Performance Audit
Street Maintenance

August 2004

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City Auditor's Office

City of Kansas City, Missouri

18-2003

August 10, 2004

Honorable Mayor and Members of the City Council:

This performance audit was initiated by the City Auditor pursuant to Article II, Section 13 of the city charter, and focused on the condition of city streets and ways to improve citizen perceptions of street condition.

Kansas City residents are not satisfied with the condition of city streets because the streets are bumpy. Citizens rate the performance of government street and transportation programs by the presence or absence of street surface bumps that cause uncomfortable and potentially damaging jolts.

Public Works misinterpreted citizen dissatisfaction with street condition. Public Works reported to the City Council that the state of Missouri maintains 45 percent of streets within city limits and that the average condition of city streets was good. However, the state is responsible for the maintenance of only 10 percent of the streets in the city. In addition, Public Works focuses on the average condition of the streets and does not take into consideration the experience a driver will have on a trip along city streets. While the average condition as measured by Public Works may be relatively good, the actual driving experience is relatively bad and leads to a high level of citizen dissatisfaction.

None of Public Works' several measures of street condition has the purpose of providing an interpretation of the way drivers experience the streets. In addition, Public Works made errors in the way streets were chosen for one of the assessments, making the comparison between different years invalid. The Director of Public Works should ensure that staff present accurate information about street condition to the City Council and that staff measure drivers' experience of smoothness of streets and use this measure as a component in rating street performance.

Utility manholes and steel plates placed in the street contribute to the roughness of street surface. Public Works told us that they do not have the correct equipment to ensure that Water Services' manholes do not rise above or sink below the street surface, and that non-city utilities sometimes do not respond to Public Works' requests to adjust their manholes. Until recently, Public Works did not track the number of steel plates on city streets and the length of time the plates remained in the street. Public Works should improve pavement smoothness by reducing all causes of roughness.

Utility cuts continue to damage streets and degrade their ride quality. Streets damaged by cuts deteriorate 1.5 times faster than uncut streets. In February 2001, the City Council adopted a street degradation fee with a goal of recovering the damage due to the cuts and deterring utilities from cutting new streets. While it is too soon to make a conclusion on whether the degradation fee achieves its goal, the Director of Public Works should monitor street cuts regulation's impact to determine whether the regulation adequately protects city streets from damage.

Public Works has been unable to resurface all streets that need to be resurfaced. Moreover, in recent years, the number of miles resurfaced significantly decreased. According to Public Works' estimates, the pavement replacement backlog now amounts to $70 million. The City Manager and the Director of Public Works should take steps to increase the number of miles of city streets resurfaced each year.

We provided a draft of the report to the City Manager and the Acting Director of Public Works on May 12, 2004. Management's response is appended. We appreciate the courtesy and cooperation extended to us during this project by the staff in the Public Works Department. The audit team for this project was Anatoli Douditski and Michael Eglinski.

Mark Funkhouser
City Auditor

Street Maintenance

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Street Maintenance

List of Exhibits

Introduction

Objectives

This audit of street maintenance was conducted pursuant to Article II, Section 13 of the Charter of Kansas City, Missouri, which establishes the Office of the City Auditor and outlines the City Auditor's primary duties.

A performance audit systematically examines evidence to independently assess the performance and management of a program against objective criteria. Performance audits provide information to improve program operations and facilitate decision-making.[1]

We started this audit because surveys show that citizens are not satisfied with the condition of city streets and identify street maintenance and smoothness as high maintenance priorities. Kansas City respondents rated streets lower than respondents from 19 other communities in the metropolitan area. Survey respondents chose maintenance and smoothness of city streets as the two top priorities they thought city leaders should emphasize over the next two years.

The Public Works Department reported that the condition of city streets was "good" based on its assessments of the condition of city streets. Public Works concluded that citizen perceptions reflect the poor condition of state roads within Kansas City maintained by the Missouri Department of Transportation.

We designed this audit to explore why citizen perceptions differ from Public Works' assessments of the condition of the streets and to answer the following questions:

- What is the condition of Kansas City streets?
- What could Public Works do to respond to and improve citizens' perceptions of the condition of Kansas City streets?

[1] Comptroller General of the United States, *Government Auditing Standards* (Washington, DC: U.S. Government Printing Office 2003), p. 21.

