



OFFICE OF THE CITY AUDITOR

City and County of Honolulu
State of Hawai'i



Audit of the City's Road Maintenance Practices

A Report to the
Mayor
and the
City Council of
Honolulu

Report No. 05-03
June 2005

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Submitted by

THE CITY AUDITOR
CITY AND COUNTY
OF HONOLULU
STATE OF HAWAI'I

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June 2005

Foreword

This is a report of our audit of the City's road maintenance practices. The audit was initiated by the Office of the City Auditor as provided in the Revised City Charter of Honolulu. The City Auditor selected the road maintenance program for review because of concerns expressed by the public regarding the poor conditions of city-owned roads and the City's overall management of its road network.

We wish to acknowledge the cooperation and assistance provided to us by the staff of the Department of Facility Maintenance, Division of Road Maintenance, and others who we contacted during this audit.

Leslie I. Tanaka, CPA
City Auditor

EXECUTIVE SUMMARY

Audit of the City's Road Maintenance Practices

Report No. 05-03, June 2005

This audit was initiated by the Office of the City Auditor as provided in the Revised City Charter of Honolulu. The City Auditor selected the road maintenance program's practices for review because of concerns expressed by the public regarding the poor condition of city-owned roads and the City's overall management of its road network.

Background

The Department of Facility Maintenance plans and administers the City's repair, renovation, and maintenance programs for city-owned roads. The department's Division of Road Maintenance is primarily responsible for the maintenance of all streets and municipal parking lots under the City's jurisdiction. Through its eight base yards throughout O'ahu, the division provides pothole patching, trench patching, first-aid, and road resurfacing utilizing city crews. Funding for road-related activities performed by the division is derived from the operating program and budget appropriations approved by the City Council. In addition, the department makes recommendations to the Department of Design and Construction for the prioritizing road resurfacing, repair, or reconstruction, based on its annual road condition survey.

Summary of Findings

This report examines the division's operations to assess its effectiveness in meeting its responsibilities. Internal controls and management practices are scrutinized, and division operations are compared to industry best practices and alternative practices of other jurisdictions around the country. The report also assesses decisions made by, and the influences of, entities outside the division that have impacted road maintenance operations. Through our examination, we found that inefficiencies within the Division of Road Maintenance and lack of support for road maintenance initiatives contributed to the City's poor road conditions.

Finding 1: The Division of Road Maintenance failed to adhere to sound management and industry best practices

- The annual pavement condition survey was last completed in 2001. The division made the annual pavement survey a low priority and city street conditions were updated sporadically. The inventory of city roads reflects the city's neglect of roadways.
- The division's road maintenance practices are reactive and rely heavily on more costly corrective maintenance. The number of resurfaced lane miles has decreased in recent years, while the number of patched potholes and first-aid applications has increased.
- Poor recordkeeping hampers the division's planning and evaluation efforts. We found that the division does not maintain or utilize historical data for road maintenance. Work logs and field reports are missing. The division is also unable to track work done by mayoral request. The city's record retention schedule is outdated and contributes to the division's poor record keeping practices.
- The division does not incorporate available technology in its road maintenance program. The division does not have a pavement management system (PMS), nor has it integrated geographic information systems (GIS) with its road maintenance program. The Department of Facility Maintenance lacks a comprehensive website.
- The division lacks formal policies and procedures, and criteria for assessing road conditions and decisions related to road maintenance applications. Instead, the division relies more on the experience of field supervisors to make judgment calls. Additionally, current work standards are not enforceable.
- The division's pothole hotline is inefficient. The hotline relies on antiquated technology and lacks appropriate policies and procedures. As a result, the division is not meeting its standard of repairing potholes within two business days.

- The division failed to adopt industry best practices, which include securing dedicated funding for road maintenance, adhering to scheduled maintenance, utilizing effective technology, and adopting customer-focused performance standards.
- Poor pothole repair techniques are sometimes used by road crews, but patching materials used are adequate. We found that the division adopted a “quantity over quality” approach in its pothole repair practices, although it did use adequate patching materials. We also found that even the best constructed patch may not last if the surrounding roadway is deteriorated. As a result, the city paid thousands of dollars to settle claims for vehicle damage caused by potholes.
- The division’s road maintenance program uses poor industry practices.
- The division’s road maintenance program generally falls short when compared to other jurisdictions.

Finding 2: Poor road conditions are exasperated by external influences

- Road maintenance funding has fluctuated over the years.
- The division suffered from long-term position vacancies and difficulty recruiting for various division positions. We found that budgetary constraints prevented the division from filling vacancies and that the division had difficulty competing with other jurisdictions in attracting candidates to fill professional positions.
- The department failed to effectively communicate road maintenance needs and consequences. We found that departmental communications failed to provide decision makers with adequate information. The department was more proactive in providing detailed information in prior years.
- The division stopped in-house road resurfacing. Additionally, asphalt suppliers limited the amount of asphalt that road crews could

use. As a result, road resurfacing crews were reassigned to other sections within the division.

- The prior administration diverted road crews away from performing road-related functions. We found that the division spent at least 5,600 worker hours on *Brunch* and *Sunset on the Beach* events during the work week and on weekends. Overtime payments for these diversions were costly and may have adversely impacted the department's budget.
- Coordination between city and state road divisions is limited and is likely to be effective in the coordination of pothole repairs only.
- Roads with disputed ownership between the city and state have not adversely affected road conditions.

Recommendations and Response

We made several recommendations to the Department of Facility Maintenance, its Division of Road Maintenance, the mayor, and managing director to improve road maintenance program operations and administration. We recommended that the department assess the status of vacant positions and pursue funding for those positions identified as essential, implement web-based technology for interacting with the community, draft and communicate the cumulative road maintenance backlog to the council, and keep an accurate account of worker hours and dollars spent on non road-related activities. We also suggested that the division adopt key industry best practices for its road maintenance program, and draft and implement a plan to eliminate poor industry practices. In addition, we recommended that the mayor ensure adequate resources for the department to pursue its road maintenance priorities and to seek a practical solution to issues regarding disputed road ownership. Finally, we recommended that the managing director update the city's records retention policies.

In response to our draft audit report, the Department of Facility Maintenance reported that it fully supported the audit and expressed general agreement with the audit findings and recommendations. The department noted particular agreement with our recommendations regarding the need for adequate funding, adoption of a pavement management system, and implementation of a comprehensive work order system. The department also acknowledged the poor condition of city

roadways and commented that it hopes to use this audit as a basis to begin needed improvements.

The department provided additional information clarifying points within the draft report, which, as appropriate, have been incorporated into the final report.

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Chapter 1

Introduction

This self-initiated audit was conducted pursuant to the authority of the Office of the City Auditor as provided in the Revised City Charter of Honolulu. In addition, the audit is consistent with the office's Annual Audit Program established for FY2004-2005, which was communicated to the mayor and Honolulu City Council in June of 2004.

Heavy rains, particularly during winter of 2004, have resulted in deteriorating road conditions throughout O‘ahu. Motorists complained of thousands of potholes that have plagued both city and state streets. Potholes and other road impairments result in damage to motor vehicles, compromise road safety, and necessitate costly emergency road repairs. These poor road conditions have prompted councilmembers and taxpayers to question the effectiveness of the city’s road maintenance program.

Background

The Department of Facility Maintenance administers the city’s repair and maintenance program for roads, bridges, streams, flood control systems, traffic signs and markings, city buildings and office facilities, and most city vehicles and heavy equipment. The department also administers the repair and maintenance programs for mechanical, electrical, and electronic equipment and facilities for parks, streetlights, and communication centers. The department is organized into three divisions: automotive equipment services, public building and electrical maintenance, and road maintenance.

Division of Road Maintenance overview

The department’s Division of Road Maintenance is primarily responsible for the maintenance of all streets and municipal parking lots under the jurisdiction of the City and County of Honolulu. The division also maintains pavements for roadways open to public use. In addition, it maintains the many city-owned streams, channels, ditches, other flood control and storm drainage systems, as well as privately owned streams on O‘ahu. The division also performs household bulky item collection, dead animal pick-up services, and helps supervise some rural area refuse collection operations for the Department of Environmental Services, Division of Refuse Collection and Disposal. Also, because of its resources and capability to perform varied types of work, it is often

called upon to assist other city agencies and departments in special situations and emergencies. This includes emergency work generated by heavy rains, wind, tsunamis, earthquakes and other natural disasters.

Currently, the division oversees 3,477 lane miles of roads throughout O‘ahu: 1,295 miles of major roads and an additional 2,182 miles of minor roads. Major roadways are essentially on bus routes and include cross-town streets, arterial and collector streets in subdivisions. All other roadways are considered minor.

The division is responsible to inspect all city-owned and -maintained roadways annually to determine pavement condition and to maintain the street inventory database. Based on annual road condition updates, the division prioritizes streets for resurfacing and other extensive road work and makes recommendations to the Department of Design and Construction to contract for the needed road work. Division road crews provide pothole patching and more extensive first aid-type repairs until the roadways can be resurfaced.

Organization

The department’s Division of Road Maintenance is split into three primary units: planning and control; Honolulu maintenance and major pool services; and rural maintenance.

The planning and control unit develops overall planning for division programs and activities, including road construction and resurfacing by contract and in-house workers. This unit also develops and maintains management support systems for planning, controlling, and evaluating the effective and full utilization of manpower, equipment, and materials. This unit also maintains the integrity of systems through monitoring, and updating the current database for performance standards and production goals.

In urban Honolulu, the Honolulu maintenance and major pool services unit (Halawa) maintains streets—including minor road repairs, trench patching, and pothole patching—and maintains storm drains, streams, canals, and other waterways, in addition to cleaning streets and municipal parking lots. Island-wide, the same unit is also responsible for resurfacing roads with in-house employees providing equipment and truck support for all maintenance activities.

The rural maintenance yards unit maintains streets and highways, including pothole patching, trench patching, and minor road repairs. This

unit also performs refuse-related activities, such as bulky item pick-up and dead animal pickup, and investigates complaints related to maintenance and other related activities.

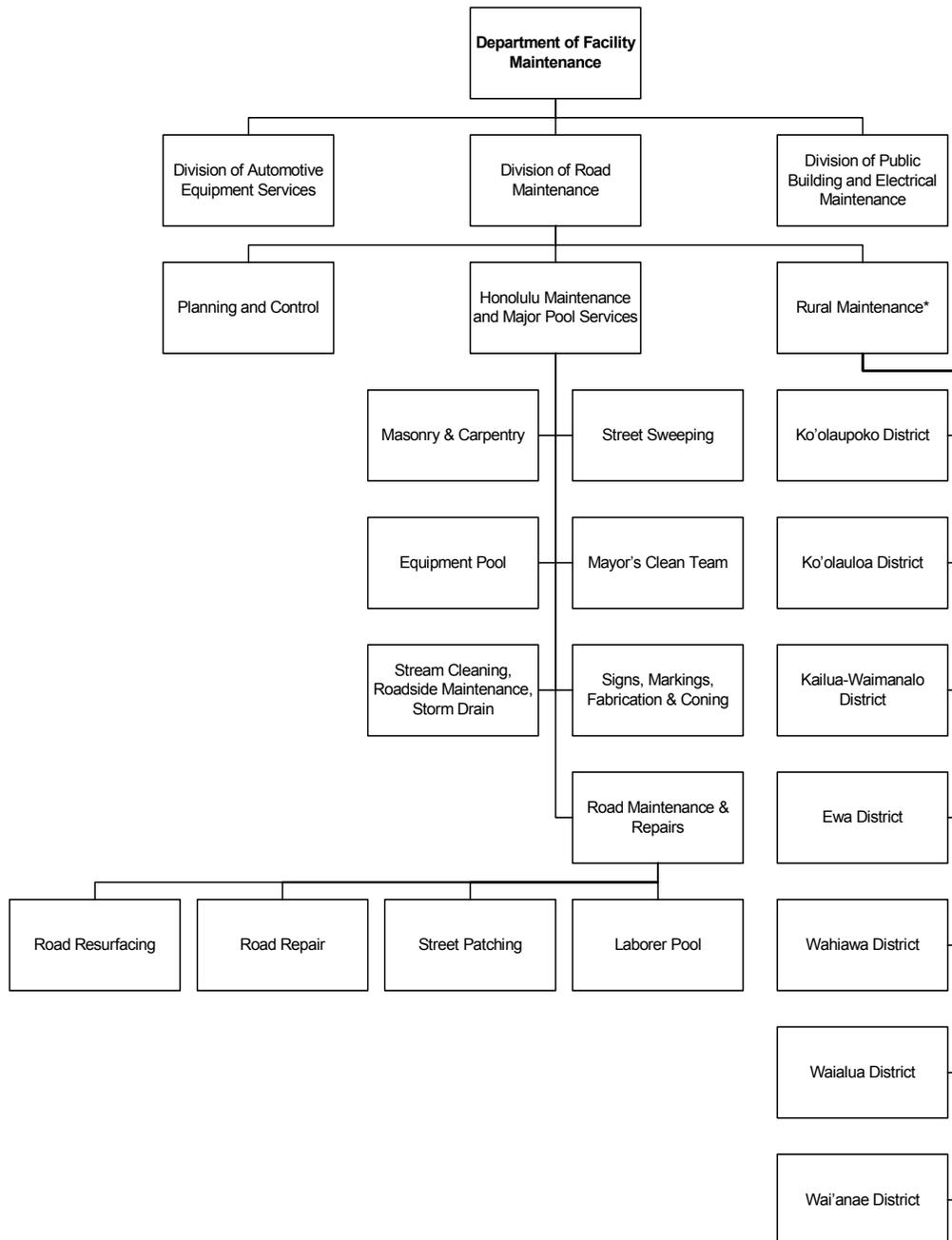
The division maintains eight base yards located in Halawa, Pearl City, Waianae, Wahiawa, Waialua, Laie, Kaneohe, and Kailua. In addition, the division has satellite yards at Sand Island and College Walk in downtown Honolulu. The Halawa yard, which serves as the Honolulu maintenance and major pool services unit, is the largest of the eight and is the coordinating point for all base yards. All major maintenance projects are performed out of the Halawa yard.

Exhibit 1.1
Photo of the Division of Road Maintenance's Halawa Baseyard



The Division of Road Maintenance's Halawa Baseyard is the largest of eight yards on O'ahu and is the coordinating point for base yards operations Islandwide. All major maintenance projects are performed by Halawa yard crews. Office of the City Auditor photograph.

**Exhibit 1.2
Department of Facility Maintenance
Organizational Chart**



*Rural Maintenance district base yards perform similar functions as the Honolulu Maintenance base yard

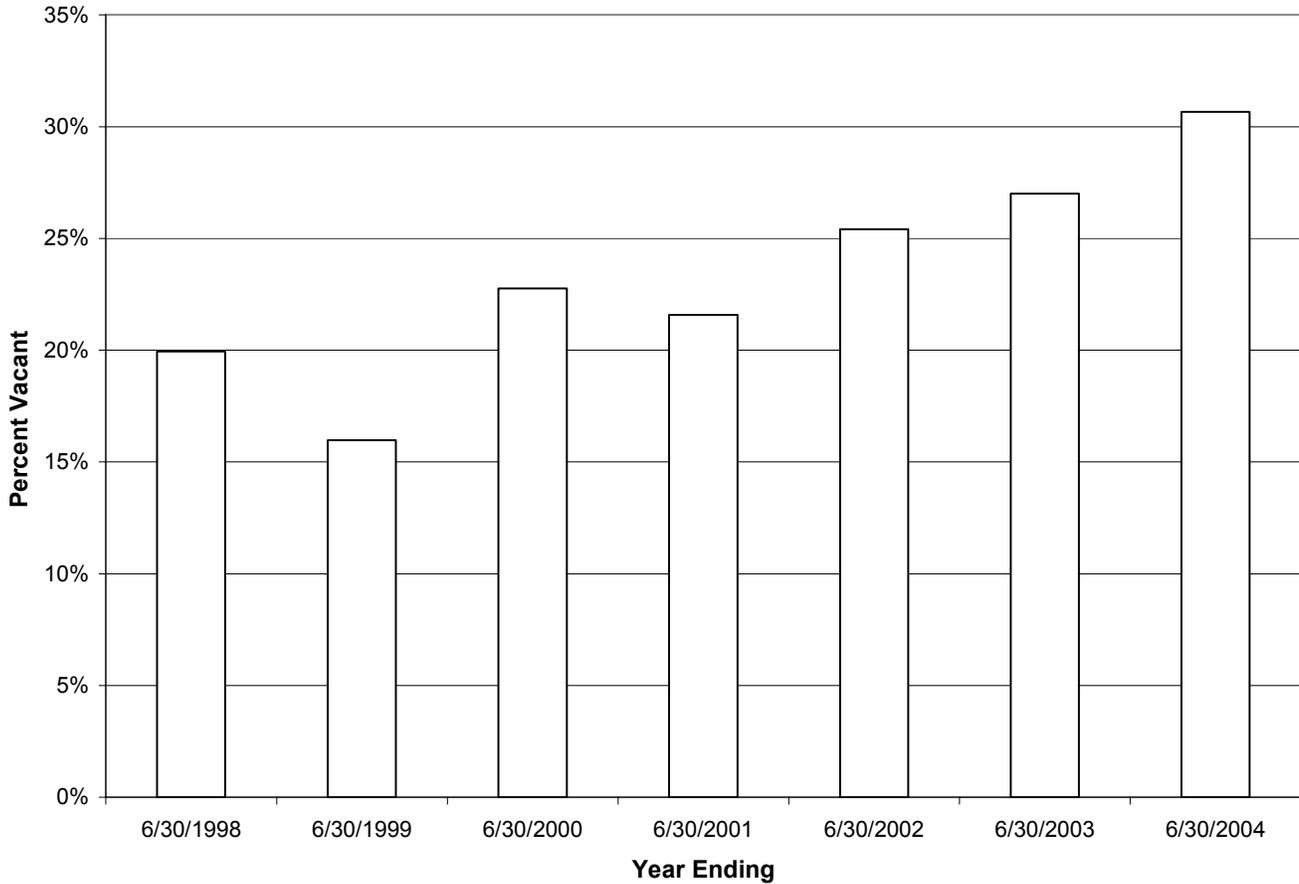
Source: Department of Facility Maintenance

Staffing

For FY2004-05, the Department of Facility Maintenance was authorized a total of approximately 778 full-time equivalent (FTE) positions, consisting of approximately 771 permanent FTE and 7 contract FTE employees. However as of January 31, 2005, there were 228 vacant positions department-wide, representing a 29 percent vacancy rate. The Division of Road Maintenance, with approximately 437 authorized permanent FTE positions, comprises over 56 percent of the department's total personnel positions. The department reports that as of January 1, 2005, the division had 140 vacant positions or approximately 30 percent vacancy. As shown in Exhibit 1.3, while the division has never had less than a 15 percent vacancy factor since the city-wide reorganization in 1998, the vacancy rate has steadily climbed in the last three fiscal years to about 30 percent.

