

Secretary of State AUDIT REPORT

Bill Bradbury, Secretary of State
Cathy Pollino, Director, Audits Division

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Two-Way Radio Communications: Opportunities Exist to Strengthen Planning and Coordination



Summary

PURPOSE

Two-way radios provide an essential communications link for many government organizations operating in Oregon. The purpose of our audit was to determine if these systems are meeting user needs at the least possible cost.

BACKGROUND

Oregon state agencies have made substantial investments over the decades to develop two-way radio systems, which are necessary for the conduct of state business. Local and federal agencies also have made significant investments in radio systems. Yet, despite past and ongoing investments in radio infrastructure and equipment, public officials are concerned about the ability of their organizations to easily talk to one another. This is especially critical for public safety personnel whose safety depends on effective communications.

RESULTS IN BRIEF

We found overlapping and duplicative systems, many of which are incompatible with other groups, agencies, or jurisdictions. Officials attributed the cause of this situation to Federal Communications Commission regulations governing radio spectrum assignments. Still, these problems severely limit the usefulness of radio communications, especially in situations that demand large-scale immediate interagency communications and coordination. We also found that it may be possible to achieve cost saving on the purchase and maintenance of replacement systems through improved agency coordination and cooperation.

During the course of our audit, Oregon took a significant first step toward improved radio communications amongst government agencies. In September 2002, Governor Kit zhaber issued Executive Order No. 02-17 creating a State Interoperability Executive Council (SIEC). This group is charged with the responsibility to improve public safety communications statewide. The SIEC holds promise as an effective forum for the dozens of government agencies that will need to coordinate their actions to improve radio com-

munications. Yet, until a consensus can be reached on necessary actions, public agencies in Oregon will continue to individually invest millions of dollars on overlapping and duplicative systems. Not only will this spending not resolve interoperability problems, but some new investments have the potential to make the problem worse. This can occur when new radio equipment purchased by one agency or jurisdiction isn't readily compatible with older equipment used by others. Oregon state officials have limited ability to solve the problem of interoperability on their own; however, the state must provide support and effectively participate as a partner in the SIEC so that solutions can be found as quickly as possible.

RECOMMENDATIONS

The state of Oregon can contribute to more effective and economical two-way radio communications between local, state, and federal agencies by supporting the efforts of the SIEC and by avoiding duplication of efforts amongst state agencies. To facilitate needed improvements, we recommend that the Department of Administrative Services:

- Ensure that the interoperability council has the administrative and technical support necessary for it to develop a coordinated plan to improve statewide two-way radio communications.
- Work with the Governor's Office to strengthen planning and coordination necessary for achieving interoperability. This may include designating a lead agency or key contact to participate on the interoperability council as well as guide the implementation of plans affecting state agencies.

AGENCIES' RESPONSE

Officials from the Departments of Transportation, State Police, State Forestry, Corrections, and State Interoperability Executive Council generally agreed with the information and recommendations presented in our report. A response from these organizations is included at the end of this report.

