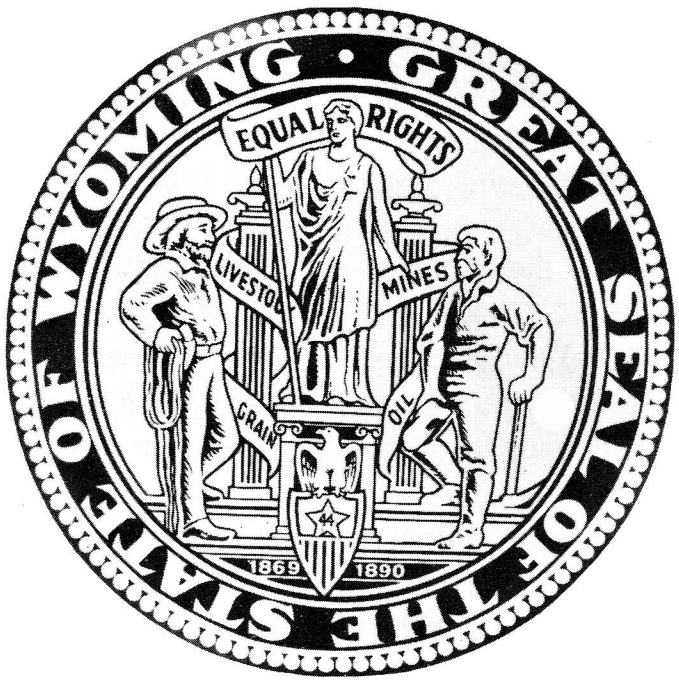

State of Wyoming

Statewide Communication Interoperability Plan

Record of Changes

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Executive Summary

After many studies and surveys, Wyoming began a Public Safety Mobile Communications Plan in 2002. This plan was started with the assistance of the Federal Public Safety Wireless Network, now known as Safecom. A State Steering Committee consisting of a wide range of Wyoming public safety agencies and organizations, with the assistance of a private contractor, produced the Wyoming Public Safety Mobile Communications Plan in 2003.

This plan consisted of two (2) phases; Phase One – Assessment and Phase Two – Planning. Phase One was a detailed look at the current public safety radio systems in Wyoming and the future needs of the Public Safety Agencies. This was accomplished through surveys, site visits and open public meetings. Phase Two saw the development and release of a Request for Information to the vendor community for the development of WyoLink – Wyoming's Statewide Public Safety Interoperable Radio Communication System.

During Phase Two, the Steering Committee reviewed the available options on providing the needs addressed during Phase One. Three alternative architectures were further explored; VHF digital trunked system, 800 MHz digital trunked system and a "do nothing" approach of having the individual agencies and areas continue with their current radio systems. The Steering Committee recommended and approved the development of WyoLink as a VHF digital trunked P-25 radio system with a core structure of 57 radio sites to the governor and legislature. This solution was the most effective and efficient method to meet the goals expressed by the user community.

The VHF alternative solves the shortfalls of the vast majority of public safety communication systems in Wyoming. The improvements are highlighted below:

- Significantly improved interoperability between any WyoLink subscriber (local, state and Federal agencies and users) statewide at any time
- Relatively easy transition from current analog systems
- Support of non-WyoLink users at least during the next ten years
- A modern, state-of-the-art P25 digital trunked infrastructure
- Meets FCC mandatory requirements
- Flexibility of design and smooth transition to evolve
- Voice and data capabilities
- Improved survivability and reliability of channels, sites, and the overall network
- Elimination of pent-up demand for enhanced features (encryption, additional channels, AVL, control of subscriber units, and emergency/panic functions)
- Improved statewide mobile coverage
- Improved portable coverage for selected areas
- Replacement of aging, obsolete equipment
- Satisfy user community desire for a State plan and clear direction forward

The year-long planning process concluded with the Wyoming Communications Interoperability Education Forum on November 6, 2003. This event examined some of the issues specific to implementation of WyoLink and the current policy, funding, technical, and operational challenges facing the public safety community within the state as WyoLink is implemented. The forum included presentations, a facilitated discussion between PSMC Steering Committee members, and working sessions that focused on developing a "consensus statement" regarding policy, funding, technical, and operational issues.

The Wyoming Public Safety Communications Commission (PSCC) was created in 2004 by the Wyoming Legislature from the former State Agency Law Enforcement Communications System (SALECS) and Public Safety Mobile Communications (PSMC) Steering Committee. The PSCC consists of seventeen (17) members appointed by the Governor to three-year terms representing State of Wyoming agencies, public safety organizations, Federal agencies, tribal and the general public. The mission of the Wyoming Public Safety Communications Commission is to develop recommendations for policy and guidelines, identify technology and standards, and coordinate intergovernmental resources to facilitate statewide wireless communications interoperability with emphasis on public safety.

The 2004 start-up funding totaled $6,800,000 of the $51,000,000 that would needed to complete the core build-out of WyoLink. On May 1, 2004, Wyoming Department of Transportation hired a project Manager to oversee the development of a Request for Proposal (RFP), manage the procurement process and manage the construction development of WyoLink. The WyoLink RFP was published on July 15, 2004. WyoLink will be a Project-25 digital, trunked, VHF Hi-band (136-174 MHz) radio system utilizing 57 sites. The system will be interconnected via the Wyoming Department of Transportation (WYDOT) microwave backbone and its planned extensions.

Responses to the WyoLink Request for Proposals were received on September 27, 2004. Proposals were received from EF Johnson Inc and Motorola. A Technical Evaluation Team, representing a cross-section of Wyoming's public safety disciplines diligently studied the proposals and evaluated the overall strengths and weaknesses of each one. Following a review by WYDOT Executive Staff and the Public Safety Communications Commission, the Wyoming Transportation Commission received the evaluation report and recommendations. On October 14, 2004, the Wyoming Transportation Commission accepted the Technical Evaluation Team's recommendation to award the WyoLink equipment and development services procurement to Motorola.

Design and construction of the WyoLink project was initiated in November 2004 with the pilot phase completed in May 2006. This project was initially projected to be a six year development, but has since been upgraded to include a second zone controller and have a completion of the core 57 sites in 2008. The current projection is that 43 of the projected 57 radio sites will be completed in 2007.

WyoLink has secured $50,447,011 in funding for the completion of the 57 site core infrastructure system including the master controller and second zone controller. This funding includes upgrading the ASTRO 25 SmartZone to Version 7.2. The funding is summarized below:

WyoLink Funding – July 2005 thru June 2008

WyoLink Funding Sources	FY '05	FY '06	FY '07-'08	Total Funding
Wyoming Transportation Commission Funds	$ 5,200,000			$ 5,200,000
Homeland Security Grants	$ 1,200,000	$ 1,000,000		$ 2,200,000
Bio Terrorism Grant	$ 400,000			$ 400,000
Wyoming Legislative General Fund	$ 7,172,671		$35,111,340	$42,284,011
Wyoming Transportation Commission Funds – WyoLink Support			$ 363,000	$ 363,000
Total	**$13,972,671**	**$ 1,000,000**	**$35,474,340**	**$50,447,011.00**

The Public Safety Communications Commission (PSCC) has completed the rule making process and the rules have been filed with the Wyoming Secretary of State. The Rules and Regulations provide the administrative procedures for the development of policies and procedures, participant determination, rules and regulations of the FCC, rules and regulations of the NTIA and fees.

The PSCC has adopted the WyoLink Handbook, Membership Agreement, recommended the WyoLink operating system upgrade from ASTRO 25 version 6.5 to 7.2, hosted a Federal Agency Interoperability Summit for the federal agencies that may become members of WyoLink (58 attendees representing 22 Agencies), signed a Memorandum of Understanding with the Department of the Interior, and has provided public informational meetings for local agencies and elected officials on the progress of WyoLink and expectations.

The ongoing projects includes the completion of the core WyoLink system in 2007, development of portable radio enhancements including a budget proposal, development of a training program and adding members to the WyoLink system.

Current interoperability in Wyoming and redundancy to the WyoLink radio system consists of the resources provided by the Wyoming Office of Homeland Security, Two (2) mobile support vehicles and portable tower system, swapping radios, console patches, ACU1000 gateways and shared channels.

To realize all of the benefits of the WyoLink system the PSCC identified nine (9) challenges that need to be completed and attain interoperability between local, state, tribal, federal and non-governmental agencies. Those challenges are:

- WyoLink and Interoperability training for all users;
- Dispatch Center connectivity and wireless redundancy;
- Portable radio coverage enhancements;
- 800 MHz connectivity to the two (2) local areas with 800 MHz systems;
- Mobile and Portable radio purchases;
- Frequency acquisitions;
- Radio site acquisitions;
- Interoperability with adjacent states;
- Enhancing the Strategic Technology Reserve.

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1 State of Wyoming

1.1 Overview

Wyoming is located in the Rocky Mountain section of the western United States. It is bounded on the north by Montana, on the east by South Dakota and Nebraska, on the south by Colorado and Utah, and on the west by Utah, Idaho and Montana. Wyoming is one of three states entirely bounded by straight lines. From the north border to the south border it is 276 miles; from the east to the west border, 375 miles. Wyoming is the tenth (10^{th}) largest state with an area of 97,814 square miles with the smallest population (50^{th}) at 515,004, according to the 2006 estimates. Wyoming has several medium sized cities with concentrated populations and vast areas of extremely low population densities. Overall the population density is just over 5 persons per square mile. Cheyenne, the State Capitol, is the largest city with a population of 55,731.

The Great Plains meet the Rocky Mountains in Wyoming. The state is a great plateau broken by a number of important mountain ranges. The highest point is Gannett Peak at 13, 804 feet and lowest point is the Belle Fourche River at 3,099 feet. The mean elevation of Wyoming is 6,700 feet. Approximately 47% of the state is owned by the Federal Government. The Rocky Mountains are located along the western edge along with Yellowstone National Park and Grand Teton National Park. The Big Horn Mountains are in the north central part of the state with the Laramie Mountains extending from the central part of the state to the southeast. The Bear Lodge Mountains, which are part of the Black Hills, are located in the northeast part of the state. The south central part of Wyoming includes the Medicine Bow Mountains. There are 10 National Forests including the Thunder Basin National Grasslands, 2 National Parks, 2 National Monuments, 1 National Historic Site and 1 National Recreation Area.

Wyoming's economy is based upon mining (coal and trona), natural gas production, agriculture and tourism. In addition to the economy features, the critical infrastructure of the Wyoming includes electrical power generation and transmission and F.E. Warren Air Force Base, home of the 90^{th} Space Wing. The largest recurring events include the University of Wyoming home football and basketball games, Cheyenne Frontier Days and the Wyoming State Fair.

Three interstate highways transect the state, Interstate 80 along the southern portion of the state, Intestate 25 runs from the southeast to the north central and bisects with Interstate 90 which runs through the northeastern part of the state. The Union Pacific Railroad runs east to west along the southern portion of the state. Burlington Northern Sante Fe Railroad has a northern route across the northeast part of Wyoming and a north south route from the northeast to the southeast, which is shared with the Union Pacific Railroad.

The climate is semiarid, but because of its topographical diversity, it is also varied. Annual precipitation varies from as little as five inches to as much as 45 inches a year, some in the form of rain and some in snow. Because of its elevation, Wyoming has a relatively cool climate, the normal mean temperature is 45° Fahrenheit. Above the 6,000 foot level the temperature rarely exceeds 100° F. Summer nights are almost invariably cool, though daytime readings may be quite high. Away from the mountains, low July temperatures range from 50° to 60° F. Wyoming's climate can include extreme temperature highs and lows, in the summer, parts of the state can experience temperatures above 100° and in the winter, extended temperatures below 0° are common. The average wind speed is 12.9 mph. Heavy snowstorms, blizzards, floods, tornados and wildland fires are natural disasters that can be typical for Wyoming.

Wyoming is divided into twenty three (23) counties and seven (7) Homeland Security Regional Response areas with ninety nine (99) incorporated municipalities. There is one Indian Reservation located in the central portion of the state. The Public Safety agencies include 23 Sheriff Offices, 56 Police Departments, 134 Fire Departments, 66 Ambulance agencies and 41 Dispatch centers. The State of Wyoming has 11 agencies that have public safety roles including law enforcement, corrections, health, livestock, state parks, transportation, forestry, fire marshal, state engineer and homeland security.

Wyoming was required to provide only one Tactical Interoperable Communication (TIC) Plan in 2006. Laramie County/Cheyenne was chosen as the TIC area because of the State Capitol and being the most populated county in the state. The TIC plan was submitted to the Department of Homeland Security, reviewed and exercised. The Laramie County TIC plan was rated as one of the top five (5) plans of those that were submitted nationally. After the peer review, the plan was revised to incorporate the suggested revisions.

2 Public Safety Mobile Communications

2.1 History

In 1992, the FCC released a proposed rule making that would have a drastic impact on two way communications. It would eventually mandate changes which would be very costly for the unprepared. In early 1994, the WYDOT Telecommunications Program began thinking about developing a plan to enable a statewide backbone infrastructure radio system which would not only take care of all WYDOT two-way radio needs for the foreseeable future, but which would serve other state agencies as well. Not only that, but if the plan was expanded just a small bit, it could incorporate all public safety entities in the state at the county and municipal level, should they wish to participate.

It was decided that the best approach would be to form a Users Group, consisting of representatives from all levels of public safety throughout the state, and an organizational meeting was convened on February 20, 1997. There was general agreement that Wyoming's public safety community has considerable expertise on the subject, and the feeling was that we could evaluate our needs and come up with a reasonable plan internally, thereby saving the expense of hiring outside consultants.

An exhaustive survey was distributed, recovered, and compiled. The User Group Technical Committee analyzed the data and issued a summary recommendation and initial cost projection. The results raised eyebrows and caused considerable concern among county commissioners and city councilmen who were afraid they were going to be forced into funding a new communications system.

- The momentum of the project was effectively stalled; however, the county commissioners association was agreeable to having a review of the User Group findings done by an independent consultant. Quantum Communications (Salt Lake City, UT) was retained in 1998 to evaluate the current state of the State of Wyoming's public safety land mobile communications systems, and issued their report on May 24, 1999.

In spite of the results of this report, there were still enough negative feelings at the county level that the project momentum remained stalled.

Early in 1999, Governor Jim Geringer had conversations with the county commissioners and mayors with respect to his understanding of the needs for upgrading the State's public safety communications. Shortly after that, the Office of Information Planning and Coordination retained RSM McGladrey to assist on telecommunications matters. Their first assignment was to update the public safety communications situation within the state and provide a report. Interviews were conducted around the state and a report in Power Point format was given on August 16, 2000. There were seven final points to the RSM McGladrey report:

1. Identify accurate budgetary costs.
2. Develop a plan for a governing and control board.
3. Develop information on potential funding sources.
4. Continue to pursue partnership possibilities.
5. Obtain participation commitments.
6. Develop a draft RFP based on the results of the Motorola engineering study.
7. Prepare a comprehensive plan for the legislature.

As a consequence of the meetings and interviews that were conducted during the RSM McGladrey study, it was determined that an RFP would be out of the question without a financial commitment from the State.

On May 15, 2001, the Wyoming Legislative Transportation Interim Study Committee heard a presentation on the subject of public safety communications and agreed to consider funding a Request for Proposals (RFP) for further study of the need for creating a single public safety mobile communications infrastructure, to be known as the “Wyoming Public Safety Mobile Communications Plan”.

The Wyoming Statewide Public Safety Mobile Communications (PSMC) Plan would address the needs of all state government public safety agencies; it included federal and local government entities and other interested partners. The plan reviewed existing public safety infrastructure in the State of Wyoming; explored the impact, costs, and benefits of various options; and made recommendations needed to proceed with acquisition and implementation of a statewide public safety mobile communications system that will meet clear requirements, with a specific architecture. The plan's architecture description dictated how Public Safety Mobile Communications systems fit together, and with other information systems.

Phase One of the Wyoming PSMC Plan will determine user requirements and operational architecture for Statewide Public Safety Mobile Communications in Wyoming, and set the stage for Phase Two analysis. To do this, Phase One will identify potential stakeholders, build consensus and bound the problem. Work will include reviewing past outreach results, background studies, and Memorandums of Understanding (MOU). It will review and document existing public safety mobile communications infrastructure, its interoperability, and emerging needs and opportunities. With Steering Committee guidance, Phase 1 will prepare business case information for several alternatives. Alternatives will include the option of doing nothing to upgrade the existing infrastructure, for the purpose of comparison. The purpose of Phase Two will be to generate a Request for Proposal (RFP) which will meet the needs of the stakeholders identified in Phase One; meet the requirements of the overarching telecommunications architecture and public safety standards; address the detailed responsibilities among the stakeholders; provide policy recommendations for Statewide Public Safety Mobile Communications organization and operation; demonstrate representative technology; and present the final Statewide Public Safety Mobile Communications Plan and estimated costs to all stakeholders.

The RFP describes a Steering Committee to consider high-level planning and policy issues, contribute support for this initiative at high levels, and direct the Project Manager and the consultant in the development of the Plan. A Technical Evaluation Committee will evaluate the proposals, for selection of the successful Consulting Firm.

During September through November, 2001, the request for proposal was presented to the Wyoming Joint Transportation and Highways Interim Committee, Wyoming County Commissioners Association, Wyoming Transportation Commission, budget per review with Governor Geringer, Wyoming Telecommunications Council, Wyoming Chapter of the Association of Public-Safety Communications Officials (WYAPCO), Wyoming Association of Municipalities Public Safety Committee and Wyoming Counter Terrorism Commission.

On January 16, 2002, the State Agency Law Enforcement Communication System (SALECS) Commission resolved to invite participants for the steering committee for the planning process. These included the Wyoming Association of Municipalities, the Wyoming County Commissioners Association, the WY Chapter of the Association of Public Safety Communications Officials, the WY Sheriffs' and Chiefs' Association, the WY Fire Chiefs' Association, the Counter-Terrorism Commission, the WY Department of Transportation, and the WY Department of Health. Non-voting "ad hoc" members may also be designated. The Steering Committee will direct the Project Manager and the consultant in the development of the Statewide Public Safety Mobile Communications Plan. The committee will consider high-level planning and policy issues, and will contribute support for this initiative at high levels.

A consultant team sponsored by the Federal Public Safety Wireless Network initiative (PSWN) visited Wyoming in January 2002. They assessed what Wyoming needs in a public safety mobile communications plan, to overcome the roadblocks to funding such a large project. The PSWN team used the information gathered in a broad-based series of meetings and interviews to recommend a strategy for the public safety mobile communications planning effort. The resulting June 2002 report endeavors to provide:

1. A clear purpose and need for developing a comprehensive business case for a new statewide system.
2. A detailed process for gathering and analyzing input from stakeholders that influence the funding process.
3. A methodology for developing each core component of a business case.
4. Guidance and recommendations on how to market the business case to influential audiences.
5. Relevant examples on how to perform each part of the strategy, developed from data gathered in Wyoming.
6. A listing of the systems planning tasks that must be documented and explained to critical stakeholders.

In June 2002, Governor Geringer led several state agencies to collaboratively fund this RFP at a maximum of $300,000. Also, several organizations have been explicitly named as cooperating parties for the RFP: the Association of Public

Safety Communications Officials (APCO), Wyoming Chapter; Wyoming Association of Municipalities; Wyoming Counter-Terrorism Commission; Wyoming County Commissioners' Association; Wyoming Law Enforcement Communications (SALECS) Commission; and the Wyoming Telecommunications Council. The SALECS Commission has the lead for convening the initiative Steering Committee.

Clarifications on the Public Safety Mobile Communications RFP went out July 2002. Proposals were received by August 16, 2002 and the proposal evaluation process was done through August and September, 2002. Federal Engineering (FE) was selected in a highly competitive procurement, from the initial field of 17 'Statements of Interest'. FE's documented experience planning land mobile radio systems for sparsely populated states like WY, and their thorough approach for gathering information from all levels of government made them the outstanding candidate..

2.2 PSMC Steering Committee

In October 2002, Governor Jim Geringer initiated Wyoming's Public Safety Mobile Communications (PSMC) plan by appointing a Steering Committee. The steering committee included a wide range of public safety organizations. The committee representatives and agencies or organizations represented included:

Kelly Hamilton	Livestock Board/State Agency Law Enforcement Communications System (SALECS)
Jim Narva	Wyoming Fire Marshal
Joe Evans	WY County Commissioners Association
Dan Perko	WY Chapter APCO & Wyoming Forestry
Fran Cadez	WY Department of Health
Dave Kingham	Natrona County Sheriff's Office/Representing Wyoming Sheriff's
John Heller	WY Emergency Management Agency
Billy Janes	Torrington Police Chief/Representing Wyoming Police Chief's
Mark Joiner	Bureau of Land Management/Representing Federal Agencies
Tim Hibbard	Wyoming Department of Transportation
Dave Johnson	Wyoming Association of Municipalities
Robert Wyatt	Wyoming Telecommunications Council
Robert Wilson	WYDOT – Project Manager

From the Steering Committee, a project team was identified to represent the Steering Committee with Federal Engineering and assist with the planning activities. The project team consisted of Kelly Hamilton, Mark Joiner, Robert Wilson and Kent Drummond, State of Wyoming, Administration and Information, Information Planning and Coordination Office.

On November 7, 2002, the Public Safety Wireless Network (PSWN) Program jointly hosted the Wyoming Public Safety Communications Interoperability Conference with the Wyoming Public Safety Mobile Communications Plan Steering Committee and in cooperation with the Wyoming Association of Municipalities, Wyoming Chapter Association of Public Safety Communications Officials (APCO), Wyoming County Commissioner's Association, Wyoming Homeland Security Council, Wyoming Law Enforcement Communications (SALECS) Commission, Wyoming Telecommunications Council, and the Wyoming Department of Transportation. The PSWN Program is a federal joint initiative of the Department of Justice and the Department of the Treasury. The program's mission is to plan for and foster interoperability among local, state, federal, and tribal public safety wireless networks, so that no life is lost because public safety responders cannot communicate with one another. The Chairman of the Homeland Security Council, General Boenisch, gave the keynote address, emphasizing that public safety communications between agencies are crucial to Wyoming's security. The conference was attended by 84 people representing elected and appointed officials, public safety executives, and communications managers. The conference attendees learned about initiatives that are under way, and focused on improving interoperability among public safety wireless networks within Wyoming. They also heard "lessons learned" from Colorado, North Dakota, and South Dakota in the development of statewide radio systems.

The conference culminated in a presentation on the Wyoming statewide PSMC planning initiative. Partner agencies from federal, state, county and municipal government are working on a comprehensive plan to improve Wyoming's wireless communications system, for the long term. The existing system were outdated and inadequate to safely meet emergency responders' communications needs for both daily and major incident communications. Existing radio systems are easily overloaded by congestion that delays crucial communications. State and local agency cooperation is hampered by lack of interoperability during emergencies; this problem is getting worse as individual agencies independently upgrade their systems. In cooperation with WYDOT, the Homeland Security Council selected a consultant (Federal Engineering), via the RFP process, to work with many involved agencies to write this authoritative, broad-based plan.

The first phase, assessment, concentrated on understanding current PSMC infrastructures and equipment as they existed at the time of the survey. The majority of this data was obtained through the following approaches:

- An internet based survey running on *FEClientNet* that was responded to by the participating agencies/entities. A total of 72 unique responses were received and many were updated several times after the initial submission. A good deal of effort was put into refining the demographics of the towers.

- A series of seven group interview sessions attended by numerous participants as well as nine tower site visits were held in various locations across the State, over a two-month period of time. These sessions were attended by State, Federal, County, local agencies and municipalities, and private companies on a voluntary basis and consisted of structured interviews. In addition, open sessions were held to clarify inputs and provide participants with an opportunity to express their concerns, needs and requirements.

Discussions with members of the Steering Committee were also held to further clarify information that was obtained through the other sources.

Phase Two, Planning, saw the development and release of a Request for Information (RFI) to the vendor community. Responses from six vendors were used to prepare a range of all conceptual alternatives, which were then narrowed down to two reasonably viable statewide alternatives for detailed analysis; VHF-highband and 800 MHz frequency bands. The RFI information was used to create a cost breakdown for these two options, plus the cost implications of "Doing Nothing" for a shared statewide system.

A finalized set of recommendations was developed that defined the technical and functional architecture as well as the budgetary requirements for a system that will provide improved coverage, improved interoperability across all State and local public safety agencies, and improved functionality especially in the critical areas of encryption and mobile data. The Wyoming Statewide Public Safety Mobile Communications plan was delivered October, 2003

All of the Steering Committee meetings were open meetings and attended by many interested stakeholders.

On November 6, 2003 the Wyoming Communications Interoperability Educational Forum was held, which drew first responders and policy makers from Wyoming as well as other states. This forum was the conclusion to the planning for the PSMC plan and the start of WyoLink. The recommendation brought forward through the assessment and planning was for a Project 25 digital, trunked, VHF/150 MHz infrastructure utilizing 57 radio sites with interconnectivity via the WYDOT microwave backbone and planned extensions. The attendees developed a "consensus statement" that allowed policy makers and state legislators address issues raised by the session attendees.

3 Public Safety Mobile Communications Plan

3.1 Phase 1 - Assessment

3.1.1 Summary of Existing Systems

The following is a summary list of the significant existing PSMC issues, grouped into categories of Technical, Functional, Coverage, Interoperability and Operational.

Technical – Specific technical capabilities typically relating to maturity of electronics, standards, spectrum and installation practices:

- Technologies in use have been in place for many years, with upgrades being done on an individual case basis, typically focusing more on the subscriber units than on the overall systems.
- Technology has not advanced beyond conventional, wideband, analog systems, due to a universal lack of funding as well as the absence of an overall statewide plan.
- Most of the systems are analog, although there appears to be a trend toward digital technologies in new systems, such as Casper and Federal Government.
- Equipment age has been a problem for many years, with much of it difficult to repair and/or having no replacement parts available.
- State sites are generally better equipped (shelter, power, inter-site communications, etc.) than local government sites. There is no standard policy or practice for providing ancillary equipment such as uninterruptible power supply (UPS), generator capacities, fuel tank sizes, alarms or air conditioning. Power load assessments and load testing is not done on a regular basis.
- Minimal redundancy/backup exists, therefore systems must be inherently reliable.

Functional – the capabilities available to the users. Basically, respondents were satisfied with the capabilities of their systems, in that they are able to communicate.

- Functional capabilities of Federal, State, county, and local systems are described in paragraphs 3.1.2 through 3.1.5.

Coverage - is generally defined as the geographic area in which signals are adequate to permit users to communicate with the network.

- Coverage issues are well understood and important to the respondents, especially portable, regional and statewide coverage and statewide roaming.
- In-building coverage was cited by some respondents as a concern and was only partially offset by the use of vehicle-based repeaters.

- While several respondents cited specific areas where coverage gaps exist, the overall coverage plots indicated that these areas are primarily in the very rural/low population density areas or in mountain/valley areas.

Interoperability - The ability of different organizations to communicate with one another when necessary.

- Generally, interoperability is provided by switching channels, mutual aid frequencies, or sharing frequencies and/or radios from interoperating agencies. It is a manual process providing limited capability for multiple agencies to interoperate. It is only through the creativity and knowledge of their systems that interoperability capabilities are put in place by agencies on an "as needed" basis.
- There are significant opportunities for creating a consolidated infrastructure including both the number of sites and common systems.
- Users want improved interoperability to operate in today's public safety environment - ideally the ability to communicate with anyone at any time.
- Cooperation between the State, county, local and Federal users is very important to all respondents.
- Interoperability to neighboring states was mentioned in several cases as important as well.
- Most respondents are waiting for State direction on an overall PSMC plan before moving forward on their own.

Operational - defines how agencies operate and use their communications systems.

- Individual channel failures are addressed by switching channels or simply waiting for repair.
- Many areas need additional channel capacity and/or more efficient use of channels.
- Interference and/or static is increasing due to channel selection/overuse and overcrowding on choice mountaintop locations.
- The systems typically have only one control point, which would result in significant loss of communications capability if that one site fails. Repeaters will still provide local area communications and some agencies have MOU's for backup communications services.
- Most contributing users believe that a single system-wide radio infrastructure will be best for all, but worry about funding and user fees.
- Several studies of limited duration have been done but did not look at capacity requirements or utilization over sufficient time. However, the respondents seemed to know where capacity issues existed, mostly from their day-to-day experiences and knowledge of their systems.

