM Large Conference Room *	Prineville Dist BLM, Crooked River National Grassland
<b>Continuation of Schedule</b>				
Mon. Dec. 13	1300-1500	Prineville	Ochoco SO Large Conf Room & VTC **	Line Officers
Tue. Dec. 14	0900-1100	Bend	Bend Fort Rock East West Conference Room *	Deschutes NF Non-Fire
	1300-1500	Prineville	Prineville BLM Large Conference Room *	Ochoco NF Non-Fire
Wed. Dec 15	0900-1100	Bend	Deschutes SO - Upper Deschutes Conf. Rm *	Those who missed the session
	1300-1500	Bend	Deschutes SO - Upper Deschutes Conf. Rm *	Telecommunications Specialists
* Please attend the sessions in person if possible. There will be a conference line/bridge available for those who are not able to attend in person. 1-866-703-7014 #4386186				
** There will be Video Teleconferencing available for line officers who are unable to join us in person. Please contact Kolleen Shelley 208-830-4925 by no later than December 10th should you require the use of VTC.				

Kolleen Shelley, IIOG Program Manager, presented the introductory remarks regarding the history and goals of the project. Team Members Reed Wilson and Clif Richardson then provided detailed attendee guidance for the meeting. A written questionnaire was distributed for completion by those in attendance. The questionnaire provided an opportunity for the participants to document information regarding radio system performance, use, maintenance, training, and support.

The Team performed group interviews with the radio net users. Once complete, the Team asked open-ended, subject matter questions to encourage additional discussion and group interaction. Appendix A provides completed interview forms. Section 3.1 summarizes the three tiers of operational scenarios and provides a baseline for understanding the explanation of the information received from the interviews and discussions with Forest Service and BLM personnel. Section 3.2 provides discussion of the common comments received from personnel of both Agencies. Section 3.3 focuses on topics, issues and concerns of personnel from the Forest Service people, while Section 3.4 focuses on topics, issues and concerns from BLM personnel.

### **3.1 RADIO TIER DEFINITIONS**

The Team learned, in interviews with the user community, that essentially three primary radio net communication needs / operational scenarios exist. The Team refers to these scenarios as Tiers 1, 2 and 3. Prior to discussing the findings, it is important to explain the radio net system operational tiers to add clarity and understanding to the finding. Each tier reflects the level of radio activity, based on the findings above. These three tiers of radio net/personnel environments were consistently described to the interview team in discussions with all users. To focus attention and refine areas of improvement, a definition of the radio net operational tiers becomes necessary because the communication resources available for each tier vary.

#### **3.1.1 TIER 1 RADIO NET OPERATION**

Tier One represents normal, operational use. The tier includes normal, daily, operational use. Only small incidents break up the relative quiet of the daily activity. Generally, calls to dispatch include reporting in and out of back country areas by field personnel. In Tier 1, the radio net has sufficient capacity and personnel are fully capable of handling communication needs. Tier 1 typically occurs from November through March.

