



OFFICE OF THE CITY AUDITOR

City and County of Honolulu
State of Hawai'i



Audit of the Honolulu Police Department's Utilization of the 800 Megahertz Telecommunications System

A Report to the
Mayor
and the
City Council of
Honolulu

Report No. 11-01
August 2010

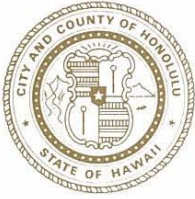
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Submitted by

THE CITY AUDITOR
CITY AND COUNTY
OF HONOLULU
STATE OF HAWAII

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August 2010



EDWIN S.W. YOUNG
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August 31, 2010

Mr. Kirk Caldwell, Acting Mayor
City and County of Honolulu
530 South King Street, Second Floor
Honolulu, Hawai'i 96813

Dear Mr. Caldwell:

Our office has completed its review of the 800 Megahertz (MHz) Telecommunications System, the primary means of radio communication for the Honolulu Police Department.

This audit was conducted pursuant to Resolution 03-70, CD1, *Requesting a Performance Audit of the City and County of Honolulu's 800 Megahertz Telecommunications System*, which was adopted by the Honolulu City Council on September 24, 2003. In the past, the system was the subject of controversy due to previous problems such as system glitches, outages, and voice and data transmission problems. The controversy also involved its suitability for daily police operations. The city council resolution requested an audit to determine the causes of the problems that occurred with the system, solutions to the problems, and remedies available to the city for the recovery of public funds expended to solve the problems.

The primary objective of the 800 MHz Telecommunications System is to provide uninterrupted, high quality digital voice communications in support of daily police field operations 24 hours a day, 7 days a week. It is designed to provide secure communications, increase the availability of information, and help assign police resources more efficiently and effectively.

The system is a computer-based radio system consisting of multiple channels and features which allow users to communicate simultaneously across the entire system, within an organization, or within small pre-defined talk groups. The system supports a large number of users by sharing, allocating, and reassigning radio channels as needed (*trunking*) rather than providing individual channels. The system includes a microwave backbone consisting of radio towers, facilities, and radio equipment rooms located around the island of O'ahu and components located in radio equipment rooms nearby transmission towers, and at command and control sites.

Our review and analysis focused on system implementation, implementation costs, and ongoing operational and maintenance costs to determine the true costs of the system and its operations. Although the system currently is multi-departmental in usage, we limited our review and assessment of the management and operational effectiveness of the system to the Honolulu Police Department's utilization during the period FY2005-06 through FY2007-08. The audit was performed in accordance with generally accepted governmental auditing standards.

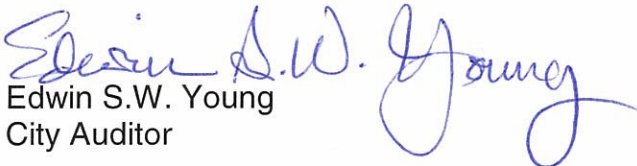
Our audit results indicate a flawed design and poor management over the design and implementation of the 800 megahertz telecommunications system resulted in cost overruns and system problems. Despite its controversial past, the 800 megahertz telecommunications system is currently reliable. As the system reaches the end of its lifecycle, management faces challenges related to continued operation and maintenance of the system. The city's role and acceptance of the system along with the passage of time limits the potential recovery of public funds used to resolve the system development and installation problems.

The City departments generally agreed with the audit recommendations. The Honolulu Police Department reported they implemented some of the recommendations before the draft report was issued and the Department of Information Technology did not submit additional comments in response to the draft report. The Department of Design and Construction provided additional information to clarify the history, expansion, and challenges of the project. DDC disagreed that it did not provide technical support to the Department of Information Technology.

We wish to express our appreciation for the cooperation and assistance provided us by the Acting Mayor and the staffs of the Mayor/Managing Director's Office, the Department of Information Technology, the Department of Design and Construction, and the Honolulu Police Department.

If you have any questions regarding the report, please call Wayne Kawamura, the auditor-in-charge, at 768-3138 or me at 768-3130. Thank you for your assistance and response.

Sincerely,


Edwin S.W. Young
City Auditor

c: Kirk Caldwell, Acting Mayor
Department of Information Technology
Department of Design and Construction
Honolulu Police Department
Van Lee, Deputy City Auditor
Wayne Kawamura, Senior Auditor

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Chapter 1

Introduction

This audit was conducted pursuant to Resolution 03-70, CD1, *Requesting a Performance Audit of the City and County of Honolulu's 800 Megahertz Telecommunications System*, which was adopted by the Honolulu City Council on September 24, 2003. The resolution indicated that the system was intended to improve the performance and security of communications among police officers; however, during implementation, various operational problems required correction to protect the safety of officers in the field. The resolution requested an audit to determine the causes of the problems that occurred with the system, solutions to the problems, and remedies available to the city for the recovery of public funds expended to solve the problems.

Background

The 800 megahertz (MHz) radio system is the primary means of radio communication for the Honolulu Police Department. It is a computer-based radio system consisting of multiple channels and features which allow users to communicate simultaneously across the entire system, within an organization, or within small pre-defined talk groups. The system will only permit pre-identified radios to communicate on the system. The system can support a large number of users by sharing, allocating, and reassigning radio channels as needed, which is known as *trunking*, rather than providing individual channels.

For example, police officers can talk within their patrol district, with central dispatch, or with other pre-defined talk groups. When a user attempts to communicate on the radio, computers in the system will automatically select the next available channel. When the user is finished, the channel is released and is available again to be reallocated for use.

The city's microwave backbone consists of a number of radio towers, facilities, and radio equipment rooms located around the island of O'ahu. The 800 MHz system components are located in radio equipment rooms nearby transmission towers, and at command and control sites. The system sites are shown in Exhibit 1.1.

Exhibit 1.1
800 MHz System Infrastructure, as of December 2009



Legend:

- MW = Microwave
- Simul = Simulcast
- 800 = 800 MHz radio
- PS = Police Station
- Slave 800 = 800 MHz site without controller computers

Source: Department of Information Technology

System objectives

The primary objective of the system is to provide uninterrupted, high quality digital voice communications in support of daily police field operations 24 hours a day, 7 days a week. It is designed to provide secure communications, increase the availability of information, and help assign police resources more efficiently and effectively.

System problems reported

The system has been the subject of controversy due to previous problems such as system glitches, outages, and voice and data transmission problems. The controversy also involved its suitability for daily police operations. According to Resolution 03-70, CD1,

...the 800 megahertz digital communications system was supposed to improve the performance and security of communications among police officers. However, various problems occurred with the system, such as blackout and garbling of radio communications, and difficulties with software. Correction of the problems was needed to protect police officers in the field who require immediate assistance... .

Details regarding the system inventory, roles and responsibilities of the Honolulu Police Department and the Department of Information Technology, and management of the system are itemized in Appendix 1.

Audit Objectives, Scope, and Methodology

The City Council resolution requested an audit to determine the causes of the problems that occurred with the system, solutions to the problems, and remedies available to the city for the recovery of public funds expended to solve them. In addition, we reviewed and assessed the management of the 800 MHz radio system, and its operational effectiveness for the Honolulu Police Department.

Our review and analysis focused on selected aspects of the management framework employed by the Honolulu Police Department, coordination with the Department of Information Technology, and evaluations of the operation and maintenance of the 800 MHz radio system during the period FY2005-06 through FY2007-08. We reviewed the system implementation, implementation costs, and ongoing operational and maintenance costs to determine the true costs of the system and its operations. Our review focused on the implementation of the telecommunications system contracts, and not the procurement process for the contracts. Although the system currently is multi-departmental in usage, we limited our review and assessment of the operational effectiveness of the system to the Honolulu Police Department's utilization during the period FY2005-06 through FY2007-08.