Part of the division and departmental vacancies are due to the city administration vacancy cutback practices. Generally, the budget and fiscal services department instructs departments to reduce salary expense by a specific dollar amount. The department determines the number of positions to keep vacant to satisfy this budgetary restriction (vacancy cutback). The number of positions that remain vacant varies according to departmental needs and the vacancy cutback amount. In current budget requests, the department is attempting to fill at least 79 of the 228 currently vacant positions. Although the department reports that positions affected by vacancy cutbacks vary annually, departmental reports as of July 1, 2004, show that of the 133 reported vacancies, 61 (46 percent) of those positions had been vacant for three or more years.

Exhibit 1.3
Division of Road Maintenance – Position Vacancy Rates
FY1997-98 to FY2003-04



Source: Department of Facility Maintenance

Budget

For FY2004-05 the department was appropriated \$40,223,804, of which \$14,596,653 (36.3 percent) is allocated to the Division of Road Maintenance. The Highway Special Fund is the source of approximately 87.9 percent of the division’s funding, which as shown in Exhibit 1.4, continues to be the division’s primary funding source. Exhibit 1.5 shows the expenditure patterns for the division.

Exhibit 1.4
Division of Road Maintenance - Source of Funds
FY2001-02 to FY2004-05

	FY2001-02	FY2002-03	FY2003-04	FY2004-05
General Fund	\$5,816,760	\$2,705,679	\$2,152,2693	\$1,767,794
Highway Fund	\$11,502,906	\$12,572,852	\$12,138,772	\$12,861,609
Bikeway Fund	\$20,000	\$10,000	\$10,000	\$10,000
Solid Waste Fund	\$180,000	\$180,000	\$0	\$0
Special Projects Fund	\$185,000	\$0	\$0	\$0
Community Development Fund	\$0	\$0	\$500,000	\$0
Total	\$17,704,666	\$15,468,531	\$14,801,465	\$14,639,403

Source: The Executive Program and Budget, Fiscal Year 2005, City & County of Honolulu

Exhibit 1.5
Division of Road Maintenance – Expenditures
FY2001-02 to FY2004-05

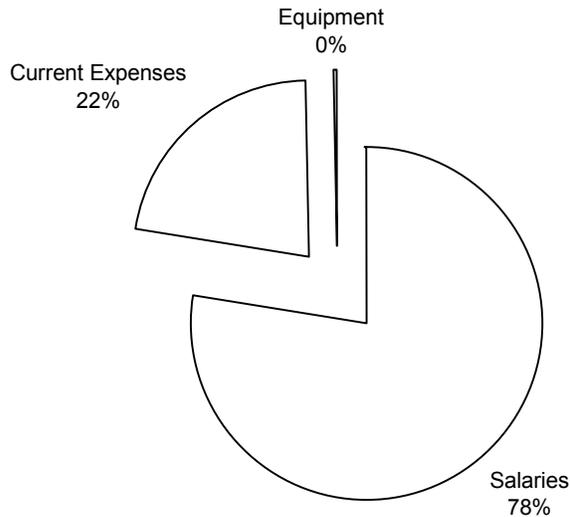
	FY2001-02	FY2002-03	FY2003-04	FY2004-05*
Salaries	\$10,704,343	\$10,314,297	\$10,653,638	\$11,340,919
Current Expenses	\$3,118,152	\$2,931,996	\$3,393,160	\$3,250,084
Equipment	\$8,998	\$8,852	\$33,349	\$48,400
Total	\$13,831,493	\$13,255,145	\$14,080,147	\$14,639,403

*Projected

Source: The Executive Program and Budget, Fiscal Year 2005, City & County of Honolulu

As shown in Exhibit 1.6, approximately 78 percent of the division's expenditure is for salaries and related costs.

Exhibit 1.6
Division of Road Maintenance
FY2004-05 Operating Budget Expenditure Characteristics



Source: The Executive Program and Budget, FY2004-05, City & County of Honolulu

Road Maintenance Program Involves Three Departments

The overall road maintenance program involves the activities of three separate departments. The Department of Facility Maintenance provides pothole patching, roadway first-aid, and road resurfacing services. The Department of Design and Construction is also responsible for road resurfacing, in addition to major road reconstruction and new road construction via contract with private vendors, using capital improvement funds. The Department of Planning and Permitting approves permits for non-city contract work on city roads such as utilities, board of water supply, and other entities that might have to excavate a city road in order to complete another construction project.

Department of Facility Maintenance

As noted previously, the Department of Facility Maintenance plans and administers the city's repair, renovation, and maintenance programs for city roads. Through its eight base yards throughout O'ahu, this department provides pothole patching, trench patching, first-aid, and road resurfacing utilizing city crews. Funding for road related activities performed by this department is derived from the operating program and budget appropriations approved by the council.

In addition to making road repairs, this department also makes recommendations to the Department of Design and Construction for prioritizing road resurfacing, repair, or reconstruction, based on its annual road condition survey. The Department of Facility Maintenance conducts analyses and makes recommendations, but does not manage major road resurfacing or reconstruction.

Department of Design and Construction

The Department of Design and Construction is the central agency responsible for the execution of the city's Capital Improvement Program (CIP). The department is responsible for coordinating the planning, design, construction inspection and bidding phases of all CIP projects and provides land services functions for all city projects. Additionally, the department develops and administers wastewater facilities plans, parks master plans and infrastructure master plans, and provides planning, design, and other support to other agencies for operating and maintenance projects.

Major road construction, reconstruction, and resurfacing projects are contracted out to private companies and managed by the department. Based on the Department of Facility Maintenance's street condition assessment and prioritization list, the department conducts project development and scoping. The department manages contract procurement, designs, plans, specifications, and estimates, and obtains necessary permits and approvals, advertises and evaluates bids, and executes contract. Contracts are awarded by the Department of Budget and Fiscal Services.

Department of Planning and Permitting

The Department of Planning and Permitting is responsible for the city's long-range planning and community planning efforts, and for the administration and enforcement of various permits required for the development and use of land. It also administers and enforces various codes pertaining to the construction of buildings, city standards, and regulations pertaining to infrastructure requirements.

The department processes and issues permits to non-city contractors for grading, street excavation, and sewer connections, and reviews various land development and building permit applications for infrastructure adequacy. The department also conducts site inspections to ensure compliance with approved plans and city standards for roads, drainage systems, and sewer systems. Once the project is approved by the city, the Department of Facility Maintenance's road maintenance division is responsible for maintaining these roads.

Road Maintenance Program Prior to the 1998 Reorganization of City Departments

Prior to 1998, the city's road maintenance activities were managed by the Department of Public Works. After the reorganization, various road maintenance and construction functions were dispersed between three separate departments.

Department of Public Works managed the road maintenance program

Prior to the city's departmental reorganization in 1998, the Department of Public Works was responsible for all public work improvements such as roads, streets, bridges, highways, drainage and flood control systems, and refuse collection. The department was also responsible for issuing permits for road construction projects conducted by private developers or agencies.

At the time, the Department of Public Works was organized into five divisions that managed its various programs. The department's Division of Engineering was solely responsible for the design and construction of streets, highways, and associated work. The division issued permits for grubbing, grading, stockpiling and trenching work within city streets, and inspected construction of subdivision and division projects. It also assisted the Division of Road Maintenance by preparing plans and calling for bids on construction of maintenance work done by contract.

The reorganization plan split road maintenance functions among three departments

After the 1998 reorganization, the various street construction and maintenance, permitting, and inspection functions were split among three separate departments.

- The Department of Facility Maintenance patches potholes and trenches, and conducts in-house resurfacing. Although it conducts pavement condition surveys and prioritizes streets in need of major resurfacing or reconstruction, the department does not control which streets are actually selected for such work.
- The Department of Design and Construction is responsible for contracting major road resurfacing and reconstruction. Although it receives street project priorities from the Department of Facility Maintenance, it is not bound by those recommendations.
- The Department of Planning and Permitting processes and issues permits to non-city contractors for grading, street

excavation, and sewer connections, and reviews various land development and building permit applications for adequacy of the infrastructure.

Audit Objectives

The audit objectives were to:

1. Review and assess the city's road maintenance and repair program practices.
2. Make recommendations as appropriate.

Scope and Methodology

Our audit focused on the Department of Facility Maintenance, Division of Road Maintenance, and its activities related specifically to the road maintenance program, such as pothole repair, minor road patching, first aid repairs, and road inspection surveys. In addition to scrutinizing the division's operations, we also reviewed the coordinated activities of the Departments of Design and Construction, and Planning and Permitting to assess their impact on the road maintenance program.

In conducting this audit, we reviewed pertinent ordinances, laws, rules, audits, reports, and studies related to road maintenance. We also reviewed road maintenance program information from other municipalities throughout the country and industry best practices as recommended by these jurisdictions, trade organizations, and the U.S. Federal Highway Administration. In addition, we interviewed various staff from the Department of Facility Maintenance, the state Department of Transportation, and other city agencies. We reviewed applicable policies and procedures, work logs, budget documents, testimonies, departmental reports, and other related data. Additionally, we observed and interviewed road crews out in the field.

The audit was conducted from February through May 2005 in accordance with generally accepted government auditing standards.

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Chapter 2

Inefficiencies Within the Division of Road Maintenance and Lack of Support for Road Maintenance Initiatives Contributed to the City's Poor Road Conditions

O‘ahu is the main hub for government, industry, and economic activity for the State of Hawai‘i. It is also home to the majority of the State’s 1.3 million residents and the thousands of visitors who arrive each day. As the backbone of our state’s surface transportation system, roads and bridges play a central role in the state’s economy. Making needed improvements to city roads and bridges is key to providing a safer, smoother, more efficient transportation system that will save motorists money and time while improving the economic livelihood of its citizenry. For the City and County of Honolulu, the Department of Facility Maintenance’s Division of Road Maintenance is tasked with the important responsibility of maintaining the city’s vast network of streets. This report examines the division’s operations to assess its effectiveness in meeting its responsibilities. Internal controls and management practices are scrutinized, and division operations are compared to industry best practices and alternative practices of other jurisdictions around the country. The report also assesses decisions made by, and the influence of entities outside the division that have impacted road maintenance operations.

Summary of Findings

1. We assessed the Division of Road Maintenance operations and identified several deficiencies that hampered the division’s effectiveness. We found that the division failed to take advantage of available technology to improve its operations. Pothole repairs are not always done effectively and the division failed to maintain an accurate record of city road pavement conditions. In addition, the division also suffers from many administrative shortcomings in its road maintenance planning and record keeping. When we compared the division’s operations against industry best practices and alternative practices of other road maintenance jurisdictions around the country, we found that the Division of Road Maintenance failed to incorporate key industry best practices in its

road maintenance program. We also found that the division employs many poor industry practices.

2. In addition to internal shortcomings, the Division of Road Maintenance was adversely impacted by outside influences and decisions. Lack of funding and chronic vacancies hampered the division's ability to effectively maintain city roads. The former administration's directive to cease in-house road resurfacing was particularly problematic because it allowed roads to deteriorate and created conditions for potholes to appear. Despite division vacancies and funding shortages, the division was also asked on numerous occasions to assist with non road-related city functions, which diverted crews from its road maintenance duties. Coordination between the city and state on road maintenance issues remain limited. However, the issue of disputed roads between the city and state has not adversely impacted road conditions.

The Division of Road Maintenance Failed to Adhere to Sound Management and Industry Best Practices

In assessing the Department of Facility Maintenance's Division of Road Maintenance operations, we found that the division suffers from poor administration and internal controls in managing important records, documents, and policies and procedures. The division also failed to properly execute its annual pavement condition survey and has often employed poor pothole patching practices. Particularly problematic are the scores of missing documents, leaving the division without data to scrutinize or use for future planning. We also reviewed industry best practices as well as practices of other road maintenance jurisdictions throughout the country. Compared with the division's operations, we found that the division did not incorporate many of these recommended or best practices.

The annual pavement condition survey was last completed in 2001

The division's Planning Section conducts an annual pavement condition survey of all roadways maintained by the City. The purpose of the annual survey is to update road conditions throughout the City's road network. To accomplish the survey, staff physically drive and inspect all of the City-maintained roadways. They look for various types of pavement failures and determine the street's condition rating. Roads are evaluated against condition criteria and are assessed against a five-point rating scale ranging from "good" to "very poor." The road condition data is then used to update the street inventory database. The updated street inventory is then used as a planning and budgeting tool to identify

and program roadways in need of resurfacing or reconstruction. According to division policy, two full-time production control technician assistants are tasked with conducting the annual field survey and updating the street inventory database with the pavement information gathered. However, the last comprehensive annual pavement condition survey was conducted in 2001.

The division lacked personnel to conduct the survey

Pavement condition surveys were conducted annually until the late 1990s. According to the division, staffing shortages and increased demands on the division over the past several years resulted in the last rating being done in 2001. In the early 1990s, the division employed summer interns to conduct the pavement condition survey. In 1993, the division allocated two production control technicians positions to conduct the survey, who also had other functions within the division. Currently, both production control technician assistant positions within the division's planning section are vacant. One position has been vacant for two years, and the other, for approximately three years. The division estimates that it would take about six months to complete the annual condition survey. However, the division has never had an opportunity to dedicate staff for this function so it can only estimate the time it would take with a dedicated staff of two. The 2001 survey took approximately one year to complete.

Division administration made the annual pavement survey a low priority

According to division staff the annual pavement condition survey is a useful tool. However, this function was not a priority. A division administrator rationalized that since the division and the Department of Design and Construction had not done any significant work on city roads, and no resources were immediately available to initiate major road projects, the division did not feel that spending time and resources for the annual survey was worthwhile. In addition, the division chief is contemplating a conversion of one of the production control technician assistant positions currently allocated to conducting the annual pavement survey to a purchasing agent for the division. The division chief determined that securing a purchasing agent position to consolidate purchasing supplies and equipment is more urgent than conducting the annual survey. Furthermore, the division chief is proposing that the annual pavement condition survey be conducted every two years until the road maintenance backlog is back on track.

Condition of city streets are updated sporadically

Although a comprehensive pavement condition survey has not been completed since 2001, condition information is updated in the city's database, the *Islandwide Inventory of City Owned and Maintained Roadways*, if work is done on a particular street. The division acknowledges that unless the City does some type of work on a roadway, it may not have any current information about the road condition in its inventory. If road work is not completed on a particular road, especially private roadways that do not experience a lot of wear and tear, the city may have little information about the road other than its existence.

Inventory of city roads reflect the city's neglect of roadways

We reviewed the *Islandwide Inventory of City Owned and Maintained Roadways*, updated as of January 10, 2005. We found that some streets were, in fact, updated to reflect roadwork conducted in years 2002-2004. We also found roadways whose last recorded roadwork were completed in the years 1958 and 1963. The inventory also includes road conditions for which the owner is unknown, but the city includes in its inventory.

Absent a formal pavement management system, the annual pavement condition survey is the most important planning tool the division has. However, the division has not made the survey a priority and failed to update its inventory of city streets and their conditions. Division administrators have taken an "intuitive" approach in assessing the current condition of city roads; they surmise that since the 2001 survey, road conditions could only have gotten worse. While their view is logical, this approach is insufficient as the primary basis for the division's planning effort going forward. As a result, the existing condition ratings are suspect, and may understate the true condition of city roads, the cost to bring those roads up to standard, and the personnel needed to address road maintenance backlogs. Furthermore, decision makers do not have accurate data on which to make sound budget and work planning decisions to effectively manage city roads.

The division's road maintenance practices are reactive and rely heavily on more costly corrective maintenance

There are three primary types of pavement maintenance operations:

- *Preventive Maintenance*. Performed to improve or extend the functional life of a pavement. It is a strategy of surface treatments and operations intended to retard progressive failures

and reduce the need for routine maintenance and service activities.

- *Corrective Maintenance.* Performed after a deficiency occurs in the pavement, such as a loss of friction, moderate to severe rutting, or extensive cracking. May also be referred to as “reactive” maintenance.
- *Emergency Maintenance.* Performed during an emergency situation, such as a blowout or severe pothole that needs repair immediately. This also describes temporary treatments designed to hold the surface together until more permanent repairs can be performed.

Although all three types of maintenance are important, preventive maintenance activities are the most cost-effective and offer the best means for prolonging pavement service life. We found that the division’s road maintenance operations rely more heavily on emergency and corrective maintenance.