#### **3.1.2 TIER 2 RADIO NET OPERATION**

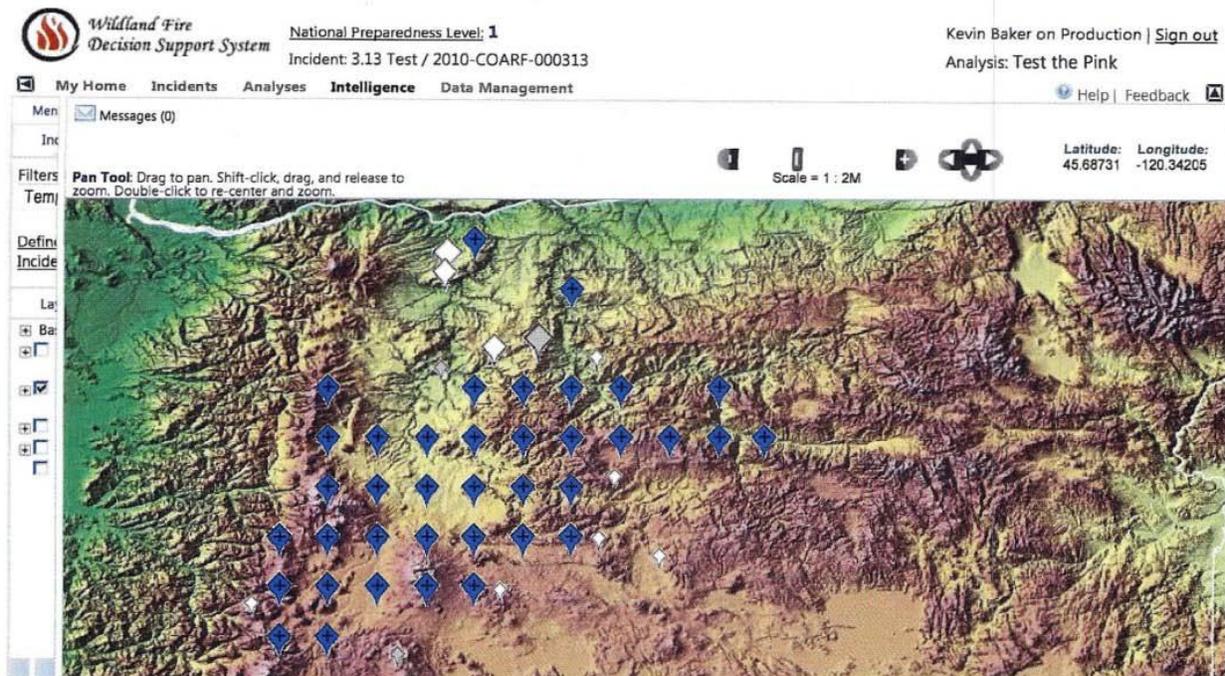
Tier 2 consists of periods where one or more locally managed incidents must be handled with locally available communication and personnel resources. Tier 2 must handle multiple incidents with the embedded local personnel, equipment, and radio net. Radio Net congestion, personnel communication frustration, and the creative use of alternative communication processes appear in Tier 2. Most users placed radio net deficiencies in Tier 2 because existing radio capacity is not capable of supporting multiple simultaneous incidents. No national resources are brought to bear in this response.

One particularly striking demonstration of this tier is a weather event where a thunderstorm moves through central Oregon, with lightning strikes setting off multiple small fires. Figure 3-1, supplied by the Wildland Fire Decision Support System, demonstrates the pattern of fires as storms move along their west to east path. These multiple small fires typically do not generate a national response because they are not large enough to trigger mutual aid and auto aid agreements. Therefore, the multiple small incidents must be managed by the existing local radio net. Because the smaller fires are spread out over a large geographical area, multiple incident commanders must communicate with Dispatch (and perhaps, local external responders) through the existing radio system. Since the radio system uses a single channel, multiple incidents frequently exceed the capacity of the radio system to handle all of the voice traffic.

#### **3.1.3 TIER 3 RADIO NET OPERATION**

In a major incident(s), resources are deployed to the region by the National Interagency Fire Center (NIFC). In such incidents as a major fire, national facilities, equipment, and personnel are transported into the region from various locations around the country. Included in this cadre of resources is radio repeater equipment programmed with nationally available VHF channels and portable radios cache issued to the incident response team. Once these national communications assets are deployed in the field and operational, traffic on the local radio net is vastly reduced to a generally manageable level. However, communication between the deployed radio equipment and the local net may not be available. Generally, national portable radio assets are issued to the Dispatch Center so they can monitor, and, if necessary, act as "human repeaters" between incident personnel and the local radio net users.

Figure 3-1, Tier 2 Radio Use Example



### 3.2 OVERVIEW OF FINDINGS

The Team identified a series of common, similar findings and needs for both the Forest Service and BLM.