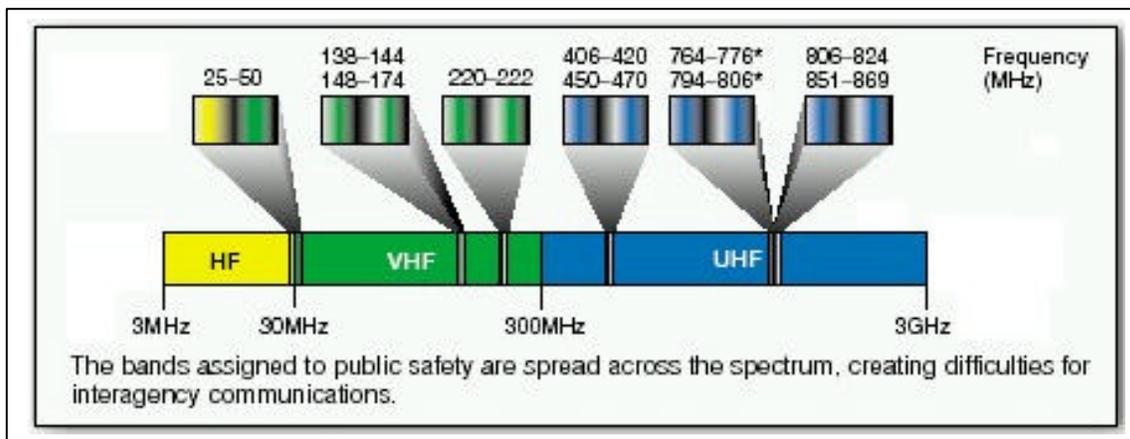
Introduction

Two-way radio communications support state government operations in a variety of important ways. For example, transportation, forestry, parks, and fish and wildlife workers

use their radios to coordinate work activities and to report emergencies. Corrections personnel rely on radios to maintain security within institutions. State police depend on radios so that they can respond to routine and urgent calls. While many situa-

tions require action by staff of only one agency using a single two-way radio system, other situations require a response by multiple agencies using radios from several different systems. An effective and coordinated response requires radio

Figure 1: Public Safety Spectrum Bands



Source: Public Safety Wireless Network

interoperability, which is the ability to talk with whom you need and when you need. Radio interoperability is especially important for public safety personnel who must coordinate their actions to carry out their jobs effectively.

Public Safety Radio Operates on an Array of Channels

The public safety radio spectrum refers to an array of channels, like those on the television, which are available for communications transmissions. As shown in Figure 1, the current public safety channels are located in several portions of the radio spectrum, resulting in separate spectrum "islands" that isolate public safety operations and jurisdictions. This fragmentation of spectrum impedes interoperability because no single radio can span all of the public safety channels. Consequently, agencies using different portions of spectrum cannot talk directly with each other. Responders end up using multiple radios or other ad hoc means of linking communications.

Radio Interoperability is Not an "On" or "Off" Condition

Interoperability is considered to be at a high level when all of the agen-

cies that need to communicate can do so in real time. The lowest level of interoperability would be sending runners with messages between agencies to communicate. Various possibilities exist in between these two extremes. In some cases, agencies establish communication links via dispatch centers. Another way to establish some degree of interoperability occurs when agencies exchange radios from each others' systems. Some agencies rely on cell phones to communicate. While all of these methods provide a communication link, they limit those who can listen and communicate in real time.

According to experts at the Public Safety Wireless Network program, interoperability simply refers to the ability of public safety personnel to communicate by radio with staff from other agencies, on demand and in real time. These experts suggest that public safety agencies require the following three types of interoperability:

- *Day-to-Day Interoperability* involves coordination during routine public safety operations. Interoperability is required, for example, when firefighters from around a county join forces to battle a structural fire or when neighboring law enforcement agencies must work together during a vehicular chase.

- *Mutual Aid Interoperability* involves a joint and immediate response to catastrophic accidents or natural disasters and requires tactical communications among numerous groups of public safety personnel. Airplane crashes, bombings, forest fires, earthquakes, and hurricanes are all examples of mutual aid events.
- *Task Force Interoperability* involves local, state, and federal agencies coming together for an extended period of time to address a public safety problem. Task forces lead the extended recovery operations for major disasters, provide security for major events and conduct operations in response to prolonged criminal activity.¹

A National Task Force has Identified Five Key Barriers to Interoperability

In February 2003, the National Task Force on Interoperability issued the report *Why Can't We Talk?* According to the Task Force, there are five key reasons why public safety agencies cannot talk to one another:

¹ Public Safety Wireless Network Program. *Public Safety & Wireless Communications Interoperability*. Online. Available: <http://www.pswn.gov/admin/librarydocs/interopbooklet.pdf> [3 Sept. 2003]

