

# **Audit of the County's Road Resurfacing, Improvement, and Maintenance Practices**

Report No. 15-01  
October 2015



Office of the County Auditor  
County of Maui



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## Office of the County Auditor

The mission of the Office of the County Auditor is to:

- Serve as a catalyst for positive change in County government through focused independent audits and examination.
- Advocate for the efficient and appropriate use of public resources.
- Increase government transparency for the purpose of bringing a higher quality of life to the citizens of Maui County.

The Office of the County Auditor consists of a County Auditor and necessary staff, and is responsible for promoting economy, efficiency, and improved service in the transaction of the public business in both the legislative and executive branches.

To ensure the objectivity of the Office of the County Auditor, the Revised Charter of the County of Maui (1983), as amended, requires that the County Auditor be independent of the Mayor and the County Council. As such, the County Auditor is appointed to a six-year term.

We adhere to very rigorous and demanding professional auditing requirements described in Generally Accepted Government Auditing Standards, or more commonly referred to as *GAGAS* or the Yellow Book. These standards include requirements for planning our work, ensuring that our staff is properly trained and supervised; determining our rationale for the objectives, scope, and methodology; selecting the criteria we use to evaluate the audit subject; and ensuring that our evidence is sufficient, relevant, and competent.



### Office of the County Auditor County of Maui

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## **Preface**

This audit was initiated by the Office of the County Auditor pursuant to Section 3-9.1 of the Revised Charter of the County of Maui (1983), as amended, and the Plan of Audits for Fiscal Year 2015 issued by the Office of the County Auditor. This audit was selected because of the public's interest in the condition of roads in the County of Maui and the recent pavement preservation efforts by the Department of Public Works, Highways Division. The audit was conducted from November 2014 through September 2015.

We wish to express our appreciation for the cooperation and assistance extended by the director and staff of the Department of Public Works, as well as others who assisted us throughout the course of the audit.

Lance T. Taguchi  
County Auditor

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# EXECUTIVE SUMMARY

## *Audit of the County's Road Resurfacing, Improvement, and Maintenance Practices*

Report No. 15-01, October 2015

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### **BACKGROUND**

The Department of Public Works ("the Department") is comprised of three divisions: the Development Services Administration, the Engineering Division, and the Highways Division. Of these divisions, the Engineering Division and Highways Division are responsible for maintaining the integrity of the County of Maui's nearly 1,160 lane miles of roads. The annual average cost of road resurfacing, rehabilitation, and reconstruction from Fiscal Year ("FY") 2011 through FY 2014 was approximately \$15.5 million. An additional \$1.3 million is appropriated for pavement preservation.

The objectives of this audit were to evaluate whether the management processes utilized by the Department will protect the integrity of the County's roads and maximize the lifespan and public safety while minimizing the maintenance costs; and make recommendations as appropriate.

Five areas of focus were identified to support this assessment:

1. Long-Range Plan;
2. Pavement Preservation;
3. Potholes;
4. Complaints; and
5. Interdepartmental Coordination.

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### **FINDINGS**

***There is no comprehensive long-range plan to maintain all existing County roads***

While plans that provide high-level, policy-oriented guidance exist, these documents do not address all existing County roads. The Department does not have a comprehensive long-range plan that incorporates 1) midrange plans, 2) annual plans, and 3) pavement preservation techniques.

Although the Department has identified a target Pavement Condition Index ("PCI") of 75 for County roads, the total cost and annual funding required to reach and maintain that level has not been determined.

Based on the Department's current practice, it is estimated to take approximately 65 years<sup>1</sup> to reconstruct or rehabilitate all 1,160 lane miles of County roads--beyond the scope of the Department's existing 6-year midrange plan.

We recommend the Department develop a comprehensive long-range plan, based on achieving and maintaining the targeted PCI. The plan should align the long-range planning needs with the Department's existing midrange and annual plans, incorporate the impacts of the Pavement Preservation program, and serve as a basis for future funding requests. We also recommend the Department utilize the iWorQ system to align the Engineering Division's reconstruction efforts with the Highways Division's Pavement Preservation program.

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***The unavailability of historical data and lack of meaningful performance measures do not allow for a thorough evaluation of the long-term feasibility of the Highway Division's Pavement Preservation program***

The road construction industry has touted the merits of pavement preservation as a way to greatly reduce or delay costly road reconstructions. As such, the County should be commended for moving towards initiating the proactive concepts of pavement preservation in its road maintenance activities. However, the Highways Division's Pavement Preservation program is still in the early stages and its long-term feasibility is yet to be determined. Our audit found the County's Pavement Preservation program does not appear to be aligned with the Engineering Division's reconstruction efforts nor is it part of a comprehensive long-range plan.

Some performance measures are tracked and reported in the County's annual Budget and in the Department's Annual Report. However, our audit found those measures are primarily statistical in nature and provide little insight as to how well County roads are being maintained or to the actual value and benefit to the public.

The availability and integrity of data is fundamental to the Department's ability to measure the value and benefits of the Pavement Preservation program. Audit testing found the iWorQ Pavement Management module, which evaluates the condition of roads, is not being updated on a timely basis by neither the Engineering Division nor the Highways Division.

The Department has both the Work Management and Pavement Management modules of the iWorQ system at its disposal. There is no integration of the data in the Work Management module and

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<sup>1</sup> Based on the estimated 1,160 lane miles (per iWorQ system) of County roads divided by average number of lane miles (17.76) reconstructed and rehabilitated by the Department between FY 2013 and FY 2014.

the data in the Pavement Management module. Such integration would greatly enhance management's ability to improve the Pavement Preservation program's operational efficiency and effectiveness.

We recommend the Department update the Pavement Management and the Work Management modules of the iWorQ system on a timely basis to maintain the data's integrity. We also recommend the Department investigate the integration of the iWorQ Work Management module and the iWorQ Pavement Management module.

Lastly, we recommend the Department conduct a full cost analysis (including fringe benefits of County employees) over the next few years to determine the long-term feasibility of the County performing slurry seal and overlay pavement preservation techniques in-house versus utilizing outside contractors.

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***Each District of the Highways Division records repaired potholes differently and at varying levels of detail. A centralized database does not exist to maintain the pothole repair information***

Each District patches its own potholes. Our audit found there is no consistency in the way each District records repairs. Therefore, the data is not in a format that would allow the Highways Division to analyze or determine the effectiveness of pothole repair methodologies, the frequency of repairs to the same pothole or street, staff productivity, or the best repair option. This may also hinder management's ability to analyze pothole repair data in conjunction with planned pavement preservation techniques and may result in potential lost opportunities to either extend the life of a road or defer the incurrence of costly reconstructions.

Our audit also found there are several ways pothole complaints are received, and the Highways Division does not have a formal method to track all those complaints. There is no standard process to record and manage complaints, ensure a resolution, and provide feedback to the complainant.

We recommend the Department develop a standardized method to record pothole repairs. The data should be maintained on a common spreadsheet and entered into the iWorQ system in a consistent manner to assist in determining the effectiveness of these repairs. The data should also be compiled in a manner that will assist in determining future pavement preservation projects and should be integrated into the annual, midrange, and long-range planning processes.