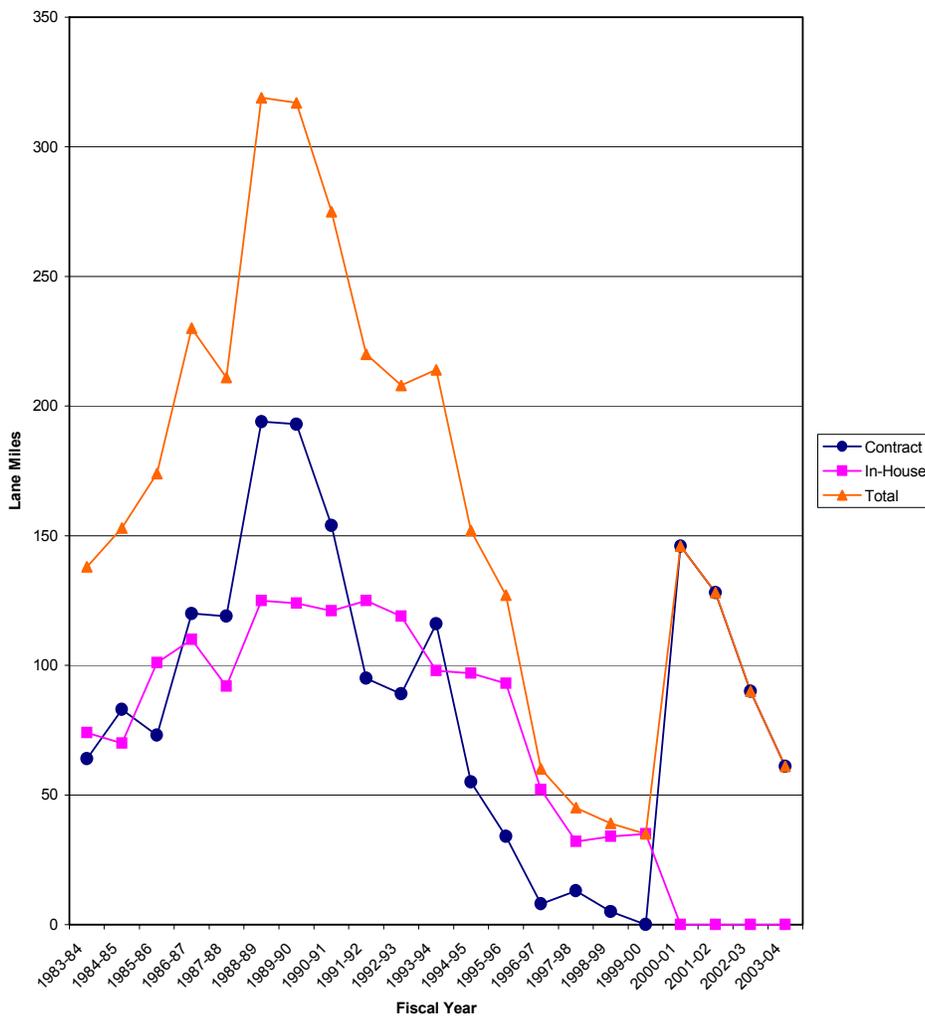
A preventive maintenance program adopts a systematic approach to using a series of treatments over time. The goal of such a program is to apply these treatments early, extend pavement life, and enhance system-wide performance in a cost-effective and efficient way. Studies show that preventive maintenance is six to ten times more cost-effective than a “do nothing” maintenance strategy. In addition, by extending the life of a pavement section until it can be rehabilitated, preventive maintenance allows an agency to even out its maintenance budget from year to year, which otherwise vary greatly. Benefits of pavement preservation include improved customer service and substantial life cycle savings.

One common preventive maintenance activity is road resurfacing. Road resurfacing involves applying a thick hot mix asphalt overlay (greater than one inch) over the full roadway width and length. Since 1999, this preventive maintenance activity, funded through capital improvement funds and managed by the Department of Design and Construction and performed by private contractors, has decreased significantly. Corrective and emergency maintenance, such as potholes and first-aid repairs, which are done in-house by the division utilizing general operating funds, has increased. First-aid repairs involve resurfacing narrow roadways and performing major and minor repairs of asphalt roadways, including base work and/or overlays to distressed areas.

The number of resurfaced lane miles has decreased

Beginning in FY1994-95, the City switched the funding mechanism for contract road resurfacing from general operating funds to capital improvement funds. During the 10-year period between FY1994-05 to FY2003-04, the number of resurfaced lane miles decreased substantially compared to the previous ten years. A high of 319 lane miles of asphalt concrete roadways were resurfaced in FY1988-89; in contrast 45 lane miles were resurfaced in FY1997-98. Exhibit 2.1 reveals the downward trend in road resurfacing over the past 20 years.

Exhibit 2.1
Lane Miles of Asphalt Concrete Roadways Resurfaced
FY1983-84 to FY2003-04



Source: Division of Road Maintenance

The number of patched potholes and first-aid applications has increased

In FY1993-94, the division patched 27,234 potholes; in FY2003-04, the division patched over double the number patched ten years earlier at 68,872 potholes. The tonnage of asphalt concrete used to make first-aid repairs also increased 20 percent between the period of FY1993-94 (7,807 tons) and FY2003-04 (9,354 tons). Though the number of potholes patched and tons of asphalt concrete poured for first-aid applications varied throughout the years, there is a general upward trend for these corrective maintenance categories.

Our audit focused primarily on the city's road maintenance program over the last three fiscal years. When comparing the number of resurfaced lane miles with corrective actions such as potholes and first-aid between FY2001-02 and FY2003-04, we found that road resurfacing decreased by over 52 percent, while the number of potholes patched increased by over 79 percent, and tons of asphalt concrete used for first-aid applications increased by 291 percent. Exhibit 2.2 shows the relationship between decreased road resurfacing and increased potholes and first-aid applications.

**Exhibit 2.2
Road Resurfacing v. First Aid and Pothole Patching
FY2001-02 to FY2003-04**

		FY2001-02	FY2002-03	FY2003-04	Percent change from FY2001-02 to FY2003-04
Roadway resurfacing	Lane miles	128	90	61	-52.3%
First aid repairs	Tons AC ¹	2,387	1,829	9,354	291.9%
Pothole patching	Each	38,432	40,195	68,872	79.2%

¹ AC = Asphaltic Concrete

Source: Compiled by the Office of the City Auditor

Industry experts note that some agencies are reluctant to program treatments on pavements in good condition when there is a large backlog of pavements in poor condition within the system. It is common for preventive maintenance to be forgotten when potholes and other maintenance problems demanding immediate attention and consume much of a limited maintenance budget. The public expects that problems

such as potholes get fixed first, causing preventive maintenance work to be neglected.

We found that the city's road maintenance program has relied more on patching potholes and applying first aid than resurfacing. While patching potholes and applying first aid are appropriate for the short term, long-term neglect in resurfacing city roads will lead to more costly repairs in the future.

Exhibit 2.3
Photo of Division of Road Maintenance Workers



A road repair crew applies first-aid repairs on Kilaha Street in Ewa Beach. Temporary first-aid repairs increased 291 percent between FY2001-02 and FY2003-04, while road resurfacing decreased 52 percent during the same period. Office of the City Auditor photograph.

Poor record keeping hampers the division's planning and evaluation efforts

Proper record keeping and data collection are essential to any organization. Accordingly, the City issued a general records schedule that establishes record keeping guidelines for city agencies. We found that the division does not fully comply with city records retention guidelines, nor does it adhere to standard management practices in maintaining proper records.

According to the division's functional statement, the planning and control section is responsible for developing overall planning for division programs and activities, including road construction and resurfacing by both contract and in-house workers; developing and maintaining management support systems for planning, controlling, and evaluating the effective and full utilization of manpower, equipment, and materials; and maintaining the integrity of systems through monitoring, performance and production goals. In order to meet these responsibilities, the division needs to maintain adequate records of its activities, extract appropriate data, and use the data to assess the division's effectiveness and efficiency.

The division does not maintain or utilize historical data for road maintenance

As part of our audit, we attempted to review a sample of city-owned streets to analyze historical data, determine what routine or preventive maintenance should have been performed since the road's inception, and what actual treatments have been applied. However, we were unable to perform this exercise because, according to division staff, the division does not maintain historical data on roads. The division staff believes that historical information is not necessary and instead relies on visual inspection to determine work needs. With current data, the division could probably identify when a road was resurfaced last, but not necessarily when it was first constructed, how many times it was resurfaced, or a comprehensive history of all work done on a particular stretch of road. If historical data is needed, the division works with the Department of Planning and Permitting to review original construction plans and any work done by a private contractor. For city work, the division would check Department of Design and Construction records. Furthermore, division staff advises that its files are generally limited to information from 1990 to the present.

While we will defer to the division to determine if historical data is truly necessary for the type of work it does, we believe there is value in maintaining historical data so that it can perform trend analysis and forecast maintenance models for city-owned roads, based on actual experience. If the division had a formal pavement management system in place, it would have maintained important historical information.

Work log and field reports are missing

Another audit task directed us to calculate the number of nonroad-maintenance requests made, the number of worker-hours and equipment

utilized, and the estimated cost for each request. We initially attempted to review the road division's daily work program log sheets from FY2001-02 to FY2003-04. According to the Honolulu superintendent, the work log sheets are used to plan and assign work on a daily basis. However, the division was unable to produce work logs for calendar year (CY) 2001; consequently, we were unable to review log sheets for FY2001-02 as planned.

According to division staff, the Halawa base yard is supposed to send a copy of the work logs to the division's administrative office. We reviewed log sheets at both the division's Halawa base yard and administrative offices and found numerous missing log files. In addition to missing files for all of CY2001, the division was missing work log files for 64 workdays in CY2002 and 132 days in CY2003.

Because the work log files were incomplete, we were unable to accurately calculate the number of requests made for nonroad-related services, the man-hours spent, and the associated costs. We believe the division, too, is unable to accurately track work hours and resources spent for nonroad-related work services for the time period between CY2001 and CY2004.

The division is unable to track work done by mayoral request

In reviewing the work logs, we found that nonroad-related requests from the mayor were made through two standing work order numbers. We requested that the division run a report detailing the number of man-hours spent and associated costs for work done by the division's road repair section for CY2002 to CY2004 under the two specific work order numbers. Division staff made a request to the Division of Information Technology to run a report with our requested specifications. The division staff responded that the Division of Information Technology could not find any information for work done under the work order numbers from CY2002 to CY2004 in its performance database. The two work order numbers related to mayoral requests did not show up in the database at all.

The city's record retention schedule is outdated

The city issued a general records schedule in 1985. The schedule includes records commonly held by all departments such as correspondence, personnel records, etc. The schedule guidelines apply to the department or division holding the record copy (the copy which is

regarded as the official copy) of a document and the length of time the record copy must be kept.

The current schedule applicable to the Department of Facility Maintenance and the Division of Road Maintenance is actually for the former Department of Public Works, Division of Engineering. It appears that the schedule was not amended when the city completed its reorganization of city departments in 1998. According to the current schedule, street files are to be retained for a period of ten years. The division's records for streets appear to comply with this requirement. The schedule also states that work request files are to be retained for a period of five years. We interpret that to mean work logs and other related data should have been available for CY2001 through CY2004.

The city's current records retention schedule is outdated. Additionally, its guidelines are not clear and do not reflect current departmental requirements. We believe the records retention schedule should be updated to properly reflect the activities of the current departmental structure, and amend retention guidelines that appropriately reflect advances in electronic data storage capability and other technologies. The outdated records retention guidelines notwithstanding, we believe that the division should improve its record keeping system by ensuring that accurate records are maintained and by exploring electronic data storage capabilities.

The division does not incorporate technology in its road maintenance program

The division has not taken full advantage of available technology to improve its road maintenance program. To date, the division does not utilize a pavement management system, nor has it integrated its road inventory with the city's Geographic Information System (GIS). Additionally, the division lacks a comprehensive website that provides information and offers online opportunities for public input and request.

Division does not have a pavement management system (PMS)

A pavement management system (PMS) is a general term used to describe an integrated approach and decision-making process to achieve more effective road maintenance. A PMS provides a consistent, objective, and systematic procedure for setting priorities and schedules, allocating resources, and budgeting for pavement maintenance and rehabilitation. A PMS can also quantify information and provide specific recommendations for actions required to maintain a pavement network at an acceptable level of service, while minimizing the cost of maintenance and rehabilitation.

A PMS is typically computer-program based; the computer, however, is generally only a tool to assist in providing the information necessary for an effective PMS. The system can range from manual procedures using paper and pencil, to a high-tech computer assisted system. The division chief expressed interest in a PMS but, to date, has not scoped a system, formulated an implementation plan, nor made a funding request to the council or administration.

Jurisdictions without PMS rely on inefficient road maintenance methodology. A study by the Maryland Transportation Technology Center found that jurisdictions that do not utilize a PMS typically rely on one or more of the following methodologies:

- Last Year's Budget – the road maintenance budget is based on the prior year's funding, which may have experienced an arbitrary increase or decrease.
- Standard Program – a program is based on a periodic maintenance schedule, such as micro-surfacing every five years and overlay every fifteen years, whether the street really needs it or not.
- "Fighting Fire" Approach – Fix the roads when citizens constantly complain.
- Worst-First – The streets in worst shape are fixed first. While this approach has a certain logical appeal that satisfies the public and politicians, it is flawed.
- Political Pressure – Use of political consideration to establish priorities and budgets.
- Gut Feel – rely on the experience, knowledge and instinct of managers and experienced employees.

In our view, the division embraces elements of all these methodologies.

The study notes that while these techniques may have worked in the past, in today's environment, the simplicity of these techniques is inadequate. These traditional methods only function when roads are in relatively good shape and there are ample funds available to spend on road maintenance.

Local jurisdictions generally do not use pavement management systems. Pavement management systems have existed for a number of years. The Federal Highway Administration has promoted use of pavement management systems for over 20 years. Today, individual states are required to have a PMS in place as an eligibility requirement for receipt of federal funds. Similarly, the Federal Aviation Administration requires active use of a PMS as a prerequisite for federally-funded civil airport projects. While states and other jurisdictions that actively seek federal funding are required to utilize PMS, local jurisdictions do not. However, the wide range of available systems allow local jurisdictions to implement one that is appropriate to their size, needs, and financial conditions.

Division has not integrated geographical information systems with its road maintenance program

A geographic information system (GIS) is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information. GIS also includes the procedures, operating personnel, and spatial data that go into the system. The power of GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship. A GIS can reveal important new information that leads to better decision making.

Many computer databases that can be directly entered into a GIS are being produced by federal, state, and local governments. Baltimore County Public Works in Maryland uses GIS for a roadway condition program for dangerous or poor locations, road maintenance, and improvement planning and scheduling. The Ada County Highway Department in Boise, Idaho uses its system for roadway ownership and maintenance information, road width information, and road design, drainage, and pavement markings.

The City and County of Honolulu maintains a GIS for commercial real estate. The system, called Hawai'i's Economic Development Property Locator Geographic Information System, locates available commercial real estate property and displays different types of demographic and business reports based upon a selected distance from a particular property. In addition, the system provides aerial maps, identifies zoning and enterprise zones, and offers technical support.

Although the City maintains a GIS for economic purposes, the division has not integrated its road maintenance program with the system. The division is, however, working on a pilot project with the Department of

Planning and Permitting to identify drain lines on the GIS. There are no immediate plans to use GIS for road maintenance.

Jurisdictions around the country are finding that integrated data can be a useful tool and are moving toward using GIS capabilities in road maintenance programs. The road maintenance division in Boulder, Colorado, for example, imported charted road maps into a GIS to create digital maps for every county asset. The division is exploring a sidewalk and pavement management program as a result of the GIS data collection. The city found that by using software that ties the county's collected inventory to maintenance done on roads, bridges and other assets, the county's finance officials have the vital information needed to account for the cost of county assets.

The department lacks a comprehensive website

Of the 26 offices, agencies, departments, and commissions in the executive branch, the Department of Facility Maintenance is one of only five that does not maintain a separate, free-standing website. The city's webpage only provides a link to e-mail the department's director, a list of departmental divisions, and a link to a department organizational chart. Given the department's service-oriented mission, the department should invest the time and resources to maintain a website so that the public will have greater access to department information and have additional opportunities to interact with its various divisions.

The division lacks formal policies, procedures, and criteria for assessing road conditions and decisions related to road maintenance applications

The division drafted work standards in 1997. Prior to 1997, the division operated without any formal work standards to control work productivity. In some cases, no productivity goals were seriously considered or imposed. The standards enable supervisors to clearly define for employees what is expected of them for work assigned on a daily basis. In addition, the standards ensure division-wide consistency for performing similar work, facilitating planning and coordinating work, evaluating work performance, equipment and staffing requirements, and to evaluate existing procedures and informal standards.

Maintenance standards were also developed for various work elements including street patching, trench patching, resurfacing, and first aid. The standards establish recommended crew size, required tools and equipment, productivity standards, required materials, and recommended procedures. While the division is to be commended for establishing these standards, it does not establish criteria for when these applications should be applied nor are these work standards enforceable.

The division relies on the experience of field supervisors to make judgment calls

According to a division administrator, the division relies on visual inspection to determine work needs. There are no written criteria that state, for example, “if you have a pothole this size, this is the treatment to apply.” Field supervisors will inspect road conditions and recommend the appropriate treatment based on their experience and knowledge of street repair. While we believe field supervisors are likely to be knowledgeable about road repair techniques, the lack of standardized criteria may result in varying quality of applications applied in jurisdictions throughout the island. Exhibit 2.4 provides an example of a pavement treatment selection guide that might prove useful to the division and improve standardized road maintenance applications.

Exhibit 2.4
Sample Pavement Treatment Selection Guide

Pavement Treatment Selection Guide

Pavement Condition	Parameters	Treatment								
		Thin Hot Mix Overlay	Fog Seal	Crack Sealing	Sand Seal	Chip Seals	Slurry Seal	Micro-surfacing	Cold In-Place Recycling ²	Hot In-Place Recycling ²
Traffic (ADT) ^{1, 2}	<1000	●	●	●	●	●	●	●	●	●
	1000 — 4000	●	●	●	●	●	●	●	●	●
	>4000	●	◐	●	○	◐	◐	◐	◐	◐
Ruts	<5mm	●	●	●	●	●	●	●	●	●
	5mm — 25mm	◐	○	◐	◐	◐	◐	●	◐	●
	>25mm	○	○	○	○	○	○	◐	◐	◐
Cracking Fatigue	Low	●	◐	●	●	●	○	●	●	○
	Moderate	●	○	◐	◐	●	○	◐	●	●
	High	◐	○	○	○	○	○	○	●	●
Cracking Longitudinal	Low	●	◐	●	●	●	○	●	●	◐
	Moderate	●	○	●	◐	●	◐	◐	●	◐
	High	◐	○	◐	○	○	○	○	●	◐
Cracking Transverse	Low	●	◐	●	●	●	○	●	●	●
	Moderate	●	○	●	◐	●	◐	◐	●	◐
	High	◐	○	◐	○	○	○	○	●	○
Surface Condition	Dry	●	●	○	●	●	◐	●	◐	●
	Flushing	●	○	○	◐	●	○	●	◐	●
	Bleeding	●	○	○	○	◐	●	●	●	●
	Variable	●	◐	○	◐	●	●	●	◐	◐
	Portland Cement Concrete pavement	●	○	◐	●	●	●	●	○	○
Ravelling	Low	●	●	○	●	●	●	●	◐	●
	Moderate	●	◐	○	●	●	●	●	◐	●
	High	●	◐	○	●	●	◐	●	◐	●
Potholes	Low	●	○	●	●	●	●	●	○	○
	Moderate	●	○	◐	◐	◐	◐	◐	○	○
	High	●	○	◐	○	○	◐	◐	○	○
Texture	Rough	●	○	○	◐	◐	●	●	◐	●
Ride	Poor	●	○	○	○	○	●	◐	◐	●
Drainage	Poor	○	○	○	○	○	○	○	○	○
Snow Plow Damage	High	●	●	●	●	◐	●	○	○	○
Skid Resistance	Low	●	○	○	●	●	●	●	○	◐

- = Recommended
- ◐ = Provisionally recommended (dependant on road conditions)
- = Not recommended

This table provides general guidelines only. Each road should be assessed for the causes of distress and condition before a specific treatment is selected. Chart recommendations assume good quality design and construction. (Developed by Ontario's Asphalt Emulsion Manufacturers)

¹ Truck traffic as a percentage of ADT should be considered
² When treatment used in conjunction with HMA overlay

Source: The Ontario Hot Mix Producers Association

We interviewed two field supervisors and asked them how many potholes crews generally patch per workday. One supervisor reported a range of 160 to 400 per day. This supervisor further commented that his crews do not always square off and compact a patch. Crews will generally fill the pothole and smack it down with a shovel, doing as many potholes as possible to reduce the hazard to the driving public. The other supervisor indicated crews patch between 10 and 30 potholes per day. This supervisor noted that if the pothole is done correctly, which means cleaning it out, filling it with patch material, then compacting it, the crews will do 10 potholes per day. If they roll over it with a truck instead of manually compacting them, they can do 30 potholes per day. While we acknowledge that several variables may explain the sharp contrast in productivity output perceptions between the two supervisors, their responses indicate that procedures are not always standardized.