We reviewed project files held by the Honolulu Police Department and the Department of Information Technology to assess the management responsibilities, cost, and effectiveness of

the system for police operations. We reviewed city ordinances, policies, procedures, practices, and related documentation to determine operational, maintenance, monitoring, reporting, and evaluation requirements pertaining to the system. We also interviewed appropriate departmental and project consultant staff to obtain further information on the issues under review. Finally, we examined recommended best practices in telecommunications and information technology, including risk assessment and continuity planning, and compared them to departmental management practices and operations. We consulted the National Institute of Standards and Technology's *Generally Accepted Principles and Practices for Securing IT Systems* and *Risk Management Guide for IT Systems*, and the Public Safety Wireless Network's *Operational Best Practices for Managing Trunked and Mobile Radio Systems*.

This audit was conducted pursuant to the authority of the Office of the City Auditor (OCA) as provided in the Revised Charter of Honolulu and included in the OCA's Proposed Annual Work Plan for FY2008-2009. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Audit Results

A flawed design and poor management over the implementation of the 800 MHz telecommunications system resulted in cost overruns and system problems. Despite its controversial past, the 800 MHz radio system is currently reliable. However, as the system reaches the end of its lifecycle, management faces challenges related to continued operation and maintenance of the system. The city's role and acceptance of the system along with the passage of time limits the potential recovery of public funds used to resolve the system development and installation problems.

Chapter 2

Design Flaws and Poor Management Over the Design and Implementation of the 800 Megahertz Telecommunications System Project Resulted in Cost Overruns and System Problems

Best practices indicate project managers should ensure project designs are accurate and costs are controlled throughout the project. The original 800 megahertz radio system was to be delivered in *ready-to-use* condition within three years at a cost estimate of \$34 million. During the implementation of the system, project managers made 31 change orders and 4 contract amendments to correct design flaws and to complete the system. Project managers allowed the contractor and the user, the Honolulu Police Department, to influence the management of the project. This resulted in the system taking 11 years and costing the city \$64.8 million to complete. The city's role and acceptance of the system, in addition to the passage of time, limits the potential recovery of public funds used to resolve the design flaws and system development and installation problems.

Background

In 1990, the city hired a consultant, Schema Systems, to assist with the design of a large scale radio and mobile data system that would satisfy the long term communications needs of the Honolulu Police Department. In 1991, the consultant produced a communications study and master radio plan which recommended that the police department replace the existing analog radio system of UHF, VHF, and microwave radios with a new radio and mobile data system based on 800 MHz technology. The plan detailed three component phases: (1) improvements to the city's digital microwave communications system; (2) a voice radio system using 800 MHz *trunked* technology; and (3) a mobile data system to support laptop computers for field officer use. Separate development contracts covered each component.

In FY1992 -1994, the City Council provided \$7.6 million in the capital improvements budget to implement the new 800 MHz telecommunications system. Work to install the radio system began in 1994.

Best practices indicate project managers should ensure project designs are accurate and costs are controlled throughout the project

Managing a complex project such as the implementation of the 800 MHz telecommunications system requires comprehensive oversight from start to finish to ensure the project is completed on time, within budget, and according to specifications. Under the terms of the contract, the contractor, Ericsson-General Electric Mobile Communications, Inc., was to deliver a *turnkey*, ready-to-use¹, system in three years at a total cost of \$34 million.

**Exhibit 2.1
800 MHz System Implementation Cost Estimate**

Development Phase	Cost
Microwave Control System and Facilities	\$8,716,500
Voice Radio System	\$15,100,020
Data Radio System	\$10,644,075
Estimated System Cost	\$34,460,595

Source: Honolulu Police Department

The design contained in the radio system contract was flawed

Flaws in the original design specifications prevented the completion of the system within the required three years. Design flaws included locations for signal amplification, equipment types needed for the system, and obsolescence.

Signal amplification. In the preparation of the system design, the consultant considered and tested whether adequate coverage could be provided in different areas on the island, and whether certain radios, particularly portable radios, could be reliably used. The consultant determined that a reliable voice and mobile data system could be implemented at 800 MHz with proper planning and engineering.

Through testing, the design consultant identified certain improvements that were needed to enhance or provide reliable

¹ The contractor was responsible for designing, building and completing an operational system. Upon completion, the contractor was supposed to turn the system over to the City, ready to use.

radio communications coverage in certain locations on O'ahu. In particular:

- The consultant identified the need for bi-directional radio signal amplifiers, which are used in areas to increase radio signal strength and improve radio communications. These amplifiers were for the Pali and Wilson tunnels that connect Honolulu with windward O'ahu because radio calls would drop near and within the tunnels.
- The designer also provided for two additional bi-directional amplifiers to be installed in optional locations. Testing had identified several pockets on the Windward side of the island which had little to no radio coverage due to the terrain.
- When the 800 MHz radio system was put into use in December 1997, it was discovered that the system as designed did not resolve radio coverage issues in the problem areas identified, and that additional bi-directional amplifiers and additional communications sites were needed to provide suitable communications for the police department.

The original design did not identify other areas that needed signal amplification. For example:

- The original design within the contract did not identify the need for bi-directional amplifiers in tested problem areas like Diamond Head, 'Ahuimanu, Castle Junction, and Nu'uuanu-Pali Drive areas. Amplifiers were needed in these areas to improve radio communications coverage.
- A new facility was needed for communications between the Kâne'ohe police station and in the Kapa'a Quarry area.
- The area around Wai'anae in leeward O'ahu was not sufficiently covered by radio communications coverage as designed.
- New communications sites were added at Lualualei, and Pu'u Pâpa'a at 'Aikahi, to resolve the problems in Wai'anae and Kâne'ohe.

All of these changes were considered necessary for officer safety, especially in areas where criminal activity was high.

**Exhibit 2.2
Photos of Portable Radios**



Ericsson M-RK II



Jaguar 700 P

Change orders and contract amendments were used to correct flaws and complete the system

Equipment. The original design failed to specify the right equipment needed to make the radio system fully operational:

- In June 1997, the police department switched its patrol communications from analog to the 800 MHz radio system using Ericsson M-RK II portable radios.
- The department tried to switch its communications to AEGIS digital format and encountered major communications difficulties. The department had to switch back to analog communications.
- In 2001, the radio system was upgraded to ProVoice digital format, but the M-RK II radios did not support the format. The department had to purchase additional radios, Jaguar 700P radios, to make the system work.
- In April 2002, the department was finally successful in switching all communications to digital format on the 800 MHz radio system.

Obsolescence. The design was also subject to technological changes that required different or additional components and equipment than originally specified. For example, the mobile data computers for the police vehicles specified certain Panasonic laptop models which did not have the processing and memory capacity needed to satisfy mobile data reporting requirements. The city used change orders to acquire different laptops with faster processors and more memory space.

To resolve the shortcomings in the original system design, project managers issued 31 change orders and 4 contract amendments. These changes increased system implementation costs, reduced funds available for other phases of the project, and delayed the completion of the 800 MHz telecommunications system.

Change Orders. We found 31 change orders and 4 contract amendments were issued during the implementation of the system. We concluded that these were issued to complete funding for the project, to resolve many of the design flaws in the original system, and to expand the scope of the original system. For example:

- Since the radio system contract was only partially funded, change orders were used to provide additional funding for the project.

-
- Change orders were issued to authorize upgrades to specifications or enhancements to the radio system and were justified as providing increased capacity, capability, and flexibility over the original system components or configurations. These upgrades included changes that were necessary to improve system reliability or the ability to maintain the system.
 - Change orders were used to provide additional items for the system. One change order was used to purchase additional 800 MHz radios so the Honolulu Police Department could operate in digital format on the new *trunked* system.
 - Change orders were also used to enhance the system by expanding infrastructure, adding bi-directional amplifiers, and developing communications sites at Pu'u Pâpa'a and Lualualei. The changes were supposed to improve radio coverage and frequency efficiency, and to promote officer safety. As discussed earlier, during the testing to create the system design, there were several areas which had problematic radio coverage. The contract provided two amplifiers for known problem areas, with funding for an optional two more. Change orders were used to fund five additional bi-directional amplifiers which were not included in the original contract.
 - Change orders were used to fund the one-year service warranty for an incomplete system. The project was said to have entered the one-year service warranty period beginning in February 1996, and contract funds were used to cover the warranty period. The system was incorporated into police operations in June 1997.
 - City priorities changed in the latter part of the project to enable interoperable public safety communications, which provide a common line of communication between civil defense, Honolulu Police Department and other city public safety groups in the event of natural disasters and other public safety emergencies.
 - Change orders were used to fund initiatives to improve the overall operations of the prosecuting attorney's office radio system, and to convert the fire department radio system to the 800 MHz radio system. Both changes were outside the scope of the contract.