We also recommend the Department establish a standard method to consistently and uniformly record, manage, and track the responsiveness and resolution of all pothole complaints.

***Road-related complaints from the public are not recorded or tracked in a structured and consistent manner by neither the Engineering Division nor the Highways Division***

Road-related complaints are received, documented, and tracked in various ways by the Engineering Division and the Highways Division. There does not appear to be an established standardized methodology in place, nor a database accessible to both Divisions. During the course of the audit, we could not determine whether all complaints received are actually recorded and resolved. Road-related complaints are purportedly considered in planning future roadwork projects. However, the inconsistent manner in which the Engineering Division and Highways Division manage and track complaints makes it difficult to verify how complaints are actually used in planning future roadwork projects.

We recommend the Department establish a process to consistently and uniformly record road-related complaints received by the Engineering Division and the Highways Division. At minimum, the process should:

1. Track the status of all road-related complaints from the date received through final resolution.
2. Provide for a mechanism for the Department to communicate with the complainant.
3. Provide data to enable analysis of road-related complaints, including but not limited to the quantities, types, location, and resolution status.
4. Assist in developing the annual, midrange, and long-range planning of future projects.
5. Inform the public of the Department's progress, efforts, and responsiveness to road-related complaints.

***There is no structured process in place to coordinate Capital Improvement Projects ("CIP") with other County departments prior to initiation of reconstruction, rehabilitation, or pavement preservation projects by the Department of Public Works***

Our audit found there is no longer a centralized County employee assigned to coordinate County CIP. Such a position would review, analyze, evaluate, and formulate recommendations on the annual Capital Program and annual Budget. Further, the position would ensure the individual efforts of each department are not in conflict.

During the course of the audit a meeting was held between the Engineering Divisions of the Department of Public Works and Department of Water Supply. The meeting discussed upcoming road reconstruction, rehabilitation, and resurfacing projects. The meeting appears to be the first of its kind in recent history.

The County's Geographic Services Manager developed a CIP-related app that could be used as a tool for interdepartmental coordination. The app incorporates Pictometry and could enable the Department of Public Works and other County departments to

see future road projects. However, it does not appear this app is being utilized.

We recommend the County assign a centralized employee to coordinate the CIP of various County departments and eliminate the occurrence of duplicate and conflicting roadwork projects.

We also recommend regular meetings be conducted (perhaps semi-annually) between the Engineering Divisions of the Department of Public Works and the Department of Water Supply. The meetings should cover, at minimum, each Department's respective future planned projects. Consideration should be given to include the Department of Water Supply Field Operations and the Department of Public Works Highways Division in those meetings, as both of these Divisions possess the "boots on the ground" knowledge of their respective operations.

Finally, we recommend the County consider utilizing software already at its disposal (i.e., Geographic Information Systems) to serve as a visual aid for interdepartmental coordination of County CIP.

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## **Management's Comments**

The Department generally agreed with our findings and recommendations and, in some instances, has already begun implementation.

A copy of Management's comments is attached as "Attachment 1".

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# Chapter 1

## Introduction

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This audit was initiated by the Office of the County Auditor pursuant to Section 3-9.1 of the Revised Charter of the County of Maui (1983), as amended, and the Plan of Audits for Fiscal Year (“FY”) 2015 issued by the Office of the County Auditor on June 30, 2014. This audit was selected because of the public’s interest in the condition of roads in the County of Maui and the recent pavement preservation efforts by the Department of Public Works, Highways Division.

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### BACKGROUND

The Mission Statement of the Department of Public Works (“the Department”), as stated in its FY 2014 Annual Report, is:

*“To protect the public’s health, safety, property, and environment by developing and operating the County’s road [emphasis added], drainage and bridge systems and administering its building codes.”*

The Department is comprised of three divisions: Development Services Administration, the Engineering Division, and the Highways Division. Of these divisions, the Engineering Division and the Highways Division are responsible for maintaining the integrity of the County’s roads.

The Engineering Division “Plans, designs, constructs and inspects various types of Public Works improvements such as roadways, bridges, drainage facilities, buildings and other structures.”<sup>1</sup>

As described in the FY 2016 Budget, the Engineering Program provides “engineering and inspection services to plan, design and construct highway, drainage and bridge improvements for the County of Maui. Road-related services include developing design standards for road improvements within the County.” One of the Engineering Division’s goals for FY 2016 is to provide routine maintenance by resurfacing, reconstructing, rehabilitating, or preserving County roads and bridges to ensure accessibility and a safe riding surface.<sup>2</sup>

The Highways Division “Maintains roadways, bridges, drains and their appurtenant structures....Developing our Pavement

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<sup>1</sup> Annual Report, Department of Public Works, FY 2014 (July 1, 2013 - June 30, 2014), p. 2.

<sup>2</sup> FY 2016 Budget, p. 607.

Preservation Program to maintain the integrity of our roadways continues to be a focus of the Division, to get back to the basics for roadway maintenance. With the continued support of the Mayor's Administration and the Council, we aim to provide the **'Right Fix, on the Right Road, at the Right Time'** in order to extend pavement life, resulting in an overall reduction in maintenance costs."<sup>3</sup>

The FY 2016 Budget describes the Highways Division's Road, Bridge and Drainage Maintenance Program as follows: "protects the public's investment in its highway infrastructure by providing a program of pavement preservation, cleaning and maintaining for its drainage facilities, and by supporting the maintenance of its bridges." The Highways Division's goals for FY 2016 include: 1) Improve maintenance of County infrastructure and public right-of-ways, 2) Effectively maintain County streets and drainage facilities and develop sustainable roadways to extend pavement lifespan and minimize capital improvement costs, 3) Improve effectiveness and efficiency of program's service by providing timely response to service requests.<sup>4</sup>

The Highways Division is comprised of crews within six districts: Wailuku-Kahului, Makawao, Lahaina, Hana, Lanai, and Molokai.

The Department utilizes a software program, called iWorQ, as its primary road database. The iWorQ Pavement Management module is used to inventory and assess all of the County's roads. Representatives from iWorQ drove and rated each of the County's 4,000-plus roads in 2008 and 2013. Road segments were classified into five distress types: 1) Transverse Cracking, 2) Fatigue/ Alligator Cracking, 3) Longitudinal Cracking, 4) Patching and Potholes, and 5) Edge Cracking. Based on the iWorQ data, the system determines the Remaining Service Life ("RSL"), assigns a Pavement Condition Index ("PCI"), and recommends the treatment to be performed for each road segment.

According to the iWorQ Pavement Management module data on August 24, 2015, there are approximately 547 miles of County roads (1,160 lane miles with 4,000-plus road segments) in the County. The pavement preservation techniques utilized by the Department to maintain these roads include pothole repairs, crack sealing, seal coating, slurry sealing, thin overlay, rehabilitation, and reconstruction. With the exception of reconstruction and rehabilitation, all of these techniques can be performed

<sup>3</sup> Annual Report, Department of Public Works, FY 2014 (July 1, 2013 - June 30, 2014), p. 79 and p. 81.

<sup>4</sup> FY 2016 Budget, p. 627, 630-631.

by the Highways Division personnel. The rehabilitation and reconstruction activities are contracted out.