Current work standards are not enforceable

The work standards have not been officially adopted because of union concerns. Accordingly, these standards are not used to rate crew productivity. However, the division has been following these work standards to assist in planning the work to be done. A division administrator further clarified that the standards were used primarily for planning and work distribution purposes only. The main reason for the standards was to standardize work across the island. Prior to the standards, each district was doing work differently. Although the division established these work standards, they are not truly enforceable. Division administrators and work crew members we spoke with admit that crews do not always follow the standards.

The work standards are not applied to actual operations, but used as a planning tool. Under current conditions, there is no consequence should the division fail to meet these work standards. As a result, the division is unable to accurately measure worker productivity against an enforceable standard or ensure that workers are afforded adequate equipment, materials and other resources.

The division should amend its work standards to specify not only application standards, but criteria for when to apply those applications. Also, work standards need to be enforced to ensure that all jurisdictions throughout the city are afforded the same quality of service.

The division's pothole hotline is inefficient

The division maintains a 24-hour pothole repair hotline for the public to report potholes and other road damage. Residents may call the pothole

hotline and leave a message on a voice recorder describing the complaint and its location. A clerk will retrieve voice messages two or three times each day, usually once in the morning and again in the late afternoon, then fills out an investigation and service report for each complaint. A production control technician then assigns a service number to the complaint for tracking purposes, sorts the requests by location, and distributes them to the appropriate base yard for repair. If a complaint involves a state-owned road, division staff will fax the complaint to the state Department of Transportation; the state agency does the same for complaints it receives regarding city-owned roads.

In FY2003-04, the division's pothole hotline received 5,290 calls. Of that total, 3,947 were for pothole patching and pavement repairs and the rest were for other work. An additional 68,872 potholes were patched at locations identified through means other than the pothole hotline.

While the 24-hour pothole hotline is an effective customer service tool, the division is unable to meet its standard of patching potholes reported through the hotline within two business days. The division could greatly improve its service by utilizing technology as part of its pothole program. A web-based reporting system and electronic transfer of information to the base yards will help the division achieve its goal of responding to pothole requests within two business days. Establishing policies and procedures would help to ensure standardized service and establish customer service objectives.

Pothole hotline relies on antiquated technology

The division's pothole hotline relies solely on telephone communication and voice recording to obtain resident complaints about road conditions. If a caller left a contact phone number and requested a follow-up phone call, the project supervisor would notify the caller that the request was complete. However, the caller would not receive a phone call regarding the status of their request, even if there was a lengthy delay. Return calls are made only after a repair request is complete. With this system, the caller has no contact person from whom to obtain status information, because the pothole hotline is handled exclusively by a voice recorder.

Other jurisdictions are taking better advantage of technology to increase interaction with the public and improve its customer service. For example, the District Department of Transportation for Washington, D.C., which established a standard to repair potholes within 72 hours, offers the public two ways to report potholes or dangerous road conditions: 1) phone a city-wide call center to file a report or 2) submit

an online service request through its Service Request Center. Residents submitting requests online receive a tracking number for every completed request so that they can check back at any time to see when a district government agency expects to investigate or take care of a particular problem. Online users may also track the status of the request from the moment it is submitted to the time the complaint is resolved.

For telephone complaints, all service requests are put into the district's tracking system, and the complainant receives a service request number. If a pothole has not been repaired by the specified date of completion, complainants are asked to call the Mayor's Hotline for follow-up, using the service request number as a reference. In contrast, Honolulu's pothole hotline program lacks such customer service enhancements.

Another example of inefficiency within the division involves transmitting pothole hotline requests to the rural yards. According to division staff, service requests taken from the pothole hotline are sorted by location and service request forms are routed to the appropriate base yards either through company mail or couriers from the respective base yards will come by the Halawa office to pick up service requests. This system is inefficient. Messages from the pothole hotline are retrieved two or three times per day. If couriers collect them daily, or internal mail picks them up twice daily, it could take at least one business day for the service call to go from the pothole hotline to the appropriate base yard.

Staff commented that the division used to fax service requests directly to the base yards. However, once the pothole request volume increased significantly, it became impracticable to fax numerous service requests. Division staff also commented that some base yard crews do not have the time or expertise to retrieve electronic data such as e-mail, and are generally more used to working with hard copy documents.

The pothole hotline program lacks appropriate policies and procedures

We requested a copy of the pothole hotline policies and procedures, but division staff told us that the program did not have any policies and procedures. Instead, staff produced a copy of procedures for the pothole patrol dated September 14, 1989. In addition, we reviewed a memorandum from the assistant chief of the Division of Road Maintenance, Department of Public Works, to the Honolulu acting superintendent, Road Repair Section dated December 21, 1993, providing clarifying procedures for the pothole hotline. The document clarified that: road repairs should be made within two working days, the

road repair section shall notify the complainant of the action taken, and repair delay explanations should be included on the service request form. The procedures for the pothole patrol are similar to the current practices of the division's pothole hotline program. Both utilize the same phone number, both require that potholes be patched within 48 hours, and both require completion of the service report form. Current practices also comply with the clarifying directives issued in 1993 including notification of the complainant of actions taken and including repair delay explanations on the service request form.

Although the division loosely follows the established procedures for the pothole patrol and pothole hotline (1993), the staff person in charge of the pothole hotline insists that there are no formal policies and procedures for the program. Consequently, the division has no internal controls for the program and the program cannot be held accountable for its operations and productivity. Furthermore, there is no assurance of continuity in program practices should the current production technician assistant in charge of the program vacate the position.

The division is not meeting its standard of repairing potholes within two business days

The division's current standard is to patch potholes within two business days. According to the division's own statistics, in FY2003-04, the division patched 1,530 of 3,947 potholes reported through the pothole hotline within 48 hours. According to division staff, the low compliance rate (39 percent) is attributed to more pothole requests and fewer workers to patch them. As a result, it takes much longer to patch the potholes. In addition to volume of requests and limited staff, crews were limited to the tonnage of asphalt they could pick up on any given day. Exhibit 2.5 shows that between FY1998-99 and FY2003-04, the division's ability to meet the 48-hour standard decreased over the years, averaging only 59 percent compliance during that period.

**Exhibit 2.5
Pothole Hotline Statistics – Division of Road Maintenance
FY1998-99 to FY2003-04**

	FY1998-99	FY1999-2000	FY2000-01	FY2001-02	FY2002-03	FY2003-04	Total
Patched within 48 hours	916	897	730	1,083	1,083	1,530	6,239
Patched over 48 hours	60	132	141	1,032	551	2,417	4,333
Total potholes reported via pothole hotline	976	1,029	871	2,115	1,634	3,947	10,572
Percent patched within 48 hours	94%	87%	84%	51%	66%	39%	59%

Source: Division of Road Maintenance

To identify the length of time it takes for a pothole to be patched if reported through the pothole hotline, we selected 50 random service request forms dated March 1, 2004 through March 18, 2005. To calculate the number of days it took the division to patch a pothole requested through the pothole hotline, we counted every business day from the date of complaint, to the date of completion. We excluded weekends and state holidays, but included a weekend day if the date of completion fell on a Saturday or Sunday.

In our sample of 50 service requests made between March 1, 2004 and March 18, 2005, we found:

- The average number of days it took to patch a pothole requested through the pothole hotline was 15.76 days.
- The number of potholes patched within the division's standard of two business days was five, or 10 percent of the sample.
- The amount of time it took to patch a pothole ranged from 1 to 132 business days.
- Nearly half, or 48 percent of our sample, had potholes patched between 3 and 10 business days.

Poor pothole repair techniques are sometime used by road crews, but patching materials are adequate

The Federal Highway Administration defines a pothole as bowl-shaped holes of various sizes in the pavement surface, with a minimum width of six inches. *Low-severity* potholes are less than 1-inch deep, *moderate* from 1- to 2-inches deep, and *high severity* potholes as greater than 2-inches deep. Potholes form when water becomes trapped beneath the pavement surface. As vehicles run over the saturated base materials, the unsupported surface layer collapses resulting in a hole. The pothole expands as the traffic hits the hole.

Industry best practices note that using high-quality pothole patch materials and applying appropriate patching techniques are important elements when patching potholes, with quality of materials carrying more weight when compared to patching technique. We reviewed the division's pothole patching procedures and found that while the division did not always practice preferred patching techniques, the materials used for pothole patching are adequate. However, we also found that even quality materials and patching techniques may not always last if roads are deteriorated beyond a certain point.

Quantity over quality is the division's pothole practice

Many maintenance agencies use the *throw-and-go* method for repairing potholes. Although not considered the best way to patch potholes, it is the most commonly used method because of its high rate of production. Experts recommend a similar method, considered superior to the traditional *throw-and-go* technique, called the *throw-and-roll*.

Under the *throw-and-roll* technique, road repair crews place the patching material in the pothole, compact the patch using truck tires, verify that the compacted patch has some crown, then move on to the next pothole. One difference between this method and the traditional *throw-and-go* method is that some effort is made to compact the patches. Compaction provides a tighter patch for traffic than simply leaving loose material. The one to two minutes of extra time required to compact each patch should not significantly affect productivity.

According to division procedures for pothole patching, crews are to clean and clear potholes of debris; fill with patch material and compact with a shovel if the pothole is one foot in diameter and one-inch deep or less, or roll over it with a dump truck if the pothole exceeds these parameters; and clear area of loose patching material before traveling to the next jobsite. We note that road repair experts recommend that all pothole patches, regardless of size, receive compaction by rolling over them with a vehicle.

We interviewed both road crew and administrative staff and found that crews do not always follow division procedures or industry best practices. Road crew workers commented that their main objectives are to patch as many potholes as possible and provide immediate relief to the driving public. In order to patch as many holes as possible, crews do not always compact patches with a vehicle or make the best possible patch. Two interviewees commented that they generally fill a pothole and smack it down with a shovel. Another road crew worker commented that his crews will roll over patches for deeper potholes.

In addition to the large number of potholes to be patched on any given day, road crew workers also explained that they do not always spend the appropriate amount of time patching potholes because of the traffic impact on major thoroughfares. For example, when pothole crews go to heavily traveled corridors such as Kapi'olani Boulevard or Beretania Street, traffic can be held up while potholes are patched. Crews often get yelled at by motorists who are stuck in traffic, blaming pothole crews for the traffic tie-ups. At the same time motorists complain about potholes on the roads and demand they be fixed. For busy corridors, road crew workers feel that it is not worth taking the time to make perfect patches.

The division uses adequate materials for pothole patching

According to industry best practices, the use of hot-mix asphalt concrete is the preferred material for patching potholes. Hot-mix asphalt is a heated mixture of mineral aggregate and asphalt cement, and is appropriate for repairing isolated areas. Hot-mix asphalt patches typically last from three to six years. If done correctly with proper preparation, hot-mix patches can last 15 years or more.

Division policies and procedures require the use of hot-mix asphalt concrete for pothole patching on city streets. *Quickpatch* repair mix, or its equivalent, is used if hot-mix asphalt concrete is not available. According to two private road construction companies we interviewed, the city specifies asphalt concrete mix for both road repair and resurfacing, which meets industry standards.

Sometimes even the best constructed pothole will not last

Industry experts caution that maintenance techniques applied to pavements that are completely deteriorated beyond a certain point are a waste of money. According to division administrators, if roads were in better condition, potholes could be constructed better, too. To be

effective, a pothole patch needs to bond to the edges of the roadway. If the road surrounding a well-repaired pothole (one that uses the best quality materials or compacted tightly) is deteriorating, the entire patch will likely pop out and result in a bigger hole. Effective repair options are limited for a road that is badly deteriorated at the base or subgrade.

In addition, experts recommend that road repairs fall in line with the life of the pavement. For example, if that pavement is due for reconstruction in three years, a 20-year patch would not be appropriate. Road repair administrators need to judge how much money to spend on an extensive fix. In some cases, they may decide that shovels of hot-mix asphalt will do best.

Given the poor condition of many city roads, patching potholes may not be an effective, long-term solution. One division employee acknowledged to us that crews are sometimes patching the same pothole more than once. By sticking to regular scheduled maintenance tasks, the division can decrease the accumulation of water in the subgrade and road base, and reduce pothole formation.

The city paid thousands in pothole claims

As a result of the high number and severity of potholes on city streets, the city has paid out thousands of dollars to claimants for damage done to motor vehicles operating on city streets. In FY2002-03, the city paid \$9,213 to settle 22 of 39 claims filed against the city for pothole damage. For FY2003-04, the city paid \$53,484 to settle 158 of 321 claims against the city. During this one-year period, dollars paid increased 480 percent and claims filed increased 723 percent. Exhibit 2.6 shows the number of claims filed and paid, and dollar amounts expended for pothole damage claims against the city from FY2002-03 through March 31, 2005.

**Exhibit 2.6
Pothole Claims Filed Against the City
FY2002-03 to FY2004-05**

	FY2002-03	FY2003-04	FY2004-05*
Total number of claims filed	39	321	259
Total number of claims paid	22	158	53
Total settlement amount paid	\$9,213.47	\$53,483.83	\$22,550.56

*July 1, 2004 to March 31, 2005

Source: Corporation Counsel

Potholes are not merely a nuisance for drivers; they constitute a dangerous safety hazard that can produce substantial damage to vehicles, force drivers to veer suddenly in traffic, or even cause the driver to lose control of a vehicle after contact. The Division of Road Maintenance responded to the proliferation of potholes on city streets by setting out an agenda that would patch as many potholes as it could in the least amount of time. In its zeal to patch more potholes quicker, the division sometimes sacrificed quality in its patching procedures.

Although it used standard patching materials, the division faced the challenge of trying to patch potholes on roads that may have deteriorated to the point where even the best patch will not last. As a result, city roads remain in poor condition, claims against the city for pothole-related damage have skyrocketed, and taxpayers are footing the bill for damage to motor vehicles traversing hazardous roads. Nevertheless, crews continue to patch potholes in an effort protect the driving public. Ultimately, the best solution to pothole problems is not employing the best material or patching procedure, but to minimize the formation of potholes in the first place. This can be accomplished through regular, scheduled maintenance of the city's road network.

The division failed to adopt industry best practices or alternative practices of other jurisdictions

In addition to internal deficiencies within the division, we reviewed numerous reports, publications, and manuals to identify industry best practices in road maintenance: *Better Roads Magazine*, *The ABC's of Pavement Preservation*, *Best Practices Handbook on Asphalt Pavement Maintenance*, *The Road Information Program (TRIP)*, *the Strategic Highway Maintenance Program (SHRP)*, and recommendations from the U.S. Department of Transportation's

Federal Highway Administration. We also reviewed best practices from the cities of Salt Lake City, Utah; Washington, District of Columbia; Washington County, Oregon; and San Mateo, California. Through this review, we identified 24 best practices and 5 poor practices in road maintenance programs.

We found that of the 24 industry best practices, the division complied with 2 best practices; complied somewhat with 7 best practices; and failed to comply with 15 best practices. We also found that the division's operations matched the 5 poor road maintenance practices identified in our review. Exhibit 2.7 shows the division's compliance with select industry best practices. See Appendix A to review the division's compliance with all 24 practices.

**Exhibit 2.7
Industry Best Practice Compliance – Division of Road Maintenance**

Best Practice	Does the City comply?	Comments
Pothole patching. Use high-quality patching materials.	Yes	For pothole patching, the division generally uses a asphalt/concrete mix, which is adequate.
Having a comprehensive inventory of all city or town roads by pavement type, thickness, and condition or roadway allows the department to coordinate and prioritize maintenance efforts, which is more effective and saves money.	Somewhat	The division has an annual roadway inspection program in place. However, the last annual inspection was done in 2001.
Routine pavement surface treatment applications accomplished once every seven years have proven to be a cost-effective step for preserving and extending pavement performance service life.	Somewhat	Generally, the division programs pavement surface treatments at 10-year intervals for major roadways and 15-year intervals for minor roadways.
Implement and adequately fund a pavement preservation program that postpones the need for significant rehabilitation by performing initial maintenance on road surfaces while they are still in good condition.	No	The division does not receive adequate funding, nor does it have a pavement preservation program that focuses on maintenance on road surfaces that are still in good condition.
Cost Effectiveness - Does the treatment enhance pavement performance? Enhanced performance can be measured in several ways, including comfort, convenience, safety, or life cycle costs. If there are no improvements in any of these customer-related issues, then there is no reason to use the treatment.	No	We found no evidence that the division considers comfort, convenience, safety, or life cycle costs in determining treatment. According to division officials, treatment selection is left to the supervisors in the field, using their "discretion".
Cost Effectiveness - Is the treatment cost-beneficial? Measuring the benefit of a treatment should include an assessment of the pavement's performance, and not necessarily the performance of the treatment itself.	No	There is no evidence that cost-benefit analysis is considered when determining road treatment.
Cost Effectiveness - What is the best treatment method to use? Once a treatment has been determined to be cost-effective, and then select the best materials and construction methods.	No	Since the division does not appear to evaluate enhanced pavement performance or to conduct cost-benefit analysis, we determine that the division cannot select the best materials or construction methods.
Pavement preservation is best executed in the framework of a pavement management system that will enable a road agency to identify pavement condition throughout its road inventory.	No	The division does not maintain a pavement management system.