1. "In many jurisdictions radio communications infrastructure and equipment can be 20 to 40 years old. Different jurisdictions use different equipment and different radio frequencies that cannot communicate with one another, just as different computer operating systems will not work together or an AM receiver will not accept an FM signal. There are limited uniform standards for technology and equipment."
2. "There is limited funding to update or replace expensive radio communications equipment, and different communities and levels of governments have their own funding priorities and budget cycles."
3. "Planning is limited and fragmented. Without adequate planning, time and money can be wasted and end results can be disappointing. Agencies, jurisdictions, and other levels of government compete for scarce dollars, inhibiting the partnership and leadership required to develop interoperability."
4. "The human factor is a substantial obstacle – agencies are naturally reluctant to give up management and control of their communications systems. Interoperability requires coordination and cooperation. It requires a certain amount of shared management, control, and policies and procedures."
5. "There is a limited and fragmented amount of radio spectrum available to public safety." According to the Interoperability Task Force, "The Federal Communications Commission (FCC) has allocated certain frequencies to public safety, but it is inadequate and scattered across the spectrum, making it difficult for different agencies and jurisdictions to communicate. Initially, almost all public safety spectrum assignments were confined to the low frequency range, but as technology

advanced and improved, transmission at higher frequencies became possible and the FCC assigned additional frequency bands to public safety. The result -- public safety operates in 10 separate bands, which has added capacity, but which has also caused the fragmentation that characterizes the public safety spectrum today."

Background

Over a period of decades, Oregon state agencies have developed two-way radio systems adapted to their specific needs. Currently, there are four large statewide systems owned by the Departments of Transportation, State Police, State Forestry, and Corrections.

Transportation's radio system is among the largest in state government. It includes some 2,500 mobile radios, 1,200 portable radios, 300 fixed stations, 160 microwave terminals, and 86 radio towers. Some of the main purposes for this system are to coordinate work activities, respond to traffic incidents, and notify public safety agencies of roadway emergencies. On any given day, a thousand or more employees may use this system in the course of their work responsibilities. Operating in the VHF portion of the radio spectrum, the system is maintained by a staff of 18.

State Police own another large state radio system, comprised of over 1,900 mobile and handheld units, 108 radio towers, and a staff of five radio technicians. Generally, every state trooper and game officer has both a mobile and a portable radio available for his or her use. Like Transportation's system, State Police radios operate in the VHF radio spectrum.

Forestry shares its system with the Parks and Recreation Department, and the Department of Fish and Wildlife. The Forestry radio system includes more than 4,200 radios, 63 towers, and 10 radio staff. The For-

estry system is also a VHF system. Originally built after the 1933 Tillamook burn, Forestry staff developed their system to help protect public and private forests from wildfires. Parks personnel, as well as staff from Fish and Wildlife, use their system for logistical purposes, coordination of work, and for emergencies.

The Corrections system is the smallest of these statewide systems. It is a UHF system with about 2,200 radios, 11 towers, and four radio staff. Corrections workers use their system to communicate with security checkpoints in institutions and for prisoner transport.

In addition to these four state systems, numerous other local and federal government agencies own and operate two-way radio systems in Oregon. Just at the local level, there are 14 regional governments, 36 counties and 240 incorporated cities and towns, not counting ports, special service districts, and transit districts. While not all of these entities may own a two-way radio system, many do to aid in the provision of a wide range of important public services. Oregon also is home to a variety of federal agencies with radio systems necessary for the conduct of federal government business. The sheer number and variety of jurisdictions and agencies combined with the differing business needs and technologies in use demonstrate the difficulties inherent in optimizing intergovernmental interoperability.

Audit Results

The results of our audit suggest a pressing need to improve the two-way radio communications ability of public agencies in Oregon. Over a period of many years, agencies have purchased equipment and developed systems to serve their individual business needs. Many of these existing systems function reasonably well in allowing personnel to communicate internally with others within a particular public agency. Even so,

we noted significant shortcomings that will need to be addressed in coming years.

We found that existing two-way radio systems overlap coverage areas served by systems owned by other state, local, and federal agencies. These systems provide limited interoperability, seriously hindering the ability of agencies to conduct business and ensure the safety of agency employees and the public.

Public organizations at all levels of government in Oregon are making substantial investments in their existing radio systems without a coordinated statewide plan to address interoperability problems. This is a particularly difficult problem due to the numerous agencies that will need to coordinate their planning and budgeting in the future to improve interoperability and minimize duplication.