3.1.2 State Systems

The following sections summarize each of the five State systems. The Wyoming Department of Transportation (WYDOT) maintains and operates the majority of the State's PSMC radio networks, including 43 mobile radio repeater and/or microwave relay sites. The five statewide networks operated or supported by WYDOT are:

- SALECS (State Agency Law Enforcement Communications System),
- Mutual Aid,
- Maintenance (WYDOT),
- State Patrol (WHP), and
- Wyoming State Forestry Division.

The mountaintop transmitter sites are interconnected via an analog 2/6 GHz microwave network also maintained and operated by WYDOT. Most sites are owned by WYDOT. WYDOT strives to continuously improve communications infrastructure by tracking outages and conditions of ancillary components such as access roads, towers, grounding, and shelters. WYDOT recently evaluated their 43 sites for building conditions (inside and outside), tower conditions, and safety. In this evaluation, 16 sites were rated as good to adequate with possible areas for improvement, seven sites were adequate with areas of concern, and 20 sites were in need of definite improvements. Many new buildings, rooms, and towers are planned during the ongoing upgrade of the backbone microwave network.

State two-way radio repeater system specifics are shown below:

- Number of 2-way radio sites - 30.
- Number of microwave relay only sites - 10.
- Tower types - most guyed, except three self supporting.
- Average tower age - 20 years.
- Average tower condition - 16 good/adequate, 12 fair/poor.
- Grounding - 24 good/adequate, 4 fair/poor. State is reviewing tower guy grounding scheme and upgrading grounding to single-point grounding.
- Shelter condition - 18 good/adequate, 10 fair/poor.
- HVAC - Thermostatically heat/venting - all sites. Air Conditioning - 4 yes, 24 no.
- Generator - 20 sites have 15 kW units, LPG fueled with 234 hour tanks.
- UPS - none for two-way radio equipment (all sites have battery backup for microwave equipment). To ensure clean and uninterrupted power all sites should have UPS installed with 15-30 minutes of runtime.
- Site physical security - most are at unmarked roads/sites, some with fences, no perimeter alarms.
- Shelter physical security - all sites (except Salt Pass) have door alarms.

SALECS

The State Agency Law Enforcement Communications System (SALECS) is the primary channel for the law enforcement function of several State agencies (Division of Criminal Investigation, Game & Fish, Brand Inspectors, Livestock Law Enforcement Officers, State Parks & Historic Sites, Arson Investigators), as well as some Federal entities who have statewide law enforcement responsibilities, but no communications systems of their own. The system is dispatched by the Wyoming Highway Patrol, and oversight is provided by a commission appointed by the Governor. Control stations have been made available to county and municipal law enforcement for the purpose of their being able to communicate with State law enforcement personnel, and to be utilized by county and municipal law enforcement in the event of failure of their own primary systems. SALECS repeaters are collocated with systems utilized by the Wyoming Highway Patrol, Department of Transportation Maintenance, and State Mutual Aid. SALECS traffic is logged by the WHP dispatch center recorder.

SALECS system specifics are shown below:

- Number of sites - 26.
- Coverage - 5 sites rated as inadequate.
- Number of channels - all sites rated as inadequate.
- Average peak number of users - 32/site Four sites are seriously overloaded (> 50 peak users).
- Traffic peak - hunting season.
- Receive frequency - 154.740 MHz.
- Transmit frequency - 155.640 MHz.

State Mutual Aid (MA)

State Mutual Aid is a single channel radio system that does not employ repeaters, which means a transmission from a mobile or portable would not be rebroadcast from the receiving mountaintop site. It would only be heard by WHP or County/Municipal Dispatchers, or another mobile or handheld that would be in close proximity to the transmitting unit. The Mutual Aid system is operated by the Wyoming Department of Transportation, however through MOU agreements, many other Wyoming entities have the frequency in their dispatch centers, mobiles, and portables for the purpose of a common communications channel. Obviously, this simplex channel can become very congested when many users are trying to access it.

State Mutual Aid system specifics are shown below:

- Number of sites - 24.
- Channel is simplex (non-repeater), without PL tones.
- Coverage - 5 sites rated as inadequate.
- Number of channels - 21 sites rated as inadequate.

- Average peak number of users - 48/site. Nine sites are seriously overloaded (> 50 peak users).
- Traffic peak - year round.
- Receive frequency - 154.875 MHz.
- Transmit frequency - 154.875 MHz

WYDOT Maintenance

WYDOT Maintenance has divided the State into five (5) geographical districts. Each district operates its own independent dispatch center with one console each. Those locations are:

- District 1 - Laramie (southeast WY).
- District 2 - Casper (east central WY).
- District 3 - Rock Springs (southwest WY).
- District 4 - Sheridan (northeast WY).
- District 5 - Basin (northwest WY).

Maintenance system specifics are shown below:

- Number of sites - 28.
- Uses repeaters, with PL tones - for regional communications, without audio recorder logging.
- Coverage - all sites rated as adequate.
- Number of channels - 23 sites rated as inadequate.
- Average peak number of users - 36/site. Seven sites are seriously overloaded (> 50 peak users).
- Traffic peak - winter.
- Receive frequency - 156.105 MHz.
- Transmit frequency - 157.290 MHz.

Wyoming Highway Patrol (WHP)

WHP uses one centralized, statewide dispatch center in Cheyenne with ten consoles. The dispatch center is primarily for WHP, but also serves secondary roles for Mutual Aid and SALECS. WHP, MA, and SALECS are all monitored and recorded at the Cheyenne WHP dispatch.

WHP system specifics are shown below:

- Number of sites - 26.
- Uses repeaters with PL tones.
- Coverage - 1 site (Snow King) rated as inadequate.
- Number of channels - 22 sites rated as inadequate.
- Average peak number of users - 30/site. Three sites are seriously overloaded (> 50 peak users).
- Traffic peak - year round.
- Receive frequency - 155.445 MHz.

- Transmit frequency - 154.680 MHz.

Wyoming State Forestry Division

The Forestry Division utilizes VHF High-band, microwave linked statewide for regional coverage and monitoring via eight repeater sites. Two of the repeater sites are commercial leases, the remaining six are shared with the WYDOT or BLM.

The Forestry Division system is currently utilized by 15 cooperating County Fire Organizations, State Parks, the State Engineer, WY Interagency Coordinating Center, two USFS lookouts, WY Department of Agriculture, WY State Fairgrounds, and the State Recreation Commission. The equipment's average age is 25 years old (some mountaintop equipment continues to utilize vacuum tube technology). There are some 4,000 to 5,000 portable radios available for use to assist communications during fire incidents. They are cached in Boise, Idaho.

State Forestry Division system specifics are:

- Number of sites - 8.
- Coverage - all sites rated as inadequate.
- Number of channels - all sites rated as inadequate.
- Traffic peak - Fire season.
- Receive frequency - 151.430 MHz.
- Transmit frequency - 151.160 MHz.

3.1.3 Summary of Common Characteristics

Technology - All State systems operate in the VHF High-band using conventional wideband analog equipment.

Equipment Age - Most infrastructure equipment ranges in age from 10 to 20 years old, generally having passed its design life and becoming more difficult to service. Some equipment (Forestry) is still using vacuum tube technology which is considered by most to be antiquated.

System Interfaces and Frequency Sharing Agreements - Currently interoperability is often implemented in the most basic of ways through frequency sharing agreements, which include:

- State Mutual Aid (for all public safety)
- SALECS (primarily for State law enforcement agencies, but also used by city, county and federal users)
- Fire Emergency Radio Network - FERN (mostly on-site, simplex frequency)
- Other "informal" public/private agreements (*i.e.*, with ranches)

There are no real direct interfaces between the various radio systems that are operated by the State. The majority of the interfaces are created through manual patching or dispatcher relay arrangements. The Mutual Aid frequencies provide for some interface capabilities but provide very limited capacity. Further, they provide for a one-to-one interface rather than a full system-to-system interface. The shared capability of the SALECS system also allows a limited degree of interfacing between user agencies, but is only used by local and Federal law enforcement agencies in emergency situations to interface with SALECS, not with each other.

Traffic - As previously shown under the system specific information sections, all five statewide systems have inadequate channels to handle traffic peaks with as many as 23 channels being seriously overloaded. While these systems are somewhat redundant and traffic can be diverted from one system to another, this is less than an ideal situation. In fact, if one channel was inoperative, the traffic would quickly overload the remaining active channels..

Backbone Communications (Microwave) - The existing inter-site communications is provided by the WYDOT 2/6 GHz analog single-thread microwave network. It connects 43 sites which include microwave relay points, WYDOT offices, and the PSMC sites throughout the State. WYDOT has undertaken the design and implementation of an upgraded backbone network to replace the current network. The system is being designed, installed, and operated by existing WYDOT technical staff. This microwave network upgrade will be completed with the same schedule as the WyoLink project.

The new backbone will consist of 6 GHz digital equipment of a single-thread design, much as today's existing network. Capacity of the backbone is as follows:

- Major backbone circuits - three DS-3, 134 Mbps.
- Minor backbone circuits - one DS-3, 45 Mbps.
- Spurs to serving points - 12 DS-1, 18.5 Mbps.

These bandwidths are estimated by WYDOT to provide capacity for the following applications:

- Voice/PBX for WYDOT District offices.
- WYDOT ITS (Intelligent Transportation System) along State highways.
- T1 to trunk sites.
- Future expansion of the State's PSMC 2-way radio networks.
- Reserve for undefined applications.

One weakness of a single-thread design is the lack of path redundancy. With a single-thread design there is only one path to the next relay/service point. There exists a single point-of-failure that would cause services to be lost (until repairs are made) beyond the failed node or circuit. To maintain a higher level-of-service for PSMC applications, it is recommended that the new microwave network be reviewed and if economically viable, augmented by "closing the loops," *i.e.*

connecting path branch ends together to form closed circuit/path rings, thus providing path redundancy.

3.1.4 Local PSMC Systems

A total of 72 local public safety agencies submitted information via a user's survey. With the exception of the five statewide systems (SALECS, WHP, State Mutual Aid, WYDOT Maintenance, and State Forestry Division) and BLM, the following summaries categorize local systems. The local public safety systems have not made significant changes since the 2003 study. Due to the age of the base stations and repeaters, there have been some replacements.

Technology - Most local PSMC agencies are using conventional, wideband, analog systems. Several systems, most notably the new 800 MHz Casper system, are moving into trunked, narrowband, digital, or a combination of these technologies.

Frequency Bands Used - The following shows the number of agencies using one or more of the public safety radio bands (please note that agencies use multiple bands, therefore the percentage of use is greater than 100%):

- Low Band - 16 (22.2%).
- VHF High Band - 68 (94.4%).
- 220 MHz - 1 (1.4%).
- UHF - 4 (5.6%).
- 700 MHz - 0.
- 800 MHz - 5 (6.9%).
- 4.9 GHz - 0.

Equipment Age - While vehicle and portable radios averaged approximately seven years old (up to 15 years old), the infrastructure equipment (especially mountaintop repeaters) was as old as 40 years (some still use vacuum tubes), with over 25% of the agencies having equipment over 20 years old.

Traffic - The data indicates that there are two extremes. The low traffic end (peak number of simultaneous users below ten - 65.9%) seems to indicate a duplication of channels and underutilization. The high traffic end (peak number of simultaneous users above twenty - 19.5%) seems to indicate the need for additional channels. Detailed traffic analysis would be required to determine actual loading. On average there are 3.6 channels per agency. 36.2% of agencies have reported needing additional channels. As expected, traffic has daily, seasonal, and situational peaks.

Backbone Communications - For the most part, local agencies use telephone circuits to interconnect dispatch facilities to remote repeaters and base stations.

3.1.5 Federal Systems

The Bureau of Land Management submitted information that also included site location information for Department of the Interior (DOI). DOI records show 225 2-way radio sites within the State of Wyoming. There are 22 BLM sites which gives them spotty statewide coverage. Some Federal information was also submitted for Warren AFB and included in the overall survey summary.

The Federal government had mandated moving all Federal agencies to APCO Project 25 digital by 2005. BLM has chosen to use a conventional VHF High-band design rather than trunking technology, due to small number of channels BLM requires. DOI's mandated move to P25 digital had been delayed until 2007. Each Federal agency may chose between implementing a conventional or trunked system, dictated by the number of channels each agency needs.

BLM has maximum of 400 terminal units on the air at any given period. There are cooperative agreements between the Federal government and the State for collocating sites. At a minimum, these will be a valuable resource as the State expands its radio networks to improve coverage. As has been discussed before, there is considerable overlap between State, county, local and Federal networks. There should be an excellent opportunity to consolidate sites. Most BLM terminal equipment is approximately six years old.

BLM 2-way base station/repeater site specifics are shown below:

- Number of 2-way radio sites - 22 (9 base stations and 13 repeaters).
- Tower types - most self supporting, except one guyed (to be changed by end of 2003).
- Average tower age - 10 years (to ANSI/TIA/EIA-222-F-96 standard).
- Average tower condition - all good.
- Grounding - all good (to Motorola R56 standards).
- Shelter condition - all good.
- HVAC - Thermostatically controlled heat/venting - all sites. Air Conditioning - none.
- Generator - none, except State site at Pumpkin Butte.
- UPS - all sites have 670 watt units for radio equipment.
- Site security - unmarked road/site, no fences, no alarm.
- Shelter security - no sites alarmed to BLM (other collocated users may be monitoring security).

BLM system specifics are shown below:

- Coverage - all adequate (for mobile).
- Number of channels - all adequate.
- Average peak number of users - 50/site (can be overloaded at times). Communications handled by ICS.
- Traffic peak - fire season.

- Receive frequency - 164.250 MHz.
- Transmit frequency - 168.275 MHz.

3.2 Summary of High Level Characteristics

The following subsections provide summaries of the Technical, Functional, Coverage, Interoperability, and Operational characteristics of the systems as identified in the surveys, site visits, and interview processes.

3.2.1 Technical Areas

Site Locations and Licenses - Information on 319 FCC licenses was submitted by the respondents to the survey. The FCC database indicates 175 frequencies are used at base station or repeater sites at 469 different locations (this includes all non-Federal users within the State). This gives a good picture of what is typical of large geographic states- Wyoming has a high concentration of sites in the urban areas and very few sites in the remote or rural .

Trunking - The use of trunking systems is light in Wyoming with only three agencies having implemented systems and two more were planning to in the near future. The State is not using trunking technology on any of its systems.

Digital vs. Analog Modulation - Most of the PSMC systems in Wyoming are using 30 year old analog technology. However, three agencies are using digital radios, most with backward analog capability for interoperability. One additional agency is planning to move into digital in the near-term. It should be noted that all Federal government agencies upgraded their systems to digital technology within the 2005-2007 time frame.

Inter-site Communications - Inter-site communications, either from a base station/dispatch center to a remote repeater or in the case of regional/statewide systems between mountaintop repeaters, are provided by the local telephone companies or by private microwave networks. Both interconnection methods are single-thread designs. If a circuit is lost, the system or channel being fed by that circuit will be down until repairs are made. The primary reason for lack of redundancy is cost.

Many remote sites have backup generator power, but not all. When power is lost and there is no generator, radio systems are at the mercy of either the power company or mother nature as to how fast the problem can be rectified.

Quality of Service (QoS) - The State has an active program to manage the overall quality of service of its systems. Currently, the following categories are tracked and measured:

- Radio Outages/Availability.

- Console Outages/Availability.
- Microwave Outages/Availability.

The data that was provided for the 2002 results indicated that all of these areas were performing at a level that was better than 99.6% availability, with Microwave availability consistently exceeding 99.99% and radio availability consistently exceeding 99.92%.

There was essentially no information provided for the county and local systems, although informal discussions during the interviews and site visits indicated that the local personnel had good knowledge of any problems. There is no standard approach that has been established by the industry for any QoS measures.

3.2.2 Functional Areas

Mobile Data Use - Mobile data is not currently used on any statewide public safety two-way radio network. Mobile data use statewide is minimal with only three agencies reporting current activity. An additional eight agencies expect to be using mobile data within ten years(2012). Having said this, the interviews indicated that more agencies are interested and believe mobile data will be needed, however funding and system capability will stunt growth.

Encryption - Voice encryption is not used on any statewide public safety two-way radio network. Encryption for secure voice communications use statewide is small with 13 agencies reporting current activity. Two more agencies expect to be implementing encryption by 2006.

Coverage Areas - While most agencies did report some dead spots in their coverage, they say their coverage is adequate. This is not unusual, as virtually no radio network has 100% coverage; such coverage would be cost prohibitive. A high degree of mobile coverage is possible due to the higher transmit power and better gain of mobile radio antennas. However, a major challenge for any new infrastructure will be providing cost effective portable coverage. Portable radios have far less performance characteristics thereby driving up the cost of portable coverage.

Interoperability Matrix and Analysis - Interagency communications are accomplished today by the following methods:

- 65% By switching channels.
- 60% Mutual Aid (State or local).
- 30% Dispatch center patching.
- 25% Additional radios (other frequency bands).
- 10% Cellular telephones.
- 6% Incident Command System (ICS), cross-channel, or phone lines.

In addition, another method of interoperating is by using shared systems. Approximately 58% of agencies directly share their infrastructure, multiple agencies on the same frequency.

Currently, interoperability is often implemented in a basic way, through frequency sharing agreements. In these cases, agencies have Memorandums of Understanding (MOU's) to use each other's frequency channels or by using the State/Local Mutual Aid channels. While radio communication can be established by either of these methods, there are basic problems.

- Generally, units cannot communicate with their home dispatcher while outside their primary area.
- State Mutual Aid channels are designed for simplex communications, primarily car-to-car, without being repeated (relatively short-range).
- Mutual Aid channels often are not monitored by all units/dispatchers.
- During emergencies or special events, channels quickly become overloaded.
- Provisions have not been put in place for a massive infrastructure/system failure; this requires extensive cross-agency and cross-municipality planning.

Secondary interagency communications methods such as dispatch center patching, additional radios on different frequency bands, and cellular phones offer even less efficient communications and often create additional problems.

Approximately 78% of the agencies have stated that interoperability is; very important, extremely important or critical to their mission. Further, 49% of the agencies stated that they need better interoperability with WHP.

3.2.3 Operational Issues

This section summarizes several operational areas that were identified during this phase of the project.

Channel Usage and Traffic - Agencies reported 194 channels being used. This equates to an average of 3.6 channels per agency. This can be misleading as frequency reuse (in statewide systems) keeps the number of channels down while maximizing the number of users. The statewide systems accomplish statewide all-user availability on a single channel. An adequate number of channels were reported by 64% of the agencies. At least two agencies are experiencing channel overload during peak user periods as they show over 50 simultaneous users. Approximately 78% of the agencies said they do not need additional channels and 15 agencies reported an average need for almost two additional channels.

General Operational Issues - While there are certain similarities between one community of users and another regarding how they operate and use their public

safety communications, each has developed uniquely. Technical, political, and operational priorities/needs and the availability of funding have lead agencies/communities of interest down different paths.

Operational procedures are generally geared to minimize communication deficiencies caused by technical limitations of the two-way systems, such as coverage, interoperability, or availability shortfalls.

Many dispatch centers support multiple agencies with multiple consoles. When a console fails, its traffic will be picked up on the other collocated consoles. There is also cooperation within a community whereby multiple, separated dispatch centers have each others' channels on their consoles. During a failure, another center can provide limited support. While not all public safety dispatch centers are state-of-the-art, most have CAD (computer aided dispatching) and logging capability. The sophistication of each dispatch center is driven by several factors, namely; government requirements, corrections of system deficiencies, demands of users being served, political support, a guiding director with high priorities and of course funding.

Those who provide and are responsible for radio communications, know the weaknesses of their systems and have operational procedures in place to deal with common problems that can occur

The public safety communications providers strive for a quality of service that provides communications whenever and wherever it's needed. Portable and in-building radio coverage and/or non-congested channels are great examples of needs that are, at times, economically infeasible. While the public safety officers may want ideal communications, quite often funding is not available, and inefficient operational workarounds are standard procedure. System enhancements must be cost effective and affordable.

Cellular Telephone Services - A total of 25 agencies have tried or are using cellular to augment their PSMC systems. Of these, only 7% are highly satisfied and 74% are partially satisfied. Agencies listed the following benefits for using cellular:

- Offers voice privacy (but not encryption).
- Easy (but limited) data solution.

Agencies also listed the following "problems" with cellular that do not allow its universal acceptance in their PSMC environment:

- Limited coverage.
- Unusable during emergencies (without PS priority).
- High cost.
- Missed/dropped calls.
- Limited multi-party communications.

Several agencies are also using satellite phones which, even with their higher cost, offer true statewide coverage without the service limitations of cellular service.

3.3 Envisioned Baseline Needs

This section of the report will outline the desired operational and technical environment including the coverage, functional, and interoperability issues of PSMC study. This section also identifies differences that exist between the requirements for county, local, State, and Federal user groups.

Wyoming has considerable pent-up demand for improved systems, but three main issues have stalled these efforts.

- The first hindrance has been the lack of progress in moving from the preliminary analysis stage into an implementation phase. The State has delayed this process through multiple "studies" over the past five years or more, trying to get buy-in without success. The user community wants to see an accepted and approved State plan, before they will move forward.
- The second impediment is the funding issue. County and municipal agencies are unprepared for the appreciable sums needed to replace/upgrade their existing infrastructures and subscriber units. Progress will be slow transitioning from the current environment without considerable funding assistance either on a state or federal level.
- The third road block to the progression is technology. The vast majority of users in the State have technology (and in some cases, equipment) that dates back 30 years or more. The status quo has been analog, wideband, conventional equipment. Today's environment includes, and soon will demand, that all users move into the world of digital, narrowband, and/or trunked systems and equipment. Careful management of the valuable and limited radio frequency spectrum has become much more important for system owners. The FCC has been pushing "re-farming," the conversion from wideband to narrowband channels for years now and has finally set mandatory dates for both ceasing the issuance of type acceptance on new equipment and the discontinuance of all use of wideband equipment. New or modified FCC licenses, that do not include both narrowband and trunking systems and equipment, have become very difficult to get approved.

3.3.1 Summary of Envisioned Baseline Needs

The following is a summary list of significant envisioned PSMC baseline improvements:

Technical

- Subscriber equipment capabilities and standards - replacement of aging infrastructure equipment with a system that will meet FCC requirements and Wyoming user needs.
- Compliance with APCO Project 25 standards is critical to facilitate compatibility across the state and with Federal agencies. This standard is being adopted virtually across all Federal, state, and local entities as well as by the primary equipment manufacturers. Considering any other standard or approach would potentially isolate Wyoming from not only the ability to interoperate but from Federal funding sources as well.
- Infrastructure improvements - backup power, environmental controls, security capabilities for towers and shelters.
- Reliability of backbone communications.
- Improve system reliability by removing single points of failure.
- Modify microwave design to ring topology for path redundancy.
- Minimum of two master control points.
- Increased capacity, minimum of one extra channel per site.

Functional

- Low-speed data communications capabilities.

Coverage

- Expanded regional and statewide coverage, particularly for portables in selected areas.
- Statewide roaming capability.

Interoperability

- Full capability for necessary agencies to interoperate. Actual SOP development will determine the interoperability needs of the user community.
- Local/regional tactical channels.
- Enhanced interfaces to existing systems (State, county, local, Federal, neighboring states).

Operational

- Extend microwave backbone to additional dispatch centers.
- Increased capacity, radio channel congestion - add channels wherever congestion exists.
- Consolidate sites where cost effective

Overall Quality of Service

Overall Quality of Service (QoS) should be addressed in two areas, voice and data transmissions. The performance indicator for QoS on mobile services is the user's perception with respect to the service they are receiving.

The QoS of voice transmissions will be determined by requiring a minimum Delivered Audio Quality (DAQ) 3.0, where speech is understandable with slight effort, occasional repetition may be required due to noise distortion.

The QoS of data transmissions will be determined by assurance that the transmission was received and its latency. Where assurance of delivery is important, packet reception will be acknowledged by the receiver; transmission will be repeated by the transmitter until the acknowledgment is completed. The latency needs of applications served by low-speed data are not highly demanding; less than 15 seconds of delay is generally acceptable.

3.4 Urgent Need for Statewide Plan

Many of the potential PSMC users that would join the statewide network have expressed the urgent need for a statewide plan of action. These users want funding mechanisms, an implementation schedule, and vendor contract options. Users have been holding off to see what the State will do, before upgrading their equipment. Local agencies cannot afford short-term temporary solutions or to invest in incompatible equipment.

Stakeholders suggest that consensus must be built by both technical and operational public safety professionals, and supported by their organizations. There are varied opinions from user representatives as to technical issues (e.g., VHF *vs.* 800 MHz), but support for the concept of a statewide system is high. Key points are:

- Funding of infrastructure.
- Fees/access charges - reasonable costs.
- Funding of subscriber equipment.
- State and local commitment to a plan.
- Implementation schedule.
- Support by State/local officials.
- Agreement to share sites/frequencies, in principle.
- Joint control and operation.
- Improved coverage.
- Technology to support data.

3.5 Future Requirements

The PSMC plan identified additional and emerging requirements over a ten year (2003-2013) planning period. Some of the requirements are new, and others expand on the baseline requirements.

3.5.1 Technical Requirements Detail

One of the major problems within the existing Wyoming public safety communications environment has been the lack of technical innovations over the past ten or more years. This is not necessarily the fault of agencies but rather a consequence of inadequate funding. Industry has enjoyed a major evolution in technology from the analog, wideband, conventional equipment currently in use in Wyoming to narrowband, digital, trunked radios.

Project 25 Compliance - Respondents were unanimously in favor of maintaining alignment with evolving future standards, especially related to APCO Project 25.

Internet Protocol (IP) Based Radios - These emerging technology radios will facilitate low cost interconnection to remote repeaters and dispatch centers. More importantly, IP radios will allow for full interoperability regardless of the frequency band or channel assignments of the communicating devices.

Software Defined Radios - Emerging software defined radios can rapidly adapt to the local network environment promoting interoperability across a diversity of infrastructures, much like today's multimode cellular radios. This innovation promises to allow a visiting public safety responder to communicate with local dispatchers regardless of the frequency band or type of radio.

Flexibility - Although these innovations may be years away, any new Wyoming system should be sufficiently flexible to adopt these and other new technologies as they emerge.

3.5.2 Functional Requirements Detail

The future functional requirements were primarily grouped into two areas – data communications and security. These are consistent with the findings for the baseline requirements, but add future capabilities that were not identified for the short term.

Low-Speed Data – The 2003 survey inquired as to the need to communicate using data with other agencies that cannot be accomplished today. Eleven agencies (15% of respondents) answered affirmatively. The following summarizes data interconnect needs of the respondents:

- Interagency.
- Cities to county.
- Federal agencies.
- Highway Patrol.
- Neighboring states (including border cities).
- Neighboring towns.
- Warrant checks.
- NCIC.

High-Speed Data - Specific questions were not asked in the survey concerning the need for high speed data. High speed data is a longer term concern on the part of many in public safety nationwide. As applications move away from a text-based user interface, and rely more upon GUIs (graphical user interfaces), the communications bandwidth needs go up exponentially. Add to this GIS (geographic information systems) and other popular emerging government applications, and the need for high speed data in the long term becomes apparent.

Encryption – The 2003 survey inquired as to the need for encrypted (secure) voice and data communications and found that seventeen agencies answered affirmatively. Respondents that currently do not rely upon secure communications were asked to rate its importance:

- 57% indicated it was an optional requirement,
- 23% said it was needed for routine operations, and
- 20% indicated it was mission critical.

An infrastructure with associated subscriber radios that supports secure communications at affordable prices will allow users the flexibility to mix clear and encrypted communications on a channel-by-channel basis.