- 1) **Peak Communication Needs:** The summer recreation season places the highest demand on the radio net, dispatchers, and personnel. Peak communication load and congestion generally occurs with fires during the summer season. Clearly the fire technician ranks, including added summer personnel, are the most visible operational users in this environment. Additionally, the greatest recreation and environmental scientific activities peak during the summer season place added strain on the radio net. Up to an additional 1500 radios may be issued during the summer season to support these Forest Service and Bureau of Land Management activities exacerbating communication difficulties during a fire event. Though the summer season is far and away the busiest time of the year, the Team learned that winter activities are on the rise and may contribute to radio net issues in the future.
- 2) **Unique Event Communication Needs:** The communication needs of a typical fire danger incident are clear and most recognizable. As a result, the communication needs during a fire incident (even a large incident) are well understood and there have been several informal standard procedures that apply to fire incidents. However, the communication needs outside of a fire incident are not as recognizable. As a result, communication planning for these non-fire events is challenging.
- 3) **Collocated Radio Net Communication Sites:** The Team noted that only Aldrich and Grizzly Peak contain both FS and BLM radio net repeaters. The remaining radio sites for each agency are unique to the respective Agency area of responsibility and, hence, coverage.

4) Coverage: There is a lack of radio coverage in canyons and riverbeds throughout each area of responsibility. Due to the challenging deep terrain of the forests, canyons and 100 mile of the Lower Deschutes and practically all of John Day River basins, incident communication is challenged due the Radio Frequency “shading”. Fire and Recreation personnel described creative use of personal and alternate communication techniques to overcome the obstacles. Fire described using personnel placed up the side of canyons to act as “human repeaters”, allowing incident commanders to communicate with dispatch and others via the radio net. Tying up personnel to act as “human repeaters” prevents these people from working in the fire line itself. Recreation monitors and supports activities on both the Lower Deschutes and lower John Day Rivers. One responsibility includes ensuring public enjoyment of the natural resources. In some instances, the Recreation personnel may encounter citizens who are not abiding by the rules of use. Additionally, the four mile stretch of rapids in the Lower Deschutes River generally results in five to ten capsized boat rescues per season. In both of these incidents, recreation personnel are unable to communicate to dispatch to request law enforcement and/or emergency services. To service this need, either personnel are sent to the ridge overlooking the riverbed, where the radio net can be accessed, or they use commercial wireless service (if available) to contact emergency services personnel. Public Safety personnel arriving at the scene are encumbered with the same communication challenges.

5) Training: Formalized, user-centric radio training courses should be provided to the radio users. Most described a lack of documented, maintained, understood, repeatable and effective radio system training by qualified or experienced personnel. Historically, there have been good programs in the past. However, with shrinking budgets over several years, these programs “died on the vine”. Several informal methods were described. Peer-to-peer training and informal radio technician to user training were the most common. Another challenge is the wide variance of users requiring training. A new fire fighter arriving may have been familiar with radio operation in previous positions or in other locations. As such, they are generally quick and savvy students. At the other end of the user spectrum are the seasonal recreational volunteers, who typically have limited or no previous experience with radios. The volunteers require little use of the radio net except in an emergency. As infrequent users, they require basic, ease-of-use instruction. Further, they are self-conscious about when and how to use the radio net. As such, they may be less inclined to use the radio when it is necessary, such as call-in/call-out to dispatch when they depart to backwoods areas or cross over into the adjacent Willamette National Forest. Further, their basic operational knowledge is generally forgotten in the off-season. Hence, they require retraining at the beginning of each new volunteer season. In the middle of these two extremes are the environmental personnel and their volunteers. Though more frequent users than the recreation team, they have much less experience than fire personnel. A user targeted training program should be reconstituted and/or created to meet the widely varying needs and experience levels of the user community. Exacerbating the training issue is the preponderance of three different manufacturers’ of portable radios in use by both the Forest Service and Bureau of Land Management.

6) Frequency allocation occurs each year in the spring for Forest Service and BLM organizations. This timing is after allocation of portables in March, as the volunteer season and the fire season begin. These yearly changes in allocation, arriving in late spring, add to the Telecommunications technician work load. Telecommunications technicians are required to locate each and every radio issued to the field for reprogramming in a very short timeframe. The attempt to corral each radio, and ensure its proper new programming, adds not only to the expense of operation and maintenance, but is fraught with an opportunity to

either miss a radio and/or incorrectly program a radio. An effort to move frequency allocation into December from April is underway within the Forest Service.

7) Many users noted the difficulty of use of portable radio equipment. This was particularly noted by the volunteers who use the radio for only a portion of each year. While targeted training, above, will certainly assist in this issue, the use of three portable radio manufacturers' equipment, Vertek, Motorola, and King, compounded the concern. Indeed, three manufactures radios created challenges throughout the organizations. Each manufacturer requires its own programming cables, unique software, battery chargers, repair guidelines, and spare parts/accessories. This drives Operations and Maintenance costs higher and requires the communications technicians to remain knowledgeable of three portable radios versus one.