Scope and Methodology

We observed the way the Public Works Department assesses the condition of the streets, and we analyzed these data. We reviewed the department's budgets, resurfacing contracts, and Service First presentations to the Mayor and the City Council. In addition, we reviewed the results of citizen surveys and city employees' and business leaders' focus groups. We also measured roughness of a sample of KCATA bus routes. To understand how to improve citizen perceptions, we reviewed literature and analyzed the results of prior Kansas City citizen surveys.

We conducted this audit in accordance with generally accepted government auditing standards. No information was omitted from this report because it was deemed privileged or confidential.

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Background

The Street and Traffic Division of the Public Works Department maintains about 2300 miles of mostly asphalt streets in Kansas City, Missouri. The division consists of four sections. Street Preservation oversees all street resurfacing projects and inspects utility cuts. Street Maintenance is responsible for patching potholes, minor bridge repair, cleaning roadside ditches, snow and ice removal, and crack sealing of residential streets. Traffic Engineering issues traffic control and block party permits for street closures, establishes vehicle parking zones, and determines speed limits and intersection controls. Traffic Operations maintains the city's system of traffic lights and signs, and removes graffiti from public structures.

The Street Preservation Section prepares and oversees contracts for asphalt resurfacing, slurry sealing of residential streets, and crack sealing of arterial streets. Most of the section's budget comes from the city's General Fund, Infrastructure and Maintenance Fund, and Local Use Tax. Every year Street Preservation visually inspects approximately 1,000 miles of streets in the city. To identify streets for the inspection, Public Works engineers assign scores to streets. Newly resurfaced streets are assigned a score of 100. Every year, the score is decreased by 10 points. Therefore, seven years after resurfacing, a street reaches a score of 30, which indicates that resurfacing may be in order.

Thirty-three percent of city streets are in a condition that may require resurfacing, foundation repair, or street reconstruction. Public Works has

an annual resurfacing program, but does not have a program for foundation repair or street reconstruction.

Street Maintenance crews patch potholes, perform minor bridge repair, clean roadside ditches, remove snow and ice, and seal cracks on residential streets. The section's budget comes from the city's share of the State Motor Fuel Tax. Street maintenance responsibilities are divided between three maintenance districts.

Prior Audits of Street Maintenance and Preservation

In 1997, we conducted an audit[2] of the resurfacing program with a subsequent follow-up audit in 2000.[3] In 1997, we found problems with Public Works' controls over contracting, bid specifications, and contract monitoring. These problems decreased the benefits derived by the city through competition for resurfacing work. We made a number of recommendations to improve contracting practices, ensure that bid specifications reasonably represent the work done under the contracts, and improve inspection practices.

In 2000, we found that Public Works made progress in implementing the recommendations included in our original audit. Bid practices improved and controls over contracts had been strengthened. Contract changes were about half of what they were in 1997. The amount of asphalt used was monitored more closely, the reimbursement of state sales tax was almost eliminated, and bid specifications used to evaluate proposals focused on major items. We also found that further improvements were needed. Lists of streets to be resurfaced were provided only to contractors that regularly bid. This could give the appearance of favoritism. Warranty inspections were still not documented.

In a 1994 audit of the Utility Cuts program,[4] we found that utility cuts damage streets, shorten their life, and are costly. The city's regulatory program was ineffective, city standards were not followed, and city inspectors did not do routine inspections of the utility cuts. At the time of the audit, permit fees were low and did not recover the cost of damage caused by utility cuts. In a 1999 follow-up,[5] we estimated the cost of damage to the streets to be about $1.4 million per year and that newly

[2] *Public Works Department: Street Resurfacing Program Contracts*, Office of the City Auditor, Kansas City, Missouri, March 1997.
[3] *Public Works Department: Street Resurfacing Contracts Follow-up*, Office of the City Auditor, Kansas City, Missouri, September 2000.
[4] *Public Works Department: Utility Cuts Program*, Office of the City Auditor, Kansas City, Missouri, March 1994.
[5] *Public Works Department: Street Cut Inspection Follow-up*, Office of the City Auditor, Kansas City, Missouri, March 1999.

paved streets were still cut more frequently than necessary. We also found that Public Works made significant progress in implementing the recommendations of the original audit.

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Findings and Recommendations

Summary

Kansas City residents are not satisfied with the condition of city streets because the streets are bumpy. Citizens rate the performance of government street and transportation programs by the presence or absence of street surface bumps that cause uncomfortable and potentially damaging jolts while driving over them. Citizens driving along routes we tested would experience up to seventy-seven jolts per five minutes of a car ride.