Increased System Costs. The cost of the contract amendments and change orders increased total system implementation costs approximately \$29.5 million. The costs are listed in Exhibit 2.3 below:

Exhibit 2.3
800 MHz System Contract Amendment and Change Order Costs

<i>Item</i>	<i>Cost</i>
4 Contract Amendments for System Design Work	\$968,952
1 Microwave System Change Order	\$149,046
24 Voice Radio System Change Orders	\$22,012,820
6 Mobile Data Computer System Change Orders	\$6,369,206
Amendment and Change Order Costs	\$29,500,024

Source: Department of Budget and Fiscal Services

Reduced Funding. Since the total system required annual appropriations over several years, contracts were funded to meet immediate project priorities and funding deferred for lower priority phases until the funds were *needed* or *available*. Funds for under-funded phases were provided through change orders. For example:

- The microwave control system required planned upgrades of \$9 million, but available records show that only \$5.9 million in upgrades were actually funded. Contract amendments and change orders were also used to close the funding gaps.
- Similarly, the data radio system was estimated to cost \$12.3 million, but only received \$6.3 million in funding. Contract amendments and change orders were also used to close these funding gaps.

We found the radio system contract went through 24 change orders, which added \$22 million to the initial contract price. The changes extended the time needed to complete the project, and

resulted in less project funds being available for other required phases of the project.

The project managers in the Department of Design and Construction allowed the contractor and the user, the Honolulu Police Department, to influence the management of the project, which resulted in cost overruns and delays in completing the project

The Department of Design and Construction was designated the project manager and was responsible for overseeing the contracts, providing approvals, and ensuring the projects were completed on time, within budget, and according to planned specifications. The Honolulu Police Department was designated as the user and client.

Department of Design and Construction did not apply appropriate project management practices and cost controls to manage the contractors' performance. We found there were city fiscal directives and contract terms regarding project management that could have been used to control the project's time of delivery, contract costs, and to ensure the original contract terms were satisfied with minimal changes or cost impacts.

The failure to follow city directives and best practices resulted in cost overruns, project delays, and system problems. Some of the changes were not authorized by the contract or city policies. The change orders caused the project to take over 11 years to complete what was intended to be a three-year project. For example:

- On occasions during the radio system's implementation, the contractor proposed to the police department that it should make various upgrades to the system and purchase additional equipment to improve the system's functionality. These changes exceeded the original specifications, design, and scope. In consultation with the police department, the design and construction staff accepted these changes as being necessary for officer and public safety, or essential to a working system.
- The contractor was to deliver a complete radio system in three years. The city did not enforce its right to timely performance, and approved time extensions that allowed the contractor to exceed the three-year time frame.
- The police department was allowed to deal directly with the contractor, request changes to the system, and review contractor change proposals prior to sign-off by the design and construction department.

The system took 11 years and \$64.8 million to complete

As discussed earlier, the telecommunication system was projected to cost \$34.5 million and take 3 years to develop.

As of the completion of the radio system in 2005, the city expended approximately \$48.6 million dollars in system implementation costs (including \$29.5 million on change orders and contract amendments) and \$16.2 million in major maintenance costs during the implementation period to support the system while it was being brought online. Exhibit 2.4 identifies the total cost of the 800 MHz telecommunications system. The completed system cost the city \$64.8 million and 11 years to implement.

Exhibit 2.4
800 MHz Telecommunications System Costs

<i>Item</i>	<i>Cost</i>
Initial System Design	\$432,715
Microwave Control System Contract	\$5,840,929
Voice Radio System Contract	\$11,563,000
Data Radio System Contract	\$1,240,364
Cost of Implementation Contracts	\$19,077,008
Additional System Design	\$968,952
Microwave Control System Change Orders	\$149,046
Voice Radio System Change Orders	\$22,012,820
Data Radio System Change Orders	\$6,369,206
Amendment and Change Order Costs	\$29,500,024
Total System Implementation Cost	\$48,577,032
Mobile data equipment and service	\$4,807,500
Replacement radio purchases	\$8,284,436
Radio system equipment, repair, and maintenance contracts	\$3,124,169
Major equipment, maintenance, and repair related costs	\$16,216,105
Total 800 MHz System costs	\$64,793,137

Source: Department of Budget and Fiscal Services

As shown in the exhibit, the cost overruns were due to contract amendments and change orders that totaled \$29.5 million. The radio contract change orders totaled \$22 million of the \$29.5 million. The cost to implement the 800 MHz telecommunications system increased because of design flaws, project management attempts to resolve the flaws, loose project management, and maintenance costs incurred during the 11 years it took to complete the system.

The City's role and acceptance of the system limits the potential recovery of public funds used to resolve the design flaws, and system development and installation problems

The liquidated damages provision contract states that if the contractor fails to meet the deadline, the contractor was liable for penalties totaling \$500 per calendar day, with a total cap at 50 percent of the total bid amount (or approximately \$9.83 million).

We reviewed the liquidated damages provision to determine if the city could recover funds that were expended to resolve the system implementation problems. In our opinion, although the project took 11 years to complete, the city cannot enforce the liquidated damages provision because it approved the time extensions for the project, approved the change orders and contract amendments, accepted the system, and approved the contract as complete. Moreover, the statute of limitations appears also to have expired for filing damage claims.

Chapter 3

The System is Currently Reliable

Despite its controversial past, current management of the Honolulu Police Department and the Department of Information Technology have taken actions to provide and maintain a reliable radio system. The Honolulu Police Department has a system to repair radios and has a preventive maintenance program. The Department of Information Technology has a system to monitor and maintain infrastructure. The system is properly tuned and optimized to provide 95-97 percent coverage. As a result, the system was operational during two recent public safety emergencies and users are satisfied with the performance of the system.

Despite Its Controversial Past, Current Managers Have Taken Actions to Provide and Maintain a Reliable Radio System

The 800 MHz radio system is critical to the communications needs of the police department in promoting public safety, and for enabling communications between first responder agencies in the event of emergencies. In our opinion, current managers of the system are promoting and maintaining a reliable radio system. In the period 1998 to 2004, the 800 MHz radio system had many problems, including radio coverage dead spots, garbled communications, software problems, and site failures which required the use of backup or parallel systems. At the time of our review, these problems had been resolved and no significant outages or other major problems were reported between 2006 and 2008. Police users reported they were satisfied with the system and the system met their daily communications needs.

No significant, widespread outages, or major problems with the system occurred during the period reviewed. More specifically:

- We reviewed the system monitoring logs for calendar years 2006 through 2008 and found no significant, widespread outages, or other major problems with the radio system.
- We reviewed preventive maintenance records for the system batteries, alarms, and detectors at selected communication sites for the period 2003 to 2008. We found only three instances where voltage alarms and detectors failed the testing process, those problems were resolved and in later testing were in working order.

-
- We found no indication that problems uncovered in preventive maintenance led to or caused significant, widespread outages or other major problems with the radio system.

The Honolulu Police Department has a system to repair radios and has a preventive maintenance program

The police department Telecommunications Systems Section troubleshoots and maintains radio equipment, mobile data components, and communications radio rooms. This section instituted a preventive maintenance policy for radios and equipment, inspects and repairs items brought in for repairs, checks for wear and tear, and regularly performs preventive maintenance on portable radios. For example, when officers report for annual weapons certification, their radios are turned in to the Telecommunications Systems Section staff for routine preventive maintenance. The photo below shows the Telecommunications Systems Section facility.