8) Operations and Maintenance is further exacerbated by departmental walls that dissuade technicians from repairing equipment across organizations. As a case in point, both the Forest Service and Bureau of Land Management have repeater equipment at Grizzly Peak and Aldrich Mountain. As an example, assume there is a Forest Service equipment malfunction at Grizzly Peak. Should a BLM technician be in the area, he currently cannot respond and affect the repair. The Forest Service Communications Technician may be an hour away. However, that tech will have to drive to the site rather than allowing the BLM technician locally to assess and complete the repair. In addition to increasing the costs of operation and maintenance, the added repair delay causes radio net users frustration in their normal communication.

9) Every portable radio has programmable displays, which allow the communications technician to enter field characters to identify the channel for the user. Each agency's communication technician has created a naming scheme for their radios. (i.e.: Grzly Pk vs. Grizzly). Though recognizable to a daily user, in instances where cross organizational radios are deployed to manage an incident, the naming convention differences may be difficult to interpret in an emotionally heightened incident. Standardization across agencies would eliminate this issue.

10) Coordinated use of the Radio Net is through the Central Oregon Fire Management Service (COFMS) and Aviation missions for fire and other emergency needs.

### **3.3 NATIONAL FOREST SERVICE INTERVIEW SUMMARY**

1) Radio system coverage is required in both the Deschutes and Ochoco National Forests (see Figure 2-1). The Forest Service radio net has been added to over many decades to provide coverage in these two Forests. Further, radio coverage overlaps into the Crescent and Willamette National Forest areas. This requires users to manually switch between radio channels for personnel traveling between these areas. With the rugged terrain and the laws of radio propagation physics, there are ravines and canyons (particularly in the Deschutes National Forest) where radio net coverage is non-existent. When communication is needed in the canyons and ravines, in most instances field personnel have to set up several workarounds. On those occasions where Public Safety, Recreation and/or Environmental personnel travel in these areas, two forms of communication are employed. The first involves contacting dispatch and/or other team members to let them know that they are entering a certain area that does not have radio coverage, and when they will return. Upon returning, the personnel contact dispatch and/or team members again to confirm their return. The informal second method is to use commercial wireless (cellular) phones and/or texting to let comrades know their status. This, of course, is only valuable when commercial radio coverage is available. Forest technicians and fire field crew personnel also have a satellite phone

available to them as a last resort communication method. However, deep within a canyon, a satellite phone may be only helpful in the brief moments when a satellite moves over the narrow aperture of the canyon/riverbed area.

- 2) Many interview responders expressed the belief that perhaps texting and/or e-mail communication may be an acceptable technique to remove some administrative communication from the radio net.
- 3) As the radio net is the lifeline for all Forest Service staff, the top level concern is the radio system must work all the time. As discussed earlier, the highest radio net volume is from June through September. One responder noted that there is moderate traffic use in April-May and October-November. This leaves the months of December through March as the lowest radio usage. This last time period is slowly changing as an increase in winter recreational use of the Forests is increasing with each season.
- 4) The summer congestion period has many contributors. Certainly fire incidents are the most recognizable use of the radio net. However, even with minimal daily usage, the increase of several hundred summer volunteers and busy environmental staff/volunteers also contribute to the overall radio net congestion and the number of concurrent operations that are required. In some cases, Fire personnel could be working a dozen spot fires while both Recreation and Environmental personnel are also using the radio net for field operations. This radio need was described in Section 3.1.2 as Tier 2 and occurs when the radio net congestion exceeds the radio capacity. This communication need must be addressed in any future radio system design / upgrade.
- 5) Channel capacity is an ongoing problem. The fire personnel require dispatch communication. Dispatch centers are located in central areas, as well as district and field offices. During the busy times of the year the single radio channel must support communication for dispatch communication, incident command, fire ground and the “check in / checkout” of personnel simultaneously. These communications needs often exceed the capacity of the radio system.
- 6) Training, as addressed earlier, is accomplished on an informal basis via peer-to-peer or technician-to-peer basis. While this may serve the purpose, with the vast level of users, from complete novice to technical expert, this peer training does not provide a uniform course with an outline based on the users’ areas of expertise and associated communications use.
- 7) As the Ochoco National Forest has overlapping geographic working areas for both the Forest Service and Bureau of Land Management, interoperability between organizations is needed. For public safety cross functional incidents, the Forest Service has a need to communicate with:
  - Deschutes County Sheriff
  - Crook County Sheriff
  - Jefferson County Sheriff
  - Warm Springs Agency
  - Oregon Department of Forestry (ODF)
  - Oregon Wireless Interoperability Network (OWIN)
- 8) These organizations have a combination of formal Memorandum of Understandings and informal partnerships and agreements to provide cross-functional communications to one another. Those public safety agencies that operate in the VHF radio band share their frequencies. Having tactical channels programmed into each organization’s radios allows personnel to intercommunicate with the “twist of a knob” on their issued radio. For those operating in the 700 and 800 MHz public safety band using proprietary “trunking” protocols,