Public Works misinterpreted citizen dissatisfaction with street condition. Public Works reported to the City Council that the state of Missouri maintains 45 percent of streets within city limits and that the average condition of city streets was good. However, the state is responsible for the maintenance of only 10 percent of the streets in the city. In addition, Public Works' focus on the average condition of the streets does not take into consideration the experience a driver will have on a trip along city streets. While the average condition as measured by Public Works may be relatively good, the actual driving experience is relatively bad and leads to a high level of citizen dissatisfaction.

None of Public Works' measures of street condition provides an interpretation of the way drivers experience the streets. In addition, Public Works made errors in the way streets were chosen for one of the assessments making the comparison between different years invalid. The Director of Public Works should ensure that staff present accurate information to the city council and that staff measure the drivers' experience of smoothness of streets and use this measure as a component in rating street performance.

Utility manholes and steel plates placed in the street contribute to the roughness of street surface. Public Works told us that they do not have the correct equipment to ensure that Water Services' manholes do not rise above or sink below the street surface, and that non-city utilities sometimes do not respond to Public Works' requests to adjust their manholes. Until recently, Public Works did not track the number of steel plates on city streets and the length of time the plates remained in the street. Public Works should improve pavement smoothness by reducing all causes of roughness.

Utility cuts continue to damage streets and degrade their ride quality. Streets damaged by cuts deteriorate 1.5 times faster than uncut streets. In February 2001, the City Council adopted a street degradation fee with a goal of recovering the damage due to the cuts and deterring utilities from cutting new streets. While it is too soon to determine whether the degradation fee achieves its goal, the Director of Public Works should monitor street cuts regulation's impact to determine whether the regulation adequately protects city streets from damage.

Public Works has been unable to resurface all streets that need to be resurfaced. Moreover, in recent years, the number of miles resurfaced significantly decreased. According to Public Works estimates, the pavement replacement backlog now amounts to $70 million. The City Manager and the Director of Public Works should take steps to increase the number of miles of city streets resurfaced each year.

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Residents Express Dissatisfaction with Bumpy Streets

City streets are bumpy. Citizens driving along the routes we tested would experience up to seventy-seven jolts per five minutes of a car ride. Citizen surveys and focus groups show that Kansas City residents are not satisfied with the condition of city streets. Citizens and business owners rate the performance of government road and transportation programs by the presence or absence of road surface bumps that cause discomfort and damage while driving over them. Drivers' perception of the condition of the roads is sensitive to bumps.

Surveys Show Dissatisfaction with Street Conditions

Citizens rate the condition of city streets low. In 2003, respondents to the citizen survey identified street maintenance and smoothness as top priorities that should receive emphasis from city leaders in the next two years. Over 50 percent of respondents in 2003 were dissatisfied or very dissatisfied with street maintenance and smoothness. (See Exhibit 1.)

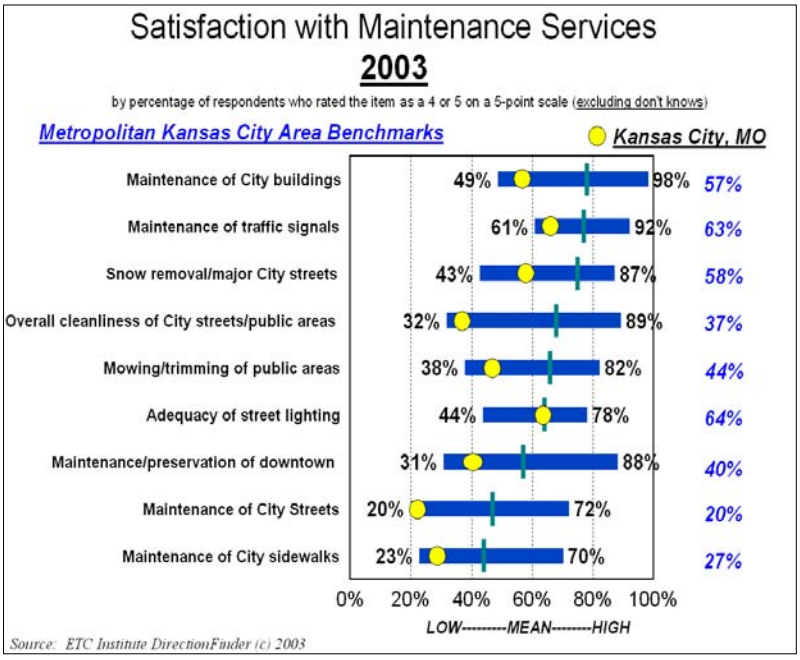
Exhibit 1. Dissatisfaction with Maintenance and Smoothness of City Streets, Percent of Respondents