**Exhibit 3.1
HPD Telecommunications Systems Section Radio Repair Shop**



The Telecommunication Systems Section radio shop installs, maintains and repairs mobile and portable radios used on the 800 MHz radio system.

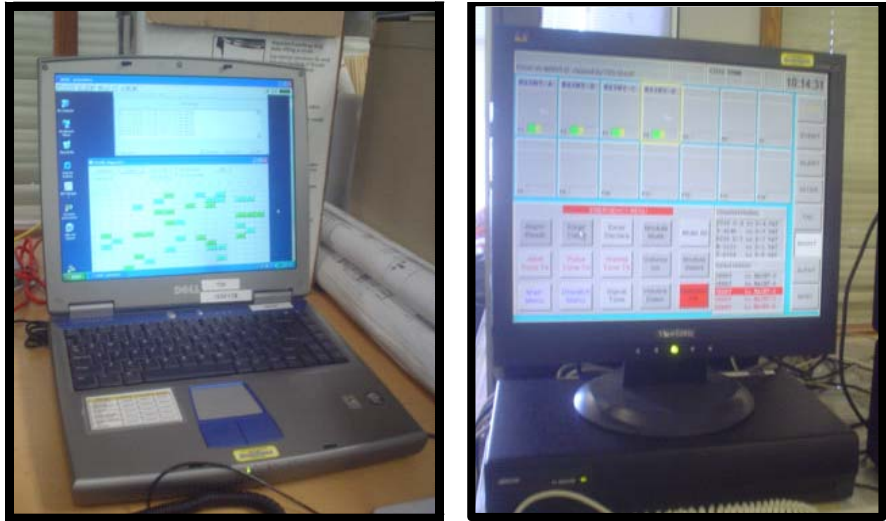
Source: Office of the City Auditor

If the Telecommunications Systems Section receives a trouble call, a technician will investigate the nature of the problem by checking a system console. If the system shows alarms or a failure message, the technician will determine whether the problem is with the field unit's radio or the nearby transmission site. The Telecommunications Systems Section staff can also listen to radio communications in the police patrol district to determine if others are having the same problem. If necessary, the staff can go out with radio equipment to simulate the problem or to ensure the radio communication site is working properly. If a problem exists at a radio communications site, the Telecommunications Systems Section staff may go to the site to perform necessary repairs or report the problem to the Department of Information Technology for follow-up action.

The Department of Information Technology has a system to monitor and maintain infrastructure

The Department of Information Technology monitors the system and assesses the performance of the infrastructure. If a system alarm or failure message is received on the console used to monitor the system (see photo below), the Information Technology staff, or the police department Telecommunications Systems Section will perform maintenance at the problem location. In the future, the Department of Information Technology will assume full responsibility for managing the entire network infrastructure, which includes the city's microwave backbone, equipment rooms, communications towers, and radio system components.

Exhibit 3.2 System Monitoring Consoles



The state of the 800 MHz radio system is monitored by system consoles which indicate system alarms or states of failure. The left image is a computer that emulates a police dispatcher's communications console and shows system status. The right image is a console that can monitor individual sites for alarms and status.

Source: Office of the City Auditor

Staff report the system is tuned and optimized to provide 95-97 percent coverage

According to the Honolulu Police Department and the Department of Information Technology staff, the system is tuned for optimization. Our review of system logs, trouble calls, reports, and other records confirmed staff comments that the system is properly tuned and optimized. According to the staff, since 2005, the system has performed well under the oversight of the police and information technology departments.

Prior to 2005, the Honolulu Police Department and the Department of Information Technology staff reported problems with the system components and equipment at some communications sites. The staff of both departments reported that although a contractor performed regular maintenance on the system, they found that some communication site components and equipment were not set to ensure reliable performance. The staff stated the contractors would tune the radios within an acceptable range rather than to specific settings and this impacted the performance of the system. Since the staff of both departments have assumed responsibility for the system and set

the communication components and equipment to specific settings, the system is more reliable.

The staff of both the Department of Information Technology and the Honolulu Police Department reported the radio system now provides 95-97 percent coverage of the city. The departmental staff stated radio coverage problems exist in a few areas around the island, but these will be offset by the future use of bi-directional signal amplifiers, which increase signal strength to improve the reliability of radio communications. During our site visits, the Department of Information Technology staff identified areas where coverage was spotty and we noted the surrounding terrain was deep in valleys or blocked by ridges. Both departments report that no radio system, including the 800 MHz radio, can provide 100 percent coverage and reliability, and the cost of marginal improvements at this point to the system is prohibitive.

The system was operational during two recent public safety emergencies and users are satisfied with the performance of the system

Public Emergencies. The 800 MHz radio system was operational during two recent major public safety events involving lengthy, island-wide power outages.

- The first event occurred on Sunday, October 15, 2006, when the effects of an earthquake off the coast of the island of Hawai'i knocked out the power on O'ahu for 14 hours.
- The second event occurred on Friday, December 26, 2008, when the effects of lightning strikes on the island's power grid caused an island-wide blackout for 12 hours.
- During both events, Department of Information Technology Technical Services staff joined other emergency response agencies at civil defense to monitor the civil emergency. In both instances, the 800 MHz radio system was fully functional.

The Department of Information Technology issued a policy that the city's communications towers and facilities must withstand a category 4 hurricane and commissioned an engineering study to identify any improvements needed and the cost of such improvements. The study indicated not all towers and equipment rooms are properly hardened against conditions that would happen in a hurricane, so there can be no guarantee that the city's communication systems, including the 800 MHz radio

system, would withstand severe weather such as a Pacific hurricane or severe rain and wind storms.

Users satisfaction. We contacted the State of Hawaii Organization of Police Officers' O'ahu Chapter to obtain the union's perspective on the state of the Honolulu Police Department communications system and to discuss any problems with the 800 MHz radio system. This organization had encouraged the City Council to initiate this audit due to problems it had with the 800 MHz radio system, its suitability for daily police operations, and problems with system glitches, outages, and voice and data transmission problems.

The union's O'ahu chapter chair confirmed our overall assessment that no major problems currently exist with the 800 MHz radio system. The chapter chair disclosed that he was assigned to the field and is a daily system user. He stated that he had not received any recent complaints from police officers about the 800 MHz radio system, the reliability of the radio system, or officer safety since the system was *rebanded*¹ in 2007. At our request, the chair solicited the opinions of the O'ahu board's district representatives and they reported they had not received any complaints from officers in their districts regarding system glitches or radio problems since the system was *rebanded*.

¹ In 2004, the Federal Communications Commission determined that cell phone and public safety frequencies should be segregated. This segregation was called *rebanding*.

Chapter 4

Challenges Exist as the System Reaches the End of Its Lifecycle

The system is approaching the end of its lifecycle which creates several challenges. These challenges include physical, security, and environmental issues; and management's ability to address system needs, system upgrades, and infrastructure improvements. Other challenges include the absence of a comprehensive risk assessment for continued operations, and the absence of data needed to make key decisions.

The System is Approaching the End of Its Lifecycle, Creating Several Challenges

The operation of the 800 MHz radio system is critical to the communications needs of the police department in promoting public safety, and for enabling communications between first responder agencies in the event of emergencies. Although the system is currently reliable and working, the age of the system and the state of some of its supporting facilities may affect the city's ability to continuously provide the communications needed during emergencies, and to protect police officers and the public.

The current 800 MHz system was designed to last twenty years. As the system reaches the end of its lifecycle, management faces challenges regarding the continued operation and maintenance of the system. For example:

- Vendor support for repair and maintenance may not exist in the near future, and costs to replace equipment and components may increase. The system was sold and installed as a closed proprietary system, which limits replacement options to a limited set of vendor licensed equipment and components. As the single authorized source for support services, the city is dependent on the vendor, Harris Corporation, or its licensees to provide tuning and repair services. The vendor has warned the city that performing unauthorized service on the system and its components may void warranties and service agreements.
- The Honolulu Police Department's Telecommunications Systems Section reported difficulty in finding replacement parts, and that shipping costs are making repairs costly.