Source: Compiled by the Office of the City Auditor

In our view, of all the industry best practices identified, we find that dedicated funding, adopting a preventive maintenance philosophy, utilizing effective technology, and adopting customer-focused performance standards are the most important practices the division should implement in the near future. The following discussion illustrates how other jurisdictions have benefited from implementing some form of these identified best practices.

Dedicated funding

An integral part of any road maintenance program is dedicated funding. Salt Lake City, Utah has allocated funding to support its annual maintenance and surface treatment programs, and, more importantly, provided a consistent level of funding to address a portion of the annual rehabilitation needs. Every street in the city receives maintenance, surface treatment, or rehabilitation every seven years. Activity coordination is improved and mobilization costs have been reduced. GIS mapping and database links facilitate and enhance processes in zone management.

Salt Lake City's Department of Public Services found that these types of routine pavement surface treatment applications have proven to be a cost-effective step for preserving and extending pavement performance service life. The demand for major pavement rehabilitation has been effectively deferred on many streets because the surface treatment applications slow the rate of pavement deterioration related to environmental conditions. The surface treatment program has reduced the demand for pothole repair and other road deficiencies.

When budgets get tight, it is easy to sacrifice long-term returns for short-term needs. If a program such as preventive maintenance that depends on continuity is delayed or curtailed, it can nullify years of hard-won success. Preventive maintenance can only work if the program is applied consistently and if there is a sustained, predictable level of funding.

Adopting a preventive maintenance strategy

Salt Lake City is one of many jurisdictions throughout the country that has recognized the benefit of preventive maintenance. Experts agree that preventive maintenance activities are the most cost-effective and offer the best means for prolonging pavement service life.

Michigan's Department of Transportation established its preventive maintenance program in 1992 with the express goal of "keeping good

roads good.” In the first five years of the program, the state spent \$80 million on preventive maintenance. Without the preventive maintenance program, according to one study, the state would have had to spend \$700 million on rehabilitation to bring the roads up to the same condition.

Georgia spends between \$70 million and \$80 million a year on preventive maintenance. The state is committed to rehabilitating 10 percent of the network every year and resurfacing the entire network every 10 years. A study showed that between 1992 and 1997, the smoothness of asphalt pavements in Georgia improved by 300 percent.

Utilize effective technology

Another important element of a successful road maintenance program is technology. Implementation of a pavement management system (PMS) and integration with a geographic information system (GIS) are two technological tools used by cities and states to improve their road maintenance programs.

In addition to program technology, many jurisdictions have realized productivity gains from implementing newer, more productive equipment. In 2003, the District of Columbia purchased four pothole patching trucks. The self-contained units have a hydraulically-driven screw conveyor for dispensing asphalt premix materials; this eliminated dump beds, mix shoveling, and wasting of materials. The hydraulic system also powers the unit’s jackhammer oil pumps, asphalt agitator, and other tools, such as concrete and asphalt saws, tampers, water pumps, and even tree trimmers. One of these new trucks with a crew of three has replaced as many as three vehicles formerly used to repair potholes: a dump truck to haul asphalt, another truck to carry a third crew member, and sometimes a third truck to haul extra tools or traffic lights.

The South Carolina Department of Transportation was able to use special funding to evaluate use of a spray injection pothole repair machine. After testing the system in 1997, the department purchased 59 units for deployment throughout the state. South Carolina determined that the devices were very cost effective and estimated that they reduced the need for repeat maintenance by about 60 percent.

Adoption of customer-focused performance standards

The Federal Highway Administration has identified customer-focused performance standards as one measure that could contribute significant advancement in road construction practices. The agency challenged

highway officials to consider a different way of thinking, “What if the government agencies and contractors responsible for highway construction were to use customer-focused performance standards—standards addressing characteristics such as smoothness, noise, longevity, and congestion—to define the highway infrastructure without being prescriptive about *how* it is built?” The primary benefit is that an organization is allowed to use its expertise and experience to come up with innovative ways of obtaining the desired performance, rather than simply doing what has always been done before.

For example, the National Highway Traffic Safety Administration is charged with maintaining crashworthiness standards, so the agency developed standards such as the frontal crash compliance test. It also dictates the average level of fuel efficiency that an automobile’s manufacturer’s vehicles must maintain. The current standard is 27.5 miles per gallon for passenger automobiles and 20.7 gallons for light trucks. In addition, the U.S. Environmental Protection Agency regulates standards for motor vehicle pollution. In this instance, the agency directs how much pollution autos may emit, but automakers decide how to achieve the pollution limits.

Automobiles coming off the assembly line today are safer, more fuel efficient, and produce fewer emissions than those built a decade or two ago, not because someone dictated how they should be built, but because the desired end result was defined, and the industry was given the freedom to innovate and figure out how that result could be achieved. Consequently, lives and fuel have been saved, and the air that we breathe is cleaner than it would otherwise be.

Virginia, for example, has special provisions for new construction and maintenance resurfacing, with smoothness expressed as International Roughness Index (IRI) in inches per mile. For new construction, contractors receive full payment for an IRI between 55 and 70 inches per mile. For maintenance resurfacing, a maximum 10 percent bonus based on the asphalt concrete surface cost is possible for interstate sections with an IRI less than 45 and for non-interstates with an IRI less than 55.

In its annual report for 2004-2005, the City of Irvine, California included as part of its output measurements efficiency and effectiveness accomplishments. Under efficiency, the agency published the percent of reported asphalt deficiencies repaired within three days. For effectiveness, the agency revealed the percentage of arterial roadways

and local roadways maintained at or above established pavement quality indicator standards.

In contrast, the division’s current practice relies on the annual pavement condition survey to evaluate city roads. Furthermore, a review of the division’s maintenance standard for resurfacing does not include end-product or customer-focused standards. The guidelines are limited to procedural inputs, and provide no guidance as to what the end product should be. And while the federal guidelines are suggested to highway construction and maintenance, the concept can benefit all road-related agencies, including the City and County of Honolulu.

The division’s road maintenance program uses poor industry practices

In addition to industry best practices, our literature review also identified poor industry practices. Poor practices include reduced or postponed maintenance, hiring and wage freezes, cancelled or temporary resurfacing, operating outmoded or hard-to-maintain equipment, and employing a “worst first” pavement maintenance philosophy that tosses scarce public funding at pavements that should be allowed to fail first, then be reconstructed in an orderly programmatic manner. We found that the division’s practices were consistent with these poor practices, which are identified in Exhibit 2.8.

**Exhibit 2.8
Poor Industry Practices – Division of Road Maintenance**

Poor Practice	Comments
Reduced or postponed maintenance.	The division, along with the Department of Design and Construction, has deferred maintenance for many years. The current backlog is estimated at \$300 million.
Hiring and wage freezes.	The division’s position vacancy rate ranged between 15-31 percent from FY1997-98 to FY2003-04.
Cancelled or temporary resurfacing	For the last four years, the division has been relegated to pothole patching and first-aid work—all temporary applications.
Operating outmoded and/or hard-to-maintain equipment.	According to division workers, they are operating with old equipment that breaks down often, resulting to lowered productivity and, ultimately, higher costs.
“Worst first” pavement maintenance philosophy that tosses scarce public funding at pavements that should be allowed to fail first, then be reconstructed in an orderly, programmatic manner	Because so little funding has been directed at reconstruction or resurfacing in recent years, the division has taken on a “worst first” approach to road maintenance, whereby they will prioritize deteriorated streets for remedy, and use virtually zero funds for scheduled maintenance.

Source: Compiled by the Office of the City Auditor

The division's road maintenance program generally falls short when compared to other jurisdictions

We judgmentally selected the cities of San Diego, California; Portland, Oregon; Irvine, California; and Sarasota, Florida, and sought information relating to their city road maintenance programs. We examined information relating to the general duties and responsibilities of their road maintenance programs; how they funded road maintenance activities; applied pavement management systems and other information systems; applied advanced technology, techniques or equipment to road maintenance, and the factors that affected the current road conditions in their city.

After examining all of the information, we derived profiles for each of the cities with respect to their individual road maintenance programs. We also compared these cities to Honolulu in order to determine how its road maintenance program and practices compared to those applied in these jurisdictions. The individual profiles of the jurisdictions selected can be found in appendices B-E.

As a starting point, Exhibit 2.9 presents information on the rated conditions of all public roads within cities with populations of greater than 500,000. The table presents the data as tabulated by non-profit public interest group, The Road Information Program (TRIP) in 2002.

**Exhibit 2.9
City Population: 500,000 and Greater
Percentage of Roads in a Given Rated Condition**

Urban Area	Poor	Mediocre	Fair	Good
San Diego	60%	31%	4%	4%
Honolulu	30%	50%	8%	12%
Portland	10%	31%	21%	37%
Sarasota-Bradenton	5%	14%	21%	61%

Source: TRIP analysis of 2002 Federal Highway Administration data

The City of Irvine did not qualify in terms of population size, so no common size statistics were available. Within our samples, the urban area of Sarasota-Bradenton had the highest percentage of roads in good condition overall, and San Diego had the highest percentage of roads in graded poor condition overall. By comparison, Honolulu placed second

to San Diego with 80 percent of roads evaluated as mediocre to poor condition.

We have presented the data from the examination of the selected four cities in a summary form in Exhibit 2.10. The table applies common categories from the road maintenance practices of each city and compared them to Honolulu, with respect to size of road inventory, maintenance techniques applied, funding mechanisms, public access availability to direct services, and service statistics.

Exhibit 2.10
Select City Comparison of Road Maintenance Operation and Productivity Attributes

	San Diego, CA	Irvine, CA	Portland, OR	Sarasota, FL	Honolulu, HI
Street/lane miles	2,800 street and alley miles	1,612 lane miles	3,951 lane miles	634.8 lane miles	3,477 lane miles
Patch potholes?	Yes	Yes	Yes	Yes	Yes
In-house resurfacing?	Yes	Yes	Yes	No	No ⁴
Apply slurry seal?	Yes	Yes	Yes	Unknown	No
Primary funding sources	Gas tax, special funds, and CIP	General funds, gas tax, special funds, and CIP	Intergovernmental funds, grants, donations, bureau revenues, system development charges, general transportation revenues, general funds, and other revenues	Intergovernmental funds, charges for services, transfer, intra-governmental services, and other miscellaneous funds	General fund, highway fund, bikeway fund, and community development fund
Dedicated tax?	½ percent sales tax for the period of 1987 to 2008	½ percent sales tax approved by Orange County voters in 1990	No	Seven Cent Gas Tax and Five Cent Local Option Fuel Tax	No
Fully funded? ³	No	Yes	Unknown	Yes	No
Pothole telephone hotline?	Yes	Yes	Yes	Yes	Yes
On-line pothole hotline?	Yes	Yes	No	Yes	No
No. of days to repair pothole?	2	3	2	2	2
Use a pavement management system (PMS)?	Yes ¹	No ²	Yes	Unknown	No
No. of potholes repaired annually (latest figures)	70,000	Unknown	Unknown	Unknown	68,872

¹ San Diego uses a Work and Assets Management System, which integrates GIS, GPS, and other software.

² Irvine maintains a computer-based model, including a pavement condition inventory of all streets, which ensures that the city can effectively manage deferred maintenance and remain above the threshold of visible deterioration.

³ “Fully funded” means that a road maintenance agency received funding that matched its request for current-year road maintenance expenses.

⁴ The Division of Road Maintenance stopped in-house road resurfacing in FY 1999-2000

Pothole Service

We found that Honolulu had the largest number of public road lane miles of the jurisdictions selected. All jurisdictions, including Honolulu, apply some form of dedicated pothole service as a function of city road maintenance. Recently, largely due to unusually severe weather, San Diego, Irvine, and Honolulu have experienced an increase in the number of pothole related service.

With respect to pothole service turnover rate, Honolulu's turnover from request for service to completion of work is comparable with that of other jurisdictions. All jurisdictions apply some combination of a dedicated phone line and online Web-based service requesting of road maintenance services.

Use of pavement management or other information systems

Other jurisdictions use pavement management systems or information systems effectively to support their road maintenance activities, but Honolulu does not possess such capability. In other jurisdictions, this practice appears to be effective in such decision support functions as street selection for maintenance and resurfacing, costing out budgets, costing out appropriate maintenance, and selecting appropriate treatments for road maintenance. It is also effective in maintaining current and historical information on maintenance activities, treatments applied, and other data.

Coordination between jurisdictions

While not in the table, other jurisdictions appear to coordinate road maintenance services between jurisdictions more frequently than Honolulu does with the state transportation department. In particular, the city and county of Sarasota have adopted intergovernmental agreements whereby the city of Sarasota does all road maintenance work within the city, including on county and state roadways, on a reimbursable basis. We note that Sarasota-Bradenton had the highest percentage of roads in good condition, when evaluated by the Federal Highways Authority in 2002.

Application of road maintenance techniques

Though all jurisdictions examined apply the same techniques to pothole service, the California jurisdictions each apply slurry seal as a complementary, preventative road maintenance technique. At present, Honolulu does not seem to use this same technique.

Although it is comparable to the other jurisdictions in many respects, the division's road maintenance program generally falls short when compared to other jurisdictions' application of information systems to road maintenance, coordination of maintenance with other jurisdictions, and application of preventative techniques as a measure of road maintenance.

Poor Road Conditions are Exasperated by External Influences

In addition to internal shortcomings, the road maintenance program was also adversely impacted by decisions made and influences outside of the division's immediate control. Funding reductions were imposed on the Department of Facility Maintenance, and its predecessor prior to 1998, the Department of Public Works, resulting in chronic vacancies that date back at least 10 years and increases in the backlog of road maintenance resurfacing. The division, however, did not fully communicate funding needs to decision makers. Additionally, the administration halted the division from conducting in-house road resurfacing, which had adversely affected city road conditions and limited the division's repair options. Finally, the former administration routinely asked the division to provide manpower for various city projects and events unrelated to road maintenance, thereby taking workers away from their duties to repair and maintain city roads.

Road maintenance funding has fluctuated over recent years

Since FY2001-02, the division's operating budget has fluctuated, with a high of \$15,468,531 in FY2002-03, to a low of \$13,831,493 in FY2001-02. Capital improvement budgets for street and parking lot rehabilitation, which are managed by the Department of Design and Construction, totaled less than \$7 million annually in FY2001-02 and FY2002-03, and jumped to \$40 million in both FY2003-04 and FY2004-05. Despite higher budget allocations for road rehabilitation for the last two fiscal years, the city has seen a steady decline in the number of lane miles resurfaced. Exhibit 2.11 reveals the funding allocations for operating expenses and capital improvement program projects, and the number of lane miles resurfaced.

Exhibit 2.11

Operating and Capital Improvement Program Budgets for Road Maintenance and Rehabilitation Versus Number of Lane Miles Resurfaced FY2001-02 to FY2004-05

	FY2001-02	FY2002-03	FY2003-04	FY2004-05
Operating Budget – Division of Road Maintenance	\$13,831,493	\$15,468,531	\$14,080,147	\$14,596,653
Capital Improvement Program (CIP) Funds – Rehabilitation of streets and parking lots*	\$4.5 million	\$6.2 million	\$40 million	\$40 million
Lane miles resurfaced	128	90	61	-----

*CIP funds for street rehabilitation are managed by the Department of Design and Construction

Source: Compiled by the Office of the City Auditor

Industry best practices suggest that a reliable source of funding is one of the most important elements of a road maintenance program. The City’s fluctuating budget allocations contradict this recommended best practice. The fluctuating budget allocations are particularly problematic for road resurfacing because resurfacing is identified as a key industry best practice for maintaining roads and preventing pothole formation.

The division suffered from long-term position vacancies and difficulty recruiting for various division positions

Budget restrictions imposed by the administration made it difficult for the division to fill key positions throughout its work force. Lower compensation rates for city positions, relative to other jurisdictions, added to the division’s recruitment shortfalls, and adversely impacted recruitment in other city agencies related to the road maintenance program. As a result, the division was limited in the manpower it could deploy for road maintenance work.

Historically, division vacancies such as supervisors, crew leaders, and vehicle and equipment operators are filled through promotional opportunities. Entry-level positions, such as laborers, are filled from an open certified list. For example, supervisory positions filled through promotion result in crew leader-level vacancies, which then become promotional opportunities for those in lower classifications. The cycle continues until the entry-level laborer vacancy is reached. In the past, the process to approve and fill recruitment and filling vacancies through promotion has taken over a year to complete.

Budgetary constraints prevented the division from filling vacancies

According to division administrators, the department's vacancy rate as of January 31, 2005 was 29 percent. Administrators further explained that one of the causes for the vacancy rates are budgetary restrictions imposed by the administration or council. Although positions were not frozen, they could not be filled because funding was inadequate to fill them.

The division had difficulty competing with other jurisdictions in attracting candidates to fill professional positions

Division administrators explained that the pool of qualified candidates, especially engineers, is limited in Hawai'i, and both the public and private sector compete for these same candidates. According to the division chief, the city offers the lowest compensation package for engineers; candidates can earn more money in the private sector or working for the state or federal government. This situation not only affects the division, but also the Departments of Design and Construction and Planning and Permitting.

As a result of the engineer shortage, private contractor work, for both city and non-city projects, lacks effective inspection and oversight. For example, the Department of Planning and Permitting is responsible for inspecting road projects conducted by the private sector on city streets. By permit requirements, these companies must restore pavement to certain specifications. However, the department lacks qualified inspectors and many projects go unchecked. Consequently, problems arise as some private-sector road repairs are not constructed to road specifications. For the sake of expediency, the division will patch whatever pothole they may find on a city street, even though it may have been the result of poor workmanship on the part of a private contractor. The Department of Design and Construction, which is responsible for managing road maintenance contracts on behalf of the city, also lacks qualified engineering staff to routinely inspect projects and ensure quality control.

The department failed to effectively communicate road maintenance needs and consequences

One of the industry best practice recommendations from an audit of the Road Services Division Capital Planning program for King County, Washington suggested that successful implementation of a pavement preventive maintenance program requires that the department proactively educate elected officials of the long-term benefits of the program. This

education needs to be ongoing because council members and executives change over time. Information should show not just the effect that varying funding levels will have on the pavement network, but also the anticipated additional costs to rehabilitate or rebuild roads that were not overlaid in time. We found that while the department provided useful information about its road maintenance program in the past, in recent years, information communicated to decision makers has waned.