“pools” of radios are maintained and issued to personnel to communicate on mutual response incidents. Though workable and used widely in similar operations nationwide, it does require repeating of incident information twice - once through the home radio, and again through the issued radio. For major Tier 3 fire needs, the Forest Service must also communicate with airborne craft (both fixed wing and helicopter) supporting the incident. Again, using VHF frequencies, air command radios and Forest Service radios both contain these communication resources.

9) Interviews with Aviation personnel revealed they have had three VHF frequencies they can use to communicate with ground personnel, which meets their needs. However, two of these channels will no longer be available to them. Historic anecdotes described a frustrating operational scenario when only one VHF frequency was available. The largest frustration surrounded inbound aircraft responding with fire retardant unable to immediately drop their cargo on a fire due to inability to communicate with ground incident commanders for final approach and drop information. This not only resulted in a delay of retardant delivery, but added the cost of aircraft fly around until accurate drop information could be obtained from the ground incident commander via the radio net. With the recent requirement to surrender two of the three airborne radio channels, the air personnel expect a return to the days of “fly arounds”.

10) Law Enforcement has perhaps the most challenging communication needs, as their territory encompasses multiple forests and districts. To support this operation, officers rely on multiple radios, both mobile and portable, as well as commercial wireless phones and Mobile Data Terminals (MDT).

11) Several interviewees commented regarding special radio needs. By its very definition, the digital modulation scheme used in newer radio equipment provides a level of security that may make encryption moot. The Team believes this situation would only exist for a short period of time. Since the digital modulation is an open standards-based algorithm, it will be easily decoded by commercially available scanners in the future, and hackers will have little trouble with intercepting voice calls. For that reason, we encourage the use of encryption for sensitive law enforcement and other applications requiring tactical security. Encryption as a need was mentioned in Law Enforcement response. The use would be valuable when special operations, requiring utmost security, are undertaken. Such availability would add an additional layer of officer security, as well as maintaining an element of perpetrator surprise.

12) Tactical channels would be particularly valuable in Tier 2 operations, as noted above. Under current single channel operations, an incident commander with an urgent need to reach dispatch may be unable to communicate due to other, less urgent, communications.

13) Dual band radios are not currently in use. The assignment of pool radios between agencies and/or local channel programming of radios is the current mode of operation.

14) The United States Forest Service has a National IT Help Desk that takes trouble call tickets. The USFS documents and prioritizes the calls in the software application “Right Now”. There are three tiers of incident response:

- Severity One; One hour response time
- Severity Two; End of the working day
- Severity Three; Three working days

15) Trouble tickets may be telephoned in or logged on-line. The IT Help Desk forwards the tickets to the Queue Manager in the appropriate Region. The Queue Manager forwards the ticket to the appropriate Radio Technician in the field for repair. In some instances, a repair call may be placed directly to a technician, as some personnel have direct knowledge of the

individual responsible. In these rare incidences, the tech generally adds the issue to "RightNow" via the portal - assigns it to themselves, and then closes it, once the issue is resolved. To minimize trouble tickets in the summer season, the telecommunication technicians perform routine maintenance and alignment of repeater equipment during the winter season, as weather allows. This leaves them relatively free to respond to portable and mobile radio repair and training needs in the summer months.