More specifically, radios and components repaired locally must use authorized parts purchased and shipped by the vendor from the continental United States. Items that cannot be repaired in-house at the radio shop must be shipped to the continental United States for authorized repairs.

Both the Department of Information Technology and the Honolulu Police Department have taken several actions to prolong the life of the system. For instance:

- The manager of the police department's Telecommunication Systems Section implemented a program to salvage parts from inoperable radios. This program was started to keep most repair work in-house, and to reduce shipping costs related to servicing radios and purchasing replacement parts. However, the continuation of this program is not guaranteed.
- The Department of Information Technology is working to overcome the limitations of the closed proprietary system by providing upgrades which will extend the useful life of the system and purchasing replacement radios that will be compatible with any future radio system. The department is developing its capability to perform infrastructure repairs in-house, is upgrading city communications facilities, and is improving radio coverage to enhance communications on the Windward side of the island.

Nevertheless, as the system reaches the end of its lifecycle, many challenges exist.

Physical, security, and environmental challenges

We visited a total of 12 of the 16 communications sites which support the city's communications system, including 9 which support the 800 MHz radio system as zone or simulcast sites¹. The purpose of the visits was to identify physical, security, and environmental vulnerabilities, and to observe the conditions of the 800 MHz radio system facilities, components and equipment, and communications towers. During our visits, we found physical, security, and environmental problems. The photos on the following page show some of the facilities visited.

¹ Zone or simulcast radio sites are locations that service a particular geographic area and/or allow for communication in either microwave or 800 megahertz.

Exhibit 4.1
Communication Site Visit Photos



The 800 MHz system is supported by remote communication sites located around the island. At left is an equipment room used to store the radio equipment, with a communications tower in the background. At right is an 800 MHz radio system bank of components.

Source: Office of the City Auditor

The 800 MHz zone and simulcast sites we visited were:

- Pu'u Manawahuā
- 'Aliamanu
- Round Top
- Koko Head
- Waimānalo Ridge
- Pu'u Pāpa'a
- Ka'a'awa Fire Station
- Kawela
- Mokulē'ia

The microwave hub sites we visited were located at the Fasi Municipal Building and Alapa'i Police Headquarters. We also visited the Kahuku police station microwave site.

To assess whether the facilities met acceptable standards of fire safety, security and operating environments for electronic equipment, we used criteria listed in the 1990 Leach-Mounce Architects Facilities Report (Facilities Report). This report assessed the state of city communications sites and facilities by using 27 generally accepted environmental standards which assess the suitability of the physical environment for proper operation of electronic equipment, and identified those sites which needed upgrades in order to implement the 800 MHz radio system².

From the 27 criteria, we selected the following 7 criteria to assess improvements made to the sites, and their current physical, as well as environmental, vulnerabilities:

- Physical security measures (locks, security cameras, alarms, fencing)
- Building and tower integrity
- Fire protection
- Backup electrical generators
- Air conditioning
- Pest intrusion
- Moisture control

Physical and security challenges. At some sites, we found facilities and infrastructures in need of physical and security upgrades and improvements. More specifically:

- The Facilities Report criteria recommended physical security such as card key locks or security keys, motion activated security cameras, and intrusion alarms. The Facilities Report stated all of the sites we visited required basic upgrades to locks, closed circuit cameras, and intrusion alarms. During our visits, the Department of Information Technology staff reported only 2 of the 16

² Pu'u Pāpa'a and the Alapa'i Police headquarters were not included in the assessment as they did not exist at the time.

sites ('Aliamanu and 'Aikahi sites) had motion sensing security cameras and security keys. Other newer equipment rooms had only the motion sensor intrusion alarms. Our site visits confirmed that those recommended physical security requirements were not fully implemented.

- Although access roads to non-police station sites were gated and locked, most of the site facilities (equipment room and tower) were not security fenced to prevent vandalism, sabotage, and unauthorized climbing of the towers. Although the Department of Information Technology staff stated they were fortunate that the sites had not suffered equipment room break-ins, we observed physical security problems, such as damage resulting from the theft of copper wiring from the exterior of the Round Top equipment room, and graffiti on the old tower at the Aliamanu site.
- Building and tower integrity is the most pressing of the physical challenges. The Department of Information Technology established a requirement that the communication facilities at key communications sites be able to survive category 4 hurricane force winds, or sustained gusts of 155 miles per hour. The radio communications facilities which must survive the winds are equipment buildings and communications towers. The department did not know if the buildings and towers could meet the new requirements and ordered a study to determine if these facilities needed upgrades, to identify maintenance and replacement priorities, and to quantify completed cost estimates for any rehabilitations or replacements.
- Three of the sites had equipment rooms from the 1950's and 1960's which were converted from military use. Possible structural integrity issues existed. For example, the Kawela equipment room had a wall which was separating from the building, resulting in a crack which exposed the room to the outside. At the Pu'u Manawahuā and Mokulē'ia sites, steel roofs attached to the concrete buildings were not secured to the walls and were unable to withstand severe wind or weather. At Koko Head, the towers, equipment room doors, and other metal fixtures were subject to corrosion from the nearby ocean. Our site visits confirmed that most of the facilities required some

form of upgrade to either the towers or equipment rooms in order to protect the communications system.

- Fire protection was previously identified as a problem for all the sites except Pu'u Manawahuā. No deficiencies were found in this area.

Environmental challenges. The city's communication sites and infrastructures supporting the 800 MHz system face challenges regarding environmental factors, such as corrosion and moisture control.

- All of the sites had backup gas powered generators to ensure continuity of operations in the event of electrical failures and power outages. However, six sites (Pu'u Manawahuā, Ka'a'awa, Waimānalo ridge, Mokulē'ia, Kawela, and Kahuku) had the generators outside the equipment room. Round Top had two generators, one outside and a small one in the equipment room. The outside generators are subject to corrosion by the weather.
- All the sites we visited had constant, uninterrupted air conditioning. No deficiencies were found.
- Pest intrusion in the form of geckos, rats, and other insects was a previously identified problem. We found no significant problems in this area.
- Moisture control appears to be a problem at the sites we visited and appeared as damage from mildew, mold and water intrusion. The Facilities Report cited water and moisture problems at 5 sites (Waimānalo Ridge, Kahuku police station, Kawela, Mokulē'ia, and the Fasi Municipal Building). We discovered evidence of moisture intrusion at 10 of the sites we visited (no problems were found at the newly renovated Aliamanu and Pu'u Pāpa'a sites). For example, at Round Top, there is water intrusion from a metal panel which ran up to the communications tower and served as a conduit for rain water to enter the equipment room. At Pu'u Manawahuā, Waimānalo Ridge, Ka'a'awa, and Kahuku, there is evidence of previous moisture control problems in the form of water stains, damaged wall paint, and mildew damage. The placement of the Ka'a'awa equipment room is problematic due to its close proximity to a drainage canal which overflowed during the 42 consecutive days of heavy rain in 2006.

Management's Ability to Address System Needs and the Lack of Expertise Could Impact the Cost of System Upgrades and Infrastructure Improvements

The management responsibilities for the 800 MHz telecommunications system have evolved since its implementation. Over its life, three city departments have been involved in its management: the Honolulu Police Department (HPD), the Department of Design and Construction, and the Department of Information Technology (DIT). The recent consolidation of the majority of the system management responsibilities into the Department of Information Technology has resulted in two critical responsibility gaps - those for implementing facilities upgrades and for managing risks to the system.

Management history. When the 800 MHz system was first implemented, responsibilities were originally divided.

- The HPD Telecommunications Systems Section maintained and repaired the digital microwave system, the 800 MHz radio systems, and the police officer radio equipment.
- The Department of Design and Construction was responsible for managing the overall system, ensuring maintenance of the system, and inspecting the microwave and radio facilities. Other Department of Design and Construction responsibilities included planning, designing, constructing, operating and maintaining the system.