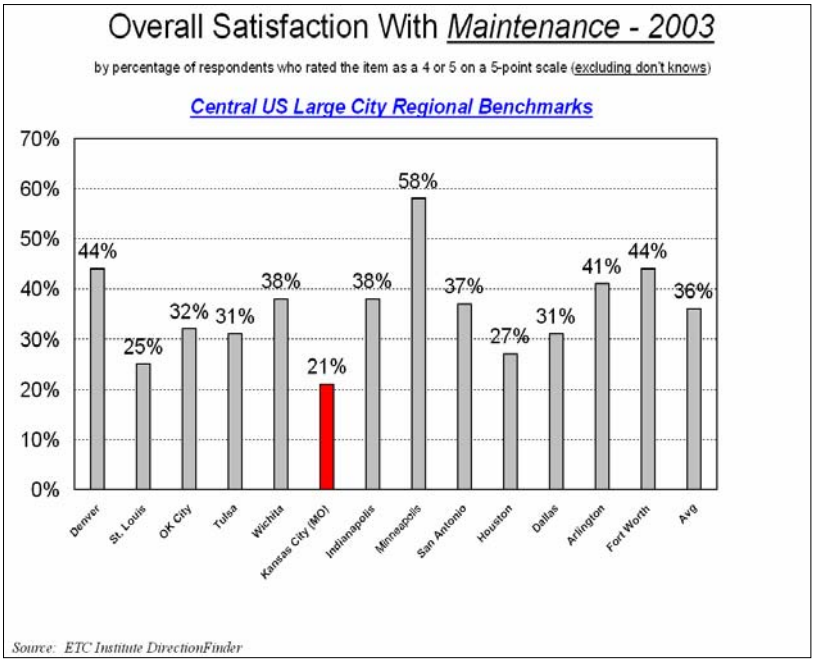
	Maintenance	Smoothness
Dissatisfied or Very Dissatisfied	55	57

Source: 2003 City Services Performance Report.

Citizens' overall satisfaction with maintenance was the lowest among other large cities in the central United States and other cities in the metropolitan area. (See Exhibit 2.)

Exhibit 2. Kansas City Residents' Satisfaction with Maintenance Services as Compared to Residents of Other Cities





To assess the condition of streets, people look at a range of factors, many of which cause bumps. In focus groups composed of city employees and Kansas City business leaders, respondents identified the condition of the road surface, potholes, steel plates, and bumps as the most important

characteristics that they consider when they rate streets as being in good or poor condition.

Research Suggests Residents Consider Smoothness

Citizens and business owners rate the performance of government road and transportation programs by the presence or absence of road surface bumps that cause discomfort and damage while driving over them. Drivers' perception of the condition of the streets is sensitive to the bumps. Even one severe jolt experienced during travel makes drivers dissatisfied with the condition of the roads and the government's performance in maintaining them.[6]

Focus groups in New York City looked at the relationship between street conditions and citizen perceptions:

> "Clearly one reason that so many people rate street conditions to be so important is that, as they tell it, poor street conditions disrupt their daily life. Street impediments cause them delays and discomfort in getting to and from work, school, shops and other destinations. […] Their own personal experiences formed the basis for their judgments (rather than media reports or hearsay). They judge the condition of the streets and the quality of maintenance by the presence of potholes and bumpy streets and what results from them: vehicle damage and palpable discomfort."

Source: *How Smooth Are New York City Streets?* Fund for The City of New York, September 1998, p. 27.

City Streets Are Bumpy

City streets are bumpy. We drove 25 bus routes and used a pedometer to count jolts[7] a driver experiences during the car ride. On average, we experienced 15 jolts every five minutes. Citizens driving along the routes we tested would experience between zero and seventy-seven jolts per five minutes of a car ride. (See Appendix A for detailed information about the test drives.)