For FY 2011 through 2014, the average annual cost for road resurfacing, rehabilitation, and reconstruction was \$15,552,129.<sup>5</sup> In addition, \$1.3 million was appropriated to the Highways Division for pavement preservation.

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## AUDIT OBJECTIVES

The audit objectives were to:

1. Evaluate whether the management processes utilized by the Department will protect the integrity of the County's road and maximize the lifespan and public safety while minimizing the maintenance costs; and
2. Make recommendations as appropriate.

Five areas of focus were identified to support this assessment:

1. Long-Range Plan;
2. Pavement Preservation;
3. Potholes;
4. Complaints; and
5. Interdepartmental Coordination.

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## AUDIT SCOPE AND METHODOLOGY

The scope of the audit was subsequently broken down into five sub-objectives to determine if:

1. the Department has incorporated long-range, midrange, and annual planning into its strategies for the investment of scarce resources to upgrade, operate, and maintain the County's roads throughout its lifecycle;
2. the Department utilizes the concepts of pavement preservation in its road maintenance activities or simply addresses road repairs when major reconstruction or rehabilitation is required;
3. the Department used all reasonable means to identify and repair potholes and whether the pothole related data is utilized in the analysis of road conditions for future roadwork;
4. complaints are received, compiled, organized, and utilized in a structured manner to assist in the decision making of

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<sup>5</sup> Calculated from the total actual costs incurred for all road capital improvement projects and FHWA road construction projects (the average of 2011 - \$10,467,319; 2012 - \$4,255,613; 2013 - \$22,051,137; and 2014 - \$25,434,445).

- future roadwork to enable the Department to respond to the public's needs; and
5. coordination with other County departments to minimize the impact of roadwork on the public are initiated prior to any reconstruction, rehabilitation, or pavement preservation project.

The majority of the detailed testing covered the period from FY 2013 to FY 2015. Data from adjacent periods were utilized when appropriate.

The audit did not include the activities of the Development Services Administration division.

The evidence gathering and analysis techniques used to meet our audit objectives included, but were not limited to:

#### Interviews and Correspondence

- Department of Public Works management;
- Department of Public Works Engineering Division management and Engineers;
- Department of Public Works Highways Division management and District Supervisors;
- Department of Public Works Development Services Administration personnel;
- Department of Water Supply personnel;
- Department of Management, Geographic Analysis and Cartographic Services Division personnel;
- Department of Management, County Capital Improvement Program Coordinator;
- Department of the Corporation Counsel, Risk Management Division personnel;
- Chief, Division of Road Maintenance, City and County of Honolulu;
- Roads Division Chief, County of Kauai;
- Acting Chief of Highways Division, County of Hawaii; and
- iWorQ management and staff.

#### Document Review

- Federal-Aid Highway 2035 Transportation Plan for the District of Maui;
- Maui County General Plan 2030;
- Proposed Roadway Development Program, Fehr & Peers, January 2007;
- Department of Transportation Statewide Transportation Improvement Program (6 year);
- Department of Public Works capital improvement project list (6 year);

- Department of Public Works road resurfacing list (5 year);
- Annual Plans of the Department of Public Works Engineering Division;
- Annual Plans of the Department of Public Works Highways Division;
- Budgets for FY 2013 through FY 2015;
- County of Maui FY Budget documents, including meeting minutes and presentation materials;
- Annual Report of the Department of Public Works, FY 2014;
- Documentation from iWorQ Pavement Management module;
- Professional literature, best practices, and guidance reports issued by the U.S. Department of Transportation, Federal Highway Administration (“FHWA”) Report; American Association of State Highway and Transportation Officials; Council for Scientific and Industrial Research; International Organization for Standardization; and the Project Management Body of Knowledge Guide 2013; and
- Audit reports issued by the following municipalities: City and County of Honolulu, Kauai, Portland, Oklahoma, Los Angeles, Denver, San Jose, San Diego, Dallas and San Francisco.

#### Analysis

- Identification and review of all existing plans prepared by the Department of Public Works Engineering Division;
- Identification and review of all existing plans prepared by the Department of Public Works Highways Division;
- Documentation of the current planning processes performed by the Department of Public Works Engineering Division;
- Documentation of the current planning processes performed by the Department of Public Works Highways Division;
- Correspondence with other Counties in the State of Hawaii as it relates to long-range planning;
- Determination of the infrastructure gap with respect to the County’s roads;
- Comparison of planned road repair activities against the actual work performed;
- Review of the existing performance measures reported by the Department of Public Works Engineering Division;
- Review of the existing performance measures reported by the Department of Public Works Highways Divisions;
- Identification of all Pavement Preservation techniques utilized by the Department of Public Works Highways Division;

- Site visits to observe Department of Public Works Highways Division crews performing seal coating, slurry sealing, and thin overlay pavement preservation techniques;
- Analysis of the iWorQ Pavement Management and Work Order Management modules and its data;
- Documentation and analysis of the current processes to capture, record, and track pothole complaints and repairs;
- Identification of how complaints are received, tracked, resolved, and utilized to plan future roadwork;
- Review of the KIVA (Request for Service) system regarding recording complaints;
- Review of the existing processes to facilitate the coordination of road-related projects; and
- Documentation of the capital improvement project and construction project processes to determine opportunities for interdepartmental coordination.

The audit was performed from November 2014 through September 2015 and was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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# Chapter 2

## Audit Findings

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### FINDING 1

*There is no comprehensive long-range plan to maintain all existing County roads.*

#### *Existing Plans*

##### **High-level plans**

The Department of Public Works (“the Department”) has access to two high-level plans related to County roads. The Maui County General Plan 2030 and a report prepared by the State of Hawaii, entitled “Federal-Aid Highways 2035 Transportation Plan for the District of Maui”, provide high-level and policy-oriented guidance. However, these plans do not address secondary roads and local streets, and do not include discussion relating to pavement preservation and the impact of pavement preservation techniques on County roads.

##### **Midrange and Annual plans**

The Engineering Division has three midrange plans:

- Department of Transportation Statewide Transportation Improvement Program (“STIP”)
- 5-year road resurfacing list
- 6-year capital improvement project (“CIP”) list

The STIP includes major roads identified by the State of Hawaii as qualifying for Federal funding. The STIP also includes road-related projects such as traffic signals, bridges, guardrails, etc. For STIP projects, the Federal government may fund up to 80 percent of the project’s cost, leaving 20 percent to be funded by the County.

The 5-year road resurfacing list is prepared by the Engineering Division and includes specific roads identified in the iWorQ system as requiring reconstruction or rebuilding. According to the Engineering Division, the engineers then prioritize those roads by district using criteria such as the funding allocated to the district, complaints received, driving the roads, and personal knowledge.

The 6-year CIP program list incorporates the projects on the STIP, the 5-year road resurfacing list, and other CIP of the Department.

The Highways Division purportedly prepared a 5- to 10-year plan.

However, the electronic document was lost when an employee's computer hard drive failed. During the course of this audit, the plan's existence could not be verified.