An administrative staff person from the division indicated to us that the previous administration directed the division to prioritize its budget requests and suggested that only the top three or four priorities would likely get funded. The administration's rationale was that since funds were limited, full funding for all departmental needs was unlikely. By prioritizing and limiting requests, funding for priority items would be given the highest consideration. The division complied with this directive and the department prioritized its funding requests. In addition to administration directives, the council can also change budget allocations and funding priorities.

While prioritizing projects can be a useful tool in lean budget times, failure to convey the entire scope of departmental needs can leave decision makers without a full understanding of a program's achievements and shortcomings. Requests that are limited to only the "top priorities" ignore the full scope of needs of a particular agency. Decision makers need full, comprehensive information in order to make informed decisions. Outside influences, whether directly or implicitly, should not impede an agency from providing full, complete information—no matter what the fiscal conditions may be.

Departmental communications failed to provide adequate information

A review of the department's prioritized list of capital improvement projects related to road maintenance in FY2003-04, indicates that annual needs for the rehabilitation and construction of city streets were communicated to the council. However, it did not include any specific information about the current road resurfacing backlog or what the consequences are for lowered funding allocations. The priority list included a vague statement implying a shortfall:

"Due to insufficient funds for contract resurfacing the past several years, numerous roadways island wide are in need of resurfacing and rehabilitation. Existing budget restraints and the reality that additional roadways will deteriorate in

future years, which will need to be rehabilitated, requires funding be made available over an extended long-term program with increases to account for the annual accelerated costs for this work.”

This statement lacks specific number of lane miles in need of work and, more importantly, how much the backlog will cost. Since the annual pavement condition survey was last conducted in 2001, the division lacks any accurate accounting for the needed backlog. A division administrator acknowledged that the division has not calculated the actual projected additional costs if roadway repairs or resurfacing is delayed, adding that additional costs are a logical assumption since so little resurfacing was done during the past eight years. This administrator went on to state that since the backlog of roadways needing resurfacing and reconstruction is so large, putting a cost on delaying the work any longer did not seem necessary.

By contrast, the capital improvement program budget request for FY2000-01 for road repair detailed an eight-year catch up program that communicated information such as total lane miles needing reconstruction or resurfacing, the current backlog of lane miles deferred, and a plan to eliminate the backlog over an eight-year period. Also, in March 2002, the Department of Design and Construction put together a presentation for the then managing director explaining the ramifications of allowing roadways to deteriorate to appoint where reconstruction is required rather than just resurfacing.

We believe that the division's view that the current backlog is too large to manage and that putting a cost on delaying the work was not deemed necessary is short-sighted. Furthermore, this view preempts the council from making appropriate financial decisions. The magnitude of the backlog is important for decision makers to consider even when funding the short-term projects. Current backlog information and associated costs should be updated annually and clearly communicated to the administration and council.

The department was more proactive in providing detailed information about road maintenance in prior years

In 1986, the then division chief, Division of Road Maintenance, Department of Public Works, issued a *Report to Justify Catchup Funds For Road Resurfacing*. The report noted that although the long-range resurfacing plan that had been in place for several years and had been used as a basis to justify annual budgetary requests for

resurfacing funds, the amounts actually approved for contract resurfacing had fallen short of the amount requested, with an average of only 66 percent provided in the last several years. The report also detailed the current shortfall and the backlog of road resurfacing. In addition, the report conducted a cost analysis for the work done most recently, and a detailed cost comparison between the money actually spent for reconstruction and a projection as to what the division might have spent if scheduled resurfacing had been funded instead. The report went on to calculate potential cost savings if catch-up funds were approved and resurfacing was scheduled over a 10-year period. Finally, the report made specific recommendations for eliminating the resurfacing backlog, including a timetable and estimated cost. To date, the division has not issued a similar report or followed up on its compliance with the report's recommendations.

The division stopped in-house road resurfacing

Since FY2000-01, the division has not conducted any in-house road resurfacing, a practice that was halted by the previous administration. Furthermore, funding for road resurfacing shifted from general funds to capital improvement funds, wresting control over resurfacing away from the Department of Facility Maintenance. In addition, road repair and maintenance suppliers limited the amount of materials that road crews could pick up on a daily basis. These conditions caused road resurfacing to fall further behind, resulting in poor road conditions and ineffective use of division staff.

The administration halted in-house resurfacing

Division road crew staff claim that the administration halted the practice of in-house resurfacing shortly after the reorganization of city departments in 1998. Staff noted, anecdotally, that this was a union issue whereby private contractors felt that city crews should only be doing pure maintenance (potholes) and that the private sector should be doing resurfacing, repaving, and reconstruction.

Asphalt suppliers limited the amount of asphalt that road crews could use. Road crew employees also stated that private asphalt material suppliers limited city crews to picking up no more than five tons of asphalt per day. With this amount of asphalt, city crews were relegated to patching potholes and other first-aid applications. We were unable to confirm the alleged administrative directive due to lack of documentation from the prior administration.

Resurfacing crew was reassigned to other sections within the division. According to its organization chart, the division is supposed to maintain a road resurfacing section. Road division staff revealed to us that since in-house road resurfacing was stopped, road resurfacing workers have been temporarily assigned to other sections within the division. We confirmed that at least one road resurfacing employee has been temporarily assigned to various sections within the division.

All road resurfacing projects were contracted out to the private sector

Since FY2000-01, road resurfacing of city streets has been contracted out to the private sector and managed by the Department of Design and Construction. However, since resurfacing was done exclusively by the private sector, the number of lane miles resurfaced has dwindled as evidenced in Exhibit 2.12.

**Exhibit 2.12
In-house v. Contract Road Resurfacing
FY2000-01 to FY2003-04**

	FY2000-01	FY2001-02	FY2002-03	FY2003-04
Contract	146	128	90	61
In-House	0	0	0	0
Total	146	128	90	61

Source: Compiled by the Office of the City Auditor

Division staff we spoke with commented that if the department was allowed to continue in-house road resurfacing, many of the problems we are experiencing today might have been avoided. Despite shifting road resurfacing projects to the private sector, overall road resurfacing productivity dropped and, in turn, adversely impacted road conditions. Thus, the decision to eliminate in-house resurfacing was shortsighted and made inefficient use of division workers and equipment.

Administration requests divert road crews from performing road-related functions

Despite the proliferation of potholes on city streets and citizen complaints, funding fluctuations, division vacancies, and other challenges facing the department of facility maintenance, the administration diverted crews to perform nonroad-related functions. The division spent well

over 5,600 worker-hours on nonroad-related functions, a figure that is likely understated due to poor record keeping by the department. Overtime payments spent on *Sunset* and *Brunch on the Beach* events, and other city-sponsored functions likely had a significant impact on the department's budget and may have prevented it from filling vacancies.

The division spent at least 5,600 worker-hours on *Brunch* and *Sunset on the Beach* events during the work week and on weekends

According to a City events calendar, from 2001 to 2004, there were 131 *Sunset on the Beach* events and 34 *Brunch on the Beach* events held on O'ahu. We sought to determine how many worker-hours were spent by the division on these nonroad-related activities for CY2002-2004. To accomplish this task, we reviewed work reports that logged daily work activity unrelated to the core mission, duties, and responsibilities of the division.

We reviewed 258 work reports covering January 2002 through December 2002; June 2003; and February 2004 through December 2004. These reports document the dates, nature of the activities performed, and work hours logged. Work logs were available for only 10 of the 131 sunset events and 20 of 34 brunch events. In total, we were only able to review work logs covering 30 of 165 events, or 18 percent of the total number of functions. Therefore, the results reported here are probably significantly understated.

We found that division employees logged at least 5,643 hours between CY2002 and CY2004 for nonroad-related activities, which included both work week and weekend days, in only 18 percent of the *Sunset* and *Brunch on the Beach* functions. Our review further identified that 119 of the work reports possessed distinguishable data related to noncore activities performed by the division. Another 139 work reports possessed data that had core and noncore activities mixed together. Exhibit 2.13 breaks down the hours spent by year.

Exhibit 2.13
Work Hours Spent on *Brunch* and *Sunset on the Beach* Events
Division of Road Maintenance, CY2002 – CY2004

Year	Worker-Hours Spent
CY2002	2,979.0
CY2003	386.5*
CY2004	<u>2,277.0</u>
Total	5,642.5

*Work logs were incomplete

Source: Compiled by the Office of the City Auditor

The data for CY2002 and CY2004 indicate a significant level of participation by the division in the city's brunch and sunset programs: 2,979 and 2,277 hours respectively. Only one set of work reports, which covered a single event was available from CY2003, and for that instance of the program alone, the division contributed 386.5 hours of work.

The road repair section spent at least 230 worker-hours on nonroad-related functions between CY2002 and CY2004

We also reviewed work logs at the division's administrative offices and Halawa base yard to track work hours spent by the road maintenance and repair section (referred to as road repair section) between CY2002 and CY2004. The road repair section specifically provides road pavement and shoulder maintenance of roadways in urban Honolulu, including resurfacing, first-aid work and pothole patching. Unlike the brunch and sunset review noted previously, which focused specifically around those event dates, this review sought to identify all nonroad-related activities performed. As such, we reviewed daily work logs to identify road repair section employees that were either directly assigned to perform nonroad-related functions or were temporarily assigned to another section within the division that was assigned to perform nonroad-related functions.

Based on our review of the log sheets available, the road repair section spent 230 worker-hours during CY2002-2004 on nonroad-related functions. These hours include work on set-up and breakdown of sunset and brunch functions, transporting welding supplies, and setting up tables and chairs for unspecified events at Dole Cannery and Honolulu Hale.

However, the division was unable to produce work logs for 64 work days in CY2002 and 132 days in CY2003, for a total of 196 days. Because of the numerous missing logs, we believe the worker-hours actually spent on nonroad-related functions are likely higher than the 230 worker-hours we identified.

While the worker-hours spent by road repair crews may appear insignificant given the three-years time span covered in our review, it nonetheless speaks to the administration's lack of planning and consideration to the taxpayers of this city. Despite the potholes that needed patching and other road repairs that citizens demand be made, city road crews were directed to other city functions that provided questionable benefit relative to Honolulu's road repair needs.

Overtime payments for nonroad-related activities are costly

Although we did not calculate the overtime costs incurred by the department for weekend work performed by division employees, we anticipate that the costs had a significant impact on the department's budget. Perhaps, if division employees were not deployed for such tasks over a three-year period, the department may have had enough money in their budgets to fill needed vacancies, purchase updated equipment, or conduct the annual pavement condition survey.

Coordination between the city and state road divisions is limited

O'ahu streets and highways are owned and maintained by either the state or city. Oftentimes, ownership is not discernable to the average citizen, making it difficult for citizens to know whom to report potholes or other road hazards. Since both the city and state maintain their respective roadways, we assessed the level of coordination between the two entities and sought to identify opportunities for further collaboration.

Current coordination between the city and the state related to road maintenance is limited to the following areas: limited collaboration on graffiti eradication, city response to natural hazards on state highways in rural areas, and occasional coordination of road maintenance work activities.

On behalf of the city, the division hosts a graffiti service line to field daily calls about graffiti on city transportation facilities. Since it is the only widely known government service line related to graffiti, the division also fields calls about graffiti in schools, private property, and state transportation facilities, among others. This results in the division being

the unofficial clearinghouse of all graffiti eradication calls for the island of O‘ahu.

If the call relates to a state transportation facility, the division logs the information from the call and faxes it over to state Department of Transportation (DOT). Approximately two years ago, the state formed a task force to coordinate graffiti eradication. However, there was no resulting coordination because the division believed that the state was trying to push all the eradication work over to them.

In addition to graffiti complaints, the division will often provide first response road clearing assistance after natural disasters such as high surf, flash flood, and mudslides, to promote public safety. The division routinely provides this assistance during such events to clear and make safe state highways in the rural areas of O‘ahu.

Coordination of road maintenance work is limited to those areas where city and state roads intersect

Presently, there appears to be minimal coordination of city and state road maintenance. All sources agree that the primary example of coordination occurs at those points where the city road maintenance project will interface with state highways in terms of location.

The division indicated its openness to more coordination of its road maintenance functions with the state in the interest of sharing information and efficiency. The state DOT has indicated that it is similarly open to such coordination. However, there are built-in factors that may make coordination difficult or make the each jurisdiction appear unresponsive to coordination efforts.

The division indicated that there are several reasons why there is not more coordination between the state and the city. There is generally very little crossover in terms of location, time, funding and priorities. This results in each jurisdiction knowing what it owns, performing its work only on its own roads, and there is little practical interface. As it stands, the division does not regularly meet with their counterparts at state DOT to coordinate road maintenance functions.

A formal program or project coordination between the city and state requires an intergovernmental agreement. This could cover such matters as resource sharing, collaboration, etc. These agreements require a council resolution, which can take up to six months to approve. Both the city and state indicated that these agreements occur very infrequently.

The last example of this kind of coordination was on the H-1 Corridor revitalization project of 1998-2003, which included city roads that intersected the freeway construction project.

City perception of coordination with state. The division indicated that some projects are unsuited to coordination. One reason is that needed repair work cannot always wait for coordination. The second reason is that state and city needs often do not overlap, nor are there concurrent schedules for issues such as funding. These issues make it difficult for the division and the state DOT to coordinate functions.

The division also commented that coordination is not possible for some maintenance activities because it lacks the safety equipment and staffing to do work on state highways or similar roadways designed for higher speed. The division indicated that it lacks the proper equipment to work safely on anything but low-speed traffic areas, further limiting coordination opportunities.

State perception of coordination with city. Prior to 1996, the state DOT indicated that the state and city would regularly meet to share information on projects and issues related to road maintenance. However, an official with the state DOT we spoke with was under the impression that the city withdrew due to the political ambitions of the former mayor and his perceived desire to advance the success of city service projects independently from coordinated activities with the state and others.

The state DOT acknowledges that the new city facility maintenance director and the division chief have been making overtures to increase coordination of road maintenance functions, share information, and coordinate projects. The state DOT indicated that it is initiating agreements to coordinate state and city pothole service, and coordinate pavement maintenance functions in order to promote better roads on O'ahu.

Other relevant coordination. The road maintenance functions of the division are more frequently coordinated with the public utilities than with the state. There is a regular, monthly task force consisting of various city divisions and the public utilities to coordinate project work and issues related to projects on city and state roadways. The division has repeatedly invited the state to attend these meetings to increase coordination between all these interests; however the state has not regularly attended. The state DOT apparently has its own regular

meeting with the utilities for similar purposes, and it does not invite the city to attend.

Increased coordination between the city and state is likely to increase efficiencies in pothole repairs only

The division is aware of the current mayor's "Working Together" initiative to have the city and state work together more efficiently and effectively, particularly with pothole service. Division staff understand that they are required to work out and coordinate road maintenance activities with the state, where possible.

The state DOT informed us that it is also trying to increase coordination with the city for road maintenance functions by securing agreements to coordinate state and city pothole service, and pavement maintenance functions in order to promote better roads on O'ahu.

There is now a public and concerted effort on the part of the state and the city to collaborate by recording call information and referring service calls at their service lines for the others' roads in the interest of promoting efficiency and improved pothole service. The city will also fill potholes on state roads near serviced city roads and the state will do the same for the city.

Although we recognize that there have been recent efforts to promote greater coordination, it is uncertain whether increased coordination will promote better systematic road maintenance by the division, or jointly with the state DOT. Even if regular coordination were to resume, there is very little crossover in terms of location, time, funding and priorities between the state and city. Both jurisdictions are also contending with resource related issues (e.g., staffing, proper equipment, etc.) that might make staffing coordinated activities impracticable. For the time being, increased coordination between the city and state is likely to increase efficiencies in pothole repairs only.

Roads with disputed ownership between the city and the state have not adversely affected road conditions

City Council Resolution No. 93-287 (CCR 93-287) characterized a longstanding dispute between the State of Hawai'i and the individual counties, including the City and County of Honolulu, over who owned or had jurisdiction over certain public highways and roadways. The implied problem of this dispute was that neither jurisdiction made an effort to improve these highways for the public benefit because ownership and jurisdiction of these roads could not be determined.

The ownership of disputed roads appears to be settled by separate statewide and city legal acts from 1993: Act 288 of 1993 Session Laws of Hawai‘i (Act 288) and CCR 93-287. A plain reading of these two documents together suggests that there are no disputed roads on O‘ahu. The statewide act appears to have transferred ownership of all disputed roads from the state to the counties, subject to acceptance by the counties. The city’s 1993 resolution appears to be an unqualified acceptance of the transfer. This notion of the legal settlement of the issue appears supported by existing documentation maintained by the department and the division in the Department of Facility Maintenance’s *Islandwide Inventory of City Owned and Maintained Roadways*, dated January 10, 2005.

However, the division presently holds the opinion that the transfer of all disputed state roads to county jurisdiction within Act 288 and acceptance of county jurisdiction within CCR 93-287 does not mean that all of the disputes are settled. The division believes that because the resolution did not have a comprehensive list of all roads transferred, not all state roads were included in the transfer. Unfortunately, this interpretation does not appear supported by language or intent of Act 288 or CCR 93-287, and may promote a continued misunderstanding that the disputed roads issue still exists.

We reviewed a judgmental sample of 220 disputed roadways for their condition as assessed by the department’s 2005 road inventory. The sample came from the 1989 Legislative Reference Bureau (LRB) report entitled *Roads-in-Limbo: An Analysis of State – County Jurisdictional Dispute* and the 1994 state Department of Natural Resources (DLNR) listing of disputed roads.

The LRB report detailed the jurisdictional disputes that existed in each county relating to road ownership and maintenance responsibilities, and listed 291 roads with disputed ownership on the island of O‘ahu. The 1994 DLNR listing also contained a list of roads with disputed ownership, and listed 426 roads with disputed ownership on O‘ahu.

The 220 roadways sampled were common to both the LRB and the DLNR listings. Our review found that the conditions, maintenance activity and evaluation of these disputed roadways were similar to those owned outright by the city, as documented in the 2005 islandwide inventory. Thus, there was no evident correlation between poor conditions or lack of maintenance activity and disputed ownership status.

Conclusion

We found that the Department of Facility Maintenance's Division of Road Maintenance failed to incorporate key industry best practices in its road maintenance program. Furthermore, it employs poor industry practices. For various reasons, the division appears to embrace a reactionary view of road maintenance, instead of the more cost-effective and efficient preventive maintenance philosophy that should prevail. Its lack of technology integration into its road maintenance program promotes further inefficiencies when compared to other jurisdictions. Also, we found that the division did not conduct an annual pavement condition survey for the last three years. As a result, the division does not have an updated, accurate assessment of road conditions.