The following sections of our report discuss these problems and their effects on Oregon's citizens, and we provide information about actions to improve this situation.

State Agencies Making Substantial Investments Without Coordination

Under Oregon's decentralized approach for managing two-way radio communications, individual agencies are spending substantial amounts for operations, equipment, and infrastructure. Department of Transportation staff estimated their annual operating costs are about \$2.4 million, State Police reported \$1.8 million, State Forestry \$1.6 million, and Corrections estimated \$400,000, for a total of \$6.2 million.

In addition, these agencies are planning for the replacement of aging equipment and infrastructure. Transportation staff reports that major components of their system will need to be replaced and upgraded within seven to eight years at an estimated cost of about \$60 million. State Police staff estimated that a

six-year project to simply replace aging radio equipment would cost \$3.6 million. Their recommendation, however, would be for a replacement system with increased utility that could cost \$100 million. Forestry radio staff expect to begin replacing their existing system with newer technology within 8 to 10 years at a cost of \$7 to \$7.5 million. Corrections staff report a \$2.2 million cost for a planned expansion and new construction. Altogether these anticipated expenditures total between \$73 and \$170 million.

These sums represent a major taxpayer investment in two-way radio communications to support state government operations. Yet, unless a way can be found to ensure cooperation, there is a risk of duplication of efforts that serves little or no purpose. Further, there is a risk that future investments will not resolve interoperability problems because agencies may continue to opt for systems that serve their individual business needs first, rather than making the compromises necessary to improve intergovernmental communications.

State and Local Personnel Report They Can't Easily Radio One Another

To help us develop an understanding of the two-way radio systems used by Oregon public agencies, we conducted a survey of communications personnel and we interviewed key individuals who were knowledgeable about these systems. We learned that many of these people were concerned about the issue of interoperability. In general, local and federal personnel were somewhat more concerned about this problem than were state personnel. Also, law enforcement personnel tended to be most concerned, likely as a result of their regular need for effective radio communications with other public safety agencies.

Public safety personnel from all over Oregon told us that the level of

interoperability provided by existing systems did not meet their idea of adequate communication. As a result, many reported daily interoperability problems that degraded their ability to be effective first responders to emergency calls. Public safety personnel were concerned because interoperability problems caused response delays and limited their ability to coordinate with other agencies. Public safety personnel reported that interoperability was a serious concern throughout Oregon and this was a problem that they must contend with on a daily basis.

Radio Communication Problems Fit Into Three Different Categories

We classified the interoperability concerns reported to us in the following three categories:

- *Low interoperability among corresponding agencies at different levels of government (e.g., a local or federal agency radioing to a state agency).*

Several local and federal agencies responding to our survey reported they were unable to adequately communicate with state agencies. For example, we heard from more than a few local police agencies that they regularly experienced problems when trying to communicate with state police. In one instance, local police personnel from a central Oregon community told us that it was very difficult for them to communicate with state police and this problem resulted in suspects being able to evade arrest. Similarly, we heard from a large suburban Portland fire and rescue agency that poor interoperability with state police and state transportation workers regularly results in delays in fire and paramedic responses in their jurisdiction.

- *Low interoperability between corresponding agencies at the same level of government (e.g., one state agency radioing to another state agency).*

State officials reported to us that they often experienced interoperability problems when they attempted to communicate via radio with sister agencies within state government. One incident that was reported to us illustrating this kind of problem occurred as a forest fire in southern Oregon approached Interstate 5. In this case, state forestry workers were unable to communicate effectively with state transportation and state police personnel to handle a developing traffic problem on the interstate.

We heard similar kinds of complaints about interoperability from city and county agencies. One case illustrating interoperability problems at the local government level involved two Portland area law enforcement agencies. As the incident was described to us, a county sheriff's car was involved in a chase of a fleeing vehicle that had fired shots at pursuing officers. Officers from the sheriff's office radioed for help from police in the neighboring city as the fleeing vehicle approached the jurisdiction's boundary. The fleeing vehicle made it to the jurisdiction's boundary before deputies were able to make contact with police. The car continued to flee and was not stopped until it hit a civilian's car causing several injuries. In this case, the sheriff's deputies felt that the chase could have ended sooner had there been adequate communication. Several other jurisdictions reiterated similar incidents to this one.