As part of the annual budget process, the Engineering Division and the Highways Division also prepares annual plans. The Engineering Division's annual plan is a listing of current year road projects identified in the 5-year road resurfacing list and the STIP listing. The Highways Division's annual plan is based on the \$1.3 million allocated for the Pavement Preservation program.

However, based on the Department's current practice, it is estimated to take approximately 65 years<sup>1</sup> to reconstruct or rehabilitate all 1,160 lane miles of County roads--beyond the scope of the Department's existing 6-year midrange and annual plans.

While high-level plans establish broad-reaching policy guidance and midrange and annual plans meet operational needs, they are not a substitute for a comprehensive long-range plan--which will fill in the gaps between the two. Such a comprehensive long-range plan could provide guidance to reduce the cost to restore all roads to a predetermined quality level and will provide the Department with a justifiable foundation for future funding requests.

### ***Risks and Impacts***

There has been a long-standing past practice of the Department performing roadwork based on "dollars available" rather than on "the level required to achieve a targeted pavement condition" or remaining service life ("RSL"). That practice may lead to roads neglected and deteriorated to a point that requires reactive maintenance. This "worst first" approach reduces the effectiveness of pavement preservation and may result in more costly reconstructions as the only repair option. In addition to being significantly more expensive, road reconstructions are more intrusive and affect the mobility of residents and visitors to a greater extent.

### ***Best Practice***

According to the U.S. Department of Transportation, Federal Highway Administration ("FHWA"), "the antithesis of Asset Management is neglect of assets until they deteriorate and require reactive maintenance treatments to restore at least minimal

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<sup>1</sup> Based on the estimated 1,160 lane miles (per iWorQ system) of County roads divided by average number of lane miles (17.76) reconstructed and rehabilitated by the Department between FY 2013 to FY 2014.

functionality without regard to long-term need or performance.”<sup>2</sup> They also state “For today’s transportation agencies, it’s not just about the short term construction and rehabilitation of roads and bridges, but about results and accountability, as agencies use transportation asset management to implement a data-driven framework for the long-term management of their highway networks.”<sup>3</sup>

According to the American Association of State Highway and Transportation Officials (“AASHTO”) “Transportation Asset Management [comprehensive long-range plan] is a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives.”<sup>4</sup>

### **Benefits**

The benefits of developing a comprehensive long-range plan (i.e., Transportation Asset Management plan) include:

- Improving the condition of all County roads in a logical and disciplined manner;
- Monitoring the progress of the Department and making appropriate adjustments;
- Extensive analysis and application of pavement preservation techniques that may extend the life of roads;
- Systematic approach to determine which roads require major reconstruction;
- Providing the Department with a logical defense to complaints relating to the condition of specific roads and a basis for explaining the timetable for repair; and
- Providing the Department with a justifiable foundation for future funding requests.

## **Recommendations**

We recommend the Department:

1. Develop a comprehensive long-range plan, based on achieving and maintaining the targeted Pavement Condition Index (“PCI”). The plan should align the

<sup>2</sup> U.S. Department of Transportation, Federal Highway Administration Report (FHWA-IF-10-009)

<sup>3</sup> U.S. Department of Transportation, Federal Highway Administration Report (FHWA-HRT-10-015)

<sup>4</sup> AASHTO TAM Guide: A Focus on Implementation (January 2011)

long-range planning needs with the Department's existing midrange and annual plans, incorporate the impacts of the Pavement Preservation program, and serve as a basis for future funding requests.

2. Utilize the iWorQ system to align the Engineering Division's reconstruction efforts with the Highways Division's Pavement Preservation program.

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## Additional Information

### *Infrastructure Gap*

In accordance with the FY 2016 Budget, the Department measures the percentage of road pavements in acceptable condition as having a PCI of 75 or better. However, the funding required to reach and maintain that level has not been determined.

In basic terms, a road-related infrastructure gap is the difference between what the road infrastructure needs are and the amount the County plans to spend. An infrastructure gap, with respect to the County's roads, has not been calculated by the Department.

To put this in perspective, if the County's infrastructure needs are to reconstruct and rehabilitate all County roads, it is estimated to cost approximately \$1.6 billion<sup>5</sup> to reconstruct or rehabilitate all County roads.

### *Pavement Preservation in Relation to a Long-Range Plan*

The AASHTO and FHWA have made Transportation Asset Management a national priority.<sup>6</sup> With the incorporation of effective pavement preservation techniques, the life of a road could be extended to about 40 years. Therefore, the Highways Division's pavement preservation methodologies should be considered in conjunction with the Engineering Division's reconstruction and rebuilding plans and incorporated into the comprehensive long-range plan.

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<sup>5</sup> Based on 1,160 lane miles (per iWorQ system 8,164,305 square yards) and the 2014 actual average cost to reconstruct and rehabilitate the County roads (\$195 per square yard).

<sup>6</sup> FHWA Asset Management Publications, Asset Management Overview, Strategies for Implementation [http://www.fhwa.dot.gov/asset/if08008/amo\\_05.cfm](http://www.fhwa.dot.gov/asset/if08008/amo_05.cfm)

## FINDING 2

***The unavailability of historical data and lack of meaningful performance measures do not allow for a thorough evaluation of the long-term feasibility of the Highway Division’s Pavement Preservation program.***

### ***History of Pavement Preservation in the County of Maui***

Pavement preservation involves a paradigm shift from “worst-first” to “optimum timing.” The Department utilizes pavement preservation concepts in its road maintenance activities to extend the life of roads and defer the major costs incurred by reconstruction. As such, the County should be commended for moving towards initiating proactive pavement preservation concepts in its road maintenance activities. The County’s preventative maintenance techniques include crack sealing, seal coating, slurry sealing, and thin overlays--all of which will bolster ride quality, provide surface drainage and friction, and correct surface irregularities.