In 2004, the Department of Design and Construction responsibilities for the system were transferred to DIT. Currently:

- The DIT is responsible for managing the city's microwave and 800 MHz radio system to ensure maintenance and upgrades fall within documented standards.
- The HPD Telecommunications Systems Section continues to provide installation, maintenance, and repair services to its inventory of mobile and portable radios used on the 800 MHz radio system.
- Both departments currently provide maintenance services to the system's infrastructure at city communication sites and radio equipment rooms.

Departmental concerns. Since 2004, the DIT has been the designated authority for the operations and maintenance of the communication systems used by the city's police, fire, emergency

medical, and civil defense functions, and the 800 MHz radio system. DIT was also granted temporary authority by the Department of Design and Construction to plan, design, construct, and manage the capital projects related to the communications system facilities upgrades.

DIT staff accepted responsibility for implementing the facilities upgrades and for managing risks to the system. However, the information technology department may not be equipped to fulfill its responsibilities without assistance from the Department of Design and Construction.

The Department of Design and Construction has the expertise to direct, plan, engineer, design, and construct the various improvements. Under normal circumstances, the DIT would coordinate its efforts with the design and construction staff to ensure the project was properly managed. However, DIT staff reported attempts to obtain design and construction staff assistance for planning and construction management were rebuffed by responses that the staff was too busy and the facilities upgrade project was not a high priority.

According to the DIT staff, design and construction staff indicated that if the facilities upgrade project was urgent, the DIT staff should do its own project planning and management. The design and construction director subsequently granted DIT special temporary authority to manage the planning, engineering, design, and construction of the various improvements.

The DIT Technical Support Division staff confirmed it is unfamiliar with procurement requirements, has no experience with planning or designing projects, and cannot provide construction management services. The lack of expertise was reported by example. When the DIT staff wanted to paint a transmission tower in Kahuku, the staff copied the procurement forms of earlier painting services and the procurement was rejected by the Department of Budget and Fiscal Services Purchasing Division because the design and construction staff was not involved in the project.

According to DIT, it lacks the expertise to effectively implement the responsibilities granted and is concerned the delegation may result in additional project costs, such as external professional services to plan, design, and manage projects. Project quality may also be impacted by the department's inexperience and lack of training in managing projects. Lastly, the department expressed concerns that its lack of expertise may result in project delays.

A comprehensive risk assessment of continuity of operations is needed

The operation of the 800 MHz radio system is critical to the communications needs of the police department in promoting public and officer safety, and for enabling communications between first responder agencies in the event of an emergency. These agencies rely on the 800 MHz radio system to help support their missions. To ensure a system satisfies mission needs, many entities perform risk management assessments.

The risk management process allows managers to identify, assess, and reduce risks to an acceptable level. For instance, the risk management process would allow managers of the 800 MHz radio system to balance the operational and economic costs of protective measures while improving mission capability. The results should also be used to design appropriate security measures for the system and make informed decisions regarding system expenditures.

No comprehensive risk assessment regarding the radio system has been performed. Plans for communications exercises which simulate the loss of communications towers are under development, but a plan for continued communications in the event of system failure does not exist. The department has created policies that address selected risks to the system and its supporting facilities, such as air conditioning, fire suppression, and environmental hazards, but these may not be adequate to protect the system from unidentified risks.

We are therefore recommending that DIT perform a comprehensive risk assessment of the 800 MHz radio system so that informed decisions can be made regarding the need to extend the life of the system, replace the system, improve supporting facilities, and ensure continued operations of the system.

Management needs data to make key decisions

Important historical information from system maintenance, monitoring, operations, and inventory are available but not properly integrated to help make decisions regarding the system. This historical data could be useful to daily operations. For example, historical logs show tests performed, test dates, test results, and other data needed to plan future preventive maintenance. However, this information is compiled separately and is not integrated in a form which would enable management analysis of what needs to be tested, when failures occurred, or anticipate what needs to be replaced.

Historical data can be used to assess and improve the effectiveness of the maintenance programs. During the audit, we found that the DIT Technical Support Division and the HPD Telecommunications Systems Section had collected substantial data regarding their maintenance activities. For example:

- The HPD Telecommunications Systems Section had an online database that tracked the status of each individual radio in its inventory and the maintenance performed. The database included details on each radio, status regarding whether it was in service or being repaired, and details on 37 activities that the radio shop performed. The data was used to report maintenance and installation workload related to the department's budget submission, but not used to assess and improve the effectiveness of the maintenance programs.
- The DIT Technical Support Division had a number of maintenance logs that tracked radio system problems and solutions over a six-year period, and preventive maintenance logs for batteries and sites. The data was not used to evaluate and improve the effectiveness of the maintenance programs.

The two databases could be used to produce information that managers could use to improve their installation, repairs, and maintenance programs. For example, the radio shop performed a total of 1,273 repair tasks on portable radios in FY2008-09. If the data were used to provide information regarding how many were re-work repairs, which common elements failed, or which repairs occurred most frequently, the staff could anticipate equipment failures, reduce radio repairs, and improve the effectiveness of their maintenance programs.

Chapter 5

Conclusion and Recommendations

Conclusion

Reliable and timely communications are important to daily Honolulu Police Department operations in order to ensure public and officer safety. Despite its checkered past, we found that the 800 MHz radio system is currently reliable and meets current HPD needs. Since the radio system's purpose has now evolved to support the interoperable communications requirements of emergency response agencies in a wide-scale public safety emergency, the importance of its reliability and continuity has grown.

The age of the system is an emerging risk to its continued operations and maintenance. The condition of the communications facilities requires attention to ensure continuous and reliable police and emergency communications. Although the efforts of the information technology and the police departments are admirable in their creativity to extend the usefulness of the system, its components, and its equipment, discussions about continuing to maintain the system or replace it must begin shortly. To facilitate the discussion, Department of Information Technology staff should conduct a risk management analysis that reviews the relevant risks to this important public safety communications system, including the age of the system and the state of its supporting communications facilities, and communicate its funding priorities to the City Council. This process can also augment continuity of operations planning by helping to prioritize which communications resources are the most important for ensuring system continuity or restoration in the event of an emergency. Existing databases can also provide useful data for managing the system.

We hope that the lessons learned from the implementation of the 800 MHz telecommunications system are not lost on the current managing departments. Any new telecommunications system or project to upgrade the city's supporting communications facilities needs to be guided by effective project management and applying cost controls during project development to ensure that the city receives the benefit of its agreements without substantial changes, and that taxpayer dollars are spent wisely.

Recommendations

1. The Department of Information Technology and the Honolulu Police Department should use existing databases to prepare management reports that can be used to assess and improve the effectiveness of their preventive maintenance programs, and make key decisions regarding the system as it reaches the end of its lifecycle.
2. The Department of Information Technology and the Honolulu Police Department should perform a comprehensive risk assessment of the 800 MHz radio system so that informed decisions can be made regarding the need to replace the system or to extend the life of the system, including improving support facilities and continued operation of the system.
3. The Mayor should ensure the priorities for telecommunications system improvements (including new equipment, upgrades, and site renovations) are coordinated among the police, fire, emergency services and information technology department staff, to ensure public safety communications needs are met.
4. The Mayor should ensure the existing 800 MHz system or its replacement are properly funded.
5. The Managing Director should direct the Department of Design and Construction to provide the support needed by the Department of Information Technology to plan, design, construct, and manage the projects related to improving and/or replacing the existing 800 MHz system.
6. The Department of Information Technology and the Honolulu Police Department should ensure that current implementation of system-related projects are controlled by the project manager, including project review, in-scope work, project cost accounting; and fulfilling budgeting and procurement requirements.

Management Response

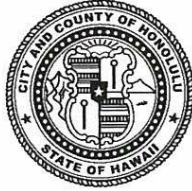
The City departments generally agreed with the audit recommendations. The Department of Design and Construction provided additional information to clarify the history, expansion, and challenges of the project. DDC disagreed that it did not provide technical support to the Department of Information Technology. The Honolulu Police Department reported they concurred with the recommendations and developed implementation plans that were jointly developed between the Department of Information Technology and the Honolulu Police Department. Some of the recommendations were implemented before the draft report was issued.