Enhanced Security Features - Clearly, security has become a priority in the post-September 11, 2001 environment. Twenty-two agencies responded through the 2003 survey describing features and capabilities needed for enhanced security, including:

- NSA approved Type I encryption.
- EMP (electromagnetic pulse) protection.
- Pre-assigned simplex frequencies for major incidents or tactical use.
- Tactical talk groups for all users, to all dispatch points.
- Data capabilities.
- All public safety interoperability.
- Better interoperability; current mutual aid frequencies and cross-channel interconnects are not effective.
- Secure communications ranging from basic encryption to total encryption of all channels.
- Additional dispatchers.
- Additional dispatch locations
- Better real-time dissemination of information and alerts.
- Stored portable radios for out-of-area responders.
- Additional repeaters for improved coverage.
- Satellite phones for backup at command centers.
- Satellite phones for improved coverage.
- Improved communications for regional response teams.
- AVL (automatic vehicle location) capability.

Future Enhanced Features - Survey respondents were asked to rate specific enhanced features that are not currently available. Survey respondents were given the choice of high, medium, or low importance. The following chart summarizes the results, listed highest to lowest.

Feature	High	Medium	Low
Paging	23	17	13
Mobile Data Access	15	16	24
Automatic Vehicle Location	9	24	24
Mobile Identification	9	15	29
Mobile Video	8	15	31
Mobile E-Mail	7	12	35
Mobile Card Swipe	5	10	36
Mobile Voicemail	3	15	36
Mobile Printing	5	10	38

While these features were not rated by all of the respondents, they represent a good snapshot of the emerging requirements that a robust public safety mobile communications system might need to accommodate during the planning horizon.

Interoperability Requirements Detail - The interoperability requirements that were identified were primarily from those organizations that felt that additional requirements to the baseline approach would be necessary. Therefore, the views of some agencies that responded to this question are worth considering to reinforce that interoperability is a valid long-term goal of the public safety mobile communications plan.

The 2003 survey asked agencies if they require voice communications with other agencies that cannot be accomplished today. Nineteen agencies answered affirmatively. This is supplemental to the 70% of the respondents that identified interoperability as a critical need for the existing/baseline requirements. The following is a summary of the future interoperability needs reported:

- Just about anyone - at times.
- Neighboring towns.
- Highway Patrol.
- Cities to County and neighboring counties.
- Federal agencies.
- Neighboring states (including border cities).
- Interagency within a town.
- Federal agencies to all state, local and tribal public safety organizations.
- Tribal to county, state, and Federal

Other interoperability issues reported in the survey and interviews were:

- The need to share services (dispatch centers and tower sites).
- Lack of ability to communicate whenever frequency bands and/or technologies are not compatible.
- State Mutual Aid is not repeated.
- Mutual Aid is muted at WHP dispatch.
- Inability to relay messages through dispatch.

Respondents that currently do not enjoy voice interoperability were asked to rate its importance. Approximately 60% indicated that it was either mission critical or needed for routine operations while 40% indicated it was an optional requirement. This once again demonstrates the increased need for improved interoperability within the Wyoming public safety community.

3.5.3 Future Network Requirements

Future improvements to the public safety mobile communications network will facilitate seamless expansion and enhancements overcoming the limitations inherent in today's environment. Tomorrow's networks should include:

High Availability

- Ability to communicate when and where users need.
- System must be highly reliable with little to no down time.
- Additional channels for backup during failures.
- Sufficient excess capacity for periods of high traffic.

Feature Rich Environment

- Public safety grade subscriber equipment.
- System must provide most of the features required.
- Both voice and low speed data through a common radio.
- Accommodate emerging applications such as AVL and user ID.

Survivability

- Public safety mobile communications system must be capable of continuous operation surviving single mode failures during natural disasters or terrorist attacks.
- Graceful degradation via overlapping coverage and other means.
- Backup operation should a network control failure occur.

Expandability

- Network should be capable of straightforward growth while maintaining architectural integrity.
- Additional channels can be added to existing sites with minimal effort.
- Additional sites can be added to improve coverage.

- New user groups and their dispatch centers can be incorporated into the network.

Infrastructure

- Adequate network support including planning, operations, and maintenance.
- A robust/reliable microwave interconnect network.
- Shelters, towers, power, and HVAC to meet the needs of the upgraded systems.

Interoperability

- Flexible and wide-ranging communications that can adapt to dynamically changing user needs.
- Routine groupings to support local, State, and Federal users.
- Support for emergency, special events, and tactical groupings.
- Interfaces to existing systems and networks.
- Interconnections to neighboring states.

3.6 Baseline Requirements and Performance Standards

3.6.1 Introduction

This section summarizes the operational, functional, and technical requirements that were developed in the previous sections of this report and includes a brief discussion of the development of each set of requirements. The final prioritization of these requirements was performed by the State's PSMC Steering Committee and Project Team.

3.6.2 Performance Standards Methodology

Performance standards were derived from experience and cross-checked with manufacturers' literature for commonly available, state-of-the-art public safety radio equipment. Standards were chosen that will satisfy Wyoming's demand for a modern system with a robust set of features and functionality to meet today's and tomorrow's needs. In addition, selected applicable standards from the following trade organizations were reviewed:

- ANSI/TIA/EIA.
- Military.
- APCO.
- Bellcore.
- NEC (National Electrical Code).
- Other industry standards and practices.

3.6.3 Prioritized Requirements

Information on potential requirements was thoroughly analyzed by the Project Team and Steering Committee members to determine which requirements are considered Basic (essential or mandatory, with the highest priority rankings), which are Optional or can be selected on an applications basis (middle priority rankings), and which are Expandable and can be delayed for future system enhancements (lowest priority rankings). The Steering Committee was well informed through data provided in previous sections as well as their own peer networking over the years.

Prioritization of Baseline Requirements

	Basic (B)	Optional (O)	Expandable (E)
Technical (T)	TB-1 Adopt mixed analog/digital capability, if digital is recommended TB-2 Upgrade with only narrowband capable equipment TB-3 Adopt APCO Project 25 standards TB-4 Upgrade network local sites to state standards TB-5 Upgrade state microwave for reliability (closed loops) TB-6 Add generators to all network sites, where necessary TB-7 Upgrade sites with UPS capacity	TO-1 Upgrade towers, where necessary TO-2 Upgrade grounding, where necessary TO-3 Upgrade shelters, where necessary TO-4 Expand generator fuel capacity to 10 days TO-5 Upgrade all network sites for building alarms	TE-1 Add air conditioning, if necessary TE-2 Add/improve site security at remote sites
Functional (F)	FB-1 Add systemwide encryption capability FB-2 Add low-speed (less than 19.2 kbps) data capability	FO-1 Allow casual use capability (*i.e.*, activating sirens) FO-2 Allow paging capability FO-3 Add AVL (automatic vehicle location) capability FO-4 Add subscriber ID capability FO-5 Add high-speed (greater than 19.2 kbps) data capability in selected areas	FE-1 Add mobile video capability FE-2 Add mobile e-mail capability FE-3 Add mobile voice mail capability FE-4 Add mobile card swipe capability FE-5 Add mobile printing capability
Coverage (C)	CB-1 Upgrade statewide mobile coverage CB-2 Upgrade portable coverage in selected areas CB-3 Add statewide roaming capability	CO-1 Upgrade statewide portable coverage CO-2 Upgrade in-building coverage for selected locations	
Interoperability (I)	IB-1 Improve statewide interoperability IB-2 Improve local interagency interoperability IB-3 Improve inter-county/regional interoperability IB-4 Improve interoperability with all state agencies (including WHP) IB-5 Improve interoperability with Federal agencies	IO-1 Add/improve neighboring state interoperability with state networks IO-2 Add/improve neighboring state interoperability with local networks	IE-1 Improve interoperability with all state agencies (excluding WHP)

Operational (O)	OB-1 Add channel(s) for tactical, backup, or reserve needs OB-2 Improve/maximize channel efficiency OB-3 Replace obsolete equipment, only with system upgrades OB-4 Enhance network reliability - add multiple master control points	OO-1 Require panic/emergency button on subscriber units	OE-1 Replace obsolete equipment, short-term

3.6.4 Performance Standards

The purpose of this section is to present an analysis of the performance standards that are common in statewide public safety mobile radio systems and supportable by today's industry. Both vendors and government agencies were contacted to determine the approaches currently in use. Performance standards were analyzed for the following areas:

- Technologies and elements such as mobile radios, portable radios, base stations, controllers, repeaters, switches and backbone equipment.
- Support processes and design phases such as general system maintenance, defining specific interfaces to existing systems, day-to-day testing, scheduling, adding new users, and fleet maps.
- Overall system parameters such as system availability, radio coverage percentage, and circuit merit.

This analysis also outlined the optimal range of criteria for each performance standard, and explained how the measurements would be gathered. The standards are testable with the appropriate testing methodology identified.

Acceptance Test Procedures

A comprehensive acceptance test procedure should be included in the equipment vendor's contract to ensure compliance with the RFP and industry practices. This section provides the means to verify all requirements for the PSMC network. This section identifies the specifics of what tests are to be performed, test setup, who performs the tests, the parameters to be tested, where the tests will be conducted, the data to be recorded, and when the tests will be conducted. Because coverage testing is a major component of this process, subsections describing it should be in greater detail than other subsections.

If the PSMC network is built out by region, acceptance will be on a per-region basis, with interoperability between multiple regions tested as the network is built out, and final acceptance when the overall statewide network is completed. The testing requirements include but are not limited to the following:

- Factory Integration (Staging) Test and Pre-Ship Acceptance.
- Shelter and Site Testing/Inspection
- Field Functionality Testing.
- Failure Mode Testing.
- Physical Configuration Audit.
- Coverage Testing.
- Interoperability Testing and Measures.
- Operational Testing by Users.
- Regional/Statewide Acceptance.

3.6.5 Conclusions

The requirements, specifications, and standards called out above were incorporated in a structured Request for Information (RFI) during Phase Two of this program. The RFI process polled the industry as to the current state of technology and the "real-world" economics involved in implementing the envisioned systems. By the end of Phase Two, the System Specifications and Desired Features were refined and eventually reconstituted in preparation for a Request for Proposal (RFP) to procure the required systems.

4 Phase 2 – Planning – Business Case

4.1 Objective of the Business Case Report

This report is intended to provide a summary of the information and recommendations contained in previous works and to present a top-level business case for moving forward with the final recommendation. It was our goal herein to set a direction for implementation of the recommended PSMC architecture and to optimize performance *versus* cost considerations.

4.2. Alternative Architectures

A total of 17 alternative architectures were examined and presented to the Steering Committee.

WyoLink Technical Alternative Architectures

Technology	Public Safety Features	
	Positive	**Negative**
VHF High Band	Familiar, most common in WY, good development, P25 and narrowband, highest compatibility with most neighboring states	Low data rates (up to 9.6 k), not directly compatible with new 800 MHz systems in WY and neighbor state (CO)
VHF Low Band	Greater coverage than other PS bands	High interference, skip, no development, no

Technology	Public Safety Features	
	Positive	**Negative**
		P25/narrowband development
220 MHz	Limited coverage	Very limited PS features, AM, very low data rates, low power
UHF	Similar to VHF Hi/700/800 technologies, better coverage than 700/800, narrowband	Lower coverage than VHF, unknown P25 development, low data rates (up to 9.6 k)
800 MHz	Several new WY systems, medium speed data (9.6-96 k)	Lowest coverage of common PS bands
700 MHz	High speed data (77-230 k per WB channel)	Limited availability (today), low coverage similar to 800 MHz
900 MHz Spread Spectrum	Possible high speed data application for hot spots (up to 11 M)	Limited range, primarily used for data, non-licensed
4.9 GHz	Possible high speed data application for hot spots (up to 54 M)	Very limited range, primarily used for data
Conventional	Fully compatible with some existing WY systems	Limited channel sharing, no virtual talk groups
Trunked	Efficient, high channel sharing, talk groups, additional features over conventional	Somewhat higher cost for subscriber equipment, substantial additional infrastructure cost
HF bands	Statewide coverage with lowest number of sites	Very limited data and features
Cellular	Commercial solution for backup voice, wide range of data speeds if deployed in WY (CDPD: 9.6-14.4 k/2.5G: 50-150 k/3G: 144-384 k), technology refresh built-in	High usage costs. Coverage shortfall: Market forces may not align with public safety needs. Also, public safety needs for reliability and capacity not met in emergencies.
Nextel	Offers “direct connect”, some PS features (talk groups), technology refresh built-in	Very limited coverage in WY (only Cheyenne area); disadvantages similar to “cellular”.
Satellite	Statewide coverage except in-building, potential for backup and remote area use	Expensive use costs, limited PS features, bulky subscriber terminals
Software Defined Radios	Potential as universal subscriber terminals	Expensive, future technology
Cross-patching Dispatch	Requires minimal subscriber upgrades, available and used today	Doesn’t address future need to narrowband
Cross-patching TRP/ACU1000	Potential use in short-term for extended emergency situations	Doesn’t address future need to narrowband, long setup time for programming

After much discussion between the Steering Committee members and the Project Team the list of viable candidate architectures was pared down to two alternatives VHF and 800 MHz, both with the same feature sets, which included narrowband, digital, P25, and trunking. Trunking technology allows all users to share system resources providing “virtual” channels (talk groups) as needed to separate traffic for specific groups and eliminates the shortcomings of dedicated-use channels. Trunking provides uninterrupted talk paths even when one or more physical channels are disabled. Trunking also provides unique flexibility for interoperability, combining talk groups into larger or smaller super/subsets.

Early in the analysis, the two WyoLink alternative architectures were compared to the third solution, "Do-Nothing." The Do-Nothing alternative does not have a consolidation plan for the public safety community of Wyoming. It assumes that systems will continue to evolve independently over the next ten years but that agencies will want digital/trunking capabilities (or equivalent cost equipment), over ten years. Although system improvements may be made on an organization-specific level, their direction will not necessarily be unified resulting in potentially less interoperability than available today at a higher cost to the State.

4.3 Request for Information Response

A Request for Information (RFI) was issued describing the needs of Wyoming stakeholders for a statewide public safety radio network. Six vendors responded including:

- EF Johnson
- M/A-Com
- Motorola
- SelectPath
- Tait
- Telesaurus

Three of those vendors responded with system-wide voice/data solutions that used P25 trunking, can interface with existing legacy equipment and networks, and offered as both VHF (narrowband) and 800 MHz systems.

The vendor responses were very helpful, giving the Project Team sufficient system details and component costs to aid in determining WyoLink system-wide budgetary cost estimates and viable needs/features that should or should not be included.

4.4 Recommended Architecture

The VHF and 800 MHz architectures met 41 of the 45 needs on the initial implementations of WyoLink, while the Do-Nothing will probably not meet any of the needs on a statewide basis. Needs not initially met for WyoLink, either for cost or technical reasons include high-speed data, mobile video, paging, statewide portable and statewide in-building coverage.

Major Benefits

Mobile Coverage:

- VHF with 57 sites offers potentially 94.6% statewide coverage
- 800 MHz with 123 sites offers 90.4% statewide coverage; 800 MHz would require approximately 200+ sites for the same coverage as VHF
- Do-Nothing coverage's vary depending on the system, coverage on WYDOT systems is currently 83.2%; no other systems offer statewide coverage

Portable Coverage:

- VHF and 800 MHz both have system enhancements for portable coverage in selected areas
- Do-Nothing systems have evolved and will continue to evolve to improve portable coverage where needed

Interoperability:

- VHF and 800 MHz both offer statewide interoperability with any WyoLink partner, to non-WyoLink users, and to neighboring states as other statewide systems develop
- Do-Nothing has limited, inefficient interoperability

Infrastructure:

- VHF, 57 radio sites, approximately 10% of the number of current sites, all equipped (or will be equipped) with backbone microwave and undergoing site improvements provided by WYDOT
- 800 MHz, 120 sites, less than half equipped with microwave, and requiring substantial site improvements
- Do-Nothing, 555 sites - a vast duplication at significant past and potentially future costs

Features:

- VHF and 800 MHz both offer modern, state-of-the-art, feature sets including subscriber ID, mobile data, AVL, encryption, casual use, improved reliability, site security and most importantly, a statewide plan
- Do-Nothing lacks a clear unified statewide direction. It is very flexible to meet local needs, but severely limited for interoperability and out-of-home-area roaming. It has dubious ability to evolve with changing technology and interoperable communications mandates.

Costs

Although several variations (number of tower sites *versus* cost) of VHF systems were explored the most effective cost VHF solution was determined to be maximizing the use of WYDOT sites. This was designated the "VHF-57" solution. 800 MHz would require considerably more sites, with accompanying

site development costs and was limited to the 123 site solution. The chart below demonstrates the system, operation/maintenance, and life-cycle costs of each solution.

Cost Comparison Summary

Item	VHF-57	800 MHz-123	"Do-Nothing"
System Costs	$51.0M	$73.9M	$71.0M
10-year O&M Costs	$56.9M	$73.2M	$83.3M
Life-Cycle Costs	$107.9M	$147.1M	$154.3M

The VHF solution is $20M less in system acquisition costs and $39M less in life-cycle costs than its nearest rival. Over the ten-year (2004-2014) period the Do-Nothing alternative with its huge, overly redundant infrastructure, will cost over $46M more than the recommended VHF architecture with less performance and operational benefits.

Funding Opportunities

The tragic events of September 11, 2001 were a wake-up call for the nation and specifically for the public safety communities to improve their ability to interoperate. Homeland Security money is available to help defray WyoLink costs. However Homeland Security and other Federal grants will not cover all of WyoLink's costs. The funding for WyoLink must be a combination of Federal, State, and user agency investments to accomplish the statewide goals. State legislative approval and support are paramount as are county and city support.

Homeland Security Issues

Homeland Security has as its cornerstone - interoperability. Events over the last couple of decades have proven time and time again, that nationally, the public safety community has been moving backwards in the interoperability area as new non-compatible technologies have evolved and been implemented coast-to-coast. September 11th finally brought these issues to the forefront. WyoLink has had interoperability as a major theme since this project was started. The user needs, RFI requirements, and chosen alternative have all dealt with improved interoperability. Once implemented, WyoLink will provide interoperability anywhere at anytime for all WyoLink partner agencies. In addition, WyoLink complies with Federal systems that now require P25 compatibility for interoperability.

Most, if not all, Homeland Security grants require improved interoperability, if not P25 compatibility. As the WyoLink recommended architecture does a superior job at improving interoperability, most Federal grants should be available for helping to fund WyoLink.

4.5 Best Alternative Architecture

After carefully analyzing both the VHF and 800 MHz architectures, the optimal solution recommended and approved by the Steering Committee is VHF. VHF offers the most cost effective benefits to the PSMC community, with inconsequential disadvantages - a clearly superior solution by virtually every measure. This is not only the most cost effective solution, but it meets the majority of system goals expressed by the potential user community.

The VHF alternative solves the current shortfalls of the vast majority of PSMC systems in Wyoming. Improvements are highlighted below:

- Significantly improved interoperability between any WyoLink subscriber (local, state, Tribal and Federal agencies and users) statewide at any time
- Relatively easy transition from current analog systems
- Support of non-WyoLink users at least during the next ten years
- A modern, state-of-the-art P25 digital trunked infrastructure
- Meets FCC mandatory requirements
- Flexibility of design and smooth transition to evolve
- Voice and data capabilities
- Improved survivability and reliability of channels, sites, and the overall network
- Elimination of pent-up demand for enhanced features (encryption, additional channels, AVL, control of subscriber units, and emergency/panic functions)
- Improved statewide mobile coverage
- Improved portable coverage for selected areas
- Replacement of aging, obsolete equipment
- Satisfy user community desire for a State plan and clear direction forward

4.6 Importance of Participation

WyoLink cannot be a single agency solution, it must serve all public safety agencies through the State. Considerable time and effort has been invested by potential local agency users in this project, as well as State and Federal agencies. These participants want the WyoLink project to be successful and are eager to be integrated into the project. They want to become full participants both in the system planning and its implementation.

This is a “sound, enduring investment for Wyoming.” Without a consolidated WyoLink solution, individual agencies will continue moving down their own paths of unique and probably non-compatible solutions, potentially negating the unique opportunity for a superior interoperable PSMC network.

5 Wyoming Communications Interoperability Educational Forum

The Wyoming Communications Interoperability Educational Forum as held November 6, 2003, in Cheyenne, Wyoming. This forum was the second symposium held in the State of Wyoming. The Wyoming Public Safety Mobile Communications (PSMC) Project Team, also known as the WyoLink Project Team, and the Wyoming Department of Transportation (WYDOT) co-hosted this 1- day educational forum, which drew many first responders and policy makers from Wyoming, as well as from other states. These public safety and government officials came together to discuss the development of WyoLink—a Project 25 (P25) standards-based, digital, trunked very high frequency (VHF) system. WyoLink will be Wyoming’s new statewide public safety mobile communications system. SAFECOM, a federal program, agreed to sponsor this forum to help build on the progress made since the first Wyoming symposium held in November 2002 in Casper.

This event examined some of the issues specific to implementation of WyoLink and the current policy, funding, technical, and operational challenges facing the public safety community within the state as WyoLink is implemented. The forum included presentations, a facilitated discussion between PSMC Steering Committee members, and working sessions that focused on developing a “consensus statement” regarding policy, funding, technical, and operational issues. Forum participants gained knowledge of the current communication interoperability problems that Wyoming is facing and the steps that Wyoming is taking to overcome these obstacles.

5.1 U.S. Senator Craig Thomas Welcomes the Public Safety Community of Wyoming

Laura Lewis, a field representative for U.S. Senator Craig Thomas, expressed her regret that the senator could not attend in person, but emphasized Senator Thomas’ support for improving communications interoperability of Wyoming’s public safety community and the coordinated effort to implement WyoLink. His letter congratulated those in attendance for making Wyoming a safer place. He stressed the importance of public safety communications interoperability and described how WyoLink would help Wyoming achieve this goal. Senator Thomas then recognized the uniqueness of Wyoming’s geography and sparse population,

and added that it would require a significant amount of work to upgrade existing public safety communications to meet the requirements of first responders for the future. He concluded his letter by declaring his support for WyoLink and urging attendees to keep him informed so that he could help Wyoming obtain additional funding from federal sources to quickly implement WyoLink.

5.2 Governor David D. Freudenthal Emphasizes the Importance of WyoLink

Governor David D. Freudenthal of Wyoming welcomed all speakers and attendees to the forum. He stressed his commitment towards improving communications interoperability for first responders and emphasized the urgency to begin implementation of WyoLink because completion of the statewide project would take many years. He noted his past commitment, as U.S. Attorney for Wyoming, to improving public safety communications, especially for officers and agents involved with criminal investigations and hostage situations. He pointed out that technical issues with the cities of Casper and Cheyenne would need to be resolved in good faith with a commitment to quickly improving communications interoperability throughout the state. In addition, he described the importance of addressing the issue quickly in order to improve the day-to-day working environment of first responders and the safety and welfare of the citizens of Wyoming regardless of city or county jurisdiction. Governor Freudenthal reiterated his support for an independent Public Safety Communications Committee within WYDOT that would have oversight of the efforts of the WyoLink system. However, he noted the importance of the future Commission to represent the broader interests of the state, and to place the needs of first responders and the public health and safety of the citizens of Wyoming as their first priority. He then recognized the efforts of the WyoLink Project Team, stating that the project did in fact represent the broadest vision of the state. He also stated that he felt confident that the Project Team and the Steering Committee would work to combat Wyoming's interoperability problem. He expressed interest in returning in a few years to discuss how the WyoLink Project Team had moved forward to make WyoLink a reality for the public safety community.

5.3 WyoLink: Wyoming's Public Safety Mobile Communications Plan

The PSMC Plan was finalized in October 2003. Based on a careful consideration of technical, operational, and financial requirements across Wyoming, the Plan consists of a set of recommendations to implement WyoLink. The WyoLink Project Team and the associated PSMC Steering Committee are composed of local, state, and federal agencies that represent a cross-section of public safety and first responder agencies in the State of Wyoming. The WyoLink Project Team worked with consultants from Federal Engineering, Inc., to develop the PSMC Plan. The end result of the Plan will be a new P25 standards-based,

digital, trunked VHF system that would be used by first responders across Wyoming.

In his presentation, Ron Bosco, the President of Federal Engineering, Inc., explained the foundation and basis for Federal Engineering's final recommendations. He stated that WyoLink was the direct result of an extensive needs, cost, and technology analysis consisting of two phases:

- Phase One: Understand Needs
- Phase Two: Develop Recommendations.

A panel consisting of six members of the PSMC Steering Committee, each from a different organization, was moderated by Mr. Robert Wilson, WyoLink Project Manager. The committee was tasked to represent the interests of county and municipal organizations, state agencies, and federal agencies throughout Wyoming. The panel discussion focused on moving WyoLink from system planning to implementation.

Mr. Wilson opened the discussion by giving a brief overview of the strategy behind the PSMC Plan. He explained that the group's approach was to strive for consensus before making decisions by talking through issues and then agreeing on principle. He then asked the panel members to share how their individual experiences had allowed them to make contributions to the committee.

5.4 Issues and Challenges for WyoLink

The Wyoming Forum offered two breakout sessions for attendees: 1) policy and funding, and 2) technical and operational. These sessions were held concurrently, allowing the attendees to choose the session that interested them most. The small size of the sessions encouraged participation and in-depth discussion from the audience. Subject matter experts, Mr. Steve Proctor, Executive Director, Utah Communications Agency Network (UCAN) (policy and funding), Mr. Jake Hunt, Operations Manager, UCAN (technical and operational), and Mr. Don Pfohl, Wireless Communications Manager, Oregon State Police (technical and operational) led the sessions.

The purpose of the policy and funding session was to discuss critical management and policy issues related to the implementation of WyoLink, such as acquiring initial grants and various funding sources, as well as the potential establishment of a Public Safety Communications Commission and subcommittees and their impact on implementing interoperable systems. The purpose of the technical and operational session was to discuss topics related to the technical and operational challenges of implementing WyoLink, such as talk group administration, P25 standards management, and radio encryption key management.

The breakout sessions were structured as working sessions in which the participants could formulate a set of issues or recommendations that could be used to provide insight and further direction to policy makers, state legislators, and WyoLink system planners.

5.5 Policy and Funding Issues and Challenges

Mr. Proctor correlated his experiences in planning, developing, and implementing a system for UCAN and the 2002 Winter Olympics to that of preparing for the WyoLink system. He facilitated the discussion on policy and funding for WyoLink by addressing the following items:

- Vision
- Funding
- Governance
- Coordination and Partnerships
- Other Issues (i.e. legal, service contracts, and agency commitments).

At the conclusion of the working session, the attendees highlighted the most important issues from the discussion. These included:

- Integrating WyoLink with other systems as seamlessly as possible
- Investigating all sources of funding, including state and federal grant resources
- Educating legislatures at the state and national level so they can lobby for Wyoming interests.

These ideas were later included in a “consensus statement” that allowed policy makers and state legislators to address issues raised by the session attendees during the forum.

5.6 Technical and Operational Issues and Challenges

Mr. Jake Hunt and Mr. Don Pfohl moderated the session and provided a wealth of technical and operational knowledge, since both of them had been managing and operating radio systems for more than 20 years. Both Mr. Hunt and Mr. Pfohl facilitated the discussion by addressing the following items:

- Interoperability linkages with existing 800 MHz systems
- In-building portable coverage
- Talk group management
- Radio encryption key management
- P25 standards management
- Low-speed wireless data applications.

Many technical and operational issues and challenges were discussed. Even though a set of recommendations was not developed, the session participants

were able to capture a list of issues that would need to be addressed by the PSMC Project Team in the future:

- Examine interoperability requirements at city and county levels to determine the best interoperability solution
- Establish interoperability linkages between existing VHF and 800 MHz systems as part of WyoLink
- Address portable coverage requirements for city and counties
- Address migration issues from analog to digital radios
- Identify radio assets that are P25 compliant and can be procured using federal grants
- Address talk group administration
- Address encryption key management issues, including oversight at the state level and administration by the local radio shops.

5.7 Moving WyoLink from System Planning to Implementation

Mr. Dan Perko, Wyoming Chapter President, APCO, made closing remarks articulating the issues and recommendations developed during the afternoon working sessions. He began by emphasizing the importance of communications between public safety officials. Public safety was a major concern to the state because Wyoming had a larger tourist population than actual population—the state wanted to uphold the reputation that first responders could and would be able to effectively provide a safe environment for all.