### **3.4 BUREAU OF LAND MANAGEMENT INTERVIEW SUMMARY**

- 1) Radio system coverage is required in the plains of central Oregon in and around the Ochoco and Deschutes National Forests and the Badlands Grassland to the east (see Figure 2-36). The BLM radio net has organically grown over many decades to provide coverage for areas administered by BLM in the central Oregon region. As described previously, radio coverage in both the Lower John Day and Deschutes River basins is poor due to the shadowing effects of the local topography. On those occasions where Public Safety, Recreation and/or Environmental personnel travel in these areas, two forms of communication are employed. The first involves contacting dispatch and/or other team members to let them know that they are entering a "dead" area for radio coverage and when they will return. This is required as coverage in the riverbed area is non-existent. Upon returning to higher ground, the personnel contact dispatch and/or team members again to confirm their return. The informal second method is to use commercial wireless (cellular) phones and/or texting to let comrades know their status. This, of course, is only valuable when commercial radio coverage is available. Field crew personnel also have a satellite phone available to them as a last resort communication method. However, deep within a canyon, a satellite phone may be only helpful in the brief moments when a satellite moves over the narrow aperture of the canyon/riverbed area.
- 2) Many interview responders expressed the belief that perhaps texting and/or e-mail communication may be an acceptable technique to remove some administrative communication for the radio net.
- 3) As the radio net is the lifeline for all BLM Staff, the top level concern is that the radio system must work all the time. As discussed earlier, the highest radio net volume is from June through September. With the summer season, an increase of several hundred summer recreation and environmental staff/volunteers also contribute to the overall radio net congestion and the number of concurrent operations that are required.
- 4) Training, as addressed earlier, is accomplished on an informal basis via peer-to-peer or technician-to-peer basis. While this may serve the purpose with the vast level of users, from complete novice to technical expert, this peer training does not provided a uniform course with outline based on the user's expertise and associated communications use.
- 5) First and foremost, the field personnel require dispatch communication. Main Dispatch Communication is located at the Central Oregon Interagency Dispatch Center (COIDC) located in Prineville at the regional airport. Communications include call-in and call-out. As the Ochoco region has overlapping geographic working areas for both the Forest Service and the Bureau of Land Management, interoperability between organizations is needed. Further, where an incident crosses from public to private property both organizations have a need to communicate with:

Deschutes County Sheriff  
Crook County Sheriff  
Jefferson County Sheriff

Warm Springs Agency  
Oregon .Department of Forestry (ODF)  
Oregon Wireless Interoperability Network (OWIN)

6) These organizations have a combination of formal Memorandum of Understandings and informal partnerships and agreements to provide cross-functional communications to one another. Crook County Sheriff, Jefferson County Sheriff, Oregon .Department of Forestry (ODF), Oregon Wireless Interoperability Network (OWIN) all operate in the VHF frequency band. Therefore, public safety agencies that operate in these radio frequency band can and do share their frequencies. Having tactical channels programmed into each organization's radios allows personnel to intercommunicate with the "twist of a knob" on their issued radio. For large scale communication needs, both also maintain a set of issuable portable radios that can be exchanged. With Deschutes County Sheriff operating in the 700 and 800 MHz dedicated public safety band using proprietary "trunking" protocols, the only operational scenario is "pools" of radios maintained and issued to personnel for cross - communication on mutual response incidents. Though workable and used widely in similar operations nationwide, it does require repeating of incident information twice: once through the home radio, and again through the issued radio.

7) Several interviewees commented regarding special radio needs. By its very definition, the digital modulation scheme used in newer radio equipment provides a level of security that appears to make encryption moot for BLM operations. The Team believes this situation would only exist for a short period of time. Since the digital modulation is an open standards-based algorithm, it will be easily decoded by commercially available scanners in the future, and hackers will have little trouble with intercepting voice calls. For that reason, The Team encourages the use of encryption for sensitive law enforcement and other applications requiring tactical security.