The Department of Information Technology did not submit additional comments in response to the draft report, but reported it is trying to obtain a consultant to study whether to replace or extend the life of the current 800 MHz radio system. According to the Department of Information Technology and the Honolulu Police Department, since August 2009, they have worked together to upgrade the 800 MHz radio system; applied better management controls over the projects; and encouraged the Department of Design and Construction to assist with the design, construction, and management of the current and future projects. The departments report they met in March 2010 with the manufacturer of the current system to discuss steps to convert and upgrade the radio system to a non-proprietary digital voice system.

There were no substantive changes made to the report based on the departmental responses.

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KIRK W. CALDWELL
ACTING MAYOR

TRUDI S. SAITO
DEPUTY MANAGING DIRECTOR

'10 AUG 30 A9:39

August 25, 2010

Mr. Edwin S.W. Young
City Auditor
Office of the City Auditor
City and County of Honolulu
1001 Kamokila Boulevard, Suite 216
Kapolei, Hawaii 96707

C & C OF HONOLULU
CITY AUDITOR

Dear Mr. Young:

Subject: Response to the Audit of the
800 Megahertz (MHz) Telecommunications System
Report No. 11-01, July 2010

Thank you for giving the Department of Design and Construction (DDC), the Department of Information Technology (DIT), and the Honolulu Police Department (HPD) the opportunity to respond to the draft audit prepared by your Office. We appreciate the amount of effort that your staff put into the preparation of the audit based on your understanding of the 800 MHz Radio System project and its evolution to how the radio system is currently operating.

The following are the responses from the three agencies. Sections or statements followed by bracketed *italic comments in blue* refer to the page number and topic in the audit report that the response addresses.

I. Department of Design and Construction:

The City's new 800 MHz Trunked Radio System (Radio System) was not without its challenges to design, install and optimize the Radio System to meet the contract requirements and to satisfy the Honolulu Police Department who are the primary users of the radio system.

Gerald Hamada, Chief of the Mechanical Electrical Division, participated in a telephone interview with Wayne Kawamura from your office on October 9, 2009. The telephone interview centered on the design and construction of the Radio System up to the time when the said Radio System was transferred from DDC to DIT.

To clarify the draft audit report, the old HPD radio system was not capable of accommodating multiple concurrent radio transmissions. In addition, the old system provided limited radio coverage and did not operate on secured or encrypted channels. The new Radio

System provides the capability of accommodating multiple concurrent radio transmissions on encrypted or secured channels, and in addition, provides broader island-wide radio coverage.

The contractual obligation of the project was for mobile and portable radios' coverage in the populated areas to meet or exceed 95% coverage, 95% of the time. This contractual obligation was met and verified by drive coverage tests conducted by the contractor and was verified by the City inspector and HPD/Telecommunications Systems Section (TSS) staff. We concur with the auditor that no radio system can achieve 100% coverage.

After the system was installed and was in operation, HPD requested additional coverage enhancements. For this reason, further enhancements including bi-directional amplifiers (BDA) to the Radio System were installed. *[Page 6. Signal Amplification; Page 7 Bullet Nos. 4 and 7. Contract Radio Coverage Requirements]*

The originally designed Radio System could accommodate 3,000 mobile and portable radios, with expansion capability to accommodate up to 4,800 units. After meetings with various City and State agencies and first responders, it was decided that all first responders should be on the same Radio System to promote interoperability. Therefore, through various enhancements, the Radio System was improved to accommodate approximately 8,000 units.

The auditor identifies specific issues relating to the design and construction of the Radio System that need clarification:

1. The new Puu Papa'a Communication site was installed to consolidate the sites at the Kaneohe Police Station and Kapaa to free up frequencies and channels to accommodate additional users on the Radio System and to improve its reliability and coverage. *[Page 7. Bullet Nos. 5 and 7. Reference to Puu Papa'a Site]*
2. The Waianae Police Station and Keaau Beach sites were part of the original contract. These sites addressed radio coverage needs in the Waianae and Makaha areas. We do not concur with the auditor's statement that the area around Wai'anāe in Leeward Oahu was not sufficiently covered by radio communications coverage as designed. *[Page 7. Bullet No. 6. Reference to Waianae Radio Coverage]*
3. At the time of the Radio System design and construction, the digital voice latest available technology utilized the AEGIS digital format. However, after the original digital voice format was installed, HPD requested that a newly released digital voice technology, Pro Voice or IMBE digital format would be more suitable for their use. As a result of the change in the digital voice format, more rugged Jaguar portable radios had to be purchased. *[Page 8. Reference to Equipment and Digital Voice Format]*
4. With the exception of the bi-directional amplifiers that were installed at Wilson Tunnel and at the Likelike Tunnel to improve radio coverage in the areas,

additional bi-directional amplifiers were later installed by the contractor to address areas requested by HPD outside of the original coverage areas. This also included in-building coverage for radio and cellular services at HPD at Alapai. *[Page 7. Reference to Bi-Directional Amplifiers]*

5. Change Orders executed in the contract included system enhancements and upgrades to the Radio System to maximize the reliability, coverage, capacity, and interoperability of the Radio System, and the purchase of mobile and portable radios as funds became available. *[Page 5. Reference to Change Orders Used to Correct Design Flaws; Page 8. Reference to Resolve Shortcomings and Design Flaws; Page 11. Reference made to Change Orders Not Authorized by Contract or City Policies]*

Time extensions to carry out the change orders were appropriately justified and approved by the City. *[Page 11. Reference to Use of Time Extensions; Page 14. Reference to Liquidated Damages]*

6. The deployment and continued expansion of the HPD mobile data application using the Radio System adversely affected the operation of the Radio System. It was known that a trunked radio system was not the ideal platform for mobile data communication. With HPD's continued expansion of its mobile data program and with the addition of more laptops performing more complex mobile data applications, voice communication and mobile data communication were eventually adversely affected. The mobile data communication application was later taken off the Radio System and put onto a separate format. *[Page 35. Reference to Mobile Data Computer Format]*

Regarding the management of the radio system project by the Building Department personnel and later DDC personnel, the project was ably managed as evidenced by the project records kept, project progress, progress payments made, and the optimization of the Radio System as the equipment was installed. Project management personnel from the Building Department/DDC met regularly with the Contractor and HPD, at HPD Headquarters at Alapai, to address issues related to the Radio System and the HPD mobile data program. *[Page 11. Reference to Project Management Practices]*

Since the transfer of telecommunications and personnel from DDC to DIT (at DIT's request) in 2004, DDC has provided DIT with technical support related to the communication system's infrastructure when requested. At the time of the transfer, the transferred personnel were fully capable of the planning, design, and construction of City projects. *[Page 28. Paragraph 3. Reference to Rebuffed Requests for Assistance; Page 28. Reference to DIT Lack of Expertise in Planning, Designing, Construction, Construction Management of Projects; Page 32. Recommendation No. 5]*

II. Department of Information Technology:

DIT did not submit any additional comments for this response memo.

Mr. Edwin S.W. Young
August 25, 2010
Page 4

III. Honolulu Police Department:

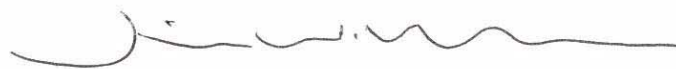
The City's DIT has been working to get a consultant to conduct a study to assess the feasibility of either replacing or extending the life of the Radio System. Furthermore, the HPD/TSS and the DIT have met with the manufacturer of the Radio System, Harris Communications. They have requested a migration path and estimate to upgrade the current system to a P25, non-proprietary format digital voice system. (Implementation date: March 2010) *[Page 32. Recommendation Nos. 1 and 2]*

DIT and the HPD/TSS continue to work together on many projects to upgrade the Radio System and microwave spur radio systems to ensure that current implementation of system-related projects are controlled by the project manager. This includes project review, in-scope work, project cost and accounting, and ensuring operational requirements are met. In addition, the HPD/TSS and the DIT will continue to encourage the City's DDC to assist with the design, construction, and project management of radio facility and tower design and construction phases of current and future projects. (Implementation date: August 2009) *[Page 32. Recommendation No. 6]*

We are open to any further questions that you may have relative to this subject.