Operationally, we found that the division road crews often sacrificed quality over quantity as it sought to fill as many potholes as possible. We also found that while the division employs proper patching materials, even the best patch may not last on streets that are too deteriorated. Poor record keeping also hampered the division's ability to effectively plan and track costs for its division activities. We also found that when compared to other jurisdictions, the city generally falls short in its overall road maintenance operations.

In addition to internal shortcomings, the division was adversely impacted by outside influences. Due to budget constraints imposed by the administration or council, the division suffered from chronic vacancies for many years. Furthermore, the former administration's directives hampered the division's ability to provide decision makers with adequate information about the true condition of city roadways, the current backlog, and the consequences for inadequate funding. The administration also enforced a policy that prevented the division from conducting in-house road resurfacing. As a result, road conditions deteriorated and division crews were relegated to patching potholes and other temporary fixes. Coordination between the city and state is limited, but the parties should continue to find areas of mutual benefit.

Despite the numerous potholes plaguing city streets, the chronic vacancies, and poor road conditions, we found that the prior administration routinely pulled division employees to assist with city functions such as *Sunset* and *Brunch on the Beach*. Over a three-year period, we found that the division spent at least 5,600 worker-hours on such events, with the overtime costs adversely impacting the department's overall budget. As a result, potholes and other road repair

needs went unattended because road services division employees were deployed elsewhere.

The department now has an opportunity to get on track with its established program, and to incorporate industry best practices, progressive technology, and other initiatives to enhance the entire road maintenance program. A shift from a reactive program to a proactive program, with the support of the administration, council and public, will go a long way toward ensuring that the city's roads are maintained to the public's satisfaction and in the most cost-effective manner.

Recommendations

1. The department should:
 - a. assess the status of vacant positions and pursue funding for those positions identified as essential;
 - b. implement web-based technology for educating the public about road maintenance issues and soliciting pothole complaints;
 - c. develop a technology integration plan with other appropriate city and state agencies that utilizes GIS programming;
 - d. draft, maintain annually, and report to the council, the cumulative road maintenance backlog, identifying both street miles and costs;
 - e. improve its record retention system; and
 - f. keep an accurate account of the worker-hours and dollars spent on nonroad-related activities.
2. The division should:
 - a. adopt key industry best practices for its road maintenance program that:
 - i. secures dedicated funding,
 - ii. adopts a pavement management system,

- iii. executes a pavement preservation program focusing on long-term maintenance,
 - iv. establishes customer-focused performance measures in road treatment decisions and output measurements, and
 - v. implements cost-benefit analysis in maintenance applications.
 - b. draft and implement a plan, and work with the administration and council, to eliminate “poor” industry practices such as:
 - i. reduced or postponed maintenance,
 - ii. hiring and wage freezes,
 - iii. cancelled or temporary resurfacing,
 - iv. operating outmoded or hard-to-maintain equipment, and
 - v. adoption of the “worst first” pavement maintenance philosophy that allows pavement to deteriorate before action is taken.
 - c. Prioritize and consistently conduct an annual pavement condition survey,
 - d. develop a comprehensive work order system,
 - e. draft policies and procedures for road maintenance applications, and
 - f. conduct in-house road resurfacing.
- 3. The mayor should:
 - a. ensure that the Department of Facility Maintenance has adequate resources to fulfill its mission to maintain city roads,
 - b. ensure that the Department of Design and Construction has adequate resources to program road resurfacing and reconstruction projects, and

- c. seek a practical solution to issues regarding disputed road ownership.
- 4. The managing director should review and develop updated record keeping guidelines for city agencies and submit recommendations to the council for adoption.

APPENDIX A

Industry Best Practice Compliance – Division of Road Maintenance

We reviewed the following publications and practices of other jurisdictions to identify industry best practices in road maintenance: *Better Roads Magazine*, *The ABC's of Pavement Preservation*, *Best Practices Handbook on Asphalt Pavement Maintenance*, *The Road Information Program (TRIP)*, *the Strategic Highway Maintenance Program (SHRP)*, and recommendations from the U.S. Department of Transportation's Federal Highway Administration. We reviewed best practices from the cities of Salt Lake City, UT; Washington, D.C.; Washington County, OR; and San Mateo, CA.

	Best Practice	Does the City Comply with the Practice?	Analyst Comments
1	Pothole patching. Use high-quality patching materials.	Yes	For pothole patching, the division generally uses a asphalt/concrete mix, which is adequate.
2	Use of performance measurements.	Yes	The department identifies performance measurements such as lane miles treated, tons of asphalt/concrete poured, number of potholes filled, etc.
3	Lobby city and county administrators for needed funds.	Somewhat	Department administrators appear before the council annually to lobby for appropriations. However, administrators do not always request or identify actual needs; requests are often prioritized and only some of the needs are identified in budget requests.
4	Having a comprehensive inventory of all city or town roads by pavement type, thickness, and condition or roadway allows the department to coordinate and prioritize maintenance efforts, which is more effective and saves money.	Somewhat	However, the current pavement inventory is not completely accurate; the last comprehensive survey of city streets was completed in 2001.
5	District of Columbia standard is to repair potholes within 3 business days (72 hours) from the time they are reported. Residents will receive a service request number, which can be tracked. If it hasn't been repaired in a timely manner, residents may call the Mayor's hotline for redress.	Somewhat	The department's standard is to repair potholes within 2 business days. However, complainants do not receive a service request number for follow up or any recourse if a pothole is not repaired within 2 working days. Complainants are notified after the repair has been made.

	Best Practice	Does the City Comply with the Practice?	Analyst Comments
6	Roadway Inspection. Investigate roadways to identify any safety or roadway structure concerns and to develop effective schedules for management activity. Work consists of cataloging surface conditions. Work should be accomplished year-round. When the activity is complete, the roadway conditions should be accurately assessed and properly reported and any necessary follow-up is documented	Somewhat	The division has an annual roadway inspection program in place. However, the last annual inspection was done in 2001.
7	Pothole patching. Place—do not throw—material in the patch area.	Somewhat	According to road crew members we interviewed, sometimes, there are so many potholes that crews don't have time to construct a perfect patch. They often apply a "grip-and-rip" technique where the pothole is filled and is compacted with a shovel.
8	The average asphalt-paved highway would receive a preventive maintenance treatment after seven years of service. A second preventive maintenance treatment would be applied after 14 years of service, and a hot-mix overlay would be scheduled after 19 years of service.	Somewhat	The division plans use intervals of 10 and 15 years for maintenance cycles. However, many streets have not received the requisite preventive maintenance for several years.
9	Routine pavement surface treatment applications accomplished once every seven years have proven to be a cost-effective step for preserving and extending pavement performance service life.	Somewhat	Generally, the division programs pavement surface treatments at 10-year intervals for major roadways and 15-year intervals for minor roadways instead of seven year intervals.
10	Productivity gains, especially through reduced labor costs, can be obtained through use of some of the newer pothole patching equipment.	No	Division policies and procedures do not reflect use of specialized equipment for pothole patching.

	Best Practice	Does the City Comply with the Practice?	Analyst Comments
11	The city has allocated funding to support the annual maintenance and surface treatment programs, and has allocated a consistent level of funding to address a portion of the annual rehabilitation needs.	No	Funding levels are inconsistent and do not always address portions of the annual rehabilitation needs.
12	Reduce repetitive activity by taking permanent corrective action.	No	Over the last several years, resurfacing and reconstruction activities have been minimal; short-term quick fixes have been more prevalent. A division employee acknowledged that some potholes have been patched more than once.
13	Cost Effectiveness. Does the treatment enhance pavement performance? Enhanced performance can be measured in several ways, including comfort, convenience, safety, or life cycle costs. If there are no improvements in any of these customer-related issues, then there is no reason to use the treatment.	No	We found no evidence that the division considers comfort, convenience, safety, or life cycle costs in determining treatment. According to division officials, treatment selection is left to the supervisors in the field, using their "discretion".
14	Cost Effectiveness. Is the treatment cost-beneficial? Measuring the benefit of a treatment should include an assessment of the pavement's performance, and not necessarily the performance of the treatment itself.	No	There is no evidence that cost-benefit analysis is considered when determining road treatment.
15	Cost Effectiveness. What is the best treatment method to use? Once a treatment has been determined to be cost-effective, and then select the best materials and construction methods.	No	Since the division does not appear to evaluate enhanced pavement performance or to conduct cost-benefit analysis, we determine that the division cannot select the best materials or construction methods.
16	Pothole patching. Compact every patch, even if you compact the patch by driving over it with a truck.	No	According to interviews with road crew employees, most often, workers will fill a patch and "whack" it down with a shovel, and move on...the "grip-and-rip" technique.

	Best Practice	Does the City Comply with the Practice?	Analyst Comments
17	By sticking to regularly scheduled maintenance tasks, agencies can decrease the accumulation of water in the subgrade and road base, reducing potholes.	No	The division does not schedule road maintenance on a regular basis.
18	Develop roadway maintenance plans that are measurable against current standards.	No	The division does not report on what it “planned” to do and what it “actually did.”
19	Plan for the response to emergency events. Use regular roadway inspections to identify and correct smaller problems and identify those situations requiring repair by heavy equipment.	No	Regular roadway inspections have not been formally completed since 2001.
20	Use of customer-focused performance standards.	No	We found no evidence that the division uses customer-focused performance standards.
21	Create a long-term plan. Road maintenance plan should be at least five years long. Major metropolitan areas need multiple plans: 1, 3, 5, 10, and 25 years.	No	The division appears to focus on annual plans.
22	Implement and adequately fund a pavement preservation program that postpones the need for significant rehabilitation by performing initial maintenance on road surfaces while they are still in good condition.	No	The division does not receive adequate funding, nor does it have a pavement preservation program that focuses on maintenance on road surfaces that are still in good condition.
23	Invest adequately to insure that 75 percent of local road surfaces are in good condition.	No	Honolulu only has 12 percent of local road surfaces categorized as being in “good” condition.
24	Pavement preservation is best executed in the framework of a pavement management system that will enable a road agency to identify pavement condition throughout its road inventory.	No	The division does not maintain a PMS.

APPENDIX B
Road Maintenance Practices
San Diego, California

The division in charge of road maintenance for the City of San Diego is the Street Division within the General Services Department. Its general duties and responsibilities include cleaning and repairing storm drain inlets, pipes, and channels; sweeping commercial and residential streets; and other traffic-related duties.

The division is responsible for alleys, bridges, curbs, gutters, dirt roads, potholes, sidewalks, street resurfacing and slurry sealing. Its in-house staff performs all work, except for resurfacing, which administered on a contract basis. The division also inspects and evaluates contractors' work to assure it meets with city codes and standards.

Funding mechanism

Funding for the division's road maintenance activities comes from the gas tax (repairs and restoration of existing roadways), and special funds, such as infrastructure improvement fund and the TransNet fund. The transportation department within the general services department is fully special funded. The current city policy is that capital outlay funds (funds for capital improvement projects) cannot be applied to repair or maintenance expenditures. Prior to 2001, San Diego borrowed money in the form of bonds to fund street repairs. This practice stopped because of fears over high interest payments.

Instead, the primary special fund mechanism that funds the division is TransNet, also known as the San Diego Transportation Improvement Program. In 1987, county voters approved a 20-year, 5-basis point (one-half cent) sales tax intended to help cities fund transportation projects in their county. The fund intends to: relieve traffic congestion; provide funding for repair and restoration of existing roadways and right-of-way facilities; and use cash rather than bonds for transportation projects, where possible.

TransNet reimbursed \$3.57 million to the division for street maintenance services in fiscal year 2004. Overall, the division's allotment was \$9.03 million from the fund to expend in fiscal year 2004, with \$1 million applied to resurfacing and slurry seal projects.

Despite the presence of the special fund, the division and its priorities will not receive full funding, due to cutbacks in appropriations from local and state legislative sources. In the current budget for fiscal year 2005, all division programs will be reduced by \$3 million, with \$1.17 million cutback from all division functions, including road materials, resurfacing and slurry sealing, and concurrent reduction of state funds for street resurfacing and slurry sealing of \$1.87 million.

Street selection for road maintenance

The division's official policy is that streets receive resurfacing on a rotating basis, every 21 years. Since 2001, due to budget cutbacks, the city programmed substantially fewer miles for resurfacing. Given budgetary constraints, the current practice of the division is to prioritize the worst streets for maintenance, given available funds.

Assessment of maintenance need

The division utilizes an integrated Work and Assets Management System (WAMS), which integrates a geographic information system (GIS), global positioning system (GPS), and a proprietary SAP resource-planning database, and applies it to road maintenance applications. The division uses WAMS for data management, including managing information on preventative maintenance, assets management, work, materials, controlling, human resources, and customer relationships.

The division's WAMS system also manages road maintenance data such as master data (locations, material, and equipment); transactional data (service notification and work orders); GIS geographic data (mapping service area locations including alleys, bridges, etc.); and GPS data (GPS trackers on service mobiles record service location data).

The WAMS also assists the division with decision support system functions, such as developing annual maintenance plans and budget, and assessing the current condition of the network of streets (i.e., distress, structure, and ride).

The division also uses WAMS for pavement management applications. The following is an example of the pothole service process via WAMS where the division receives a pothole service request. The information in the request is processed and dynamically linked to information in the database. The WAMS pulls all relevant street data, map, service data, and other applicable data. This allows for simple locating of pothole repair requests, generating work requests, and after task completion, reporting work data. The WAMS is accessible while mobile or out in the field, as service personnel can remotely query from their work location, download work requests, and report back work information.

Pothole service

The division employs two methods to accept requests for pothole service. It has a call center that the public may call to report potholes. The division also has an online service request and status request system using a dedicated form on the division's web site.

For user convenience, the public may file online requests either using a map or text method. The map method uses an interactive map, where the public can graphically pinpoint problem and location and submit the appropriate request. The text method uses a standard online information form where the public can report and describe the problem and its location.

Pothole repair

The division indicated that pothole repairs normally take up to two days, or up to one week during heavy request periods. Pothole service is prioritized by the division on a Priority 1, 2, 3 system, with Priority 1 being the worst or most in need of service. In terms of street selection, main thoroughfares have a higher additional priority than residential streets.

Currently, the division employs eight pothole service specific trucks, operated by two-person crews. Each of the pothole service trucks has warmers for hot mix. The division's on-site service process is as follows:

arrival at location of pothole with pothole truck; hot-mix is applied; the fill is raked, rolled, and swept; and the crew moves on to next service location.

The division also holds special weekend work scheduling for pothole service. The division provides pothole service on “Pothole Saturdays”, where each of the eight crews assigned to a section of the city and will work only on potholes in that area.

The division noted in its service statistics that 433 potholes were reported in November 2004 and 880 potholes reported in January 2005 after heavy rains. In FY2003-04, the division serviced an estimated 70,000 potholes. The cost of the service has increased since 2001. In 2001, pothole service cost the division \$500,000, and is forecast to reach \$800,000 in 2005.

Factors affecting road conditions

This past winter, southern California experienced an above-normal rainfall, resulting in many problems with potholes and deficient areas of asphalt. Other factors that contributed to road conditions were weakened sub-surfaces, heavy buses and truck road usage, traffic congestion, and older streets not designed for existing capacity.

There were also severe budget cuts to programmed road resurfacing and slurry seal programs. The city’s resurfacing projects for its 2,800 miles of city streets have decreased dramatically in a short period from 102 miles in 2001 to 6 programmed miles in 2005, and most notably, none programmed in 2004.

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APPENDIX C

Road Maintenance Practices

Portland, Oregon

The Street Preservation Program within the Bureau of Maintenance of the Office of Transportation is the division in charge of road maintenance for the City of Portland. Its general duties and responsibilities include pothole service; street paving and marking; sewer and drainage service; graffiti removal from transportation structures, signs, and signals; building and maintaining streets and sidewalks; street improvements in Local Improvement Districts; street cleaning; tree and bush trimming; street lighting and traffic signals; and emergency response to natural hazard events impacting transportation.

Funding mechanism

The City of Portland uses intergovernmental funds, grants and donations, bureau revenues, system development charges, general transportation revenue, general fund revenue, and other revenues to fund its transportation projects. The city uses capital improvement project funding only for major replacement and reconstruction projects and not operating matters such as pavement maintenance projects. The Preservation and Rehabilitation program funds the street preservation program. The program uses its pavement management system and periodic inspection assist in identifying road maintenance projects for funding.

Pavement maintenance priorities

The program implements a policy where the greatest priority is given to those streets constructed to city standards. Highest priority streets are asphalt, oil-macadam, and concrete streets. Oil gravel streets are substandard and are given a lower pavement maintenance priority. Alleys have the lowest pavement maintenance priority, and unimproved grade/gravel streets receive no pavement maintenance.

Assessment of maintenance need and street selection

Portland uses a pavement management system (PMS) to assist in planning street maintenance. The PMS utilizes a database that contains information such as an inventory of all city streets, street design information, past treatment, traffic, and current condition. The system also has a decision support capability used to identify current maintenance needs; identify the most cost-effective technique, given road condition; prioritize maintenance projects by type of treatment; and provide lists of needed annual maintenance.

For example, the system can generate lists of streets requiring chip seal, slurry seal, or paving. The program uses this list to coordinate their work with utilities. The list is distributed to utilities and other organizations who notify the Bureau of Transportation regarding their planned construction and repair activities. The bureau then works with the utilities and contractors to ensure that they complete utility and contract work prior to paving.

Information in the PMS database receives annual updates based on visual inspection, condition ratings, and physical testing of half of the arterial streets and one-fourth of the local streets.

Prior to the construction season, the program inspects streets to verify conditions and identify any necessary preparatory work required to be completed during the off-season.

Pothole Service

Portland utilizes a pothole service phone line for citizens to request pothole service. The program also visually inspects streets to determine if pothole service is necessary.

The pothole service treatments applied are the *throw and roll* method of applying cold mix and compacting it into the pothole, and the semi-permanent method where the pothole is milled square, filled with hot or cold mix, and the compacted with a roller. The noted disadvantages of these methods are that *throw and roll* tends to fail ahead of programmed pavement resurfacing or rehabilitation, and the semi-permanent method is time consuming, requires more staff to complete, and longer lane closures.

We were unable to obtain information relating to size of crews or specialty trucks used, or other information such as dedicated weekends for pothole service, or cost, service, and request statistics.

Factors affecting road conditions

The climate of Portland features weather that can subject roads to heavy rains and rapid freeze/thaw conditions. This unique combination of rain, frigid weather, and then rapid thaw cracks pavement, creates more potholes, and allows moisture penetration to affect road subsurface beds.