- *Low interoperability among agencies within the same jurisdiction (e.g., a police officer radioing to fire and rescue personnel within the same city).*

Another problem reported to us involved police and fire agencies within the same jurisdiction being unable to coordinate efforts because of a low level of interoperability. One such incident that was reported to us involved fire and rescue workers who arrived at a scene and had begun preparing to fight a fire, only to learn that a police action was ongoing. Fire officials had to stop

going. Fire officials had to stop and then alter their response at the scene.

Officials whom we contacted provided information about many other incidents in virtually every area of the state and at every level of government. These stories provide evidence that interoperability concerns are serious, pervasive in nature, with potentially life-threatening consequences.

Officials Fear a Large-Scale Emergency Would Overwhelm Radio Systems

Public safety and emergency management officials with whom we spoke were concerned that weaknesses in communications could stymie rescue efforts in a large-scale emergency. These officials were concerned that the current level of interoperability in Oregon would not permit communication necessary for an effective response to a catastrophic event. They felt that a high level of interoperability would be necessary to handle the volume of cross-agency communication that would be necessary to coordinate life saving efforts in such an event.

A test last year of emergency communications in the Portland area suggests that the concerns of these officials were not unfounded. In January 2002, multiple public safety agencies participated in an exercise designed to test their ability to respond to a catastrophic event. The results of the exercise suggested that emergency responders would face serious problems communicating with each other during a real large-scale emergency. This outcome is especially troubling because Portland's emergency two-way radio communication system is considered to be among the best in the state.

Weak Two-Way Radio Communications Endanger Life and Property

When public safety workers are unable to radio to one another, serious problems can result. The Sep-

tember 11, 2001 terrorist attacks on the World Trade Center and the Pentagon may provide the most vivid illustration of this problem. In New York, firefighters were trapped in the burning Twin Towers partly because they never received police department messages warning that the buildings might collapse. At the Pentagon, responding agencies from differing jurisdictions could not communicate via their radios due to poor interoperability and runners had to be used.

During the course of our audit, we came across numerous reports of how poor interoperability reduced the effectiveness of public safety staff in Oregon. Consequences included accident victims waiting longer than necessary, criminal suspects evading capture, extended car chases, and delayed response to fires. This directly affects the safety and health of Oregonians and the effects are felt daily throughout the state. Moreover, no one can predict the consequences of limited radio interoperability in the event of a catastrophic event. We conclude that the current state of two-way radio communications in Oregon is resulting in increased risk of harm to citizens, public safety workers, and property.

Efforts Underway to Improve Interoperability

During the course of our audit, Oregon took a significant step toward improving radio interoperability amongst state, local, and federal government agencies. In September 2002, Governor Kitzhaber signed executive order number EO 02-17. This order created the State Interoperability Executive Council whose purpose was to "provide policy level direction for matters related to planning, designing and implementing guidelines, best practices, and standard approaches to address Oregon's public safety communications interoperability issues." Comprised of members representing state and local

agencies, the group was also directed to:

- Research and evaluate best practices for purchasing equipment and sharing infrastructure;
- Strive to foster cooperation and improve interagency communications;
- Serve as a central coordination point for local, regional, and national interoperability matters;
- Recommend funding strategies to support development of a statewide system; and
- Develop recommendations for legislation or other state action to promote interoperability.

Technical & Administrative Support Could Aid the Search for Solutions

The executive order creating the interoperability council provided the group with a clear statement of purpose and work objectives. The order did not, however, provide any support services. Since the individuals appointed to the group already have fulltime jobs at the agencies they are representing, it follows that they will have only a limited amount of time to dedicate to the council. The council has no formal administrative or technical support provided. Officials to whom we spoke expressed concern that council members may not be able to devote the time and effort necessary to achieve the group's objectives. To be successful, the council will need to complete a variety of tasks such as conducting research and analyzing data relevant to Oregon's interoperability challenges.