If there are any questions please contact Craig I. Nishimura, Director of the DDC, at 768-8480.

Very truly yours,



Kirk W. Caldwell
Acting Mayor

c: Honolulu Police Department
Department of Information Technology

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Appendix 1

System Management Roles and Responsibilities

The 800 MHz telecommunications system is currently managed by the Honolulu Police Department and the Department of Information Technology. When the system was first implemented, the management responsibility for the system was divided between the Honolulu Police Department and the Department of Design and Construction. In 2004, the Design and Construction responsibilities were assigned to the Department of Information and Technology.

Honolulu Police Department

The Honolulu Police Department is responsible for the preservation of public peace, prevention of crime, detection and apprehension of law offenders, protection of rights of persons and property, and enforcement of federal and state laws and city ordinances and regulations. The Department is obligated to manage its resources wisely, and to pursue the most useful scientific and technological developments needed to improve police operations and management. Its goals and objectives include strengthening scientific and technological capabilities, prioritizing program accountability, and efficient management of technology

The department's Telecommunications Systems Section is responsible for planning, modifying, troubleshooting, repairing, and conducting preventive maintenance of the City and County of Honolulu's public safety 800 MHz digital voice and digital microwave communications systems, infrastructure, and police radio equipment. Their activities are directed by citywide procedures.

Department of Information Technology

The Department of Information Technology plans, directs, and coordinates the implementation of the city's information technology program, and provides technical expertise in communications technologies to all branches of city government. Part of its mission is maintaining, securing and protecting the various communications networks for the City and County of Honolulu, including those used by the Honolulu Police Department, Honolulu Fire Department, Department of Emergency Management, and Honolulu Emergency Services Department, to support public safety.

Its goals and objectives are the following:

- To apply technology to serve the public good; operate and maintain a cost-effective and efficient computer and communications network and facility; and optimize the use of technological resources and expertise to meet the needs of city employees and citizens,
- To provide a strategic technological direction for the city, including applications, communications, infrastructure, standards, strategies, and policies,
- To provide technological support for homeland security initiatives,
- To support the Mayor's Directive of 2006. In 2006, the Mayor issued Mayor's *Directive 06-02, Policy on Information Technology Services*, to update the city policy on informational

technology services. One of the directive's objectives was to improve interoperability of a common radio system to enhance communications between and among agencies. The director of the Department of Information Technology was formally given the responsibility to manage the city's microwave and 800 MHz radio systems to ensure maintenance and upgrades fall within documented standards. In the future, this may also entail the taking over of all maintenance duties for the system infrastructure, including those performed by the Police Department.

The DIT's Technical Support Division plans, installs, and maintains the city's data and voice communication network, provides technical assistance to the departmental divisions and end-users in establishing voice and communication network, and prepares reports on network usage and capacity. Additionally, this division provides technical support for the implementation of new radio systems features, maintenance of radio infrastructure, and management of the radio infrastructure system.

System Users

At the time of our fieldwork, the Honolulu Police Department had approximately 4,600 assigned radios in use on the system. These radios include portable radios and mobile radios which are installed in police vehicles. The Department of Information Technology indicated that a total of approximately 8,000 radios are authorized to use the system, which includes other city users. A recent inventory of the police department's radios is shown by Exhibit A.1.

Exhibit A1.1 Honolulu Police Department Radio Inventory

<i>Total 800 MHz Radios By Category</i>	<i>Number of Radios</i>
Assigned Radios	4,608
Available Radios	1,200
Lost/Stolen Radios	116
In Repair	74
Destroyed	15
Overall Total Radios	6,013

Source: Honolulu Police Department, as of June 2009

In FY2002-03, the Honolulu Police Department began a project to redesign the 800 MHz radio system to reduce voice traffic by using its own mobile data computers. The redesign was in addition to allowing other users, such as Ocean Safety, the Honolulu Fire Department, and O'ahu Transit Services, on the 800 MHz system. The total number of radios authorized to be on the 800 MHz radio system is shown by Exhibit A.2

**Exhibit A1.2
Number of 800 MHz Radios by Department**

<i>Department</i>	<i>Quantity of Radios</i>
Department of Emergency Management	180
Department of Enterprise Services	9
Department of Facility Maintenance	28
Department of Information Technology	56
Department of the Prosecuting Attorney	37
Department of Transportation Services (O'ahu Transit Services)	970
Emergency Services Department (Ocean Safety)	360
Honolulu Fire Department	880
Honolulu Police Department	5550
Liquor Commission	10
Medical Examiner Department	10
Total Number of Radios	8090

Source: Department of Information Technology, as of August 2009

In current usage, the radio system has become the centerpiece of the tactical interoperability public safety communications plan put forth by the Mayor's Public Safety Oversight, Operational, and Technical Committee in 2005. The purpose of the plan is to provide rapid, on-scene, incident based, mission critical voice communications among all first-responder agencies (including emergency services, fire, and law enforcement). The system must survive emergency conditions including hurricanes, earthquakes, and other events to effectively serve communication needs. The tactical interoperability plan requires communications between first responder public safety agencies at the city, state and federal level in the event of a natural disaster or terrorist attack.

The Honolulu Police Department previously stated the 800 MHz system problems were due to the proliferation of cellular phone sites, the nature of the technology, and problems with the city's microwave system towers and facilities. The department moved data communications off the 800

MHz system to a private service provider's network in 2004 to achieve greater data transmission speeds, and to enable other departmental users to use voice communication on the band.

In 2004, the Federal Communications Commission determined a *rebanding* of 800 MHz systems to move the frequencies used for public safety nationwide away from cellular phone frequencies. The cell phones reportedly created interference on the public safety radio bands. The timeline for the development of the 800 MHz radio system is shown in Appendix 2.

Appendix 2

Exhibit A2.1 Timeline of 800 MHz Radio System Development

<u>Planning</u>	<u>Activity</u>
FY1989-90 Budget	\$500,000 approved for telecommunications study
May 1990	HPD advertises for consultant services for planning and designing of 800 MHz telecommunications system
October 1990	Design contract awarded to Schema Systems.
October 1991	Schema Systems issues study and master plan. Proposes three component project, with radio component cost estimate of \$15.1 million
FY1991-92 and FY1992-93	Funding approved for 800 MHz trunked voice radio, \$16.6 million
<u>Implementation</u>	
April 1994	Two phase radio contract awarded to Ericsson-GE Mobile Communications incorporates work designed for other planned components. Contract amount: \$11.6 million for Phase 1 work
May 2, 1994	Phase I of radio system development begins, 18 month project
November 1, 1995	Phase I completion date passed
Mid-1996	HPD begins simulcasting on both VHF and 800MHz radio systems
August 1996	Phase I completed with 8 change orders, total cost \$16.3 million.
September 1, 1996	Funds received for Phase II, \$8.1 million. Phase II begins, 18 month project.
June 1997	End of simulcast. Police switch patrol communications from VHF to analog mode on 800 MHz radio system
February 28, 1998	Phase II completion date passed
1998-2002	Sixteen change orders and radio operational problems required upgrades, new radios, and communications enhancements
March 10, 2002	Revised project completion date passed
April 2002	All HPD communications switched to digital on 800 MHz radio
July 1, 2004	DDC transfers responsibility for telecommunications, including 800 MHz radio, to DIT
August 15, 2005	Radio system contract closed. Cost: \$33.6 million
<u>Management</u>	
2006 - 2010	800 MHz radio communications circuits transferred to upgraded microwave system. Add other first responder agencies to 800 MHz radio. 800 MHz rebanding project to relocate all public safety radio frequencies to eliminate radio interference with Sprint-Nextel cellular phone frequencies
2018 - 2020	Estimated date of technical obsolescence of current radio system

HPD = Honolulu Police Department
DIT = Department of Information Technology
DDC = Department of Design and Construction

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