Mr. Perko continued by highlighting the main points from the two working sessions, and then presented the following action items for audience members to take back to their organizations:

- Identify statewide interoperability requirements
- Include all public safety responders regardless of city or county jurisdiction
- Build a statewide commitment to implement WyoLink
- Investigate all sources of funding (local, state, and federal grants and partnerships) to fully implement WyoLink
- Use existing assets and resources
- Educate legislative bodies at the local, state, and federal levels regarding WyoLink
- Develop subcommittees for the forthcoming Public Safety Communications Commission to concentrate on technical needs, membership, funding, outreach, political involvement, and training requirements of WyoLink.

Mr. Perko concluded his remarks by thanking all individuals who worked on WyoLink. He then encouraged attendees to rally support from local areas to take action and move forward to improve communications interoperability with WyoLink.

5.8 Wyoming Forum Provided Venue for Education and Information Sharing to Improve Interoperability

This one-day forum showcased the importance of interoperable public safety communications and highlighted ways to improve interoperability by implementing WyoLink. Participants learned that the WyoLink system offers a unique model of statewide cooperation and provides clear evidence that states can take a lead role in developing infrastructure and get buy in from local communities.

Most importantly, the forum allowed stakeholders from across the state to discuss the policy, funding, technical, and operational issues facing the state as WyoLink moves from the system planning phase to the procurement and implementation phases of the radio system development lifecycle. A set of issues and recommendations were captured in a "consensus statement" allowing policy makers and state legislators to author legislation, directives, and guidelines to address the needs of end users and assist in the development of WyoLink.

The consensus statement would serve as a summary action list for the PSMC Project Team (and all WyoLink stakeholders) during the next year. Forum participants were encouraged to use the information and contacts they gained to improve interoperability problems at home. Participants can use SAFECOM as a resource to provide interoperability advice and solutions.

The lessons learned from this forum should be used to increase dialog regarding the need for public safety officials to adhere to the radio system development life cycle, and the importance of implementing shared, standards based systems to solve interoperability problems because no man, woman, or child should lose his or her life because public safety officials cannot talk to one another.

5.9 Consensus Statement

5.9.1 Vision

We seek statewide interoperability for the State of Wyoming. We intend for the WyoLink system to provide communications interoperability whenever the need arises with whomever we need to talk, including our home base and other mobile units and dispatches.

5.9.2 Players

We desire that our system include all public safety and first responder agencies wishing to participate including police, fire, and emergency medical services (EMS) at the local, state, and federal levels. We also recognize the need to prioritize the inclusion of players from other sectors; including transportation, airports, railroads, utilities, and refineries as resources and system capacity

permit. We expect that a broadly representative governance body will strive to equitably include all public safety agencies and emergency responders that wish to participate in the WyoLink system.

5.9.3 Commitment to WyoLink

We would like to create a template for a "Resolution to Participate" to be distributed to all organizations and agencies within the public safety community and returned by December 31, 2003. This template will represent the statewide commitment toward overcoming obstacles to enact interoperability within the state.

5.9.4 System Development

We would like to create a network that will bridge WyoLink to other systems as seamlessly as possible and allow these out-of-network agencies to be involved with and provide input into the development of WyoLink. We currently have state assets in place that we would like to use in the development of WyoLink, including a statewide digital microwave system and about 550 governmental radio sites.

5.9.5 Funding

We plan to investigate all sources of funding, including state and federal grant resources.

5.9.6 Policy Action Items

Our policy action items from this point forward are to:

- Educate legislators at the state and national level so that they can lobby for our interests
- Seek out grant opportunities
- Ask for congressional appropriations.

5.9.7 Technical and Operational Action Items

Our technical and operational action items from this point forward are to:

- Examine interoperability requirements at city and county levels to determine the best interoperability solution
- Establish interoperability linkages between existing very high frequency and 800 megahertz systems as part of WyoLink
- Address portable coverage requirements for city and counties
- Address migration issues from analog to digital radios
- Identify radio assets that are Project 25 compliant and can be procured using federal grants

- Address talk group administration
- Address encryption key management issues, including oversight at the state level and administration by the local radio shops

5.9.8 Public Safety Communications Commission

We recognize the need for the establishment of a Public Safety Communications Commission for governance purposes and oversight to implement, maintain, and operate WyoLink. This commission should include representation from state, local, and federal interests to coordinate agencies and organizations in the development of WyoLink.

5.9.9 Subcommittees

The aforementioned Public Safety Communications Commission will have subcommittees addressing the following issues: technical needs, WyoLink membership, funding, political outreach, and training. As necessary, subcommittees will be established by the Commission to address additional issues.

5.9.10 Purpose of This Document

We intend this document to serve as a "Consensus Statement" of the public safety community of Wyoming created as a result of the Wyoming Interoperability Communications Forum on November 6, 2003. We hope the ideas contained within this document will influence Wyoming policy makers and developers who are involved in the implementation of the WyoLink. We have agreed to these thoughts and ideas.

6 Public Safety Communications Commission

The Wyoming Public Safety Communications Commission (PSCC) was created in 2004 by the Wyoming Legislature from the former State Agency Law Enforcement Communications System (SALECS) and Public Safety Mobile Communications (PSMC) Steering Committee. The PSCC consists of seventeen (17) members appointed by the Governor to three-year terms representing State of Wyoming agencies, public safety organizations, Federal agencies, tribal and the general public. The PSCC meets at least quarterly at various locations around the State. The agencies and/or organizations represented include:

- Wyoming Police Chief's Association
- Wyoming Sheriff's Association
- Division of Criminal Investigation, Office of the Attorney General
- Wyoming Game and Fish Department

- Wyoming Department of Transportation
- Wyoming Livestock Board
- Department of State Parks and Cultural Resources
- Wyoming Fire Chief's Association
- Wyoming State Fire Marshal
- Wyoming Office of Homeland Security
- The Public at Large
- An Ambulance and Emergency Medical Services Organization
- Municipal Government or a Municipal Government Association
- County Government or County Government Association
- Wyoming Department of Health
- Tribal Government of a Tribal Government Association
- Federal Government or a Federal Government Association

Non-Government public safety agencies in Wyoming are limited to industrial fire brigades, private and volunteer ambulance services. These non-government organizations are represented by the Wyoming Fire Chief's and the ambulance and emergency medical services organization. The Department of Health and Wyoming Fire Marshal also provide contacts for these agencies. The volunteer fire service is represented by the Wyoming Fire Chief's and County Government.

The PSCC Mission Statement is: ***The mission of the Wyoming Public Safety Communications Commission is to develop recommendations for policy and guidelines, identify technology and standards, and coordinate intergovernmental resources to facilitate statewide wireless communications interoperability with emphasis on public safety*.**

The Wyoming State Statute lists six primary functions of the Commission:

1. Work with the administrator of the information technology division of the department of administration and information and the department of transportation in an advisory capacity to promote the development, improvement and efficiency of public safety communications systems in the state.

2. Report in writing each year in October to the governor concerning any problems related to the installation, operation and maintenance of the system and shall make any recommendations it deems appropriate as part of the report.

3. Submit a plan for statewide system networking to the administrator of the information technology division for inclusion in the statewide telecommunications plan developed pursuant to W.S. 9-2-1026.1(a)

4. In cooperation with participating federal agencies, establish and assess user fees upon any federal law enforcement agency electing to use and participate in the system.

5. Promulgate necessary rules and regulations governing system operation and participation and upon failure to comply with adopted rules and regulations, may suspend system use and participation by any participating and non-complying public safety agency or private entity.

6. Determine the participation of public safety agencies and private agencies in the wireless communications network.

The PSCC has organized itself through the election of a Chairman, Vice-Chairman and Secretary. Five working groups have been developed to further the work of the Commission on fulfilling its functions: Administration and Funding Work Group, WyoLink Operations Work Group, SALECS, Interoperability Executive Committee and Spectrum Work Group. Each of the work groups are represented by PSCC Commissioners and subject matter experts. The working groups meet as needed through out the year.

The Administration and Funding Working Group is responsible for the PSCC budget development, grants, rates and fees, and staff recruitment and evaluation. This working group has developed and awarded grants to the local dispatch centers to provide connectivity between the dispatch center and WyoLink through the zone controllers.

The mission of the WyoLink Operations Workgroup is to provide policy level oversight to the development, implementation and ongoing operation of the WyoLink state-wide public safety communication system. This workgroup is involved in the decision making for the location of expansion radio sites, WyoLink end user training, and working with the local agencies on enhanced portable radio coverage.

The Spectrum Working Group's roles and responsibilities includes the frequency policy and planning, frequency coordination and interference mitigation and FCC licensing and compliance. This work group is also responsible for the 700 MHz and 800 MHz Regional Planning Committee's responsibilities. The Region 46 – Wyoming 800 MHz Plan has been completed and upon the completion of the 800 MHz rebanding effort for Cheyenne Fire and Rescue and Casper/Natrona County the plan will be revised. The Region 46 – Wyoming 700 MHz Plan has been drafted and sent out for comments, this plan should be finalized in 2008.

To provide a professional communication system with compatibility and availability of common communication paths for all public safety users is the mission of the Inter-Operability Executive Committee. This committee has completed and forwarded to the PSCC the WyoLink Handbook, WyoLink

Membership Agreement and WyoLink Membership Application. This committee will be reviewing the membership applications and talkgroup plans for membership agencies.

The State Agency Law Enforcement Communications System (SALECS) Working Group mission is to maintain the integrity and operability of SALECS through the implementation of WyoLink. The roles and responsibilities include the communication interface between the PSCC, Wyoming Department of Transportation (WYDOT) and SALECS existing user groups and potential new users. Advise the PSCC on SALECS operations, dispatch reports, membership, costs and procedures. Coordinate and resolve issues related to WyoLink implementation for the SALECS members. Consult with WYDOT concerning equipment replacement, upgrades and compatibilities during the phased implementation of WyoLink.

The PSCC has completed the rule making process and the rules have been filed with the Wyoming Secretary of State. The Rules and Regulations provide the administrative procedures for the development of policies and procedures, participant determination, rules and regulations of the FCC, rules and regulations of the NTIA and fees. The rules also include a chapter on the appeals procedures if a determination has been made to suspend or revoke an agency's participation in WyoLink for non-compliance of the policies and procedures.

The PSCC has adopted the WyoLink Handbook, Membership Agreement, recommended the WyoLink operating system upgrade from ASTRO 25 version 6.5 to 7.2, hosted a Federal Agency Interoperability Summit for the federal agencies that may become members of WyoLink (58 attendees representing 22 Agencies), signed a Memorandum of Understanding with the Department of the Interior, and has provided public informational meetings for local agencies and elected officials on the progress of WyoLink and expectations.

The ongoing projects includes the completion of the core WyoLink system in 2008, development of portable radio enhancements including a budget proposal, development of a training program and adding members to the WyoLink system.

The Public Safety Communication Commission Statute, PSCC Organizational Charts, Commission membership and Rules and Regulations are included in Section 14 - Appendix - 14.1, 14.2 and 14.3.

7 WyoLink Request for Proposals

7.1 Background

The Public Safety Mobile Communication Plan was published in final form and distributed on March 31, 2004. Wyoming Legislature passed and Governor Freudenthal signed Senate File 16, creation of the Public Safety

Communications Commission, which became effective on July 1, 2004. The Wyoming Transportation Commission provided $5,200,000 toward the construction of WyoLink In 2004. Wyoming also dedicated $1,200,000 of the Homeland Security grant funds and $400,000 BioTerrorism funds toward the start-up of WyoLink. The 2004 start-up funding totaled $6,800,000 of the $51,000,000 that would needed to complete the core build-out of WyoLink.

On May 1, 2004, Wyoming Department of Transportation hired a project Manager to oversee the development of a Request for Proposal (RFP), manage the procurement process and manage the construction development of WyoLink.

The WyoLink RFP was published on July 15, 2004. Four addenda's were published to resolve a few technical issues and improve clarity. These addenda's resulted from ongoing feedback and questions, and updated information related to site development work.

7.2 Request for Proposals – Project Summary

7.2.1 Overview

The State of Wyoming, working through a Steering Committee and Project Team finalized a set of recommendations to develop a statewide public safety mobile communications system. The recommendations were chosen after careful consideration of all possible alternatives, including technical, operational, and financial factors; they represent the culmination of an extensive multi-year effort. WyoLink — Wyoming's statewide public-safety interoperable radio communications system — is the result of those recommendations.

WyoLink will be a Project-25 digital, trunked, VHF Hi-band (136-174 MHz) radio system utilizing 57 sites. The system will be interconnected via the Wyoming Department of Transportation (WYDOT) microwave backbone and its planned extension. The 57 sites selected for the system are or will be under the control of WYDOT; the upgrade of buildings, towers, and supporting infrastructure is being addressed under a separate project that is well under way. The established goal is to achieve 95% statewide coverage for mobile radios, with portable radio coverage enhancements to be added to address specific user needs.

WyoLink development was projected to be a six-year (2004 -2110) project. This Request for Proposals constitutes the first phase of the project, and will select a Proposer and establish the pricing structure that will apply to development of the entire project. The first construction phase of the project will develop the central control point, five radio sites in southeast Wyoming, and interfaces to one local 800-MHz systems. This "pilot phase" will provide a full-scale technology demonstration and will provide the opportunity to iron out any technical issues. This will also allow WyoLink member agencies to appreciate the features and

functions of the system and develop operational procedures based on that technology. The pilot phase procurement will purchase a limited number of user radios to demonstration system operations. Subsequent system development will be carried out in five phases, with the first phase being the largest and the remaining four to address particular RF coverage difficulties and to provide an orderly transition for WyoLink member agencies.

7.2.2 Benefits

WyoLink will provide the following critical benefits to the citizens and Public-safety responders in Wyoming:

- Full interoperability across all participating State, local, Tribal and Federal agencies. This will include an interface to the existing Casper and proposed Cheyenne 800 - MHz system, and ongoing “mutual aid” functionality for those who wait or decline to participate in the WyoLink shared system.
- Improved statewide mobile coverage from 83% (estimated coverage) to 95% (verified by field measurements).
- Full compatibility with the current and emerging Project-25 public safety digital radio communications standards.
- Digital technology, the technology of choice in the industry today and into the future, which brings added features such as encryption, low-speed data messaging, individual unit identification, and automatic vehicle location (AVL).
- Increased communications capacity through the addition of radio frequencies and the use of trunking technology, which will provide enhanced flexibility, reliability, and radio frequency efficiency.
- Improved reliability and disaster recovery capabilities through replacement of obsolete radio infrastructure and the addition of multiple control points.
- Provide overall cost savings by reducing the number of radio sites being maintained for public-safety.

7.2.3 Coverage

The goal of WyoLink is to provide 95% overall mobile radio coverage within the State of Wyoming. Interstate-80 and Interstate-25 carry the highest volume of traffic and have the potential for being the scene of a number of critical incidents. Therefore, the WyoLink system design shall strive to exceed the 95% overall mobile radio coverage goal along those highways.

In reaching the goal of 95% overall mobile radio coverage, WyoLink will provide portable radio coverage in a significant number of areas. Portable radio coverage, including in building penetration, may be extended by the development of additional sites and resources as described in overview in the PSMC plan. The ability to use portable radios will be further extended in that in-vehicle repeater technology will be available as an optional subscriber unit.

7.2.4 Internal Interoperability

WyoLink will provide interoperability by unifying public-safety agencies in Wyoming into a single radio system. The organization of the trunking system will provide sufficient talk-groups to provide for intercommunication, calling, tactical incident, and Incident Command Structure operations. Trunking technology has been chosen as it provides a high degree of resource flexibility, system reliability, and radio channel efficiency. This technology also provides the ability for a user to communicate across great distances as the need arises.

The WyoLink system will be implemented in an extended series of steps, and interoperability will function through the transition. Public safety-agencies will transfer operations to WyoLink from their existing systems based on funding availability for subscriber units. During this transition time, interoperability will be provided through backward compatibility of subscriber units: the ability of a subscriber unit to operate as a WyoLink digital trunking radio on one user channel while able to operate as an analog conventional radio on a different user channel. Patching of selected WyoLink talkgroups to existing radio systems will further interoperability during the transition.

7.2.5 External Interoperability

WyoLink will provide interoperability by interfacing with other radio systems. Interfaces to similar and dissimilar systems will be supported. In some cases, the interface will be to radio systems with in the State of Wyoming. Currently identified examples include interfacing to the 800-Mhz radio system serving the city of Casper and the 800-Mhz system being developed for the city of Cheyenne Fire Department. Other examples include interfacing to radio systems serving U.S. Forest Service, the Bureau of Land Management, Warren Air Force Base, and other federal organizations as appropriate. In other cases, the interface will be to radio systems of the neighboring states. While recognizing certain barriers that exist in linking dissimilar technologies and RF bands, the goal in selecting interface standards will be to maximize the transfer of WyoLink system features and functions between systems.

Interoperability beyond the range of established WyoLink system interfaces will be supported using conventional-mode digital and conventional-mode analog channels, both within subscriber units and within the WyoLink radio system. WyoLink will support conventional-mode analog channels to allow interoperability with emergency service responders from outside Wyoming responding within the WyoLink service area, or Wyoming emergency responders responding outside of Wyoming. The FCC has specified a national plan for VHF interoperability channels, which will be implemented by WyoLink. These channels will be of extreme value during large-scale events where public safety responders would be called into service across great distances. While the likelihood of such events

is hopefully rare, the events of September 11, 2001 indicate that such events can happen.

7.2.6 Request for Proposal Responses

A Pre-Proposal meeting was held on August 2, 2004. Answers were provided to a number of questions and the overall procurement process was clarified.

Responses to the WyoLink Request for Proposals were received on September 27, 2004. Proposals were received from EF Johnson Inc and Motorola. A Technical Evaluation Team, representing a cross-section of Wyoming's public safety disciplines diligently studied the proposals and evaluated the overall strengths and weaknesses of each one. The evaluation team received additional input from a cadre of Subject Matter Experts with particular experience that applied to specific aspects of the proposals.

Following a review by WYDOT Executive Staff and the Public Safety Communications Commission, the Wyoming Transportation Commission received the evaluation report and recommendations. On October 14, 2004, the Wyoming Transportation Commission accepted the Technical Evaluation Team's recommendation to award the WyoLink equipment and Development Services procurement to Motorola, conditioned on successful negotiation of contract terms. The Motorola proposal was deemed to represent the "Apparent Best Value", offering the lowest project risk and a competitive cost.

8 WyoLink

8.1 System Overview

Motorola proposed an ASTRO 25 VHF network for the WyoLink project. The ASTRO 25 system will provide full interoperability among state, local and federal agencies, increase the coverage area across Wyoming, and fully comply with the Project 25 standards for Phase 1.

ASTRO 25 is Motorola's fully digital, Project 25 compliant trunked two-way radio system solution. Motorola's ASTRO 25 system design provides a high level of reliability: full featured trunking with IntelliSite repeater sites and a comprehensive diagnostic network.

The WyoLink system will consist of a Single Zone, and 57 VHF remote RF sites when fully deployed. As with many statewide systems, WyoLink will be deployed in phases. Because of this phased rollout, the initial system will be deployed as an ASTRO 25 SE system, which is Motorola's small scale version of ASTRO 25. Once the proof of concept phase has been completed, the system will be upgraded during the full rollout to be a large scale ASTRO 25 system.

Functionality is the same between the 2 versions, but in the large scale ASTRO 25 system, the network equipment varies.

The pilot phase will include the Master Site and 5 remote sites in Laramie and Albany Counties. The Master Site for the entire system will be located at the Wyoming Department of Transportation facility in Cheyenne. The Zone 1 Master Site will serve as a core network center for the entire ASTRO 25 system. Data packets from the various system sites are routed through and processed from this network center. The Master site contains the core network equipment to support the wide area network, including network management servers. A Network Management terminal will also be located at the Master Site location.

The VHF IntelliSite Repeater Sites (ISR) for the Pilot Phase will be located at Sherman Hill, North Albin, 85 South, County Line and Russell Hill. Each site will look similar from a design standpoint. Each location will utilize a quantity of QUANTAR IntelliSite Repeaters connected together on a Local Area Network. Associated with each ISR site are redundant Primary Site Controller 9600 (PSC9600) site controllers and a router to interface the data packets to the Master Site location in Cheyenne. All ISR repeaters for WyoLink will be supplied in the VHF frequency range.

The pilot phase also includes a direct connect interface for the Cheyenne Fire 800 MHz system. To provide the direct connect, Motorola has included the cost to upgrade the SMARTNET system that Cheyenne Fire currently operates to an ASTRO 25 IntelliSite. This IntelliSite will then be connected directly into the WyoLink Master Site, just as the remaining 5 pilot phase sites are connected. This will allow seamless interoperability with units from Cheyenne Fire. The ISR site will be configured similarly to the VHF pilot phase sites described above, but the QUANTAR IntelliSite Repeaters will be 800 MHz instead of VHF.

Other phases will expand to include the remainder of the State of Wyoming. Future sites that are added on to the system in other phases will be configured similarly. Expansions to the master site, to incorporate the additional remote RF sites, are also included in future phases. These expansions include expansion of the network to a full scale ASTRO 25 network. The future phases also include the incorporation of the Casper 800 MHz system as an IntelliSite, just as Cheyenne Fire is upgraded in the pilot phase.

8.2 WyoLink System Configuration

The WyoLink system is comprised of system elements described as the Master Site and IntelliSite Repeater Systems. The integration of all of these elements into an ASTRO 25 system provides wide area operation with incredible flexibility, features and operational utility. Once all of the phases are complete, the system will operate with virtually transparent boundaries, creating standardized system

operation over the entire State of Wyoming. The users of this system will enjoy the use of one of the highest performance, premium quality radio networks available today.

ASTRO 25 is Motorola's third generation digital trunking radio system. This system uses proven technology and packet switching architecture to route both voice and data based on multicast Internet Protocol. This architecture provides the bandwidth efficiency and extremely wide scalability of packet networks.

The system makes extensive use of Motorola's packet network architecture. Motorola is committed to the Project 25 standards, including those defining the Common Air Interface, trunking, OTAR, data and encryption. All of the over-the-air packets will conform to the Project 25 Phase 1 standards suite.

8.3 WyoLink Upgrades

Since the original contract with Motorola was signed a couple of significant upgrades have been added to the project. The first upgrade was the ASTRO 25 upgrade to Version 7.2. With this upgrade, the WyoLink project will be operating on the latest version of the Motorola SmartZone system and allow for additional functions in the future. The second upgrade was the addition of a second zone controller in Casper. With the second zone controller, the state was split into two operating zones and allows for future expansion of the system and better connectivity of the local dispatch centers.

8.4 Development Phases

The Motorola Contract for the WyoLink system listed a sequenced approach for the system development which will occur in an orderly sequence of steps. This process was chosen based on projected funding availability and to provide sufficient time for staff training. Lessons learned from other large-scale projects indicate that a sequenced development approach provides a greater opportunity for user agencies to implement the added features and to develop appropriate operational procedures. The details of the actual development process were adjusted based on the cost proposals received and funds available during each fiscal cycle.

8.4.1 Pilot Phase 1 — July 2004 Funding

The Pilot Phase was planned as a 10%, first step, opportunity to demonstrate the validity of the technology and the performance of the features. This provided the opportunity for WyoLink user agencies to consider the operational procedures that may need to be adjusted in relation to the new features provided. The scope of this phase was adjusted based on funds available and the cost structure established by this procurement process.

The current pilot phase plan developed five radio sites and master-control- site resources to demonstrate all WyoLink features, including but not limited to:

- Trunking Features
- Data Communications Features
- Encryption Features
- Automatic Vehicle Location (AVL) Support System
- Subscriber equipment

System encryption during the pilot demonstrated radio-to-radio and radio-to-console encryption along with Over-the-Air-Rekeying operation.

Data communications and AVL are recognized as features that utilized a core system as a data communications buss rather than being specific features of the core system. However, the goal in demonstrating the extent of system capabilities with these features was addressed.

Phase 1 Sites

The Pilot Phase, master control site and five radio sites were developed in southeastern Wyoming. The locations have been elected for the pilot phase due to their proximity to the master site, which is located at the Wyoming Department of Transportation facility in Cheyenne. The five sites are in close proximity to Cheyenne for easy access during this initial development and testing process.

The Pilot Phase sites are identified in the following table:

Site Name	Latitude D-M-S	Longitude D-M-S	Antenna Height (Feet)	Elevation (Feet)
Sherman (Beacon) Hill	41° 15' 42"	105° 25' 53"	112	8770
North Albin	41° 28' 36.9"	104° 6' 6.1"	100	5368
Russell Hill/Pine Bluff	41° 15' 29"	104° 6' 16.9"	100	5345
85 South	41° 1' 17"	104° 47' 8.8"	100	6277
Whitcomb Hill/County Line	41° 39' 1"	104° 54' 6.1"	100	6035

The Sherman Hill site was developed as a six talk-channel site, while the other four sites were developed as four talk-channel sites.

Phase 1 Subscriber Units

A limited number of subscriber equipment were purchased in the WyoLink contract in order to demonstrate the technology. WyoLink user agencies will require thousands more units, which may be purchased through the contract or under the terms of this contract using the Governmental Entities Cooperative Purchasing Process.

As this will be a demonstration phase, the goal was to provide a sampling of the various options in subscriber equipment. This included a mixture of different control head configurations. Likewise, portable radios were procured in a mixture of available configurations. Optional encryption was added to 5 mobile radios, 5 portable radios, and 2 control stations; this portion of the procurement included one encryption key loader. Optional RS-232 data interface was added to five mobile radios.

An in-vehicle repeater capable of in-band operation, support trunking operation, and function to extend portable radio coverage was purchased as part of the Phase 1 procurement.

During the Pilot Phase, multiple opportunities existed to demonstrate possible applications that could ride on the low-speed data transmissions. The Proposer is encouraged to suggest a variety of subscriber equipment to be included for demonstration during the pilot phase. Such equipment may include but not be limited to: limited text message display and status reporting units, automatic vehicle location units, in vehicle repeater technology for extending portable radio coverage, barcode reader messaging systems, and other useful tools. WyoLink may purchase some as part of its commitment to demonstrate the technology, but opportunities will exist for other demonstrations at Proposer expense.

Phase 1 800-Mhz System Interface

The pilot phase procurement will involve development of interfaces between WyoLink and the 800-Mhz systems being developed for the City of Cheyenne Fire Department. This development is scheduled for early 2008.

Phase 1 Acceptance Test

On February 13, 2007 the acceptance test was completed for the Master Site upgrade and Phase 1 radio sites. There were no deficiencies noted during the acceptance test. On May 12, 2007 the PSCC, WYDOT and Motorola held a ribbon cutting and kick-off for the WyoLink project.

Phase 1 Portable Coverage

Portable radio coverage enhancements and in-building coverage enhancements within the city of Cheyenne were incorporated into the Pilot Phase funding. After the pilot phase radio sites were constructed, optimized and the acceptance test procedures were completed and documented as complete, then portable radio and in-building coverage performance was tested. The advisability of enhancements will be evaluated after the performance of the five radio sites has been documented. This will provide a model of system performance that will serve to predict what level of portable radio coverage enhancements will be required throughout the remainder of the project. One radio site will be

constructed in 2008 for providing improved portable radio coverage to the City of Cheyenne.

8.4.2 Phase 2 — July 2006 Funding

The Core Implementation Phase 2 is a 32% development step, based on total radio sites. Phase 2 consists of eighteen (18) radio sites. These sites are completed and are awaiting Federal Communications Commission (FCC) licenses to be finished. Upon the receipt of the FCC licenses the radio sites will be turned on and optimized. Two (2) microwave only sites are also included in Phase 2. Phase 2 will provide WyoLink coverage in nine (9) counties; Albany, Carbon, Converse, Goshen, Natrona, Niobrara, Platte, Sweetwater, and Uinta.

8.4.3 Phase 3 – July 2006 Funding

Site development is completed for the nine (9) Phase 3 radio sites. Construction on these sites will be completed by the end of 2007. The WyoLink radio frequency and microwave equipment is currently being installed along with the installation of the antennas and microwave dishes. Phase 3 will provide WyoLink coverage in five (5) counties; Campbell, Crook, Johnson, Sheridan and Weston.