State Statutes Suggest a Role for the Department of Administrative Services

Existing Oregon statutes provide a framework for central coordination and control over development of the two-way radio systems used by state agencies. Under ORS 283.140, the

Department of Administrative Services (DAS) is required to exercise "budgetary, management, supervision and control over all telephone and telecommunications service for all state agencies." ORS 283.505 requires the department to "coordinate the consolidation and operation of all telecommunications systems used by the state and state agencies. Notwithstanding any other provision of law, no agent or agency of the state shall construct, purchase or otherwise gain access to a telecommunications system without the prior approval of the department."

Opportunities Exist for the State to Support Improved Planning and Coordination

Important first steps have been taken to address the interoperability problem -- Oregon now has a forum to bring together experts from affected agencies to discuss solutions for our state. Yet, much still needs to be accomplished. Finding solutions will be difficult because of all the many state, local, and federal agencies that will need to cooperate and coordinate their actions and spending. While solutions to this problem are not the sole responsibility of Oregon state agencies, the state has a compelling interest and opportunity to contribute to the process of finding solutions to the serious problem of interoperability and duplication of infrastructure and service. Other states that have tackled this problem and built replacement systems report a variety of advantages, including improved interoperability, better coverage, and cost saving from joint planning, development, and maintenance.

Recommendations

The state of Oregon can contribute to more effective and economical two-way radio communications between local, state, and federal agencies by supporting the efforts of the State Interoperability Executive

Council and by avoiding duplication of efforts amongst state agencies. To facilitate needed improvements, we recommend that the Department of Administrative Services:

- Ensure that the interoperability council has administrative and technical support necessary for it to develop a coordinated plan to improve statewide two-way radio communications.
- Work with the Governor's Office to strengthen planning and coordination necessary for achieving interoperability. This may include designating a lead agency or key contact to participate on the interoperability council as well as guide the implementation of plans affecting state agencies.

Objectives, Scope, and Methodology

The objective of our audit was to determine if two-way radio systems in the state of Oregon are meeting user needs at the least possible cost to taxpayers. We focused our attention on state systems; however, because state business may require communication with local or federal agencies, some of our work related to those systems. We conducted our work between April 2002 and June 2003. As a part of our audit, we reviewed pertinent statutes, rules, and regulations. We conducted a survey of communications personnel on issues relevant to two-way radio communications, and we interviewed key managers and stakeholders. We also contacted relevant national organizations and officials in other states to learn how others have approached the problem of radio interoperability. We conducted this audit according to generally accepted government audit standards. We limited our review to those areas specified in this section of the report.

**Consolidated Response of the Oregon Department of State Police,
Oregon Department of Forestry,
Oregon Department of Transportation,
Oregon Department of Corrections, and
Tualatin Valley Fire & Rescue**

Below are the consolidated comments of the Statewide Interoperability Executive Council (SIEC), Oregon Department of Transportation (ODOT), Oregon Department of Corrections (DOC), Oregon Department of Forestry (ODF) and the Oregon Department of State Police (OSP) to the Secretary of State's Wireless Communications audit report.