8) Tactical channels, in addition to the administrative channel, would be particularly valuable during the summer season. During this period, both Recreation and Environmental teams are in the field. Accompanying them are summer volunteers for both disciplines. Though the radio usage access and call time is small, the work of these teams may take them into wilderness areas where access to any communications network, such as the BLM Radio Net or commercial services, may be impossible. As such, their whereabouts need to be reported to Dispatch so each is accounted for at the end of the workday. Environmental personnel may be working alone in areas where a call for help should be unencumbered and instantaneous.

9) Dual band radios are not currently in use. The assignment of pool radios between agencies and/or local channel programming of radios is the current mode of operation.

10) BLM employs a National IT Help Desk for trouble call tickets. BLM documents and prioritizes the calls in the software application "Remedy". Trouble tickets may be telephoned in or logged on-line. In such an instance, the IT Help Desk forwards the tickets to the State level and the State forwards the ticket to the appropriate BLM District.

11) In some instances, a repair call may be placed directly to a technician, as some personnel have direct knowledge of the individual responsible. In these rare incidences, the technician generally adds the issue to "Remedy" via the portal, assigns it to themselves and then closes the ticket upon resolution. To minimize trouble tickets in the summer season, the technician performs routine maintenance and alignment of repeater equipment during the winter season, as weather allows. This leaves them relatively free to respond to portable and mobile radio repair and training needs in the summer months.

12) In a cooperative effort to improve both Lower Deschutes River and the Warm Springs District, a temporary repeater was installed in Warm Springs District territory. A high ground location was chosen for deployment. Informal testing demonstrated slightly improved performance in the 100 mile Lower Deschutes River area and for the Warm Springs Public Safety groups in the District. Further testing and formal agreements will have to be obtained for any permanent deployment. This test repeater has been removed as of this time.

## **4 CONCLUSION AND NEXT STEPS**

The Team was tasked with development of the current Forest Service and BLM radio network equipment and individual site coverage maps, as well as a composite coverage maps, provide a foundation for a larger engineering analysis. Melding this with the user needs identified through cross-functional interviews provides a strengthened position from which to develop engineering and governance long-term solutions in Checkpoint 2. Both common and individual agency observations have been captured, proving a baseline for similar and “best practices” review.

Unique, and at times divergent, operational needs create a challenge for the Checkpoint Two design alternatives and options report. More challenging will be the IIOG team analysis process as they make critical decisions regarding the future of radio net.

The Team takes from Checkpoint 1 a full understanding of the existing radio networks and the needs of the user. The Team now transitions to Checkpoint 2 and the development of alternatives that feasibly and economically combine the USFS and BLM radio systems into an interagency radio network that leverages the existing infrastructure, supports peak requirements, provides broader coverage and capacity, allows systemic standardization of radio equipment and network components, simplifies usage, facilitates integration with cooperating agencies, eliminates duplication and redundancy, incorporates essential security provisions, and optimizes the capability of radio support personnel.

## **APPENDIX A INTERVIEW RECORDS**

(Note: These appear in separate electronic files and reside on a separate project repository)

- A.1 December 6, 2010 - PM Session - Natural Resources and Recreation
- A.2 December 7, 2010 - AM Session – Engineering
- A.3 December 8, 2010 – AM – Law Enforcement and Investigation
- A.4 December 8, 2010 – PM – County Sheriffs Offices
- A.5 December 9, 2010 - AM Session - Dispatch and Aviation
- A.6 December 9, 2010 - PM Session - Fire Leadership
- A.7 December 10, 2010 – AM – Prineville District BLM and Crooked River National Grasslands
- A.8 December 13, 2010 - PM Session - Line Officers
- A.9 December 14, 2010 – AM – Deschutes National Forest – Non Fire
- A.10 December 14, 2010 - PM Session - Ochoco National Forest – Non Fire
- A.11 December 15, 2010 - AM Session - Catch-up Session for Missing Attendees
- A.12 December 15, 2010 - PM Session - Telecommunication Specialist Closure Session

## **APPENDIX B SITE SURVEYS/EQUIPMENT INVENTORY**

(Note: These appear in separate electronic files and reside on a separate project repository)

## **APPENDIX C FREQUENCY GROUPS MAPS**

(Note: These appear in separate electronic files and reside on a separate project repository)

## **APPENDIX D FREQUENCY GROUPS**

(Note: These appear in separate electronic files and reside on a separate project repository)