8.4.4 Phase 4 – July 2006 Funding

Ten (10) Phase 4 sites are currently under construction and are scheduled for completion in 2007. Six (6) Phase 4 site locations have completed the leasing process with construction beginning in 2007 and completed in 2008. Five (5) Phase 4 sites are uncertain and are planned for construction in 2008. The remaining three (3) sites contracted sites have not been identified and upon the completion of the other core sites the PSCC WyoLink Operations Work Group will make decisions about their locations. Phase 4 will provide WyoLink coverage in eight (8) counties; Big Horn, Fremont, Hot Springs, Lincoln, Park, Sublette, Teton, and Washakie.

The WyoLink specifications performance standards are presented in a formally structured and traceable format in Appendix 14. . This appendix is a “living document” that is adjusted periodically as the system moves forward.

A WyoLink Traceability Matrix, Timeline Chart and Map of current WyoLink construction status and are included in Appendix – 14.5 and 14.6

8.5 Frequency Acquisitions

Motorola was contracted to complete the frequency planning process for the WyoLink system. Five (5) sites had already been implemented and frequencies have been determined for these sites. Each of the sites contains VHF ASTRO 25

trunked channels and some sites also contain legacy conventional VHF sites. The conventional VHF sites are to be incorporated into the combining scheme.

A search was conducted of the Federal Communications Commission (FCC) Part 90, Part 80 and Part 22 frequency databases to determine available frequencies. The site list used consisted of fifty five (55) high level sites and twenty five (25) low level sites. Spectrum fingerprinting was completed for the high level radio sites. The frequencies will be licensed as 12.5 KHz channels for the ASTRO 25 system.

A frequency re-use study was performed and yielded the twenty nine (29) re-use sets were required in an ideal re-use scenario. Without a re-use plan, WyoLink would require 284 frequency pairs. Each group of frequencies was analyzed for intermodulation issues. The interaction of the different frequencies at each site and the potential for interference was studied. The frequencies were properly chosen to ensure that intermodulation does not result.

The final frequency plan is composed of five (5) trunked pairs per site using the part 90 Public Safety, Part 90 Industrial/Business and Part 22 frequency bands. Some sites were required to be able to expand beyond the five (5) trunked pairs; Casper Mountain, Pumpkin Buttes, Snow King and Rozet are all designed a seven (7) trunked pairs and Aspen Mountain has six (6) trunked pairs. The frequencies were allocated as follows: 150.775 MHz – 156.24 MHz for transmit frequencies and 157.45 MHz – 163.25 MHz for receive frequencies.

8.6 Funding

WyoLink, through Phase 4 development, has been funded. During Fiscal Year 2005, the Wyoming Transportation Commission contributed $5,200,000, the Wyoming Office of Homeland Security provided $1,200,000 in Homeland Security Grant funds and a Bio Terrorism Grant in the amount of $400,000 for a total of $6,800,000.

In Fiscal Year 2006, the Wyoming Legislature provided $7,172,671 in General Funds and a Homeland Security Grant in the amount of $1,000,000 for a total of $8,172,671.

In Fiscal Years 2007 – 2008, the Wyoming Legislature provided $35,111,340 in General Funds for WyoLink construction and $10,050,000 for local enhancements – dispatch console grants and T-1 circuits and a Bio Terrorism Grant of $40,000 for a total of $45,201,340. The total WyoLink construction funding is $50,747,011 and $10,000,000 for local enhancements.

A budget request is being prepared for the Fiscal Years 2009 – 2010 for portable radio enhancements. This budget proposal provides only a portion of the estimated funding required for the enhancements. The budget will be presented

to the Governor and the Wyoming Legislature for action during the 2008 Wyoming Legislative Budget Session.

WyoLink Funding – July 2005 thru June 2008

WyoLink Funding Sources	FY '05	FY '06	FY '07-'08	Total Funding
Wyoming Transportation Commission Funds	$ 5,200,000			$ 5,200,000
Homeland Security Grants	$ 1,200,000	$ 1,000,000		$ 2,200,000
Bio Terrorism Grant	$ 400,000			$ 400,000
Wyoming Legislative General Fund	$ 7,172,671		$35,111,340	$42,284,011
Wyoming Transportation Commission Funds – WyoLink Support			$ 363,000	$ 363,000
Total	**$13,972,671**	**$ 1,000,000**	**$35,474,340**	**$50,447,011.00**

9 WyoLink – Federal Agency Radio Communications Summit

The Wyoming Public Safety Communications Commission and WyoLink – Wyoming's statewide digital trunked public safety radio communications project are interested in knowing what federal agencies may participate in WyoLink. Along with the participation, what (if any) resources area available from the potential participating federal agencies to help support the WyoLink project?

Discussions began at the National APCO convention in Denver, Colorado in August 2005 with some of the federal agency representatives attending the APCO convention and with the National Institute of Justice. These discussions indicated that more information needs to be disseminated between all potentially involved participants and that a summit should be held to provide the communications between interested agencies.

Bob Symons, Wyoming Public Safety Communications Commission (WYPSCC) Administrative Support, worked with the National Institute of Justice (NIJ) – National Law Enforcement and Corrections Technology Center's (NLECTC) Denver and Northwest Offices to arrange the summit between federal agencies, WYPSCC and WyoLink. Bob Griffiths and Kyle Sinclair (NLECTC-NW) and Gene McGahey (NLECTC-Denver) provided contact information for federal agency representatives that may attend the summit and helped with the logistics of sponsoring the summit.

On April 27, 2006 fifty-eight (58) people attended the radio communications summit in Cheyenne, Wyoming. Agencies represented include: NTIA/ITS –

Boulder Labs, Department of Homeland Security-WMO/FPIC, NLECTC, Alcohol Tobacco and Firearms, Department of the Interior (CIO, BIA, FWS, and NPS), Mindbank – BIA, U.S. Forest Service, Federal Emergency Management Agency – Region 8 and MERS, Drug Enforcement Agency, Federal Bureau of Investigation, USDA-APHIS, Department of Justice – Wireless Management Office, Utah Army National Guard, Cheyenne Weather Service, Department of Veteran Affairs, Immigration and Customs Enforcement, Motorola, Wyoming Department of Transportation, WyoLink, U.S. Senator Enzi's Office, U.S. Senator Thomas' Office, Montana Public Safety Services Bureau and Wyoming Public Safety Communications Commission.

Bob Symons provided a presentation on the history of the Wyoming Public Safety Communications Commission, the Public Safety Mobile Communications (PSMC) plan, and the feasibility study completed by Federal Engineering.

Tom Mahon, WyoLink Project Manager, spoke on the WyoLink project. He covered what WyoLink is, the build-out timeline, and the costs to join. Some of what WyoLink offers to potential WyoLink users include: cost savings, discrete talkgroups, shared talkgroups, automatic roaming, signaling features, caller ID's, emergency alarms, automatic vehicle location (AVL), voice encryption and mobile data. WyoLink is presently supporting DES encryption, but can be configured for AES encryption.

Federal agency participation is being sought for two reasons: Interoperable communications with federal agencies and in-kind contributions to further WyoLink infrastructure development. These reasons were further defined with operational participation, spectrum/frequency contributions and radio site development on federal lands. Federal land ownership in Wyoming is approximately 47% of the total land mass. Assistance is securing access agreements will be an invaluable contribution to the project.

A question and answer period was provided for clarification on the PSCC and WyoLink project. One of the key issues is the best practices on encryption key management and needs to be studied further and will involve many agencies including WyoLink.

The next part of the summit included hearing from the attending federal agencies on their needs and what they might be able to offer in assistance. Most of the agencies felt this was a good starting point and further discussion must take place to finalize any federal agency assistance.

Both the FPIC Spectrum Committee and the Department of the Interior need a detailed explanation of the spectrum needs. The frequency use needs to identify discrete or re-use of frequencies, real life honest frequency use with solid evidence. WyoLink is currently under contract with Motorola to provide spectrum engineering for the WyoLink project. The engineering work includes 64 sites with

7 channels per site. The reuse of frequencies is part of the engineering work being done. WyoLink will make sure that Motorola maintains dialog with the Department of the Interior and FPIC spectrum Committee. The accountability of the frequency use was discussed. Does WyoLink want ownership of federal spectrum or sharing agreements?

The architecture of the WyoLink system would be helpful information to the federal agencies. This includes the system design and predicted radio coverage, mobile and portable including the specifics on how the predicted coverage was developed. The enterprise information on the WyoLink system and the Public Safety Communications Commission will help in developing a business case for federal agency participation.

Information on the current and proposed radio sites including power needs, towers, buildings, coordinates, elevations and design criteria was requested by the federal agencies. WyoLink requested the radio site information on the federal agency radio sites in Wyoming and will submit that request in writing. A coordinated effort with the federal agencies, through the FPIC will be the best and proper channel for the sharing of information.

It was stated that the interference and inter-modulation thresholds may need to be adjusted to accommodate the spectrum use and re-use for the WyoLink system.

Encryption and key management needs to be designed and developed by all agencies and any input from local and state agencies would be useful. This is very difficult subject and will take everyone working together to solve the problems.

To maintain the effort of involving Federal agencies on the use of WyoLink, Wyoming has become involved in the Federal Partnership for Interoperability (FPIC). Wyoming and FPIC are currently involved in frequency acquisitions, interoperability with Federal agencies and encryption security for interoperability.

10 WyoLink Policies and Procedures

On December 29, 2006 the Wyoming Public Safety Radio Communication Rules were filed with the Wyoming Secretary of State. Chapter 2 of these rules defines the administrative procedures. Section 1 allows for the establishment of the policies and procedures for the management and operation of WyoLink. Section 2 defines participation determination. Sections 3 and 4 provide the citations to the rules and regulations of the Federal Communications Commission and National Telecommunications and Information Administration. Section 5 allows for the determination of user fees.

On March 13, 2007, the Public Safety Communications Commission adopted the WyoLink Handbook. On June 22, 2007 the WyoLink Handbook was revised to define the County Agency Talkgroups (CAT), Site Trunking protocols and Support Manager authorizations. The intent of the WyoLink Handbook is to describe the basic radio communications procedures for statewide digital trunked radio system and interoperability between agencies operating in Wyoming. The goal of the procedures is to assure consistent, clear radio communication for routine operation and effective standardized emergency incident communications. The handbook will be reviewed on an annual basis by the PSCC Interoperability Executive Committee and revised as necessary. Member agencies, through the membership agreement, are encouraged to provide suggested revisions to the WyoLink Handbook.

The WyoLink Handbook is available on the following websites:
http://pscc.wyoming.gov/c_minutes.html
http://wyolink.state.wy.us/join.asp

10.1 Authorized System Access

Generally, access will be granted to public safety. However, all applications are subject to review by the WyoLink Support Manager and the WYPSCC.

10.1.1 Public Safety

1. Law Enforcement - Any agency recognized by the WY Attorney General and their associated dispatch/911 operations; any agency recognized by US Attorney General and any agency recognized as a tribal law enforcement agency

2. Fire Departments - Any agency recognized by State Fire Marshal's Office or Wyoming Forestry; Any federally recognized fire Agency/department and any tribal fire agency/department

3. EMS and Medical facilities - Ambulances: Any licensed ambulance service; Medical Facilities: Any hospital or health care facility recognized by the Wyoming Department of Health

4. Homeland Security and Emergency Management - Any emergency management agency recognized by the Wyoming Department of Homeland Security

5. Tribal – Any tribal law enforcement, fire and rescue agency

10.1.2 Public Service

1. WyDOT
2. State of Wyoming Agencies
3. Support Agencies - Agencies authorized by state statute such as Red Cross, Salvation Army, and like agencies that provide support in times of emergency. To include communications service agencies that support radio maintenance or operations
4. National Weather Service - Five (5) current weather services offices serving Wyoming
5. Public Works – City, County or Town – Streets, Roads, Utilities, etc.
6. Public Transportation including School Buses
7. Court Services/Corrections
8. Regulatory
9. Other Governmental Agencies including Tribal and Federal
10. WyoLink approved authorized service providers

10.1.3 Applying for System Access

Application Process

Agencies wishing to participate in WyoLink will implement the following steps:

a. Complete the WyoLink Membership Application and the WyoLink Membership Agreement. The Membership Application and Agreement are separate documents and available from the PSCC or WyoLink and are also available on the WyoLink web site – http://wyolink.wy.gov
b. Mail/Deliver the original to WyoLink at the address listed on the application.
c. Coordinate feasibility, agency radios and fleetmapping with the WyoLink Support Manager and PSCC Administrative Support.
d. The WyoLink Interoperability Executive Committee will review the application at a WyoLink Interoperability Executive Committee meeting. The applicant is encouraged to attend this WyoLink Interoperability Executive Committee meeting to answer any

questions that may arise from the application. The WyoLink Interoperability Executive Committee will make a recommendation to the Executive Board as to the application status – approved, further review or denied.

e. The Executive Board decision will be communicated to the applicant as well as any documentation needed and any provision made.
f. Any pending applications will be reviewed monthly for changes that would modify the applicant's status.
g. The applicant will coordinate with one of the authorized subscriber programming agencies for template development parameters.
h. The applicant is encouraged to begin attending WyoLink and WYPSCC meetings and may participate in committee meetings on topics in which they may be interested.

Acceptance of New Members

To ensure compliance with WyoLink rules and regulations and to properly coordinate Subscriber ID and Talkgroup assignments on WyoLink, the WyoLink Support Manager will coordinate these assignments for the initial integration of the agency. This will include agency specific talkgroups as well as standard Multiple Agency Talkgroups that are available. The agency will need to discuss the talkgroup/channel layout for their radio equipment, available features and functions to be included in their programming template. The type and model of the agency's radios will also need to be provided. Upon receiving the talkgroup assignments, subscriber profiles and authorizations the agency can then contact an authorized service provider to program subscriber's radio equipment for use on WyoLink. Upon the completion of the programming, the authorized service provider shall contact the WyoLink Support Manager to have the subscriber ID's activated in the master controller.

Console Access

Direct connected dispatch consoles must be closely coordinated and conform to the technical requirements established by the WyoLink Support Manager and WyoLink Technical Support. Agencies requesting direct dispatch console connection to WyoLink shall mark the "Communications Center" box on WyoLink Membership Application and submit documentation indicating area and agencies served, channel or talkgroup recording capabilities, and console type and model.

10.2 Talkgroups

WyoLink will work with and prepare a Fleetmap for the Member based on the Member's current and ongoing communication needs and priorities. Fleetmap programming by WyoLink will commence once the Member approves the

Fleetmap and the Authorization for New Talkgroup or System Access and Membership Agreements are received by WYPSCC. WyoLink will work with each member to design unique talkgroups to be used by the member for normal internal traffic. The number of talkgroups allowed is determined by agency scope, size and service delivery area.

To provide interoperability between all WyoLink users, statewide and countywide multiple agency talkgroups have been developed. As a minimum, all Multiple Agency Talkgroups will be programmed into all user radios and the calling talkgroups will be monitored in the dispatch centers located within each region. WyoLink firmly advocates and aggressively pursues multi-agency sharing of county-wide talkgroups.

10.2.1 Statewide Talkgroups

All Multiple Agency Talkgroups (MAT) talkgroups are available for use by all WyoLink agencies. The following MAT talkgroup descriptions and allocations are recommended for operational usage however individual events will govern the actual assignment and usage of any MAT talkgroup.

Four multiple agency talkgroups have been assigned to each of the seven Regional Response geographic areas throughout Wyoming and state-wide for multi-agency coordination. All dispatch centers within each MAT area shall monitor the MAT calling talkgroup for that MAT area. Map of Wyoming Regional Response areas is included in Appendix – 14.6.3

Region 1: Sheridan, Johnson, Campbell, Crook, and Weston counties.

MAT 1: This talkgroup will be used for intra-regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 1. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 1-A(lpha), MAT 1-B(ravo), and MAT 1-C(harlie) –** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses.

Region 2: Natrona, Converse, and Niobrara counties.

MAT 2: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 2. This talkgroup can be used by

non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 2-A(lpha), MAT 2-B(ravo), and MAT 2-C(harlie)–** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses.

Region 3: Albany and Carbon counties.

MAT 3: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 3. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 3-A(lpha), MAT 3-B(ravo), and MAT 3-C(harlie) –** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses

Region 4: Sweetwater, Lincoln, and Uinta counties.

MAT 4: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 4. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 4-A(lpha), MAT 4-B(ravo), and MAT 4-C(harlie) –** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses

Region 5: Fremont, Teton, and Sublette counties.

MAT 5: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 5. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 5-A(lpha), MAT 5-B(ravo), and MAT 5-C(harlie) –** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses.

Region 6: Washakie, Big Horn, Hot Springs, and Park counties.

MAT 6: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 2. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 6-A(lpha), MAT 6-B(ravo), and MAT 6-C(harlie) –** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses.

Region 7: Laramie, Platte, and Goshen counties.

MAT 7: This talkgroup will be used for intra -regional multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within Region 2. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

> **MAT 7-A(lpha), MAT 7-B(ravo), and MAT 7-C(harlie) -** Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses

Region 0: State-Wide Multiple Agency Talkgroup

MAT 0: This talkgroup will be used for state-wide multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user that has an incident or need for a multiple jurisdiction response involving agencies from multiple regions.

> **MAT 0-A(lpha), MAT 0-B(ravo), and MAT 0-C(harlie) -** Tactical talkgroups that can be assigned as needed within the state for multiple agency responses.

10.2.2 County-Wide Talkgroups

All County Agency Talkgroups (CAT) talkgroups are available for use by all WyoLink agencies. CAT talkgroup descriptions and allocations are recommended for operational usage however individual events will govern the actual assignment and usage of any CAT channel.

Four county agency talkgroups have been assigned to each of the counties throughout Wyoming for multi-agency coordination. All dispatch centers within each County should monitor the CAT calling talkgroup for that County.

##CAT 1: This talkgroup will be used for inter-county multiple agency coordination and communications. This also has been designated the contact channel for any subscriber user coming into the region who needs to communicate with an agency within that county. This talkgroup can be used by non-public safety agencies for multiple agency coordination and communications or by any public safety agency whose assigned talkgroup may already be in use.

##CAT 2, ##CAT 3 and ##CAT 4 – Tactical talkgroups that can be assigned as needed within the Region for multiple agency responses. ## is the county number – e.g. 07 for Goshen County

10.2.3 Agency Talkgroups

Each agency is considered as "owner" of the private talkgroups assigned to them. Agencies are expected to use the talkgroups assigned to the department for all intradepartmental traffic. Policies and procedures for the use of the agency talkgroup are at the discretion of the department, within the technical limitations set forth in the WyoLink Handbook.

10.2.4 National Weather Service (NWS) Talkgroups

The NWS talkgroups are a direct link to the National Weather Service Offices. These Talkgroups are to be used for communications with NWS when relaying weather spotter, fire conditions and other weather related information from the field. All radios on the system will be programmed with these talkgroups.

10.3 Conventional VHF Interoperability

Wyoming has a statewide Mutual Aid channel that all public safety agencies in Wyoming may use for interoperability. The Mutual Aid Channel has recently been upgraded to a duplex (repeater) channel to provide for better radio coverage. This channel is licensed by the State of Wyoming and is managed by the Wyoming Highway Department Telecom. Each agency is required to sign a separate Memorandum of Understanding for the authorization and use of the Wyoming Mutual Aid Channel.

Upon the adoption of the Wyoming Public Safety Communications Commission, the National Public Safety Telecommunications Council interoperability channels will be included in a future WyoLink Handbook revision. The PSCC Interoperability Executive Committee is reviewing the VCAL, VTAC, VLAW,

VFIRE and VMED channels and developing protocols for their programming and use. Cheyenne Fire and Rescue and Natrona County have programmed their 800 MHz radios with the 8CALL and 8TAC channels.

10.4 Call Sign Assignments

Call Signs of any agency or entity, subscribing to the system must be obtained or approved by the WyoLink Support Manager. All Call Signs must conform to the structure specified as follows.

1. State Agencies:
   State Agencies will format call signs beginning with a phonetic designator that is indicative of the agency they are associated with, followed by a number designator, i.e. ***Henry###, PAT###, GF###, SH###, DCI###, SP###, HS###, PHN####, etc.***

2. Local/Federal Agencies:
   Agencies outside of state government will continue to maintain current call sign naming systems in day to day operations within the agency

3. Public Service Agencies:
   Agencies outside of state government will continue to maintain current call sign naming systems in day to day operations within the agency

4. New Agencies on System (Without numbering system):
   Agencies applying for access on the system need to have call sign numbering system approved by the WyoLink Support Manager.

5. Emergency/Interagency Radio Traffic:
   Call signs for initial emergency or interagency communications on the digital radio system will need to be descriptive of calling agency, ***i.e. Worland PD#, Johnson County SO#, FBI#, DCI#, MS #.***

   a. Once Incident Command has been established, a radio plan will be developed identifying call signs & communications procedures. Each agency will have a person designated as a Member Liaison Officer (MLO) that will maintain a current call sign registry.

10.5 Operational Protocol Summary

10.5.1 Routine Protocols

1. All communications regardless of nature shall be restricted to the minimum practical transmission time and employ an efficient operating procedure.

2. Unit to unit tactical communications, when feasible, shall be conducted on the appropriate talk around channel.

3. Pronounce words distinctly and rather slowly.

4. The voice should be as emotionless as possible, emotion tends to distort the voice and render it unintelligible.

5. Attempt to make your voice a regular monotone.

6. Emergency messages require no expression, but a high degree of intelligibility.

7. Do not try to be humorous on the air, it never sounds as funny as you think.

8. Do not let anger or impatience be heard in your voice.

9. The FCC forbids profanity and any superfluous or extraneous transmissions.

10. Procedure of initiating a radio call – the calling radio unit shall state the name of the receiving unit followed by their unit. For example, “Johnson County Dispatch, Charlie16” or “Pat 15, Pat 8”. The unit being called shall answer with their own radio call. For example, “Johnson County Dispatch” or “Pat 15”.

11. Procedure for when not on Primary Talkgroup – When a unit of dispatch center makes a call that is not the user’s primary talkgroup or conventional channel, the name of the talkgroup or channel shall also be transmitted. For example, “Goshen Dispatch, Pat 57 on 08MAT1”

12. Calling Talkgroups (Dispatch) – The calling talkgroup is used to dispatch calls for service, contact local dispatch centers and coordinate day-to-day activities of each agency. Lengthy transmissions and specific tactical operations will be conducted on appropriate tactical talkgroup/channel.

13. Tactical Talkgroups – Used for tactical communications between field units and the dispatch center or between field units. On larger incidents, separate and unique tactical talkgroups shall be established for specific functions. Agency specific assignments using agency specific talkgroups/channels are made by local dispatch center. Assignments using county-wide talkgroups/channels are made by dispatch as requested by the Incident Commander or designee.

14. Clear Text shall be used for all radio communications. The use of codes, particularly agency-specific codes have been found to be a barrier in the transmission of information. The most negative effect of codes is a reduction in communications interoperability during multi agency response.

15. Phonetic Alphabet – A phonetic alphabet shall be used for spelling out unusual names, license plate letters and so forth. They are always transmitted as "Alpha," "Bravo," or "Charlie" not "A as in Alpha," etc. Due to the variations of phonetic alphabets, no one phonetic alphabet will be required. Any phonetic alphabet the clearly identifies a letter is acceptable.

10.5.2 Routine Traffic

1. All radio communication should be brief and to the point. Radio system traffic shall be limited to official business only. Agency heads are responsible for the appropriate use of the system in accordance with adopted standard protocols. Proper radio etiquette is expected on any communications system. Agency protocols will dictate operations locally.

2. Radio messages will be made and received in the following manner:

   a. Caller waits for talk permit tone on selected talkgroup.

   b. When initiating communication on the statewide radio system, the following format will be used.

      "Receiving agency/unit—sending unit— on talkgroup used".
      i.e. "Wyoming Patrol – DCI-5 on MAT7".

   c. Receiver acknowledges by stating their state assigned/approved call sign.

   d. When utilizing private agency talkgroups, call sign protocol is at agency discretion.

3. Local Operation:

   a. Normal operations will be conducted on assigned agency talkgroups.

   b. Interagency traffic will be conducted on the County Agency Talkgroup (CAT) for that county or Multiple Agency Talkgroup (MAT) for that geographic area.

   c. County Agency Talkgroups (CAT) and Multiple Agency Talkgroups (MAT) are not to be used for normal dispatch.

4. Operation outside of local area.

   a. Members traveling outside their normal operating area will switch from their local talkgroup to the appropriate MAT talkgroup for the geographic area you are currently in. This is needed to prevent radios from unnecessarily tying up system resources.

   b. The digital trunked radio system is not currently set up to limit talkgroups to particular sites. This configuration allows necessary communications outside of the normal service area of an agency, often made necessary by prisoner transports, EMS & fire support outside of area.

   c. The drawback to this wide area operation is that when a talkgroup is transported to another area of the state, all traffic associated with that talkgroup is then repeated over the local tower on which that the member is affiliated. This can cause an overload situation for the local radio site, especially if a large number of members are affiliated on their home talkgroups on a single radio site. This may result in a busy condition for not only the local members where the outside talkgroups are brought into, but a potential talkgroup busy back in the home area of the member.

   d. The system is designed for this purpose, but within capacity limitations. Use home talkgroups outside of normal service area only when necessary.

5. Monitoring of talkgroups outside of home area for non-service related business is prohibited.

   a. The effect on system same as outlined above in Section VII(B)(4)(c).

b. Monitoring is defined as the actual affiliation of the radio on the talkgroup selected.

c. Non-selected talkgroups being scanned do not have the same impact on system. Scanning listens but does not affiliate with a radio site.

An example would be a Uinta County deputy heading to Douglas for training. Uinta County uses the WyoLink system as a primary communications system and generates a considerable amount of traffic. If the deputy would leave the radio selected to the local Uinta County dispatch talkgroup, all of the traffic generated in the home area would "follow" the deputy all of the way to Douglas. As the deputy traveled, each radio site that the deputy's radio roamed to would repeat all of the traffic from the Uinta County area. If the local sites along the way had many agencies active, or an active emergency, the additional traffic from Uinta County might be enough to cause busies for local agencies. Additionally, by not being tuned into the local traffic, the deputy might not be aware that an emergency exists in the area they are passing through.

10.5.3 Events

An event is defined as a non-scheduled significant incident that requires the coordinated response and interoperability of multiple agencies or jurisdictions, this includes incidents that move between jurisdictions.

1. When a situation dictates coordinated resources from agencies without common talkgroups, communications will be on the CAT Talkgroups for that county or MAT talkgroup for that geographic area.

2. All responding units will monitor the CAT or MAT calling talkgroup designated by the requesting agency for additional information and the initial report on conditions.

3. CAT and/or MAT tactical talkgroup(s) will be assigned for the duration of the emergency upon request.

4. The responsible radio dispatch will be notified by the requesting agency or Incident Commander when the requested talkgroup(s) will no longer be needed.

5. If the event “travels” from one MAT talkgroup area to another (i.e. a law enforcement pursuit or a series of severe weather events), it is recommended that the radio traffic be routed through the appropriate Dispatch Center in that area for coordinated communications.

10.5.4 Planned/Scheduled Events

Any event, known in advance, that requires additional communications resources.

1. CAT and/or MAT tactical talkgroup(s) will be assigned as available for the duration of the event upon request. Talkgroup assignment is subject to pre-emption if required for reassignment to an emergency incident.

    a. CAT and/or MAT tactical talkgroups should be scheduled as far in advance as possible.

2. Appropriate radio dispatch will be notified by requesting agency or Incident Commander when the requested talkgroup will no longer be needed.

11 National Incident Management System - NIMS

11.1 Background

In Homeland Security Presidential Directive-5 (HSPD-5), President Bush called on the Secretary of Homeland Security to develop a national incident management system to provide a consistent nationwide approach for federal, state, tribal and local governments to work together to prepare for, prevent, respond to and recover from domestic incidents, regardless of cause, size or complexity.

On March 1, 2004, after close collaboration with state and local government officials and representatives from a wide range of public safety organizations, Homeland Security issued the NIMS. It incorporates many existing best practices into a comprehensive national approach to domestic incident management, applicable at all jurisdictional levels and across all functional disciplines.

The NIMS represents a core set of doctrine, principles, terminology, and organizational processes to enable effective, efficient and collaborative incident management at all levels. To provide the framework for interoperability and compatibility, the NIMS is based on a balance between flexibility and standardization. The recommendations of the National Commission on Terrorist Attacks Upon the United States (the "9/11 Commission") further highlight the importance of ICS. The Commission's recent report recommends national adoption of the ICS to enhance command, control and communications capabilities.