#### **Exhibit 2-1 Notable Pavement Preservation Events**

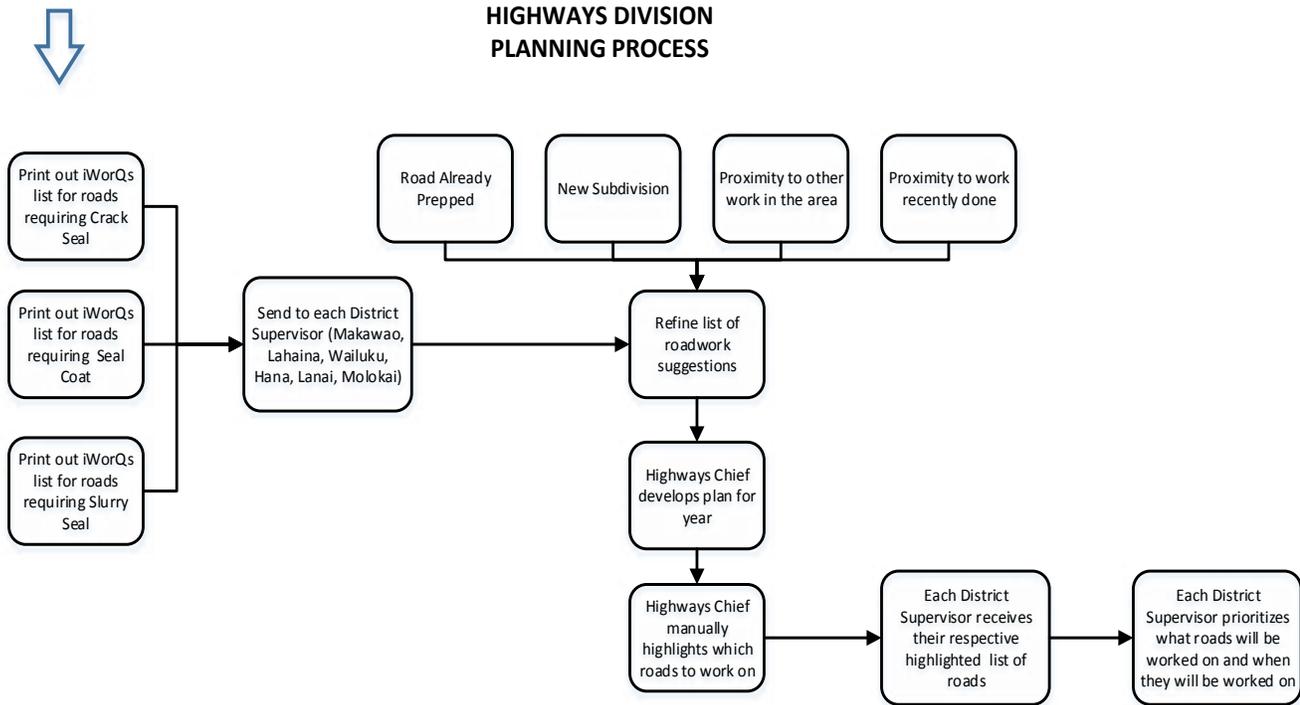
<b>YEAR</b>	<b>ACTIVITY</b>
2008	<ul style="list-style-type: none"> <li>• The iWorQ Pavement Management module implemented to track the condition of all County roads</li> <li>• Representatives from iWorQ drove and rated all County of Maui roads to generate RSL and PCI and recommended pavement preservation techniques</li> <li>• Highways Division’s Pavement Preservation program was initiated with the commencement of crack seal applications</li> </ul>
2012	<ul style="list-style-type: none"> <li>• Seal coating applications started on the island of Maui</li> </ul>
2013	<ul style="list-style-type: none"> <li>• Specialized slurry seal truck received in August</li> <li>• Representatives from iWorQ return to update prior evaluations of all County roads</li> </ul>
2014	<ul style="list-style-type: none"> <li>• Slurry seal applications initiated using District crews</li> </ul>
2015	<ul style="list-style-type: none"> <li>• Lanai and Molokai received seal coating equipment and training</li> <li>• Full complement of permanent staff for the Countywide slurry seal crew established</li> </ul>

Source: Office of the County Auditor based on Pavement Preservation program document prepared by the Highways Division, dated 9/13/2013, and discussions with Highways Division management

### Annual Pavement Preservation Work Plans

The Highways Division has a very detailed planning process for each type of pavement preservation activity (Exhibit 2-2). That process identifies the district, specific roads, road segments, square yardage, type of treatment, and the potential costs. The resulting annual pavement preservation work plan was prepared by the Highways Division management and included the extraction of data from iWorQ as well as input from the district supervisors. However, as good as the Highways Division’s planning processes are, our audit found that the actual work performed deviated from the annual pavement preservation work plan.

**Exhibit 2-2  
Highways Division Planning Process**



Source: Office of the County Auditor from meetings with Highways Division management

### Performance Measurement

It is too early to determine whether the Department’s Pavement Preservation program is achieving the anticipated benefits. Although some performance measures are tracked and reported in the County’s annual budget and in the Department’s Annual Report, those measures are primarily statistical in nature and provide little insight as to how well County roads are being maintained or to the actual value and benefit to the public.

Examples of better performance measures include:

- Percentage of planned versus actual pavement preservation lane miles completed
- Year-to-year improvement in the PCI and RSL rating
- Miles of pavement preservation seal coated/slurry sealed per full-time equivalent personnel
- Total cost of each pavement preservation technique per mile
- Percentage of crew time spent on pavement preservation activities versus other work activities
- Percentage of time devoted to each pavement preservation technique per mile, with comparisons among District crews to identify strengths, weakness, and areas for improving efficiencies

The iWorQ Pavement Management module is designed to provide valuable information required to evaluate the condition of the County's roads. It is essential the data be complete, accurate, and up-to-date. Audit testing found the iWorQ system is not being updated on a timely basis by neither the Engineering Division nor the Highways Division. The availability and integrity of data is fundamental to the Department's ability to measure the value and benefits of the Pavement Preservation program.

The Department has both the Work Management and Pavement Management modules of the iWorQ system at its disposal. The integration of the data from the Work Management module with the corresponding data from the Pavement Management module would greatly enhance management's ability to determine best practices and improve the Pavement Preservation program's operational efficiency and effectiveness.

The timely input of data and integration of the Work Management module and Pavement Management module will enable the Department to develop and analyze more meaningful performance measures.

### ***Best Practices***

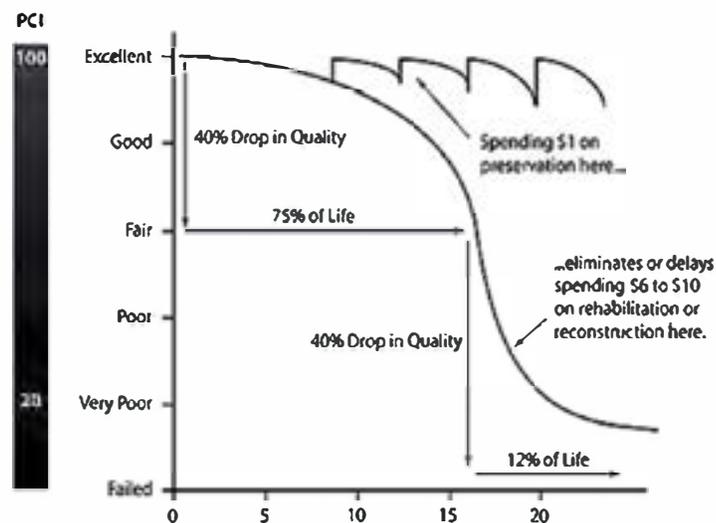
The FHWA Pavement Preservation Compendium II, Pavement Preservation: Techniques for Making Roads Last, states:

"In May 2005, the FHWA came out strongly in support of pavement preservation. Pavement preservation is a planned system of treating pavements at the optimum time to maximize their useful life, thus enhancing pavement longevity at the lowest cost..."

Typically, pavements perform well under loads until a particular point in their life spans, at which time they deteriorate precipitously and rapidly to failure. Experience shows that spending \$1 on pavement preservation before that point eliminates or delays spending \$6 to \$10 dollars on future rehabilitation or reconstruction costs."

This relationship is illustrated in Exhibit 2-3.

### Exhibit 2-3 Pavement Life Cycle Chart



Source: FHWA Pavement Preservation Compendium II – Pavement Preservation: Principles of Pavement Preservation (Updated 04/07/2011)

According to AASHTO and FHWA, highway agencies are redefining its objectives to focus on activities and strategies to preserve and maintain existing highway systems instead of fixing the worst first. This redefined strategy meets ever-growing travel demands as well as the public's expectations for safety, ride quality, and traffic flow.