Driving on bumpy streets costs more. Vehicles wear out more quickly and use more fuel when driven on rough roads. Motorists in Kansas City

[6] *How Smooth Are New York City Streets?* Fund for the City of New York, September 1998.
[7] We define jolts as sudden vertical movements of a vehicle caused by bumps and dips in the street surface. Bumps and dips can be caused by a variety of pavement defects including uneven paving, sunken utility cuts, potholes, steel plates placed in the roadway, and underground utility manholes that are not even with the pavement.

metro area annually pay an estimated $567 in additional vehicle operating costs due to driving on roads that need repair. This is significantly higher than $396 in additional costs paid annually by the average urban motorist in the U.S.[8] (See photos in Exhibit 3, showing causes of bumps.)

Exhibit 3. Street Surface Defects that Affect Street Smoothness

Plates like this one as well as the potholes next to it cause streets to be bumpy.

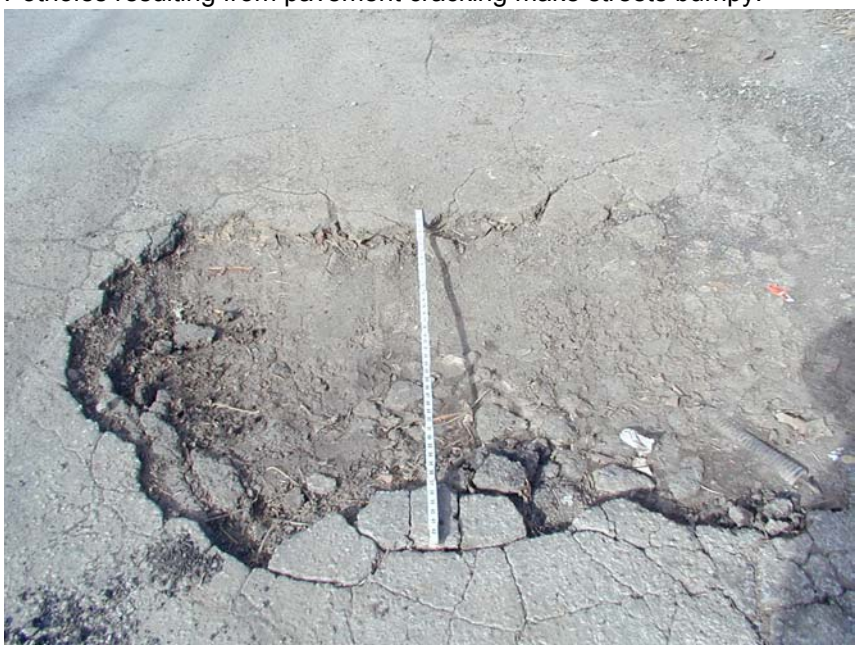
Source: Photo taken by staff from City Auditor's Office, February 18, 2004.

[8] *Keep Both Hands on the Wheel: Cities with the Bumpiest Rides and Strategies to Make our Roads Smoother,* The Road Information Program, May 2003.

Water valves and manholes placed a few inches below the pavement surface make streets bumpy.

Source: Photo taken by staff from City Auditor's Office, February 18, 2004.

Potholes resulting from pavement cracking make streets bumpy.



Source: Public Works Service First presentation, June 2003.

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Public Works Misinterpreted Citizen Dissatisfaction

Public Works misinterpreted citizen dissatisfaction with street condition. Public Works reported to the City Council that the state of Missouri maintains 45 percent of streets within city limits and that the average condition of city streets was good. However, the state is responsible for the maintenance of only 10 percent of the streets in the city. In addition, Public Works' focus on the average condition of the streets does not take into consideration the experience a driver will have on a trip along city streets. While the average condition as measured by Public Works may be good, the actual driving experience leads to a high level of citizen dissatisfaction.

Public Works Is Responsible for Nearly All Streets in the City

The state is responsible for the maintenance of only 10 percent of the streets in the city. The city maintains about 2,300 miles of streets in Kansas City while the state maintains about 300 miles. (See Exhibit 4.)

Exhibit 4. Miles of Streets Maintained by Public Works and MODOT (Centerline Miles)

Agency	Miles	Percent
Public Works	2289	80%
MODOT	299	10%
Other[9]	287	10%
Total	2874	100%

Source: City Planning and Development.

In its June 2003 Service First presentation to the Mayor and City Council, Public Works reported that 45 percent of streets within Kansas City are maintained by the Missouri Department of Transportation (MODOT). (See Exhibit 5.)

[9] Park streets, private streets and drives, stadium streets, and levees.

Exhibit 5. Power Point Slide from June 2003 Service First Presentation by Public Works

Source: Public Works Service First presentation, June 2003.