11.2 NIMS Compliance Milestones

Prior to Federal Fiscal Year 2007, all local, tribal and the state have "self certified" as to making progress with achieving NIMS compliance. In Federal Fiscal Year 2007 and beyond, all NIMS performance standards will be monitored through FEMA's Tier 1 and Tier 2 metrics'.

Each local and tribal jurisdiction has been provided the standard NIMS template for achieving Tier 1 and Tier 2 metrics'. Each jurisdiction will incorporate all elements of the National Incident Management System as a local incident management system. This will ensure a seamless transgression when state and federal assistance is needed to cope with major disasters.

The Wyoming Office of Homeland Security monitors the progress made by local and tribal governments in achieving NIMS compliance. Under Wyoming's State Homeland Security Strategies as approved by the Federal Homeland Security Department, interoperability has been identified as a high priority.

11.2.1 NIMS Integration Through The Public Safety Communications Commission

The Wyoming Public Safety Communications Commission, as set in state statute, provides for a cross sectional representation of local, tribal and state membership who has a vested interest in public safety interoperability goals. This commission is closely monitoring the development and implementation of a statewide radio communications system with the sole purpose of achieving total first responder interoperability to communicate across jurisdictional lines when responding to major crisis.

11.2.2 Interoperability For A Better Local/Tribal/State Incident Management System

The design of the WyoLink system, a digital trunked radio system, allows all dispatch centers to be inter-connected through the Master Site and Zone Controllers. The Wyoming State Operations Center (WYSOC) has installed a direct connected dispatch console to the Master Site. The WYSOC will be able to monitor any major event in Wyoming and provide dispatching capabilities in support of that event. Through the use of the Multiple Agency Talk-groups (MAT's), multiple dispatch centers will be able to assist in the communication needs within each regional response area.

The State of Wyoming has taken a major step in the effort to enhance the abilities of municipal, county, tribal and state agencies to support and respond to a major crisis event. Under the preview of Homeland Security Presidential

Directive (HSPD) 5 and 8, regional collaboration is now set in state statute to ensure a regional response to assist local jurisdictions with these major events.

11.2.3 Multi-Agency Coordination Systems (MACS) In Wyoming

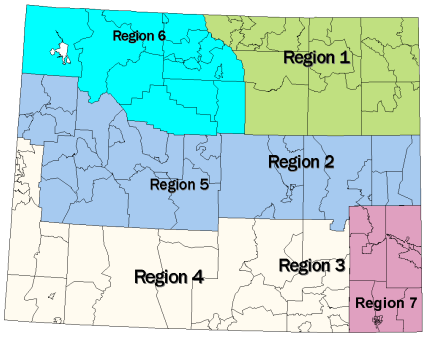
In March of 2004, Wyoming House Bill 144 was passed by the Wyo. State Legislature and signed into law by the Governor entitled the *"Wyoming Emergency Response Act" (Wyoming* State Statute §35-9-151). This Act has set into motion the creation of a state Multi-Agency Coordination System (MACS). In particular, this act allows the state homeland security director to create regional emergency response teams (MACS) within multiple county areas for the purpose of organizing, equipping, training and responding to hazardous materials, weapons of mass destruction (terrorism) and or other major events impacting a community.

Regional teams receive federal homeland security grant funds through the state in support of organizing, planning, equipping, training and exercising regional team capacity.

By the adoption of state rules and regulations, regional team members must meet minimum requirements for specific professional certification, training standards, etc. A Field Operations Guide (FOG) has been created to assist local jurisdictions with understanding specific activation, tactical considerations and other applications relevant to regional emergency response team deployment.

These regional teams are available to supplement local resources when an incident is beyond the first responders' capabilities. Teams are responding in a state capacity.

Currently, there are seven (7) regional teams located around the state within the host communities of Cheyenne, Casper, Laramie, Rock Springs, Riverton, Worland and Gillette.



WYOMING HOMELAND SECURITY REGIONS

Multi-Agency Coordination Systems (MACS)

These teams are organized primarily through the fire department; however, team members are recruited from all first responder disciplines including: fire, law enforcement, emergency medical services, public works, public health, coroner, bomb squad members, agriculture/veterinarian, homeland security/emergency management, private industry/specialists, local government administrative, public safety communications and other subject matter experts.

These teams have the ability to communicate with local, tribal, state and federal agencies through the use of an ACU-1000 interoperability radio communications platform. Once the WyoLink project is complete, this capability will be further enhanced through the use of multiple agency talk (MAT) groups.

11.3 Standard Operating Procedures For The Seven (7) MACS

11.3.1 Communications

- The RERT Leader shall assign a Communications Officer on all incidents
- The Communications Officer shall assume responsibility for developing, documenting and coordinating all data relevant to the incident
- The data gained will be used in hazard and risk assessment, evacuation recommendations, selection of protective clothing and equipment, and development of incident management considerations

Communication Functions

- Communication section activities shall be conducted is accordance with the following
    - A minimum of three information sources shall be utilized while developing hazard and risk information
    - All data gathered shall be coordinated with the RERT Leader, Safety Officer, Operations Officer, Record Keeper and EMS as appropriate The Communications Officer must know the proper operational procedures for the communications equipment
    - Handheld radio
    - Interoperability interface equipment (ACU-1000)

11.4 National Response Framework and Wyoming

Under the *National Preparedness Goal,* the State of Wyoming has revised the State Incident Management System to incorporate and institutionalize fifteen (15) specific Emergency Support Functions (ESF's) directly in line with the National Response Framework (NRF). These support functions can and will provide additional state support services to the seven (7) regional multi-agency

coordination systems (MACS) as structured in Wyoming's regional emergency response teams.

11.5 Summary

The State of Wyoming will continue to move forward with the National Preparedness Goal as a shared responsibility to the citizens of Wyoming through close coordination with all local, tribal, state and federal agencies when responding to major crisis in Wyoming communities.

11.5.1 Authorities and References

- Wyoming State Statute Title 35-9-151 through Title 35-9-159 (Wyoming Emergency Response Act)
- Wyoming State Statute Title 19-13-101 through 19-13-116 (Wyoming Emergency Management Agency)
- Wyoming State Statute Title 35-9-107 (Duties and Powers of State Fire Marshal)
- Wyoming State Statute Title 19-9 (National Guard Activation)
- Wyoming State Statute Title 19-5 (Wyoming Disaster and Civil Defense Act)
- Wyoming Title 19-13-107 (Emergency Support Task Forces -Regional Emergency Response Team)

12 Interoperability Resources

12.1 Wyoming Office of Homeland Security

The Wyoming Office of Homeland Security provides communications equipment and communications support personnel through out Wyoming for communication outages, special events, search and rescue efforts, transportation incidents, weapons of mass destruction incidents, wildland fires, and hazardous materials incidents. Approved use of the equipment is available at no cost to local jurisdictions. The Wyoming Office of Homeland Security communication equipment consists of two (2) mobile support vehicles, trailer mounted portable tower system, radio equipment, and communication personnel. Equipment is described in appendix 14.4

12.2 Swap Radios

Swapping radios refers to maintaining a cache of standby and individual public safety agency radios that can be deployed to support incidents. These radios may be from a statewide cache or from a participating agency. The swapping of

radios is limited, most radios are agency radios and used on a daily basis. The Wyoming Office of Homeland Security maintains the following cache of radios that are available for radio swapping.

- 60 Bendix King VHF portable radios
- 30 Bendix King P-25 VHF portable radios
- 15 Motorola P-25 VHF portable radios

12.3 Shared Channels

Shared channels refer to common frequencies or channels (such as those of a participating agency) that have been established and are programmed into radios to provide interoperable communications among agencies. Specific shared interoperable communications channels available within Wyoming are listed in the table below.

Primary Use	Name	Description	Frequency Tx/Rx
Interoperability between all Public Safety Agencies	Mutual Aid (Dir)	Wyoming Mutual Aid Direct - simplex	154.8750-154.8750
Interoperability between all Public Safety Agencies	Mutual Aid (Rep)	Wyoming Mutual Aid Repeated	159.1950-154.8750
National Law Enforcement Agencies	NLEN	National Law Enforcement Network	155.4750-155.4750
Fire Agency Interoperability	FERN	Fire Emergency Radio Network	154.2800-154.2800
Emergency Medical Services	EMS	Emergency Medical Services	155.2650-155.2650 and 155.3400-155.3400

12.4 Gateways

Gateway systems interconnect channels of different systems (whether on different bands or modes), allowing first responders to use their existing radios and channels to be interconnected with the channels of other users outside of their agency. Wyoming agencies use two (2) specific gateway systems; dispatch center console patches and ACU1000's. Each dispatch center has developed their protocols for console patching and varies from agency to agency. The seven (7) Regional Response teams each have an ACU 1000 that can be requested for use as a temporary gateway.

13 Challenges

At the September 11, 2007 Public Safety Communications Commission meeting, the PSCC adopted the following challenges to the WyoLink program. These challenges will be reviewed annually and revised as necessary.

13.1 WyoLink Training

WyoLink and interoperability communications training will be rolled out at the same time as the WyoLink project is optimized in the local areas. The PSCC Administrative Support has developed a training program for the WyoLink trunked radio system operation, the compatible radios usage and the WyoLink policies and procedures. Per WyoLink policies and procedures, all users will have to have completed the WyoLink training and upon the signing of the WyoLink Membership Agreement the agency training schedule will be developed.

A train-the-trainer program was included as part of the contract with Motorola for the WyoLink system. One class was completed in February 2006 that provided training to eleven (11) master trainers, another class will be scheduled in the first quarter of 2008. The first training class attendees were State of Wyoming employees representing the Wyoming Highway Patrol, Wyoming Department of Transportation, Wyoming Game and Fish, State Parks and Wyoming Department of Health. The next class will consist of trainers from the Wyoming Law Enforcement Academy and the Wyoming Fire Academy.

The Wyoming Law Enforcement Academy (WLEA) and the Wyoming Fire Academy (WFA) were chosen because they presently have a cadre of instructors and a system for providing field training throughout the state. By leveraging the present system and instructors, Wyoming does not need to develop another system of instructors, thus reducing the cost of providing agency level training to all potential users of WyoLink and making sure the training meets the minimum requirements for Peace Officers Standard Training (POST).

A training program has been developed from reviewing what knowledge the end users will need for understanding trunked radio systems and operation, radio operation, radio fleetmap, WyoLink operating policies and procedures and interoperability between local state, tribal, non-government organization's and Federal agencies for all hazards. The program will include classroom and practical radio training to all public safety agency personnel. Two levels of training will be provided, depending on the agency request, a train-the-trainer program or end user training.

As counties and regions plan exercises, WyoLink usage, policies and procedures and interoperability will be incorporated into the exercises to verify and document

the training program. Since WyoLink is being designed to be a daily usage radio system, end users will develop familiarity with the system quickly.

Upon the completion of a Department of Homeland Security Communications Unit Leader (COML) training program, Wyoming will provide that training initially to at least two (2) people from each of the seven (7) regional response areas and Wyoming Office of Homeland Security communications personnel. This initial training will be reviewed for content and numbers of trained personnel to determine when and how subsequent training will be held. Currently, trained communications unit leaders are federal interagency wildland fire personnel.

13.2 Dispatch Center Connectivity

There are forty (40) dispatch centers located in Wyoming. Of these dispatch centers, thirty seven (37) are operated by Police Departments or County Sheriff Offices. One dispatch center is located at the University of Wyoming in Laramie and one dispatch center is operated by the Bureau of Indian Affairs on the Wind River Indian Reservation. The Wyoming Highway Patrol operates the only dispatch center that has statewide capabilities. Dispatch center connectivity to WyoLink is a key component of having a statewide trunking system operational, all users must have the ability to communicate with a dispatch center.

The Wyoming Legislature recognized the importance of the dispatch center connectivity by providing $6,450,000 in grant funds to be administered by the Public Safety Communications Commission (PSCC) and Wyoming Department of Transportation (WYDOT). At the June 13, 2006 PSCC meeting, the Commission reviewed the proposed Local Dispatch Center Grant package that included the grant application and grant agreement.

The application includes one page of contact information and jurisdiction, a table of requested funds, a description of the current dispatch equipment and a page on the description of how the requested funds would be used. The direction for the grant includes a date that the grants are to be filed, December 31, 2006. The draft grant agreement has been approved for content by the Attorney General's Office. Once a grant has been made, the completed grant agreement will have to be reviewed by the Attorney General's Office. The grant package includes a grant draft request for funds. The state will require that before funds are dispersed there will need to be a request made for the funds and include invoices for the funds. There are enough funds to provide every dispatch center with a grant of $150,000.

There was discussion on how the grant would be approved by the commission and/or one of the working groups. The funding has been approved through June 30, 2008 and the fund will need to be expended by that time. Some dispatch center may not need to full $150,000 that has been planned for each center and

there will need to be time allowed in the grant process to allow for a second round of grants for those funds that may not be granted during the first phase.

The Commission recommended that the grant package include language identifying all costs that a dispatch center may need and that the description of those funds would be used for any second round grants and not have the applicant submit a second application. The commission also recommended that the grants be reviewed by the WyoLink Project Manager for technical review. The PSCC Administration and Funding Working Group would make the grants and report to the full commission the grants that have been awarded.

Grant Applications were received from thirty seven (37) local dispatch centers for a total request of $11,733,747. The PSCC has awarded $5,472,496 in grants to the thirty seven (37) dispatch centers. Two (2) dispatch centers are not using dispatch consoles and are reviewing the use of control stations to provide the wireless connectivity to WyoLink. The grant applications received by the PSCC included the wire-line connectivity to WyoLink and redundant wireless connection using control stations. Wire-line connectivity includes the console and computer upgrades and the electronic interfaces for the wire-line (T-1) connections. The redundant wireless connectivity includes the control stations, combiners and antenna systems. The Wyoming Highway Patrol dispatch center had received prior budget approval to complete an upgrade of the dispatch consoles including moving to a new location and did not apply for grant funds.

The WYDOT/WyoLink budget includes funds for the leasing of T-1 telephone lines to connect the dispatch centers to the Zone Controllers. Upon the upgrade of the local dispatch centers for connectivity, the leased telephone lines will be connected. Four (4) of the dispatch centers have opted for wireless connectivity only.

The PSCC Administration and Funding Work Group will complete the second round dispatch center grant protocols in December 2007. Upon the review of those protocols at the December 2007 PSCC quarterly meeting, the remaining grant funds will be awarded.

13.3 Portable Radio Coverage Enhancement

Governor Freudenthal, through comments made to him about portable radio coverage, asked the Wyoming Department of Transportation (WYDOT) to include enhanced portable radio coverage in the WYDOT/WyoLink budget for the 2009-2010 biennium budget. A requirement of the budget request was to include cost sharing with the local agencies requesting or needing portable radio coverage enhancements.

Since this a scope change for the WyoLink project, WYDOT asked the Public Safety Communications Commission (PSCC) for a policy on providing enhanced portable radio coverage that meets the Governor's request for local participation. The PSCC has been presented concerns about the portable radio coverage at its quarterly meetings and had asked the WyoLink Operations Work Group to develop a policy statement on providing the enhanced coverage.

The PSCC WyoLink Operations Work Group at the June 6, 2007 meeting developed and adopted a "Coverage Enhancement Goal" to be presented to the PSCC for adoption. At the June 22, 2007, the PSCC adopted the "Coverage Enhancement Goal".

Coverage Enhancement Goal

"There is no local responder link in "WyoLink" until the goal of mobile and portable radio communications interoperability is achieved.

Therefore, the goal of WyoLink coverage enhancement is to achieve interoperable public safety communications comparable with existing portable radio coverage and in areas of critical concern, identified through testing and cooperative efforts with local public safety providers, determined after statewide deployment in an area. There is an expectation of local participation within the jurisdictional area of influence."

The key points of this goal include the testing of portable radio coverage after completion of the core WyoLink project in the areas that local jurisdictions request portable radio coverage. The local jurisdictions will identify areas of critical concern and participate in the development of additional radio sites determined by the testing.

WYDOT has submitted a budget request to the Governor for inclusion in the 2009-2010 biennium budget for the radio frequency equipment that will be required for additional radio sites. The Wyoming Legislature will meet in February 2008 to adopt the 2009-2010 biennium budget.

13.4 800 MHz Connectivity

The Motorola contract for WyoLink includes the cost associated with the upgrade of the SMARTNET 800 MHz radio systems for Cheyenne Fire and Rescue and Natrona County/Casper to ASTRO 25 IntelliSites. These IntelliSites will then be connected directly into the WyoLink Zone Controllers. The 800 MHz sites will be configured similarly as the VHF radio sites, but the QUANTAR IntelliSite Repeaters will be 800 MHz instead of VHF. This will allow seamless interoperability with the Cheyenne Fire and Natrona County/Casper 800 MHz users.

Cheyenne Fire and Rescue and Natrona County/Casper portable and mobile radios will need to be upgraded to operate on WyoLink upon the completion of the system upgrades. Due to the recent rebanding of the 800 MHz project in Wyoming, most of the 800 MHz portable and mobile radios are capable of being upgraded to be compatible with the WyoLink system. Those radios that are not compatible will need to be replaced.

Since Cheyenne Fire and Rescue and Natrona County/Casper have been operating their radio systems individually, changes need be made within the Zone Controllers to accommodate the agencies current trunking protocols and talkgroups. The Public Safety Communications Commission and WyoLink will work with the agencies to develop use agreements and protocols, that are agreeable to all parties, which allow for the local autonomy in the operations of the 800 MHz systems.

13.5 Mobile and Portable Radio Purchases

Since the inception of the WyoLink project in 2004, the Public Safety Communications Commission has been tracking the vendor sales of P-25 compliant radio equipment for Wyoming local agency and state agency purchases. As part of a Pre-Negotiated Pricing Agreement negotiated between the PSCC and vendors, the vendors are to report all compliant radio sales in Wyoming. Federal agency users are not included in the reporting.

As of December 31, 2006, 2286 portable radios, 2440 mobile radios, 160 control stations and 79 base stations and/or repeaters have been purchased. A total of $17,050,716 has been spent on these purchases. The Public Safety Mobile Communications plan estimated there would be 5000 portable radios and 6300 mobile radios used on WyoLink if all public safety agencies within Wyoming used the trunking system.

The purchasing and upgrading of end-user radio equipment will continue through the life cycle of WyoLink. It is expected that Wyoming agencies will continually need to purchase compliant radio purchases and local funding will need to be augmented with grant funds to expedite the purchases.

At the June 22, 2007 PSCC quarterly meeting, the PSCC decided to review the pre-negotiated pricing agreement. The State of Wyoming is in a unique opportunity to have the National Telecommunication and Information Administration (NTIA) Institute for Telecommunication Sciences (ITS) lab review the manufacturer's certification documentation and review field testing of radio equipment for use on WyoLink. The authority to judge WyoLink compatibility should reside with the WyoLink Support Manager. The WyoLink Support Manager may seek guidance from the PSCC WyoLink Operations Work Group

as needed and as an appeals review for any or all decisions. The PSCC Administrative Support will notify all of the listed vendors of the testing process and request that the information on their radios is forwarded to the WyoLink Support Manager and scheduling of field testing. Failure of the radio equipment to meet the WyoLink requirements could include removal from the pre-negotiated pricing list. The vendors will still have to certify the prices to be at or below the WSCA or GSA pricing structures. This review of vendor documentation and field testing has begun.

13.6 Frequency Acquisitions

Motorola was contracted to complete the frequency planning process for the WyoLink system. Five (5) sites had already been implemented and frequencies have been determined for these sites. Each of the sites contains VHF ASTRO 25 trunked channels and some sites also contain legacy conventional VHF sites. The conventional VHF sites are to be incorporated into the combining scheme.

A search was conducted of the Federal Communications Commission (FCC) Part 90, Part 80 and Part 22 frequency databases to determine available frequencies. The site list used consisted of fifty five (55) high level sites and twenty five (25) low level sites. Spectrum fingerprinting was completed for the high level radio sites. The frequencies will be licensed as 12.5 KHz channels for the ASTRO 25 system.

A frequency re-use study was performed and yielded the twenty nine (29) re-use sets were required in an ideal re-use scenario. Without a re-use plan, WyoLink would require 284 frequency pairs. Each group of frequencies was analyzed for intermodulation issues. The interaction of the different frequencies at each site and the potential for interference was studied. The frequencies were properly chosen to ensure that intermodulation does not result.

The final frequency plan is composed of five (5) trunked pairs per site using the part 90 Public Safety, Part 90 Industrial/Business and Part 22 frequency bands. Some sites were required to be able to expand beyond the five (5) trunked pairs; Casper Mountain, Pumpkin Buttes, Snow King and Rozet are all designed a seven (7) trunked pairs and Aspen Mountain has six (6) trunked pairs. The frequencies were allocated as follows: 150.775 MHz – 156.24 MHz for transmit frequencies and 157.45 MHz – 163.25 MHz for receive frequencies.

There are some risks still associated with the final frequency plan. Relocation of sites from the initial site list could affect the re-use plan and available frequency list. Use of frequencies other than Part 90 Public Safety frequencies, but precedence has been set for the use of both Part 22 and Part 90 Industrial/Business by Public Safety agencies for other statewide radio systems. Licensing of any frequencies used in the plan by other agencies will affect the

frequency plan, this risk has been minimized by weekly checking the FCC database.

The frequency plan was finalized in December 2006 and the FCC licensing process began. During the frequency coordination phase of the licensing, some frequencies were removed from the plan. Additional frequencies were added to the plan and sent through coordination. All of the frequency license applications have been submitted to the FCC. There are some licensing issues and waiver issues that remain and not all sites will have the number of frequencies required to reach full operating capacity.

The Public Safety Communications Commission and WyoLink have submitted a National Telecommunications and Information Administration (NTIA) frequency sharing request, through the Federal Partnership for Interoperable Communications (FPIC) and the Department of the Interior to fulfill the operating capacity frequency goal. With the potential use of WyoLink by the Federal Agencies and the amount of federal land ownership in Wyoming (47%), this was a logical request for frequency use. There are risks associated with this request.

Any remaining frequency plan gaps will require another review of FCC frequency pools, primarily Part 80 and Railroad frequencies in the Part 90 Industrial/Business pool. Both of these pools have significant coordination and licensing challenges. Another option would be to purchase radio frequencies from current FCC license holders. Extended negotiations and unknown costs are potential risks associated with the purchasing of frequencies.

13.7 Site Acquisitions

The largest landowner in Wyoming is the Federal Government, approximately 47% of the State. The Department of the Interior, Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA) and National Park Service (NPS) and the Department of Agriculture, United States Forest Service (USFS) lands are the primary Federal land agencies.

Building a statewide trunked radio system in Wyoming requires the leasing of federal lands for radio sites. Many challenges and requirements exist when leasing Federal lands. WyoLink is currently working with the Bridger/Teton National Forest on four (4) radio site leases and the BLM on two (2) radio site leases. These radio sites are part of the core 57 radio site plan for WyoLink.

Two (2) expansion radio sites, one in the Bridger/Teton National Forest and one in the Big Horn National Forest are currently being discussed and final locations have not been determined. Upon the determination of the exact location, the leasing process will begin.

As part of the portable radio coverage enhancement, additional radio sites will be required. The “Coverage Enhancement Goal” states an expectation of local participation and this participation includes the sharing of local radio sites and/or assistance with the development of new radio sites. Local public safety agencies know the landowners in their jurisdictions and are better prepared to work with those landowners in acquiring leases for radio sites that will enhance the local public safety radio system. WyoLink will work the local agencies on the site requirements and the development of the radio sites.

13.8 Adjacent State Interoperability

Wyoming is bounded on the north by Montana, on the east by South Dakota and Nebraska, on the south by Colorado and Utah and on the west by Utah, Idaho, and Montana. Each of these states are in varying stages of developing interoperable communication systems.

Montana is currently building a system of systems in the VHF band. Montana and Wyoming have met a couple of times to start the dialog on how to provide interstate interoperability. Both States are currently constructing their radio systems and the priority is to complete the statewide systems before developing interoperability across state boundaries. Wyoming and Montana have a verbal commitment to keep each other informed on their progress an to work toward interoperability in the future.

South Dakota is presently using a VHF trunked radio system and was involved in the planning process for the completion of the Wyoming Public Safety Mobile Communications Plan. There is a possibility that Wyoming and South Dakota may share radio sites in the future. Upon the completion of WyoLink and the proposed upgrade of the South Dakota Interagency Communication System, Wyoming will work with South Dakota to develop a strategy for interstate interoperability on the two trunked radio systems.

Colorado has developed and is using an 800 MHz statewide communication system. The Consolidated Communications Network of Colorado has radio sites in close proximity to Wyoming and could be used to develop a link with Wyoming. Wyoming has been sharing updates on their systems through the use of e-mail list serves and attendance at meetings. Wyoming is committed to working with Colorado on future interoperability projects.

Utah Communications Agency Network is presently operating an 800 MHz Radio site in Wyoming. This site is located within close proximity to a WyoLink radio site. Wyoming and Utah have had very brief communications between them on interstate interoperability. Wyoming is committed to working with Utah on developing future interoperable communications.

WyoLink representatives attended and presented information at the 2006 Nebraska Communications and Exercise Conference. During this conference a panel discussion was held to allow Nebraska's neighboring States the opportunity to explain their current interoperability projects and to develop a resource list. Wyoming will continue to monitor the Nebraska interoperability project and work to develop interoperability between the States.

Wyoming has had limited dialog with Idaho on their interoperability plan. Wyoming and Idaho will need to work toward an interstate interoperability plan and the Statewide Communication Interoperability Plans should help in developing interstate cooperation.

Upon the completion of the core WyoLink system, the Wyoming Public Safety Communications Commission will work with the adjacent states to develop a plan for interstate interoperability.

13.9 Strategic Technology Reserve

The State of Wyoming continues to support the Regional Emergency Response Teams (RERT's) in providing valuable support to communities, Weapons of Mass Destruction/Haz Mat capabilities, which do not exist in many counties, and in the event of a natural disaster or terrorist attack. They depend on the RERT's for support, by delivering and maintaining a cache of radios to enhance our Mobile Support Vehicles (MSV's), located centrally and within the capitol complex. Providing P-25 VHF trunking portable radios and chargers as the Strategic Technology Reserves (STR's) to the seven RERT's and two Mobile Support Vehicles provides communities with communication options during outages, special events, search and rescue efforts to include disasters and terrorist attacks.

These MSV's already have the capability to provide satellite uplink, phone switches Telex Vega dispatch consoles with P25 VHF conventional and trunked radios, 800 MHz trunked radios, UHF, amateur radio systems and aviation radios and include a mast antenna system. The Wyoming Office of Homeland Security can also provide a trailer mounted 106 foot portable tower system with an auxiliary 7 KW generator, equipment shelter with heating and air conditioning and two P-25 Daniels 35 watt portable repeaters with 100 watt amps and duplexers. The Wyoming Office of Homeland Security communication equipment is further described in Appendix 14.4

14 Appendix

14.1 Public Safety Communications Commission Statute

ARTICLE 11 - PUBLIC SAFETY COMMUNICATIONS COMMISSION

9-2-1101. Commission; created; definitions.

(a) The public safety communications commission is created.

(b) As used in W.S. 9-2-1101 through 9-2-1104:

(i) "Public safety agency" means any federal, state or political subdivision entity that provides emergency and public safety services, including state agencies employing peace officers enumerated in W.S. 6-1-104(a)(vi)(C) through (F) and approved for participation by the communications commission, fire management services, correctional services, emergency management, emergency and disaster relief services and if desired, county, municipal and federal law enforcement agencies;

(ii) "System" means the wireless communications network providing regional and statewide radio communications capabilities to public safety agencies.

9-2-1102. Commission; composition; appointment of members; removal; terms; officers; vacancies; meetings.