## Recommendations

We recommend the Highways Division:

1. Update the Pavement Management and the Work Management modules of the iWorQ system on a timely basis to maintain the data's integrity. The iWorQ system will provide Department management with value added information to evaluate the Pavement Preservation program.

2. Investigate the integration of the iWorQ Work Management module and the iWorQ Pavement Management module.
3. Conduct a full cost analysis (including fringe benefits of County employees) over the next few years to determine the long-term feasibility of the County performing slurry seal and overlay pavement preservation techniques in-house versus utilizing outside contractors.
4. Integrate the Pavement Preservation program techniques into a comprehensive long-range plan.

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### FINDING 3

***Each District of the Highways Division records repaired potholes differently and at varying levels of detail. A centralized database does not exist to maintain the pothole repair information.***

Each District of the Highways Division records repaired potholes differently and at varying levels of detail. A centralized database does not exist to maintain the pothole repair information. The data currently collected is not in a format that would allow the Highways Division to analyze or determine the effectiveness of pothole repair methodologies, the frequency of repairs to the same pothole or street, staff productivity, or the best repair option. This may hinder management's ability to analyze pothole repair data in conjunction with planned pavement preservation techniques and may result in lost opportunities to extend the life of a road or defer costly reconstruction.

There are numerous ways in which potholes can be reported, including via:

- KIVA or "Request for Service" which may be generated by phone, walk-in, e-mail, on-line, and the County's website;
- Mayor;
- Members of County Council;
- Director or Deputy Director of Public Works;
- direct contact with Engineering Division;
- direct contact with Highways Division; and
- COM Connect, also known as "SeeClickFix".

Due to the many sources of input for reporting potholes and the lack of a formalized, established procedure to centralize and compile all reported potholes, we could not substantiate that all potholes are identified and repaired.

When potholes are not repaired on a timely basis, they deteriorate rapidly and become larger and deeper until patching maintenance is no longer possible. Expensive reconstruction of the road may then be necessary.

## Recommendations

We recommend the Department:

1. Develop a standardized method to record pothole repairs. At minimum data collected should include road names, date of the repairs, respective start and end times for each segment of road, number of potholes, and amount of asphalt used. The data should be maintained on a common spreadsheet and entered into the iWorQ system in a consistent manner.
2. Analyze the data to identify opportunities for best practices across Districts regarding scheduling and routing of the pothole repairs, productivity, effectiveness of the repairs, etc.
3. Compile the data in a manner that will assist in determining future pavement preservation projects and integrate the data into the annual, midrange, and long-range planning processes.
4. Develop a process to consistently and uniformly record, manage, and track the responsiveness and resolution of all pothole complaints.

---

## FINDING 4

***Road-related complaints from the public are not recorded or tracked in a structured and consistent manner by neither the Engineering Division nor the Highways Division.***

As with the reporting of potholes, complaints are received in multiple ways by the County.

Road-related complaints from the public are not recorded or tracked in a structured and consistent manner by neither the Engineering Division nor the Highways Division.

Also, there is no common complaint database available to both Divisions that track all complaints by type (e.g., wear, construction, potholes, roadwork by other departments), location, and resolution status. Therefore, we could not determine the extent to which complaints are considered in making future roadwork decisions.

A complaint management system demonstrates to customers and other stakeholders that recognizing and addressing the needs and expectations of complainants are important. It further shows that processes are in place to improve the product and customer service.

Although complaints are informally considered in the midrange and annual plans, opportunities exist to improve the process and better facilitate the selection of roads for future repair.

## Recommendations

We recommend a process be established to consistently and uniformly record road-related complaints received by the Engineering Division and the Highways Division. At minimum, the process should:

1. Track the status of all road-related complaints from the date received through final resolution.
2. Provide for a mechanism for the Department to communicate with the complainant.
3. Provide data to enable analysis of road-related complaints, including but not limited to the quantities, types, location, and resolution status.
4. Assist in the development of the annual, midrange, and long-range plans of future projects.
5. Inform the public of the Department's progress, efforts, and responsiveness to road-related complaints.

---

## FINDING 5

***There is no structured process in place to coordinate Capital Improvement Projects ("CIP") with other County departments prior to initiation of reconstruction, rehabilitation, or pavement preservation projects by the Department of Public Works.***

In 2010, the County Capital Improvement Program Coordinator position was established to coordinate the planned CIP of the various County departments. This position would review, analyze, evaluate, and formulate recommendations on the annual Capital Program and annual Budget. Further, the position would ensure the individual efforts of each department are not in conflict.

In 2011, this position became responsible for managing specific projects and no longer coordinated the CIP among the various departments.

During the course of the audit a meeting was held between the Engineering Divisions of the Department of Public Works and Department of Water Supply. The meeting discussed upcoming road reconstruction, rehabilitation, and resurfacing projects. The meeting appears to be the first of its kind in recent history. While this meeting is a positive step in the right direction, the Highways Division personnel and the Department of Water Supply Field Operations personnel were not considered for inclusion in these meetings.

### ***Additional Opportunities for Departmental Coordination***

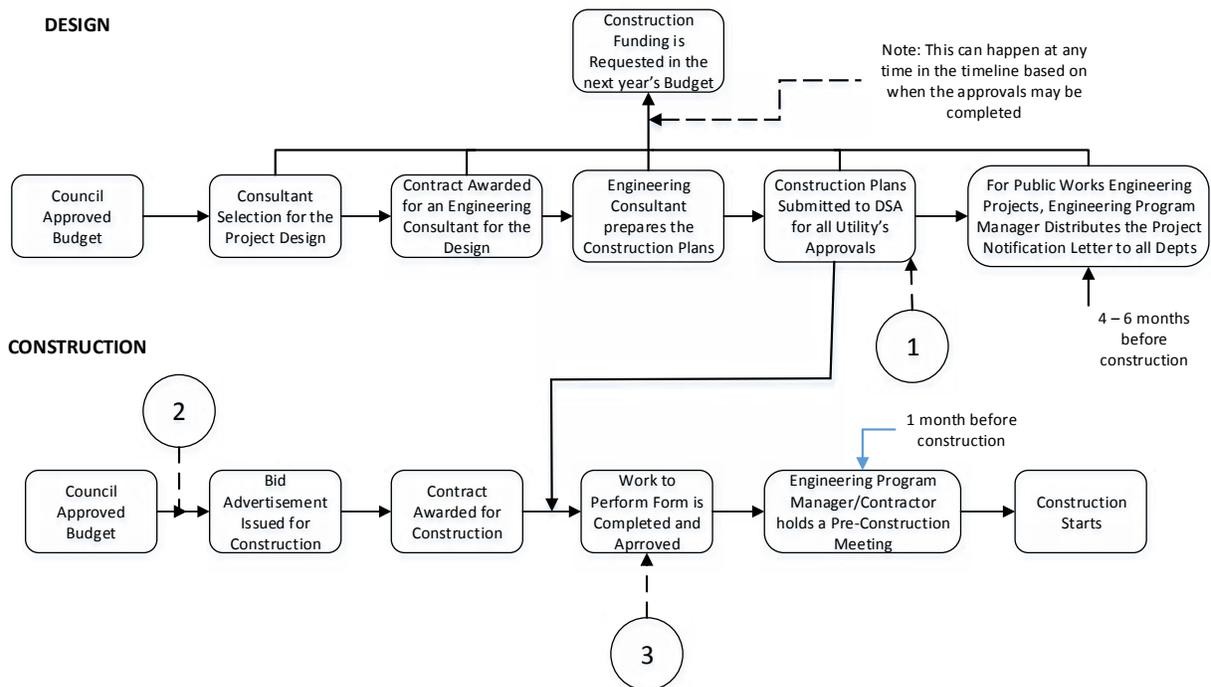
There are additional opportunities within the annual budget and project development processes where County departments may become aware of each other's CIP, including but not limited to:

1. When construction plans are submitted to the Development Services Administration division for all utility approvals.

2. Between the Budget and the bid advertisement so that any identified conflicts can be avoided.
3. When the Work to Perform Form (i.e., Work on County Highway Permit Application) is approved by each utility. Although late in the process, it is another point at which various County departments may be made aware of impending construction activities.

Exhibit 2-4 illustrates the additional opportunities for departmental coordination for construction projects. The item numbers from the examples above correspond to the circled numbers identified in the flowchart below.

**Exhibit 2-4  
Additional Opportunities for Departmental Coordination**



Source: Office of the County Auditor from meetings with Department of Management personnel

### **Geographic Information System (GIS)**

The County's Geographic Services Manager developed a CIP-related app that could be used as a tool for interdepartmental coordination. The app incorporates Pictometry and could enable the Department of Public Works and other County departments to see future road projects. However, it does not appear this app is being utilized.

## Recommendations

We recommend the County:

1. Assign a centralized employee to coordinate the CIP of its various departments and eliminate the occurrence of duplicate and conflicting roadwork projects.
2. Conduct regular meetings (perhaps semi-annually) between the Engineering Divisions of the Department of Public Works and the Department of Water Supply. The meetings should cover, at minimum, each Department's respective future planned projects. Consideration should be given to include the Department of Water Supply Field Operations and the Department of Public Works Highways Division in those meetings as both of these Divisions possess the "boots on the ground" knowledge of their respective operations.
3. Consider utilizing software already at its disposal (i.e., Geographic Information Systems) to serve as a visual aid for interdepartmental coordination of County CIP.

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## Additional Subsequent Information

During the course of this audit, we encountered two items that were outside this audit's scope and objectives to evaluate the management processes used by the Department of Public Works. These items, while not directly related, may have long-term implications on the operations of the Department of Public Works and the County's Department of Transportation (i.e., the Maui Bus).

Specifically, these items are:

1. The Federal Highway Trust Fund is in danger of becoming insolvent.
2. The County has competing and growing needs for its limited Highways Fund cash.

### Federal Highway Trust Fund

The Federal Highway Trust Fund receives money from Federal fuel taxes and distributes them to State and local governments in the form of grants. These grants are then used to pay for State and County road improvements. The continued solvency of this Fund has been an issue in recent years and according to the U.S. Department of Transportation, Highway Trust Fund Ticker:

“The Surface Transportation and Veterans Health Care Choice Improvement Act of 2015 (P.L. 114-41) authorized General Fund transfers to the Highway Account and Mass Transit Account of the Highway Trust Fund. These transfers will help maintain Highway Trust Fund solvency through the third quarter of fiscal year (FY) 2016.”

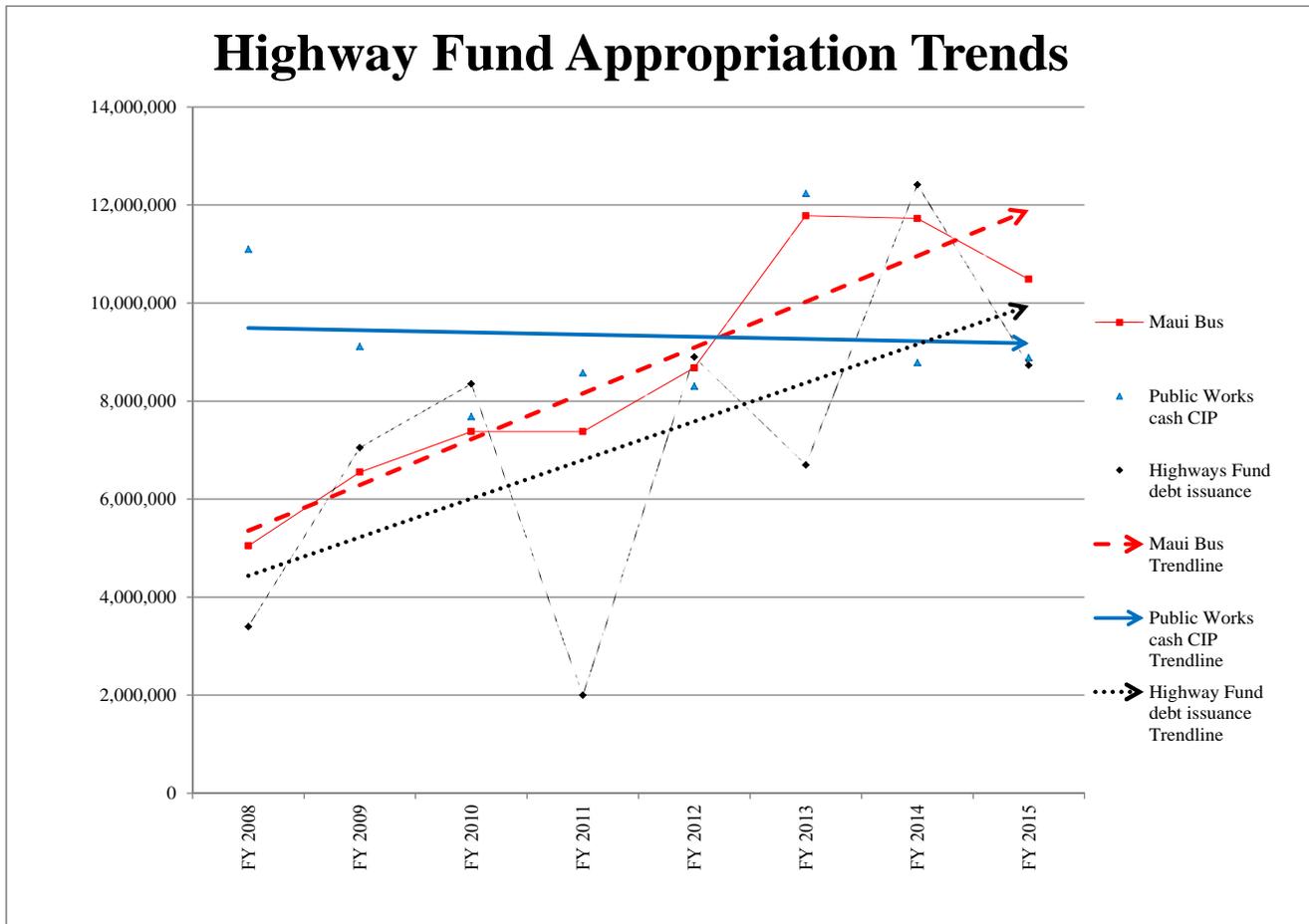
While this latest action of Congress extends funding for the Federal Highway Trust Fund through October 29, 2015, the long-term availability of Federal grants for County road improvements is uncertain. If Federal grants will no longer be available, the County would be faced with difficult decisions. Those decisions could include: reducing the number of road improvements; reducing funds to the Department of Public Works; increasing road-related taxes, fees, and assessments; and increasing debt through the issuance of general obligation bonds.