Background and Results

1. *The report correctly identifies multi-jurisdictional interoperability as a key issue facing many public safety organizations today. While it is important to address this issue, it must be recognized that interoperability is but one of a number of fundamental elements of a sound, efficient two-way radio communications system. Effectively meeting an organization's business needs must be the foundation upon which the system is built, considering the elements of cost/benefit, geographic coverage, technical feasibility, maintenance, text/data transmission, useful-life-of-product, legal requirements, and interoperability. In addition, agencies must be able to meet their current agency business needs, which accounts for nearly all of the use of the current 2-way systems and they cannot simply stop using their current system while they implement another. We believe that a full consideration of all these elements is necessary to comprehensively evaluate current and future systems.*
2. *The report notes, "the ease of organizations being able to talk with each other is especially critical for public safety personnel whose safety depends on effective communications". We agree that personal safety of first responders is indeed very important. However, there is an even more critical function of public safety communications, which is to facilitate public safety's ability to protect the public's life and property. The ability to respond in the shortest amount of time with the proper resources is the most critical use of the system.*
3. *While the report briefly mentions the Federal Communications Commission (FCC) in the Summary, a full treatment of the history, regulatory framework, and past, present and future impact of FCC regulations and requirements is missing. Much of the report content in the Introduction, Background, and Audit Results sections on **pages two through five** that questions the effectiveness and efficiency of the current state radio systems is directly related to requirements of federal law and regulation mandated by the FCC, yet the report does not recognize or address this "cause and effect" relationship. We believe that it is not possible to meet the purpose of the audit without a full and comprehensive treatment of the influence, impact and requirements of the FCC on licensees.*
4. *The report does not take into account that until only recently the technology did not exist to allow the combining of various frequencies that are used by State agencies into a system that can increase a system's efficiency. Each system has been limited to only carrying one conversation at a time, and the critical missions of the individual departments made each of them require the highest of system access. In a shared system, some priority must be assigned, and each department has times of needing the highest priority. In addition, until only recently, FCC rules only allowed very specific message content on each system, and cross-discipline use of these systems was not allowed.*
5. *As a state-level audit, the report does not adequately assess the interrelationships, viability and effectiveness of current or planned local government and federal government radio communications systems, nor the role of the private sector in systems management. In Oregon, we believe it is absolutely necessary to evaluate these systems in a fully integrated fashion to truly address the issue of interoperability and system effectiveness.*

Recommendations

We generally concur with the report's two recommendations within the context of the State Interoperability Executive Council. However, it would be counter to the intent in setting this committee up to now subjugate the collective input of those departments by designation of a lead agency or key contact to participate as the collective "state voice" on the SIEC. The SIEC was specifically organized with representation of the various departments sitting on the Council itself. The SIEC operates by consensus, and the participation of all agencies is still to be preferred.

Based on the extent of interagency coordination necessary to effectively address Oregon's interoperability issues, we believe the report should more strongly support and advocate for the SIEC model. And, we feel it should encourage that SIEC be designated as the body which formulates the State's collective position on and response to all FCC docket items with affect on Oregon.

**Consolidated Response of the Intergovernmental Services Bureau,
Administrative Services Division, Oregon Department of State Police,
Oregon Department of Forestry, Oregon Department of Transportation,
Oregon Department of Corrections, and Tualatin Valley Fire & Rescue (continued)**

ODOT, ODF, DOC, and OSP are active members of the Council, strongly support the goals and objectives of the Council, and will continue to fully participate in a collaborative fashion. In addition, the four state agencies have and will continue to work towards coordinated and cooperative solutions with other state agencies, local government, the federal agencies and the private sector in meeting our business needs.

Further Research

We believe that there is room for further research in the area of two-way radio communications and their use by State of Oregon agencies.

- 1. The audit points out that "State agencies are making substantial investments" in two-way radio communications technology. An extensive cost/benefit study should be done to evaluate whether the best investment would be to develop a multi-agency unified network as compared to individual agencies redeveloping their networks discreetly.*
- 2. The audit does not address whether efficiencies could be found to streamline the operations that maintain the state's large investment in two-way radio technology.*

This report, which is a public record, is intended to promote the best possible management of public resources. Copies may be obtained by mail at Oregon Audits Division, Public Service Building, Salem, Oregon 97310, by phone at 503-986-2255 and 800-336-8218 (hotline), or internet at Audits.Hotline@state.or.us and <http://www.sos.state.or.us/audits/auditthp.htm>.

AUDIT ADMINISTRATOR: *David J. Dean, MPA*

AUDIT STAFF: *David R. Clouse, MPA • Jamie E. Breyman • Claudia Ciobanu • Jonathan E. Hart, MA*

DEPUTY DIRECTOR: *Charles A Hibner, CPA*

The courtesies and cooperation extended by the officials and staffs of the Intergovernmental Services Bureau, Administrative Services Division, Oregon Department of State Police, Oregon Department of Forestry, Oregon Department of Transportation, Oregon Department of Corrections, and Tualatin Valley Fire & Rescue were commendable and much appreciated.

Auditing to Protect the Public Interest and Improve Oregon Government