(a) The commission shall consist of seventeen (17) voting members to be appointed by the governor and who may be removed by the governor as provided in W.S. 9-1-202. The seventeen (17) members shall be appointed from each of the following associations and agencies from their membership:

(i) Wyoming police chiefs association;

(ii) Wyoming sheriffs association;

(iii) Division of criminal investigation, office of the attorney general;

(iv) Wyoming game and fish department;

(v) Wyoming department of transportation;

(vi) Wyoming livestock board;

(vii) Department of state parks and cultural resources;

(viii) Wyoming fire chiefs' association;

(ix) Wyoming state fire marshal;

(x) Wyoming office of homeland security;

(xi) The public at large;

(xii) An ambulance and emergency medical services organization;

(xiii) Municipal government or a municipal government association;

(xiv) County government or a county government association;

(xv) Wyoming department of health;

(xvi) Tribal government or a tribal government association; and

(xvii) Federal government or a federal government association.

(b) Repealed by Laws 1991, ch. 121, 2.

(c) The commission shall elect from its members a chairman, a vice-chairman and a secretary. Vacancies in these offices shall be filled by the commission from its membership. The commission shall meet at least once every three (3) months. Appointments by the governor shall be made within thirty (30) days of expiration of membership terms. Nominee lists shall be furnished within ten (10) days upon expiration of any membership term. Each member shall serve a three (3) year term. A vacancy on the commission shall be filled for the unexpired term by the governor.

9-2-1103. Commission; compensation of members.

Members of the commission shall receive mileage and per diem provided state employees.

9-2-1104. Commission; powers and duties; advisory capacity to promote system development; public meetings; clerical and administrative support.

(a) The commission shall:

(i) Work with the administrator of the information technology division of the department of administration and information and the department of transportation in an advisory capacity to promote the development, improvement and efficiency of public safety communications systems in the state;

(ii) Report in writing each year in October to the governor concerning any problems related to the installation, operation and maintenance of the system

and shall make any recommendations it deems appropriate as a part of the report;

(iii) Submit a plan for statewide system networking to the administrator of the information technology division for inclusion in the statewide telecommunications plan developed pursuant to W.S. 9-2-1026.1(a);

(iv) In cooperation with participating federal agencies, establish and assess user fees upon any federal law enforcement agency electing to use and participate in the system;

(v) Promulgate necessary rules and regulations governing system operation and participation and upon failure to comply with adopted rules and regulations, may suspend system use and participation by any participating and noncomplying public safety agency or private entity;

(vi) Determine the participation of public safety agencies and private entities in the wireless communications network.

(b) The commission may hold public meetings throughout the state and may take other appropriate measures to maintain close liaison with regional, county and municipal organizations and agencies involved in the system.

(c) Necessary clerical and administrative support for the commission shall be furnished in accordance with W.S. 9-2-1026.1(a)(xiii).

14.2 Public Safety Communications Commission

Steve DeCecco – Wyoming Game and Fish – Chairman Term Expires – 6/30/09 307-875-3223 – steve.dececco@wgf.state.wy.us Wyoming Game & Fish, 351 Astle, Green River, WY 82935
Executive Board, Administration & Funding, SALECS

William Westerfield – State Parks and Cultural Resources – Vice-Chairman Term Expires – 6/30/10 307-777-6318 – wweste@state.wy.us Barrett Building, 2301 Central Ave., Cheyenne, WY 82002
SALECS, Executive Committee, Administration and Funding

Jerry Kennedy – County Commissioners – Secretary Term Expires – 6/30/10 307-322-2345 – jkennedy@wyoming.com 402 Tunnel Road, Rock River, WY 82083
Executive Board, Administration & Funding, WyoLink Operations

Lanny Applegate – Wyoming Fire Marshal Term Expires – 6/30/08 307-777-6385 – lapple@state.wy.us Herschler Building – 1 West, 122 W. 25th. Cheyenne, WY 82002
Inter-Operability Executive Committee

Robert Dean – Wyoming Health Department Term Expires – 6/30/08 307-777-5309 – bdean@state.wy.us Dept of Health – EMS Office, Hathaway Building, 2300 Capitol Ave, Cheyenne, WY 82002
Inter-Operability Executive Committee

Danny Glick - Sheriff's Association Term Expires – 6/30/09 307-633-4718 – dglick@laramiecounty.com Laramie County Sheriff, 1910 Pioneer Ave., Cheyenne, WY 82001

Kebin Haller – DCI Term Expires – 6/30/08 307-777-7181 – kebin.haller@dci.wyo.gov DCI, 316 W. 22nd , Cheyenne, WY 82002
Inter-Operability Executive Committee

Mark Harshman – Wyoming Fire Chief's Association Term Expires – 6/30/09 307-235-8324 – mharshman@cityofcasperwy.com Casper Fire Dept., 200 N. David, Casper, WY 82601
WyoLink Operations, Inter-Operability Executive Committee

Billy Janes – Police Chief's Association Term Expires – 6/30/10
307-532-7001 – billy@communicomm.com Torrington Police Dept., 2042 East A, Torrington, WY 82240
Inter-Operability Executive Committee

Dave Johnson – Municipal Government Term Expires – 6/30/10
307-632-0398 – Johnson@wyomuni.org WAM, 315 West 27th Street, Cheyenne, WY 82001

Mark Joiner – Federal Agencies Term Expires – 6/30/09
307-332-8460 – mark_joiner@blm.gov Bureau of Land Management, P.O. Box 16, 1535 Main St., Lander, WY 82520
Spectrum

Kim Lee – Homeland Security Term Expires – 6/30/10
307-777-7540 – klee@state.wy.us Herschler Building, 1-West, 122 W 25th , Cheyenne. WY 82002
WyoLink Operations

Doug Noseep – Tribal Term Expires – 6/30/09 307-332-3112 – biacop@washakie.net BIA Police, P.O. Box 1086, Fort Washakie, WY 82514
Spectrum

Colonel Samuel Powell – Wyoming Department of Transportation
307-777-4302 – sam.powell@dot.state.wy.us Term Expires – 6/30/08 Wyoming Highway Patrol, 5300 Bishop Blvd., Cheyenne, WY 82009
WyoLink Operations

Jimmy Siler – Wyoming Livestock Board Term Expires – 6/30/09
307-777-6441 – jsiler@state.wy.us Wyoming Livestock Board, 2020 Carrey Ave – 4th floor, Cheyenne. WY 82002
SALECS

Lauri Wempen – Emergency Medical Services Term Expires – 6/30/10
307-857-3669 – lcwempen@wyoming.com Fremont County Ambulance, 1052 Petersdorf Drive, Riverton, WY 82501

Bob Wyatt – Public at Large Term Expires – 6/30/08 307-672-2056 – dibob@fiberpipe.net 410 S. Thurmond, Sheridan, WY 82801
WyoLink Operations

Earl Atwood – PSCC Executive Director
307-777-5600 – eatwoo@state.wy.us A & I – ITD, Emerson Building, 2001 Capitol Ave., Cheyenne, WY 82002
Executive Board

Staff
Robert Symons – PSCC Administrative Support
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Work Groups

Executive Committee
Steve DeCecco, William Westerfield, Jerry Kennedy, and Earl Atwood

Administration and Funding
Steve DeCecco – Chairman, William Westerfield, Jerry Kennedy, Dave Johnson – WAM, Joe Evans – County Commissioners Association and Kevin Hibbard - WyDOT

WyoLink Operations Work Group
Jerry Kennedy – Chairman, Sam Powell, Kim Lee, Mark Harshman, Bob Wyatt, Dan Perko – Forestry & WyAPCO, Pat Byrne – Laramie County Communications, Patty Bauer – WyDOT Dispatch, Jim Archerd – Homeland Security, and Martin McCoy – WyoLink Support Manager

Spectrum Working Group – State Interoperable Executive Committee
Mark Joiner – Chairman, Doug Noseep and Larry Sheridan – WyDOT Telecom

Inter-Operability Executive Committee
Billy Janes – Chairman, Mark Harshman, Kebin Haller, Lanny Applegate, Bob Dean, Craig Post – ComTech, Dale Pawling – Cheyenne Fire and Jim Archerd – Homeland Security, and Martin McCoy – WyoLink Support Manager

SALECS
William Westerfield – Chairman, Steve DeCecco, Jimmy Siler, Dick Bolin – WyDOT and Patty Bauer - WyDOT

14.3 Wyoming Public Safety Communications Commission Rules and Regulations

Chapter 1
GENERAL PROVISIONS

Section 1. - Authority

(a) These rules are written in accordance with the authority provided in Wyoming Statute §9-2-1104(a)(v) and pursuant to the requirements of the Wyoming Administrative Procedure Act, Wyoming Statute §16-3-101 et seq.

Section 2 - Purpose

(a) The purpose of the Wyoming Public Safety Communications Commission is:

(i) Promote the development, improvement and efficiency of public safety communications systems in the state.

(ii) Promulgate necessary rules and establish policies and procedures to govern the operation, participation, and user fees of the WyoLink system.

(iii) Determine the participation requirements of public safety agencies and private entities in the wireless communications network.

Section 3. - Definitions

(a) These rules shall be known as the “Wyoming Public Safety Radio Communications Rules.”

(b) “Administrator” means the State of Wyoming employee that is tasked with the operation and management of the WyoLink system.

(c) “Commission” means the Wyoming Public Safety Communications Commission.

(d) “Director” means the Wyoming Public Safety Communications Commission Executive Director.

(e) “WyoLink” means Wyoming’s Public Safety Radio Communications System.

Chapter 2

ADMINISTRATIVE PROCEDURES

Section 1 – **Policies and Procedures**

(a) The Commission shall establish polices and procedures to provide administrative guidance and control over the management and operation of WyoLink and other State of Wyoming owned statewide radio communications system(s) used by participating agencies.

Section 2 – **Participation Determination**

(a) Agencies shall be allowed to participate on WyoLink upon completion of an application form supplied by the Commission and agreeing to follow and comply with all policies and procedures of the Commission.

Section 3 – **Rules and Regulations of the Federal Communications Commission**

(a) Citation to applicable federal law or regulation:

47 CFR 90 establishes the rules and regulations for the Federal Communications Commission, Part 90 Private Land Mobile Radio Services. The provisions of these rules and regulations govern WyoLink.

(b) The Federal Communications Commission Rules and Regulations may be viewed and downloaded from the Government Printing Office (GPO) website: http://www.access.gpo.gov/nara/cfr/waisidx_05/47cfr90_05.html

Section 4 – **Rules and Regulations of the National Telecommunications and Information Administration**

Section 305(a) of the Communications Act of 1934 provides for the regulation of interstate and foreign commerce in communications by wire or radio. The provisions of these rules and regulations govern federal radio frequency participation in WyoLink.

(a) The National Telecommunications and Information Administration Manual of Regulations and Procedures For Federal Frequency Management may be viewed and downloaded from the National Telecommunications and Information Administration website: http://www.ntia.doc.gov/osmhome/redbook/redbook.html

Section 5 – **Fees**

(a) Pursuant to Wyoming Statute § 9-2-1104(a)(iv) the commission shall review the operational and maintenance requirements and expenditures to determine fees**,** if any, for the fiscal year starting on July 1 and ending on June 30 of the following year at the first meeting of the commission after March 1 of each year.

Chapter 3

APPEAL PROCEDURES

Section 1 – **Purpose**

(a) These rules are established to provide a fair and efficient method for the commission to hear appeals of a determination of suspension or revocation of a participating agency's operating privileges for the non-compliance of the policies and procedures governing WyoLink system operation and participation.

Section 2 – **Commencement of Action**

(a) After continued or repeated non-compliance of the policies and procedures governing WyoLink system operation and participation by a participating agency the Commission Executive Director shall issue a final determination canceling the agency's participation from the WyoLink system. The agency's participation in the WyoLink system shall become effective on the 31st day after the final determination is issued.

(b) Any affected agency may request an appeal hearing on the Director's final determination canceling the agency's participation from the WyoLink system. Such requests for an appeal hearing shall be filed in writing with the Director within thirty (30) days of issuance of the final determination. If a request for an appeal hearing of the Director's final determination is filed within thirty (30) days of issuance, the effect of the final determination shall be stayed while the matter is before the Commission.

(c) An appeal request must contain the following information and:

(i) Name and address of applicant;

(ii) Telephone contact number for applicant;

(iii) Name of attorney or person who will be representing applicant on the appeal before the Commission;

(iv) A brief description of the issues to be heard at the appeal hearing;

(v) Any relevant materials the applicant wishes to submit which will be presented at the appeal hearing.

(d) Five (5) copies, including supporting materials, of the appeal request must be submitted to the Director.

(e) Within ten (10) days of receiving request for an appeal hearing, the Director shall provide written notice of the request to all involved parties and set a date for an appeal hearing by the Commission within forty five (45) days.

(f) An appeal hearing request, along with the materials submitted with it, shall be presented to the Commission. The party requesting the appeal hearing may appear in person at the meeting and give oral testimony in support of their position regarding the appeal.

(g) The executive director shall present exhibits, testimony and/or evidence to the commission which explains the executive director's position on the issue or demonstrates the basis for the determination that has been appealed to the commission.

Section 3 – **Decision**

(a) The Commission, after a hearing on the matter, shall make a decision regarding the dispute within sixty (60) days and transmit an order to all parties involved.

(b) The action called for shall be implemented in accordance with the order.

(c) Copies of the order will be mailed to affected parties, the Commission Executive Director and the administrator of the WyoLink system.

14.4 Wyoming Office of Homeland Security Communication Equipment

Mobile Support Vehicle (MSV) #1

MSV #1 equipment

- Satellite uplink
- Satellite phone
- Cellular phone
- Phone switch
- Internet capable
- Facsimile, scanner, copier/printer
- Conference room with full communications
- Tower scene lights
- 20 KW onboard generator
- Telex Vega 5 Position Dispatch System with the following equipment
  - P-25 VHF conventional and trunk radio
  - P-25 800 MHz Trunk Radio
  - UHF Radio
  - Amateur Radio
  - Aviation
- Mast Antenna System

Mobile Support Vehicle (MSV) #2

- MSV #2 equipment
  Satellite uplink
- Satellite phone
- Cellular phone
- Phone switch
- Internet capable
- Facsimile, scanner, copier/printer
- Conference room with full communications
- Tower scene lights
- 8 KW Telex Vega 5 Position Dispatch System with the following equipment
  - P-25 VHF conventional and trunk radio
  - P-25 800 MHz Trunk Radio
  - UHF Radio
  - Amateur Radio
  - Aviation

Trailer Mounted Portable Tower System

Trailer mounted portable tower system

- 106’ Torque Arm Tower
- Diesel 7 KW generator with 40 gallon fuel tank
- Equipment shelter with heating/air conditioning
- Two (2) P-25 Daniels 35 watt portable repeaters with 100 watt amplifiers and duplexers

14.5 WyoLink Traceability Matrix

As of November 2007

Motorola Contract	Status	Comments
"The Motorola ASTRO 25 system offered is a Project 25 system and therefore must operate on narrowband channels (12.5 kHz). All of the equipment provided by Motorola for use on the system will operate narrowband."	Narrowband transmission is inherent in the Project-25 standards and has been fully demonstrated.	Demonstrated during testing – 5/2006
Refer to previous comment. It should be noted that Project-25 Phase-1 standards are a suite of technical standards and summary documents. While the standards committee has produced many documents, a number of technical standards are still in process. Of particular note are standards defining how radio consoles will interface to a Project-25 system and standards defining how major subsystems will interface with one another. The finalization of these standards will further enhance the range of products that may be seamlessly integrated into a Project-25 system and allow the creation of integrated systems utilizing components from different manufacturers. While the adoption of these standards would be a positive development, implementing these standards is not addressed within the current contract as the cost and the scope of deliverables is yet undefined.	Project 25 / phase 1 standards were demonstrated through interoperability testing with some manufacturers' subscriber equipment. The Department of Commerce ITS laboratory assisted with this testing during the initial WyoLink acquisition effort. We intend to review and test a broader range of equipment for compliance with the latest published P25 standards, and WyoLink compatibility, in 2007.	

Motorola Contract	Status	Comments
The RFP required an evaluation of the status of Project-25 phase-two standards. Project-25 Phase-2 standards are currently in development. No manufacturer produces equipment built to those as yet unpublished standards. Project-25 Phase-2 standards will incorporate a two-slot TDMA (Time Domain Multiple Access) transmission algorithm — translation: two messages will be transmitted in the space where today only one message is transmitted, by interleaving the data. Thus, system capacity could be doubled without increasing the radio frequency spectrum utilized. Implementation of Project-25 phase 2 standards is not addressed as a deliverable under the contract with Motorola. Future implementation of Project-25 phase 2 standards may occur as a system upgrade, the cost of which cannot be presently specified.	Project 25 / phase 2 standards are not applicable to the WyoLink project. The decision to upgrade to version 7.2 creates a migration pathway for future implementation.	Version 7.2 Upgrade Completed July 2007
High-speed data is not supported in the current system design. However, the infrastructure being installed is capable of supporting future integration of high-speed data should that feature be desired. A path for future implementation is established within the current project. The Motorola Astro 25 system supports integrated voice and data operations and will support a future implementation of high-speed data features through the development of parallel systems at either 700 MHz or 4.9 GHz.	High-speed data is not a deliverable within the WyoLink project. However, many public safety agencies require high speed data. It is unclear which technology will be predominant: e.g, recent FCC 700MHz ruling and various commercial ventures using different technologies. Will the market naturally give rural WY cost effective coverage? Will WY subsidize one or more corporations to cover otherwise underserved areas? Will WY build a government-owned service?	

Motorola Contract	Status	Comments
Backward compatibility, which supports combined analog and digital functionality, is a Project-25 mandatory feature that applies to subscriber equipment rather than the system infrastructure. No infrastructure feature is involved in meeting this functional requirement. All subscriber units proposed can be programmed with multiple modes including: Project 25 trunking, Project 25 conventional, analog conventional repeater channels, and/or simplex channels.	Fully demonstrated to subscriber equipment operation.	
NOTE: Site infrastructure issues referenced in the PSMC Plan are addressed within the WyDOT microwave systems redevelopment project and will be remedied apart from the WyoLink project contract with Motorola or the project budget.		
Procedures and agreements related to radio site acquisition and access are being addressed in cooperation with the WyDOT Right-Of-Way office, which has technical expertise in these matters.	To expedite the project, efforts are underway to streamline the site acquisition process as it relates to USFS sites.	Eight Sites in leasing negotiations 11/2007
Generators are included in the site upgrades referenced above. The functionality of generators will be insured through automatic periodic testing and verified either through the monitoring system of the microwave or the Motorola supplied Moscad system.	Some generator upgrade work has been delegated to Motorola through change-order.	Completed at all sites that are constructed as of 11/2007
Issues of fuel capacity are addressed within the site upgrades referenced above.	Fuel capacity issues are addressed in new sites but no changes were made to existing site capacities.	Completed at all sites that are constructed as of 11/2007
Uninterruptible power will be provided in two ways, each in excess of the requirement in the PSMC plan: (1) The WyoLink master site will be equipped with a UPS system. Actual runtime is yet to be calculated and will vary based on system loading, but is predicted to be well beyond the 15 minutes called for in Appendix A (2). (2) Each WyoLink radio site will be equipped with a DC power supply system capable of	Accomplished within WyoLink site development work. Radio site equipment is supported by DC power systems with battery backup. Microwave radio systems are supported by a similar DC power arrangement.	Completed at all sites that are constructed as of 11/2007

Motorola Contract	Status	Comments
supporting the site for a minimum of 4hours in the absence of commercial or generator power. NOTE: The microwave system is also equipped with a DC power plant; that power plant is designed to provide a minimum of 96 hours in the absence of commercial power or generator. ALSO: The site emergency generators are automatically tested each week. The failure of these weekly tests will generate an alarm and should initiate a repair effort prior to a commercial power failure. This constitutes an extra measure of power system redundancy.		
While all towers will be evaluated and or upgraded as a part of the microwave systems redevelopment project, tower-loading criteria will be re-examined and documented in the course of the Motorola Detailed Design Review process for each phase of the implementation project. This additional tower loading review is intended to document that the addition of antennas will not result in structural failure, and is likewise a liability mitigation issue.	The necessity of upgrading towers and completing structure analysis of radio towers has been identified as a critical project issue. Completion of tower upgrade and structural analysis procedures is currently delaying Phase-2 implementation.	Completed at all sites that are constructed as of 11/2007
Site grounding will be evaluated and upgraded in the course of the microwave systems redevelopment project. Furthermore, grounding and bonding will be evaluated in the course of the Detail Designed Review process, specifically the Motorola R56 site audit process, which occurs during the initial steps of the Detail Design Review process for each project phase. Additionally, grounding and bonding issues will be re-inspected in the course of final site installation acceptance.	Site grounding upgrades are being accomplished in the course of WyoLink implementation.	Completed at all sites that are constructed as of 11/2007
Evaluation and upgrade of equipment shelters will be conducted within the course of the microwave system redevelopment project. The actual layout of equipment in the site shelter will be addressed within the Motorola Detailed Design Review process for each phase of the implementation project.	The physical volume of WyoLink radio and RF combining equipment necessitates building upgrades. Second buildings have been added to some sites. In other cases existing buildings have been	Completed at all sites that are constructed as of 11/2007

Motorola Contract	Status	Comments
	replaced with larger units.	
Building alarms and other site monitoring features will be upgraded in the course of the microwave system redevelopment project. All monitoring will be conducted through the microwave system monitor.	Building alarms are accomplished through the microwave monitoring system	Completed at all sites that are constructed as of 11/2007
In general, the remoteness of many of the radio sites decreases the likelihood of vandalism or other intentional damage. Upgrades to site security will be addressed as needed by WyDOT Telecommunications.	Not a WyoLink deliverable. Site alarms are accomplished through the microwave system upgrade.	
Temperature monitoring and HVAC equipment is addressed within the microwave system redevelopment project. Environmental alarms will be communicated through the microwave system monitor.	Generator upgrades are of sufficient capacity that HVAC equipment will be supported during any power loss.	Completed at all sites that are constructed as of 11/2007
The reliability of the supporting backbone network is addressed within the microwave system redevelopment project. Enhanced redundancy through closing microwave loops will be considered based upon WyDOT funding availability and technical feasibility. Furthermore, the system monitoring features of the Motorola Astro 25 system constitute a second level of reliability in that the monitoring system will recognize loss of communication with any radio site and a trouble call will be initiated.	Though funded by the Legislature, microwave communications network loop closure and other redundancy upgrades have yet to be implemented.	

Motorola Contract	Status	Comments
<u>The requirement specified a duplicate master site; this requirement was deleted based on cost and technical issues.</u> The installation of multiple master control sites was considered in the course of the proposal evaluation process. Such configuration has not been installed in any other large-scale system, represents a significant cost (roughly $3 million), and presents technical difficulties in maintaining the alignment of parallel operational databases. Based on projected expansion, the WyoLink system is likely to grow to the point where a second zone controller will be required. When that level of growth is reached, it would be prudent to locate the second zone controller off-site, in a location such as Casper, rather than co-locating it with the first zone controller in Cheyenne. This separation would mitigate the risk of having the entire network control in a single site; loss of one zone controller would not impact the other half of the state. Also, the split location would reduce microwave bandwidth requirements by terminating half of the circuits at the second location. Network control reliability is addressed in two ways, which the Technical Evaluation Team deemed sufficient one compared to the cost of installing a second full master site: (1) Redundancy — Critical devices within the master control site, as well as each radio sites, are installed with redundant parallel devices. (2) Disaster Recovery — Motorola provides disaster recovery response services. Should a catastrophic event result in the whole or partial destruction of the master control site Motorola will have replacement components on site and operating within 72 hours. Motorola demonstrated its ability to provide this level of service to following the events of September 11, 2001. Disaster Recovery cost is not prepaid and would be handled as an insurance issue following a catastrophic event.	While not identical to the requirement for a duplicate master site, installation of a second zone controller distributes network control and therefore enhances network control reliability.	Second Zone Controller completed and tested in 10/2007

Motorola Contract	Status	Comments
The Motorola Astro 25 trunked radio system is subject to periodic software and firmware upgrades. This is identical to any other high-end computer system. Periodic upgrades address software patches, security issues, and feature enhancements. The WyoLink system will be installed using software version 6.5. The final release of software version 6 will occur sometime after the current WyoLink system development is completed. The contract with Motorola includes the pre-purchase of the final version 6 software release, referred to as version 6.x. Motorola offers a number of options to address periodic software upgrades. These options, and other ongoing system maintenance issues, will be resolved in the future as WyoLink development is completed and system support moves through the warranty period.	The upgrade to version 7.2 provides for an undisturbed implementation of future software enhancements.	Version 7.2 Upgrade Completed July 2007
NOTE: Data communications features described in Appendix A (2) §2.0 FUNCTIONAL are subscriber unit dependent. Implementation of these features is not a function of the core system infrastructure. The Astro 25 system supports the implementation of these features in that the system is a data transport channel for the feature, subject to the application conforming to P25 packet data standards.		
"The Data services of the ASTRO 25 IV&D system runs at a throughput rate of 9.6 kbps and address the needs of the traditional, private mobile data market." The actual implementation of text messaging will depend upon a user agencies selection of an appropriate Mobile Data Terminal application. The WyoLink project has purchased the Motorola PMDC mobile data application and server to demonstrate these features and as an avenue of providing these features to agencies with limited resources. (see § 2.1.3 "Data Queries")	No call for text messaging.	

Motorola Contract	Status	Comments
Not supported. Low-speed data will be limited to 9.6 kbps. Voicemail applications would require a high-speed data connection, utilizing a voice over IP protocol. Were high speed data capabilities implemented in the future, this feature would still be questionable as it represents a significant load on system capacity.	Not supported.	
Database queries will be available through an appropriate Mobile Data Terminal application. The WyoLink project has purchased the Motorola PMDC mobile data application and server to demonstrate these features and as an avenue to provide these features to agencies with limited resources. Each WyoLink user agency will have the option of either (1) Selecting an MDT application from the supplier of the agency's CAD system, or (2) Integrating the Motorola PMDC application to the agency's CAD system, or (3) Utilizing the Motorola PMDC application as a stand-alone system where no CAD interface is required or available.	Demonstrated through implementation of PMDC mobile data application. Detailed functionality has been verified through completion of acceptance test procedures.	Completed May 2006
Several options for casual-use are available, but none have been purchased through the contract with Motorola. Actual implementation of casual-use applications is highly dependent on subscriber unit configurations. A simple Casual-use application, such as providing a single contact closure to activate a single device, may be implemented utilizing the "Selective Calling" feature available in WyoLink compatible subscriber equipment. More advanced Casual-use applications may be developed utilizing the integrated voice and data features. Specific applications will be addressed on a case-by-case basis, as an optional purchase, utilizing the terms and cost structures established by the contract with Motorola.	WYDOT funded a demonstration application to connect a Road Weather Information Sensor with a central server, using the IV&D channel. We anticipate completion in 2008.	

Motorola Contract	Status	Comments
Emergency buttons are available on WyoLink compatible subscriber units. The Motorola Astro 25 trunking system handles traffic based on multiple priority levels; the activation of an emergency button places that units traffic at the top of the priorities. **NOTE**: The use of the emergency button feature requires a radio console system capable of decoding the signal and displaying individual unit identification.	Emergency button operation has been confirmed through the Pilot Phase functional acceptance test plan.	Completed May 2006
Requirement for paging is deleted in Appendix A (2). From a technical perspective, paging is a feature inherently unsupported by trunked radio systems. This has to do with the way a trunked radio system routes calls. Likewise, pagers are not manufactured that will operate with Project-25 digital signaling. The RFP requirement was to provide a means of establishing a connection between a talk-group on the WyoLink system and the existing tone and voice pager systems used by volunteer firefighters. It has been determined that the most effective means for providing this interface is through a dispatch radio console patch, rather than connecting from the WyoLink system master site to the paging radio system.	Requirement deleted.	
High-speed data is not supported in the current system design, but could be integrated at a later date. Motorola Astro 25 systems support integrated voice and data operations. Potential exists for future support of high-speed data features through the development of parallel systems at either 700 MHz or 4.9 GHz.	Video not supported.	
High-speed data is not supported in the current system design, and therefore this feature is not supported. Intranet and/or Internet access could be supported were high-speed data technology implemented in the future. The Motorola Astro 25 system is capable of supporting this future migration. However, even with a high-speed data implementation strict protocols	Internet not supported.	