**The County’s Highway Fund cash: competing needs are growing**

The County’s Highway Fund is funded through transportation-related taxes, fees, and assessments due to the County. This Highway Fund cash is then appropriated to the County’s two transportation-related departments: 1) the Department of Public Works for the construction, repair, and maintenance of the County’s roads, bridges, and drainage systems; and 2) the Department of Transportation for the operation of the Maui Bus.

For FY 2008 through FY 2015, Highway Fund cash CIP appropriations to the Department of Public Works have been flat to down. For that same period, Highway Fund cash appropriations to the Maui Bus and the issuance of Highway Fund debt have been steadily increasing. These trends are illustrated in Exhibit 2-5.

**Exhibit 2-5  
Highway Fund Appropriation Trends**



Source: Office of the County Auditor from FY 2008 – FY 2015 Budget documents

It appears the increasing trend of Highway Fund cash appropriations to the Maui Bus has come at the expense of Highway Fund cash appropriations for road-related activities of the Department of Public Works. Further, this reduction in Highway Fund cash available to the Department of Public Works appears to have resulted in increased dependence on the issuance of Highway Fund debt to pay for road improvements.

The decision to appropriate limited Highway Fund cash to one department at the expense of another is a policy matter that requires close examination. Unless road-related taxes, fees, and assessments that feed the County's Highway Fund are increased, reductions in road improvements and bus service, and the continued issuance of debt, are inevitable.

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ALAN M. ARAKAWA  
Mayor

DAVID C. GOODE  
Director

ROWENA M. DAGDAG-ANDAYA  
Deputy Director

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Development Services Administration

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Highways Division

October 9, 2015

Mr. Lance T. Taguchi  
County Auditor  
Office of the County Auditor  
2145 Wells Street, Suite 106  
Wailuku, Maui, Hawaii 96793

RECEIVED  
15 OCT -9 AM 1:45  
OFFICE OF THE  
COUNTY AUDITOR

Dear Mr. Taguchi:

**SUBJECT: AUDIT OF THE COUNTY'S ROAD RESURFACING,  
IMPROVEMENT, AND MAINTENANCE PRACTICES  
(PROJECT 15-01)**

Thank you for the opportunity to comment on the draft report.

In general, the audit notes that the Department's road resurfacing, improvement, and maintenance programs have many solid elements that could use buttressing with longer term plans, database updates, and better maintenance and complaint logging. We generally agree with the findings and will look to implement most of the findings as time and funding becomes available.

**FINDING 1** – Comprehensive Long-Range Plan to maintain all County roads is needed

As discussed in the audit, we have a number of existing plans that look into various aspects of our Capital Improvement Program (CIP) projects, but not a comprehensive long-range plan. Such a plan will take a number of years to generate, as it will be dependent on time and funds available to put towards the plan, as well as a better understanding of the costs and capabilities of our nascent in-house Pavement Preservation Program. Once produced, the plan will require annual revisions as new road issues come up, funding availability changes, and pavement preservation results over time can be accurately measured.

**Recommendation 1** – Implementing a long-range plan is something we will look to do once pavement preservation costs and effectiveness are understood (next 2-3 years), and funding for this effort is provided in an annual budget.

**Recommendation 2** – Better utilizing the iWorQ system between Engineering and Highways Divisions is something we can implement immediately.

## **FINDING 2 – Pavement Preservation Program**

We are pleased to see this audit recognizes the importance of Pavement Preservation to economically extend the life of our roads and that we are on the right track in this regard.

**Recommendation 1** – We agree that updates to iWorQ should happen more regularly and will implement this right away.

**Recommendation 2** – After participating in the research for the audit, we have worked with the developers of the iWorQ program and discovered that a Work Management module work order initiated from the Pavement Management module roadway segment will link the work management treatment application to the pavement management segment history upon completion, and adjust the estimated remaining service life for the roadway segment. All highway districts are aware of this link and are initiating pavement preservation (sealcoat, slurry seal & mill/fill/overlay) work orders through the pavement management module.

**Recommendation 3** – We will do a full-cost analysis after the end of Fiscal Year 2016 and refine it annually.

**Recommendation 4** – As noted in Finding 1, we will integrate the Pavement Preservation Program into a long-range plan.

## **FINDING 3 – Pothole Database**

**Recommendation 1** – We believe that any standardized method to record pothole repairs needs to take into account how the work is typically done, which is often not by request, but by immediate observations in the field by our crews who cannot take the time to chronicle each and every repair.

**Recommendation 2** – We would agree that analysis should be done on pothole repair techniques, effectiveness, and cost. This analysis could be done in the next few years as time and budgets allow.

**Recommendation 3** – As data becomes available on pothole frequency and repairs that data will be assimilated into the road maintenance plans.

**Recommendation 4** – We will look to better track pothole complaints.

**FINDING 4 – Road-Related Complaints from the Public**

**Recommendation 1 and 2** – We will look into options on how better to track all road-related complaints and response to the complainant.

**Recommendation 3 and 4** – We will look into providing data on the road-related complaints if it can provide information at reasonable cost benefit ratio, and should it be implemented, it would feed into highway improvement project plans.

**Recommendation 5** – Informing the public has been and will continue to be done at appropriate intervals and opportunities.

**FINDING 5 – CIP Coordination with other Departments**

In general, this is an issue the Department embarked on with the Department of Water Supply (DWS) and the Department of Environmental Management (DEM) five years ago. However, though a half dozen or more projects were coordinated to successfully avoid rework, the process has not yet been institutionalized.

**Recommendation 1** – The Department does not believe a centralized employee needs to coordinate the work of the three (3) main CIP departments. This can be done by Recommendation 2, below.

**Recommendation 2** – We will institutionalize meetings with DWS and DEM to analyze opportunities to coordinate overlapping CIP projects.

**Recommendation 3** – We will consider the use of GIS in implementing Recommendation 2, above.

Thank you for the audit as it does highlight areas where we can improve on the maintenance, improvement, and planning of capital projects for our roads. The Department has a lot of pride in our ability to deliver projects, both in-house and contracted out, that already are delivering very good results.

Sincerely,



DAVID C. GOODE  
Director of Public Works

DCG:jso

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**Lance T. Taguchi**  
**County Auditor**

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*Audit of the County's Road Resurfacing,  
Improvement, and Maintenance Practices*

Report No. 15-01, October 2015

The Office of the County Auditor is tasked with promoting economy, efficiency, and improved service in the transaction of public business in the legislative and executive branches of the County. Copies of this audit report can be obtained by contacting the Office of the County Auditor.