As for its road maintenance, the city has been showing an increasing trend in its paving backlog. In past five years, the city has also eliminated its road reconstruction program and completely cut its street slurry seal program cut from budget. The FY2004-05 budget restored funding for the slurry seal program. Increasing traffic demands have also increased pressure on road maintenance.

APPENDIX D

Road Maintenance Practices

Irvine, California

The division in charge of road maintenance for the City of Irvine, California is the Street Maintenance Division of Public Works. Its general duties and responsibilities include the maintenance of asphalt roadways, bike trails, public parking lots, concrete sidewalks, walkways, access ramps, curbs and gutters, storm water drainage infrastructure, traffic control signs, pavement messages, striping, street sweeping, litter control, and special event assistance.

Funding mechanism

The division acquires its funding through the city's general fund, gas tax fund and development special funds (e.g., Systems Development Fund). City general funds, federal, state and local competitive funds support road related capital improvement projects. As a policy, Irvine uses CIP funds for new construction and rehabilitation projects only. The city's operating budget and special funds provide funding for ongoing maintenance activities.

We also discovered that Irvine is unique in that it does not possess a current pavement or deferred maintenance backlog of any kind, citywide. The city benefited from funds collected in assessments during the Internet boom of the 1990s that it applied towards its deferred maintenance backlog. Also consequential is that since 1990, Caltrans, the California State Department of Transportation, has required cities to implement pavement management systems as a condition of receiving state transportation improvement plan funds. However, we discovered that Irvine does not have such a system and thus receives no such funding.

Pavement evaluation

The division has established a Pavement Management Program to evaluate pavement condition and road maintenance needs. Under this program, the worst 20 percent of roadways in a given year are evaluated using a combination of visual and deflection testing to determine condition of pavement. This analysis helps the street division determine the best strategy for repairs based on condition and timeframe for rehabilitation.

Assessment of maintenance need and street selection

Irvine does not use a pavement management system to assist in planning street maintenance, and does not use any new technology in actual repairs made. The division currently maintains all its road service maintenance records in electronic form, and is gathering them into a database. The division plans to compile this database into a geographic information system for pavement maintenance applications.

Street pavement maintenance practices

Under its annual program of Slurry Seal and Local Street Rehabilitation (CAPE SEAL) program, the city applies slurry seal or cape seal to the streets to maintain and upgrade roadways on a regular basis, with all city streets programmed on a seven-year cycle. During the project activity, the city crews do crack filling, slurry seal application and chip seal application to protect and extend the life of the asphalt pavement. The slurry seal application acts as a water repellent cap that prevents water damage to the subsurface of the street.

Pothole Service

Although it has no pothole specific form, Irvine utilizes a service request form on the division's Internet website for the public to request services of the Street Division. It also has a hotline phone number for pothole service requests. The division also visually inspects and tests 20 percent worst streets on an annual basis, and this may form the basis of pothole service.

For benchmarking purposes, the division has a "within three business days" benchmark for repairing reported asphalt deficiencies. The division self-reported 100 percent efficiency rate for achieving this benchmark for FY2003-2004.

Pothole Repair

The division has five field staff dedicated to its asphalt maintenance program. One supervisor oversees these five staff members. The division employs two methods to service potholes, a quick repair method and a semi-permanent method. The quick repair method uses cold mix, and is reportedly usable in rain. The semi-permanent method uses hot mix, and requires lane closures during the work.

The division reported servicing a historical average about 750 repair problem locations on asphalt roads per year. Due to the exceptional 25 inches of rainfall over this past winter, the division repaired 1,500 problem locations last year.

Factors affecting road conditions

This past winter, southern California experienced an above-normal rainfall, resulting in many problems with potholes and deficient areas of asphalt. The division noted that the worst areas were on the high volume traffic roadways and some older residential areas approaching 40 years old. Other factors were increased wear-and-tear from thrice weekly trash truck visits to residential areas, due to recycling efforts. In the older areas, this equipment and current traffic volume has caused problems with the original roadways, which were not designed for such conditions and traffic load.

APPENDIX E
Road Maintenance Practices
Sarasota, Florida

The division in charge of road maintenance for the City of Sarasota, Florida is the Street and Highway maintenance division within the city's Public Works Department. It provides ongoing maintenance and repairs to city owned, county, and state owned streets within the city limits. Its general duties and responsibilities include repairing potholes, resurfacing and mechanical sweeping of city streets, debris removal, and other traffic-related functions. The maintenance work performed by the division on county or state owned roadways is reimbursable through intergovernmental agreements.

Funding mechanism

Funding for the division's road maintenance activities comes from several tax fund sources and a legislative operating subsidy from the city's general fund. The tax fund sources such as the Seven-Cent Gas Tax Fund (gas tax), the Five-Cent Local Option Fuel Tax (ELMS), and the two versions of the Penny Sales tax, are voter-approved tax initiatives, which intend to earmark a certain portion of collected tax revenues towards transportation and road maintenance.

Gas tax revenue is restricted to transportation purposes only. The city applies this revenue to both operating activities, such as street sweeping, lighting, and street/sidewalk maintenance, and capital improvement projects to streets and sidewalks. ELMS revenue is intended only for capital improvement projects for the construction, reconstruction, or resurfacing of roads that are a part of a comprehensive plan of development. ELMS revenue may not be used to fund routine maintenance. Lastly, penny sales tax revenue is also restricted to capital improvement projects, including street and highway maintenance.

Revenue from the gas tax will contribute approximately \$1.80 million, spread across all the maintenance activities of the division for FY2004-05. The budget estimated that ELMS would contribute \$1.05 million to fund street reconstruction in the city for the same fiscal year. Penny sales tax revenue for street and highway maintenance projects is approximately \$1.48 million for the fiscal year.

The current city policy prohibits general obligation debt for operating activities. The city only uses general obligation debt to finance capital improvement projects involving capital and infrastructure of a life exceeding four years. The city has fully funded the department in the past three city budgets, and the street and highway maintenance component of the transportation budget will receive a 4.91 percent increase this fiscal year. The increase was due to salary adjustments and increased employee benefits. There were minor cuts to materials and supplies and day labor. There were no apparent problems with staffing vacancies or cuts.

Street selection for road maintenance

Although we could not identify the specific parameters of street selection and evaluation, the city does reconstruct and resurface streets on a priority basis. The basic priority is determined by evaluating street conditions. The city incorporates the neighborhood planning process into its selection of streets to reconstruct and resurface. The division's decision making and discretion relating to street reconstruction or resurfacing may be supplemented by a process of community consultation and planning.

Assessment of maintenance need and street selection

We could not determine if the city used a pavement management system or other kind of information system to support its road maintenance activities. We also could not determine if they used any advanced technology, novel practices or techniques in road maintenance.

Road Maintenance

There is a unique cross-jurisdictional dynamic at work in the city related to road maintenance. The city provides ongoing maintenance and repairs to city, county, and state-owned streets within the city limits. Officially, the city government and Sarasota county government share the responsibility for providing street and highway maintenance. The city has intergovernmental agreements with the state and county for reimbursement of maintenance provided to these roadways.

Pothole service

Although we could not find specific information about their approach to pothole service, we did note that the division acknowledges some of its major tasks as “to furnish pothole repair and pavement maintenance”, and “to evaluate street pavement conditions and administer contractual resurfacing maintenance . . .”

The division utilizes a service request form on its Internet web site for the public to request all maintenance services, including potholes. An identification number is generated from the request and sent via electronic mail to the requestor, who may, at their convenience, go back to the division web site to check on the status of their request by supplying the identification number. The division also has a hotline phone number for pothole service requests from the public.

The division does use benchmarking in the application of its non-emergency service requests. The current service benchmark for the division to respond to such requests is “to respond to 90 percent of initial non-emergency service requests within two working days”. The city self reported 90 percent efficiency in adhering to this benchmark from the year 2003 to the present. This implies a service rate of approximately 81 percent of requests met within two days.

Pothole Repair

We did not find information relating to crew size and asphalt patching techniques. However, we did find that the Sarasota county pothole repair crews apply hot or cold mix asphalt with a mechanical roller.

Maintenance service statistics

The division has processed 493 and 475 pavement maintenance requests, in 2003 and 2004, respectively. The division has overseen the resurfacing and re-stripping of 10 miles per year over the past two years. The percent of streets resurfaced versus the total miles benchmark in the city has been 4.4 percent over the past two years or approximately 28 miles per year. In this respect, the city has fallen short of its benchmark the past two years. At current policy measures, it appears that the city intends to have resurfaced all lane miles every 22 years; whereas in 2002, the former policy appeared to have a road system resurfacing turnover rate of 16 years.

Factors affecting road conditions

We could not find information on what factors contribute to the road conditions in the city, or information relating to current road conditions.

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Response of Affected Agency

Comments on Agency Response

We transmitted a draft of this report to the Department of Facility Maintenance on May 26, 2005. A copy of the transmittal letter is included as Attachment 1. The department submitted a written response to the draft report on June 13, 2005, which is included as Attachment 2.

In its response, the Department of Facility Maintenance expressed general agreement with the audit findings and recommendations. The department noted particular agreement with our recommendations regarding the need for adequate funding, adoption of a pavement management system, and implementation of a comprehensive work order system. The department also acknowledged the poor condition of city roadways and commented that it hopes to use this audit as a basis to begin needed improvements.

In addition to its general comments, the department also provided comments and clarifications to specific points in the report draft. In some instances, these comments and clarifications added additional information, and as appropriate were incorporated into the final report, but did not substantively affect the report contents. We note that a number of the comments attempt to attribute our findings to a specific cause. While we acknowledge that a specific cause may contribute to those findings, we reiterate that our findings are based on a number of inefficiencies within the division as well as external sources. In four instances, we offer comments to the department's response.

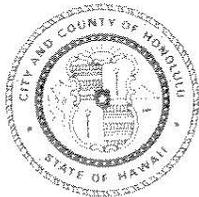
First, our report noted that department staff did not place value on historical information on city roadways and relied, instead, on visual inspection to determine work needs. In its response, the department affirmed its belief that historical information is useful, but clarified that when resources are insufficient for the historical information to be acquired, a visual inspection is more reliable and cost effective. We are encouraged that the department finds historical information useful, but reaffirm that division staff stated that historical information is not necessary. In addition, we did not find any concerted effort by the department to collect and maintain historical data, and did not find evidence that maintenance of historical information was dependent on funding levels. Data maintenance aside, we believe that there is a value to using the information to support road maintenance decisions and work

activity, and this utility is not available to the division due to poor recordkeeping and data maintenance.

Second, our report commented on the department's lack of a web page for pothole reporting and other customer interactions. The department responded that it has implemented a web-based pothole reporting site on the City's web page. We acknowledge the creation of the pothole webpage, which was implemented after our field work was completed, and commend the department for its efforts in utilizing web-based technology. However, the department itself still lacks a comprehensive webpage that provides the public with information about all its services, contact information, and links to other related information. For example, one division employee we interviewed commented that one of the inefficiencies with the pothole hotline is that the public views every hole in the road as a "pothole" and reports it as such. However, there are various road hazards, depending on the size, depth, shape, and location. A webpage that provides illustrations of the various types of road hazards would ensure that the public can more accurately report road conditions and allow the department to take appropriate action.

Third, the department suggested changing our recommendation to a road maintenance program based in part on "customer-focused" performance measures in road treatment decision and output measures to an "industry-focused" performance standard. We note that the suggested best practice "customer-focused" performance standards as recommended by the Federal Highway Administration simply promotes an approach to road maintenance programs that is intended to allow the expertise and experience of the department to develop innovative ways to address desired performance.

Fourth, the department suggested that we add a recommendation that the mayor should ensure that the Department of Planning and Permitting has adequate resources to update the roadway standards and also have the resources to adequately inspect the construction (permit work) occurring on city roadways. While we do not dispute the need for adequate funding to the Department of Planning and Permitting, we did not examine that department's budget during the course of our fieldwork and, therefore, cannot make such a recommendation.



LESLIE I. TANAKA, CPA
CITY AUDITOR

OFFICE OF THE CITY AUDITOR
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 313, KAPOLEI, HAWAII 96707 / PHONE: (808) 692-5134 / FAX: (808) 692-5135

May 26, 2005

COPY

Ms. Laverne Higa
Director
Department of Facility Maintenance
1000 Uluohia Street, Suite 215
Kapolei, Hawaii 96707

Dear Ms. Higa:

Enclosed for your review are two copies (numbers 12 and 13) of our confidential draft audit report, *Audit of the City's Road Maintenance Practices*. If you choose to submit a written response to our draft report, your comments will generally be included in the final report. However, we ask that you submit your response to us no later than 12:00 noon on Monday, June 13, 2005.

For your information, the mayor, managing director, and each councilmember have also been provided copies of this **confidential** draft report.

Finally, since this report is still in draft form and changes may be made to it, access to this draft report should be restricted to those assisting you in preparing your response. Public release of the final report will be made by my office after the report is published in its final form.

Sincerely,

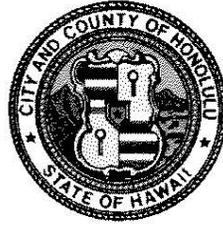
Leslie I. Tanaka, CPA
City Auditor

Enclosures

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 ULUOHIA STREET, KAPOLEI HALE, SUITE 215, KAPOLEI, HAWAII 96707
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MUFI HANNEMANN
MAYOR

LAVERNE HIGA, P.E.
DIRECTOR AND CHIEF ENGINEER

GEORGE K. MIYAMOTO
DEPUTY DIRECTOR

'05 JUN 13 P2 52

IN REPLY REFER TO:
DRM 05-615

June 13, 2005

C & C OF HONOLULU
CITY AUDITOR

Mr. Leslie I. Tanaka, CPA
Office of the City Auditor
City and County of Honolulu
1000 Uluohia Street, Suite 313
Kapolei, Hawaii 96707

Dear Mr. Tanaka:

Subject: Audit of the City's Road Maintenance Practices

Thank you for the opportunity to comment on the draft audit report dated June 2005. We fully support your audit and wish to provide the following comments and clarifications as per the attached.

As we have seen the condition of our roadways deteriorate, we realize that the deterioration that has occurred over many years will take years to correct. We hope to utilize this audit as a basis to begin that improvement.

First, many of the audit recommendations illustrate that adequate and reliable funding of resources is necessary for our roadways to improve. Our vacancy rate of 30% needs to be lowered so that resources can be programmed to address the many short comings as stated in the audit.

Secondly, we agree with the audit recommendation regarding the adoption of a pavement management system integrated into the City's GIS. We will work on obtaining an estimate of the funding necessary to initiate and implement this recommendation.

Thirdly, we agree that a comprehensive work order system would greatly improve our record keeping and provide the means to account for the labor, equipment, and materials needed to perform the various activities which we perform. This would also permit accurate reporting to the administration and the City Council and assist in justifying the budget necessary to accomplish those activities.

We believe that these three recommendations:

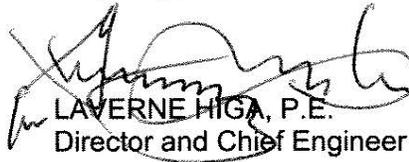
- Adequate funding for resources; i.e., labor, equipment, and materials;
- Adoption of a pavement management system; and
- A comprehensive work order system

Will all require a reliable and consistent funding level to initiate and maintain.

Mr. Leslie I. Tanaka
Page 2
June 13, 2005

Should you have any questions regarding our comments, please contact Larry Leopardi, Chief of our Road Maintenance Division, at 484-7600.

Very truly yours,



LAVERNE HIGA, P.E.
Director and Chief Engineer

LH:sm
Att.

c: Mayor
Managing Director

**Department of Facility Maintenance
Comments and Clarifications
Audit of the City's Road Maintenance Program**

- Page 1, paragraph 2
“Heavy rains, particularly during the winter of 2004, have resulted in exasperating already deteriorating road conditions throughout Oahu.”
- Page 2, paragraph 4
Honolulu (Halawa) major maintenance assistance and major equipment services; and.”
- Page 2, paragraph 6
In urban Honolulu, the Honolulu (Halawa) major maintenance assistance and major equipment services sections maintains streets, including minor road repairs, trench patching, and pothole patching, and maintains storm drains, streams, canals, and other waterways, in addition to cleaning streets and municipal parking lots. The same sections also provides island wide maintenance and equipment support for all rural corporation yards.”
- Page 8 paragraph 1
The Department of Facility Maintenance provides pothole patching “roadway first-aid, and unimproved road (no curb, gutters or sidewalks) resurfacing services.”
- Page 14, paragraph 2
“Lack of funding and chronic vacancies restricts implementation of new technologies and best practices, hampering the division’s ability to effectively maintain city roads.”
- Page 14, paragraph 3
“The division also failed to properly execute its annual pavement condition survey due to lack of personnel.”
- Page 15, paragraph 3
“However, this function was not able to be prioritized due to lack of sufficient personnel.”

“The division did not feel that spending time and limited resources for the annual survey at a time of severe budgetary constraints was cost effective.
- Page 16, paragraph 3
“However, the division has not made the survey a priority due to lack of sufficient personnel thereby failing to update its inventory of city streets.”
- Page 17, paragraph 2
“We found that the division’s road maintenance operations rely more heavily on emergency and corrective maintenance due to lack of sufficient resources.”
- Page 20, paragraph 2
“Long term neglect in adequately funding the resurfacing of city roads will lead to more costly repairs in the future.”
- Page 21, paragraph 2
“The division staff believes that historical information is useful. However, when resources are insufficient for the historical information to be acquired, a visual inspection is more reliable and cost effective.”

Mr. Leslie I. Tanaka
Page 2
June 13, 2005

- Page 30, paragraph 3
“A Web-based pothole reporting site has been implemented on the city’s web page.”
- Page 43, table at bottom of page
“The current backlog is estimated at \$300 million.”
- Page 49, paragraph 3
“However, the department lacks a sufficient number of inspectors necessary to inspect all of the many projects on an on-going basis.”

“The Department of Design and Construction, which is responsible for managing road maintenance contracts on behalf of the city, also lacks a sufficient number of engineering staff to routinely design and inspect their projects.”
- Page 63, paragraph a (IV)
“Establish an industry-focused performance standard in road treatment decisions and output measurements, and”
- Page 63, paragraph 3
Add “Ensure that the Department of Planning and Permitting has adequate resources to update the roadway standards and also have the resources to adequately inspect the construction (permit work) occurring on city roadways.”

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