Motorola Contract	Status	Comments
would be required for this feature to minimize the impact on system loading.		
The Motorola Astro 25 system supports the use of encryption as a subscriber option. The system is encryption transparent. Data packets are routed through the system based on the content of the packet header rather than the content of the packet. This provides complete end-to-end encryption as required by Project-25 standards. The actual use of encryption is contingent upon the installation of appropriate options in subscriber radio equipment. Motorola Project-25 subscriber equipment will support DES and AES encryption standards, and may support both standards in one unit. EF Johnson's Project-25 subscriber equipment supports either encryption standard, but not both within the same radio. How other manufacturers will implement encryption is to be seen. Several of the subscriber units purchased for the Pilot Phase demonstration will be equipped with encryption, for demonstration purposes.	Encryption functionality was demonstrated in the Pilot Phase functional acceptance test plan.	Completed May 2006
Individual user identification (User ID) is an inherent feature of any trunking system and is fully supported within the Motorola Astro 25 system. In a trunking system, user identification is essential as part of traffic routing protocols. **NOTE**: While all subscriber equipment will transmit unit identification, only system users whose subscriber equipment (radio console, portable radio, or mobile radio) is equipped with a display will be able to view the unit identification information. Most of the subscriber units purchased for demonstration use are equipped with display options.	User ID functionality has been demonstrated to the Pilot Phase functional acceptance test plan.	Completed May 2006
Automatic Vehicle Location (AVL) is supported by the Motorola Astro 25 infrastructure in the same manner as other low speed data transmission. Actual implementation of AVL is contingent	AVL functionality has been demonstrated to the Pilot Phase Automatic Vehicle Location functional test plan. No subscriber agencies are using the licenses at this	Completed May 2006

Motorola Contract	Status	Comments
upon the user agency implementing appropriate hardware for the subscriber equipment and appropriate display systems at the dispatch center. The contract with Motorola provides for the installation of an AVL server and display, and provides up to 50 subscriber units for demonstration purposes.	time.	
The use of card reader devices is supported as a subscriber unit option that will interface to a mobile data terminal, which itself would be interfaced to a data port on a mobile radio. No units were purchased under the contract with Motorola.	Not demonstrated as no user has requested or funded a demonstration application.	
The use of mobile printers is supported as a subscriber unit option that will interface to a mobile data terminal. No units were purchased under the contract with Motorola.	Not demonstrated as no user has requested or funded a demonstration application.	
"The Motorola Gold Elite Gateway (MGEG) and Ambassador Electronics Bank (AEB) provide the interface for consoles into the WyoLink system. The AEB and MGEG interface at the Master Site. … *"The Ambassador Electronics Bank (AEB) is a large capacity TDM audio-processing switch. In an ASTRO25 system, the AEB provides an interface for audio and call control to the wide-area trunking system. The AEB allows multiple Central Electronics Banks (CEB's), associated with individual dispatch centers, to interface into the ASTRO 25 system, allowing for expanded dispatch capabilities."* The MGEG and AEB have been included as an optional purchase under the contract with Motorola. A full set of card cages to support subscriber console interface cards has been included in the Master Site design.	Dispatch console interface functionality and has been demonstrated within the Pilot Phase functional acceptance test plan.	Completed May 2006
As the PSMC Plan and the WyoLink RFP documents specify the 57 radio sites to be developed, Motorola cannot be required to achieve a specified geographic coverage area. Should the resulting system produce	Motorola has conducted coverage drive testing of the pilot phase sites. Drive testing validated the coverage prediction	

Motorola Contract	Status	Comments
mobile radio coverage less than the 95% specified, the selection and funding of additional radio sites will be the responsibility of the WyoLink project as directed by the Public Safety Communications Commission. Motorola's evaluation of the coverage predictions contained within their technical proposal, based on initial engineering, indicates that the 95% target will be achieved for areas with vehicle accessibility, but less when inaccessible areas are included in the ratio. A special contingency has been included in the approved project budget for the installation of five additional sites to address coverage requirements. The use of that special contingency will be determined in consultation with the PSCC. Every effort was made in the course of the Detailed Design Review process to maximize coverage through careful site RF design.	modeling at a rate in excess of 95%. Coverage modeling indicates that the 57 sites originally planned for WyoLink contain both redundancy, with sites that do not add to the overall coverage, and deficiencies, where additional sites are needed. The PSCC WyoLink Operations Workgroup is responsible to review site adjustments. Redundant sites were dropped from the implementation list as a cost saving; additional sites were added to the list to address deficiencies. Development of these additional sites will extend beyond the 2007 WyoLink core implementation.	
The WyoLink system, with the selected 57 sites, will support a portable radio use in limited areas. Motorola has provided prediction coverage maps for portable radio use within their proposal. The use of voting receivers, as suggested in the PSMC plan, wasn't possible for WyoLink trunking, as a given location would need to be served by voting receivers matched with all possible control and voice channel transmitters that could possibly serve that location. Alternative approaches to enhancing portable radio coverage are provided as options within the Motorola proposal.	Portable radio coverage improvements were a contentious addressed by the PSCC. Portable Radio Coverage Enhancement Policy established 6/22/07: There is no local responder link in "WyoLink" until the goal of mobile and portable radio communications interoperability is achieved. Therefore, the goal of WyoLink coverage enhancement is to achieve interoperable public safety communications comparable with existing portable radio coverage and in areas of critical concern, identified through testing and cooperative efforts with local public safety providers, determined after statewide deployment in an area. There is an expectation of local participation within the jurisdictional area of influence. The project budget contains a contingency of five additional sites to address enhancements of portable radio coverage. Further funding is needed.	

Motorola Contract	Status	Comments
Not Supported. At such time as this requirement is mandated, the Motorola Astro 25 system may be expanded through the addition of sufficient radio sites to achieve statewide portable radio coverage. The addition of sufficient radio sites to provide statewide portable coverage would mandate dividing the WyoLink system into two zones, as the limitation of sites per zone would be a factor. The necessary development of a second zone-controller would add to the implementation cost, beyond the cost of the additional radio sites.	Refer to previous comment.	Second Zone Controller installed and tested – 10/2007
Options for enhancing in-building portable radio coverage were included in the Motorola proposal. The options vary in terms of cost, capacity, and coverage performance. Each is appropriate for a specific functional requirement and must be selected on a case-by-case basis. The addition of a single "low-level" repeater site was added to the contract with Motorola in the course of negotiations. The installation of this site is intended to demonstrate the functionality of enhanced portable radio coverage to serve the area of state office buildings and the State Capitol. However, unique challenges have arisen in selecting a suitable location for the radio site. The decision has been made to postpone the installation pending a coverage evaluation based on the VHF-57 sites serving the Cheyenne area and a clearer definition of the in-building coverage expectations. Based on the coverage results and the functional requirements, appropriate solutions will be selected and demonstrated. (Refer to previous two comments regarding portable radio coverage.)	Refer to previous comment.	
The Motorola Astro 25 system will support statewide roaming, which is inherent in trunked radio systems. The system does so by registering users and the talk-group they have selected to the repeater site appropriate for their geographic location, and then routing talk-group traffic to multiple repeater sites as	Multi-site roaming has been fully demonstrated within the Pilot Phase functional acceptance test plan.	Completed May 2006

Motorola Contract	Status	Comments
needed to set up a requested call. The extent to which a given talk group will roam is selectable within the system administration database.		
The ability of a WyoLink user to communicate as needed with any other WyoLink user is inherent in the trunking system structure, particularly the ability to provide statewide roaming. The range of options available in configuring talk-groups provides sufficient flexibility to conform the radio system to the Standard Operating Procedures of any user group. The extent of radio system flexibility will add to the necessity of careful operational planning on the part of user groups. This will bring about a change for user groups as they transition from an environment in which the structural limitations of the radio system were a determining factor in operational procedures to an environment in which the requirements of the operational procedures shaped the structure of the radio system.	The PSCC has developed a strategy for Multi-Agency Talk-groups, with statewide, regional, and county level implementation. These MAT channels will be tested during upcoming exercises.	
Local interoperability is supported through the creation of shared talk-groups. Shared, or mutual aid, talk-groups may be configured to fit the operational requirements of user agencies. In some circumstances using a console system to patch conventional channels to trunked talk-groups may be appropriate. A special circumstance exists in relation to the 800-MHz trunked radio systems in use by the City of Casper and the Cheyenne Fire Department, based on agreements reached during the PSMC planning process. In addressing the plan requirements for "seamless interoperability" between WyoLink and 800-MHz system users, the contract with Motorola provides that the two 800-MHz radio systems will be upgraded to Project-25 standards and connected directly to the WyoLink system controller. Thus, within the operating radius of the 800-MHz systems, users of either 800-MHz or of VHF subscriber equipment will enjoy the same features,	The development of countywide CAT and regional MAT channels satisfies this requirement.	

Motorola Contract	Status	Comments
functions, and talk-groups. Two caveats must be emphasized regarding the interface of 800 MHz systems to WyoLink: (1) The contract and project budget provide for the upgrade of the two 800-MHz radio systems but do not provide for the upgrade of subscriber units. The current appraisal is that upgrade of units belonging to the City of Casper will involve a firmware "flash" upgrade. However, the upgrade of units belonging to the Cheyenne Fire Department will necessitate replacement of all affected subscriber units, as those units are not capable of being upgraded to Project-25. The upgrade of the 800 MHz radio systems cannot occur until the affected agencies are ready to upgrade the subscriber units. (2) While 800-MHz subscriber units will enjoy full interoperability within the operational area of their host sites, those units will only provide simplex unit-to-unit communications to other 800-MHz users when operating outside the operational area of the two 800-MHz radio sites that will be incorporated into the WyoLink system. The use of mobile, cross-band, repeaters, as a subscriber unit option, would address interoperability requirements when operating beyond the range of the 800 MHz radio systems.		
The creation of regional interoperability talk-groups has been recommended, and will be configured according to the requirements of the PSCC Interoperability Workgroup and the Wyoming Office of Homeland Security.	Implementation of regional MAT channels satisfies this requirement.	
The inclusion of talk-groups in a user radio for communication with state agencies (or any agency for that matter) will be subject to the concurrence of the state agency and any terms or conditions of an agreement between the user's agency and the state agency. (See also "Exclusivity" §4.1.2)	Implementation of statewide MAT channels satisfies this requirement.	
Interoperability with Federal agencies may occur along two separate avenues. First, where a federal agency is utilizing a compatible Project-25 trunking system, user	Establishment of partnerships with Federal agencies is in process and is under the direction of the	

Motorola Contract	Status	Comments
radios of the federal agency or of the agency requiring communications with the federal agency may be programmed to operate on either agencies talk-groups. For example, FE Warren Air Force Base has recently installed a Motorola, VHF, Project-25, trunked radio system that is identical to the system to be installed for WyoLink. Therefore, FE Warren radios may be programmed with talk-groups that will function on the WyoLink system and thereby allow direct communication between FE Warren units and WyoLink users. Second, where a federal agency is not utilizing a compatible Project-25 trunking radio system, interoperable communications may occur through the use of conventional analog channels. Conventional analog channels will be connected to various radio consoles in the WyoLink system, and through those consoles may be patched to any talk group in the WyoLink system. The subscriber radios of a Federal agency may be programmed to operate on the conventional channels tied to the WyoLink system. Likewise, subscriber radios of WyoLink users may be programmed with the conventional analog channels of the federal agency with which interoperable communications is required.	PSCC. FBI and ATF units are presently conducting trial use with WyoLink channels programmed in their radios.	
The ability to disallow access to an agency's talk-groups is a function of the WyoLink system administration controls. The programming of subscriber radios is controlled through the use of a system administration key; a subscriber radio may not be programmed without the system key. In managing the programming of subscriber radios, talk-groups belonging to another agency will only be programmed into a radio with the permission of the owner agency. Furthermore, scanners exist that will monitor communications on a Project-25 digital trunking system such as WyoLink. Therefore, stringent exclusivity requirements will mandate the use of encryption.	Exclusive talkgroup functionality has been demonstrated within the Pilot Phase functional acceptance test plan.	Completed May 2006

Motorola Contract	Status	Comments
Interoperable communications with neighboring states may occur in one of three ways: (1) using conventional analog or digital interoperability channels, which will allow unlimited travel radius; (2) using system-to-system interconnect of specified talk-groups, which will only function in geographic areas where both systems provide overlapping coverage; and (3) using interoperability talk-groups, which will only function where the neighboring state is utilizing compatible VHF, Project-25, trunking subscriber equipment. While the Motorola Astro 25 system provides configuration options, the contract with Motorola does not provide for the establishment of state-to-state interoperable communications as described above. Implementation of state-to-state interoperability is contingent upon operational plans and the technical decisions unique to each situation. These details were unavailable during procurement and contract negotiations.	State-to-State interoperability has not yet been demonstrated. Strategies have been discussed with neighboring states but as yet no implementation has been planned.	
Distinctions between state and local agencies / networks are transparent within the WyoLink system. There will be no difference between the interoperability features available to state agencies and those available to local agencies.	There is no distinction between state and local functionality of WyoLink, other than portable coverage expectations.	

Motorola Contract	Status	Comments
In tracing the PSMC plan requirements, a discontinuity of terms is found between the usage of "Additional Channels" in Appendix-A (2) and in Appendix-S. In Appendix-A (2) the term refers to both the number of communications channels (talk-groups) and the number of repeater units at each radio site. In Appendix-S the term is used only in reference to the number of repeaters at each radio site. Therefore, the following explanation is offered for clarity: The Motorola Astro 25 trunked radio system is capable of supporting sufficient talk-groups to address all operational requirements defined in the PSMC Plan. The number of talk-groups in a radio system is entirely independent of the number of repeaters at a given radio site. The number of repeaters needed at a given radio site is directly proportional to the volume of radio traffic passing through that radio site. Where the number of repeaters is insufficient for the volume of radio traffic, users will experience "busy" signals when attempting to place a call during periods of peak traffic. The terms of the RFP and the contract with Motorola provided that all WyoLink's radio sites will have a minimum of five repeaters — one control-channel and four talk-channels. Furthermore, 10%, or six radio sites, will be configured with seven repeaters — one control-channel and six talk-channels. The system administration features of the Motorola Astro 25 trunked radio system provide resources to monitor the volume of radio traffic for each radio site. As user agencies migrate to WyoLink, the volume of radio traffic will increase. Where a pattern of “busy” signals is noted at a given radio site the installation of additional repeater units at that site will be required. The installation of additional repeaters is not addressed within the current contract with Motorola or the current project budget.	The flexibility of talkgroup management has been demonstrated through the Pilot Phase functional acceptance test plan.	Completed May 2006
Channel efficiency is an inherent benefit of any trunked radio system. As discussed in the previous comment, the number of channels (frequencies) required at a given radio site is a function of the volume of radio	The functionality and flexibility of trunked radio operation has been fully demonstrated in the Pilot Phase functional acceptance	Completed May 2006

Motorola Contract	Status	Comments
traffic rather than of the number of communications channels (talk-groups). In a conventional radio system, to add another communications channel requires the addition of another radio frequency and another repeater unit with associated hardware. In a trunked radio system, to add another communications only requires the programming of another talk group into the system controller and the subscriber units. **NOTE:** A further benefit exists in the area of reliability. In a conventional system, the loss of a given repeater unit results in the loss of the associated communications channel. In a trunked radio system, the loss of a given repeater unit results in the loss of system capacity but not the loss of the communications channel (talk group). The only consequence experienced by users would be a possible increase in the likelihood of a "busy" signal when attempting to place a call. With a trunked radio system, the control system will identify the loss of a repeater and automatically notify maintenance staff.	test plan.	
The requirements of Appendix-A (2) relate to the replacement of obsolete equipment in systems that must remain in service while WyoLink is being developed and prior to an agency's operations migrate to WyoLink. This Appendix-A (2) subsection recommends that replacement of obsolete equipment that is still in service be postponed pending migration to WyoLink. This is a prudent recommendation, subject to the conditions of the next recommendation.	In the course of WyoLink site development, base stations supporting existing statewide conventional channels are being removed or replaced	Currently in progress – Complete in 2008

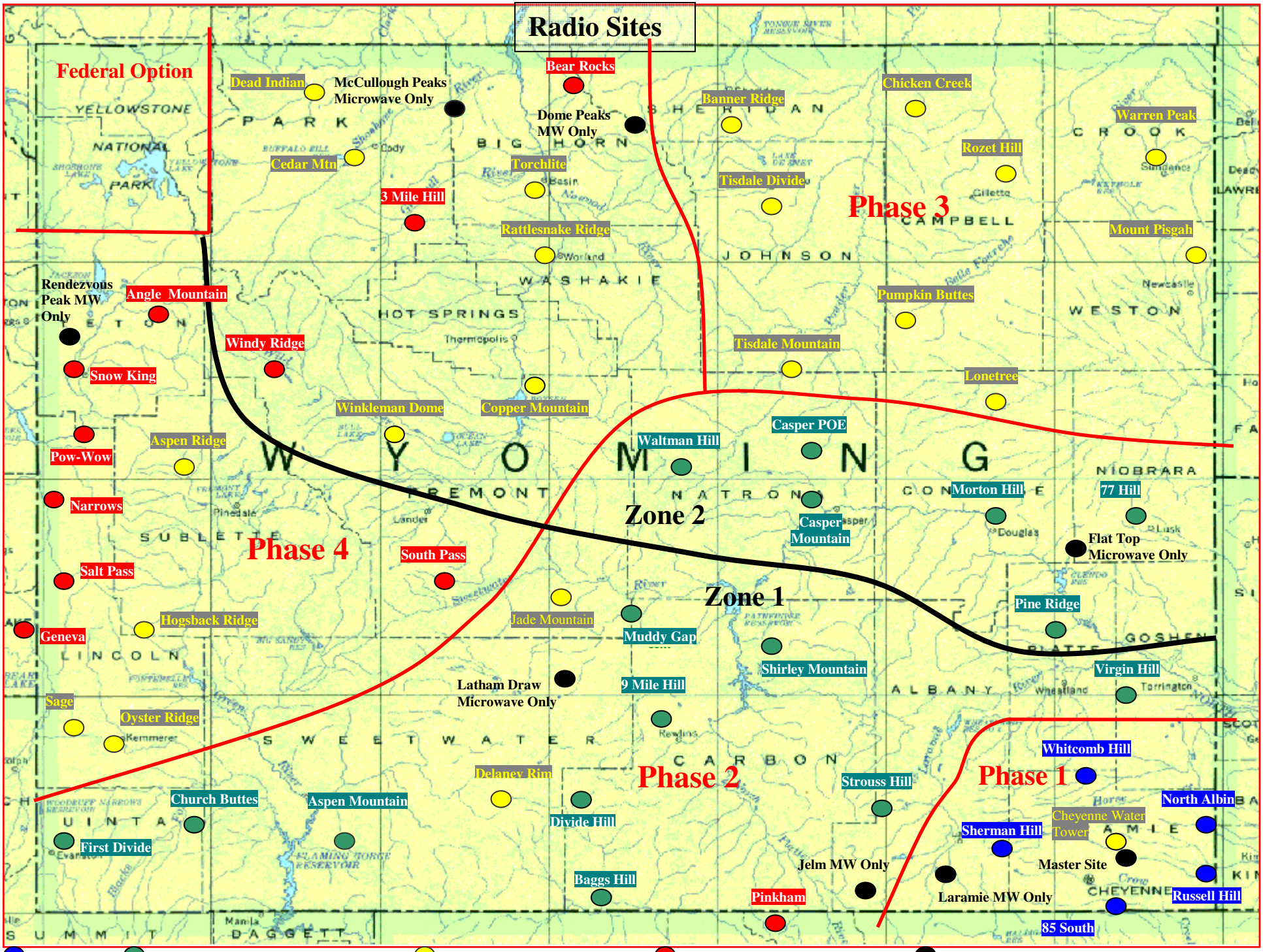
Motorola Contract	Status	Comments
This Appendix-A (2) subsection recommends that where obsolete equipment must be replaced the replacement should be accomplished with equipment that will ensure future compatibility with WyoLink. Through formal and informal communications, the WyoLink Project Team has recommended to all Wyoming public safety agencies that where obsolescence mandates the replacement of existing radio equipment or the installation of new equipment is required to address critical operational requirements, said equipment should be purchased to be compatible with future integration into the WyoLink system. The contract with Motorola includes provisions whereby other agencies may procure compatible radio system infrastructure under identical terms and costs as offered to the overall WyoLink system procurement.	Where base stations supporting statewide conventional channels are being replaced, the replacement base stations are compatible with the trunking base stations and could be upgraded in to trunking operation if desired in the future.	Currently in progress – Complete in 2008

14.6 Maps and Charts

14.6.1 WyoLink Current Status – September 2007

14.6.2 WyoLink Timeline Chart

14.6.3 Wyoming Regional Response Regions



In Service

Site complete. Waiting for frequencies.

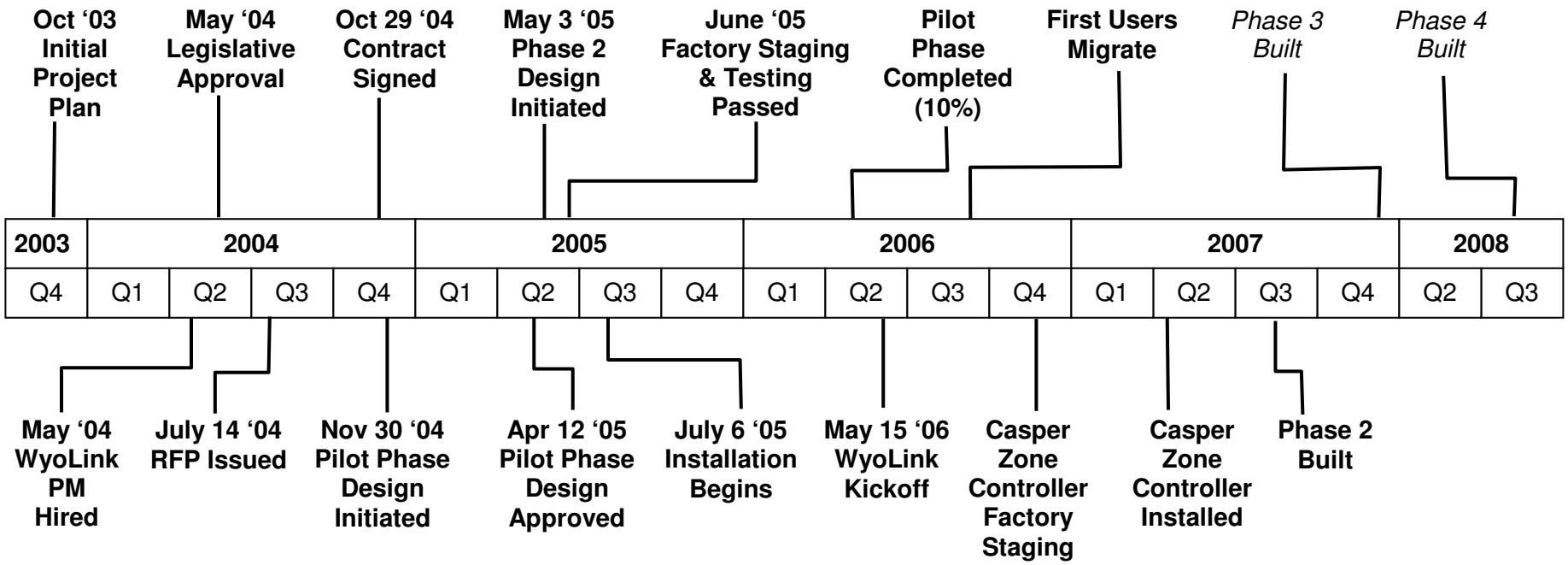
Projected Complete in 2007

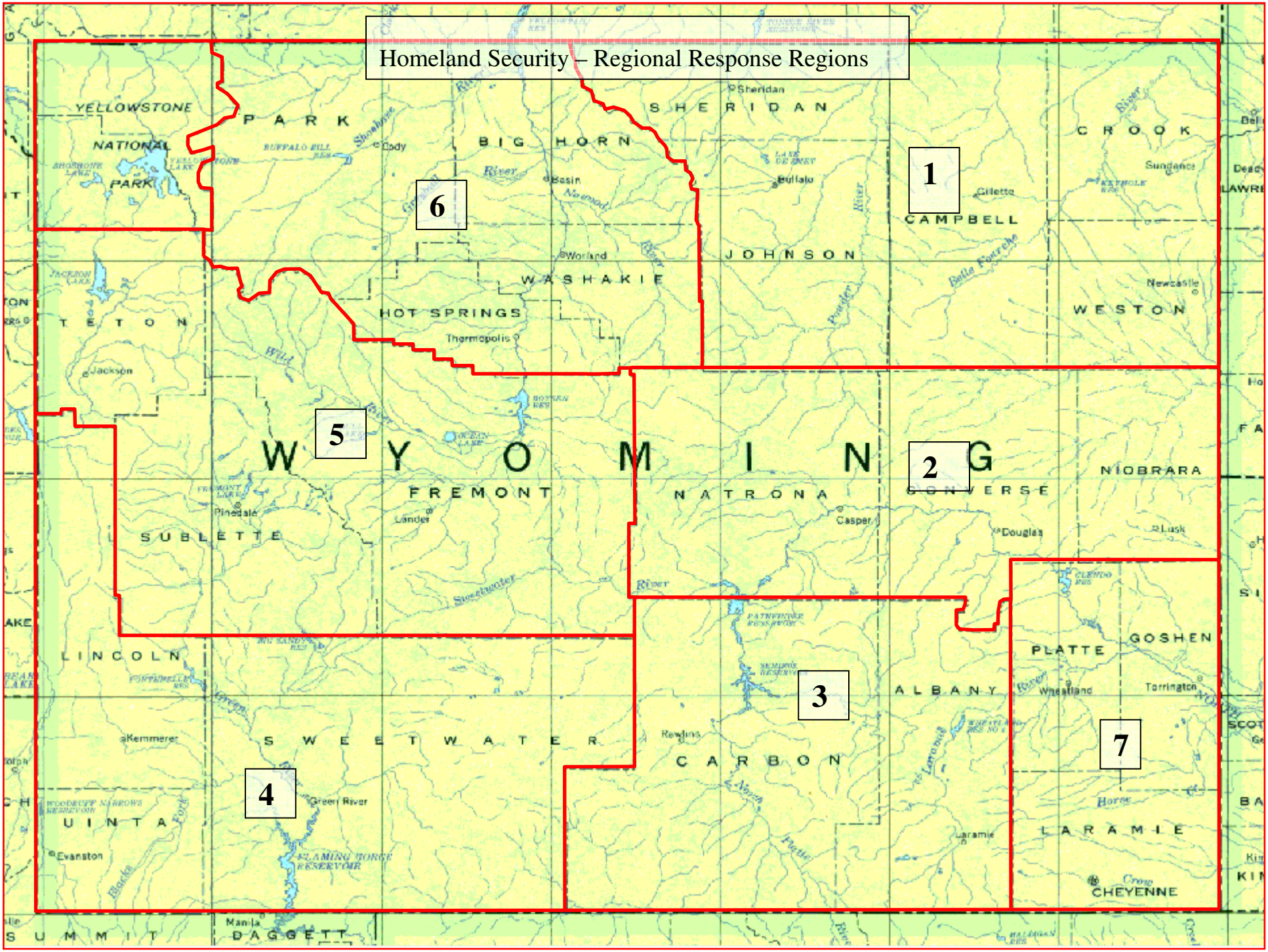
Projected Complete in 2008

Sites without radios.

11-Jan-08

WyoLink Timeline




Homeland Security – Regional Response Regions
1
2
3
4
5
6
7
YELLOWSTONE NATIONAL PARK
PARK
BIG HORN
SHERIDAN
CROOK
CAMPBELL
JOHNSON
WESTON
NIOBRARA
WASHAKIE
HOT SPRINGS
TETON
WYOMING
FREMONT
NATRONA
CONVERSE
SUBLETTE
LINCOLN
SWEETWATER
CARBON
ALBANY
PLATTE
GOSHEN
UINTA
LARAMIE
SUMMIT
DAGGETT
Sheridan
Cody
Basin
Buffalo
Gillette
Sundance
Worland
Thermopolis
Newcastle
Jackson
Pinedale
Lander
Casper
Douglas
Lusk
Kemmerer
Rawlins
Wheatland
Torrington
Green River
Evanston
Laramie
CHEYENNE
Manila