The Mayor and City Council rely on the information provided by staff to make policy decisions. To be useful, information needs to be accurate and limitations disclosed. The Director of Public Works should ensure that staff present accurate information on street condition so that users can interpret the data properly and make informed decisions.

Public Works Measures Focus on Average Condition

Public Works performs several assessments of street condition, but the assessments generally focus on the average condition of the streets. The focus on the average condition does not take into consideration the experience a driver will have on a trip along city streets. While the average condition as measured by Public Works may be relatively good, the actual driving experience is bad and leads to a high level of citizen dissatisfaction.

Public Works Data Show Low Probability of Driving over Good Street Surface

The probability of driving a mile on excellent or very good pavement in Kansas City is low. The probability of hitting a section of street that Public Works' assessment would fail due to bumps or depressions on a one mile trip is high.

Public Works data show that the average condition index of the pavement on a sample of city streets is 84 on a 100 point scale. Public Works reported to the City Council that this index reflects good or excellent condition of Kansas City streets. However, using the Public Works data to estimate the probability of driving over "good or excellent" pavement in Kansas City leads to a different conclusion about the condition of the streets. (See Exhibit 6.)

Exhibit 6. Probability Of a One Mile Trip On Good or Excellent Pavement

Pavement Condition	Probability[10]
56 or better (fair condition or better)	68 %
70 or better (good condition or better)	22 %
80 or better (very good and excellent condition)	1 %

Source: *Pavement Management Sample Study. Kansas City, Missouri,* VHB/Vanasse Hangen Brustlin, Inc., March 2002 and January 2003.

In addition, Public Works reported that over 70 percent of surveyed streets passed the bumps and depressions criteria. Looking at these data from a driver's perspective leads to the following probabilities of driving a mile with at least one bump or depression present. (See Exhibit 7.)

Exhibit 7. Probability of a One Mile Trip with At Least One Segment That Fails Due to Bumps or Depressions[11]

District	Arterial Streets	Local Streets
1	80 %	94 %
2	95 %	97 %
3	61 %	65 %

Source: Public Works Condition Assessment Data for 2003.

Focusing on drivers' experience instead of the average condition changes the interpretation of the data collected by Public Works and helps understand the reason behind the low degree of public satisfaction with the condition of city streets.

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Public Works Should Measure Smoothness and Work to Improve Street Conditions

Public Works has several measures of street condition, but none of the measures provides an interpretation of the way drivers experience the streets. In addition, Public Works made errors in the way streets were

[10] A^b x *100%*, where *A*=percent of segments above a certain PCI score, and *b*=average number of segments per mile.
[11] $(1\text{-}A^b)$ x *100%*, where *A*=percent of segments passing bumps and depressions criteria, and *b*=10 segments per mile, assuming all segments are 1/10 of a mile long.

chosen for one of the assessments making the comparison between different years invalid.

Utility cuts continue to damage streets. During the last four fiscal years, city streets were cut and patched more than 7500 times. Public Works staff told us that it is too soon to determine whether the degradation fee achieves its goals of deterring utilities from cutting new streets and whether the fee revenue is sufficient to recover the damage due to the cuts.

Public Works has been unable to resurface all streets that need to be resurfaced. Although the street preservation budget has remained fairly constant since fiscal year 1998, the number of miles resurfaced each year significantly decreased. According to Public Works estimates, the pavement replacement backlog now amounts to $70 million.

Public Works Does Not Measure Pavement Smoothness in a Way Drivers Experience It

Public Works has several measures of street condition, but none of the measures provides an interpretation of the way drivers experience the streets. Public Works visually inspects approximately one third of all city streets each year to identify streets that need resurfacing. Public Works also conducts an annual assessment of 1/10 of a mile stretches on a sample of about 5 to 9 percent of city streets. The purpose of this assessment is to estimate the percentage of streets that have defects such as potholes, cracks, etc. In addition, a Public Works' consultant has evaluated the condition of a 5 percent sample of city streets by looking at every pavement defect present at the time of the evaluation. This evaluation is an alternative method for identifying streets that need maintenance such as slurry seal, crack seal, resurfacing, etc.

Citizens want city officials to address street maintenance. In 2003, 42 percent of respondents identified street maintenance as a priority for city officials. Driving experience affects citizens' perceptions of the city's performance. To address these concerns, Public Works should measure the drivers' experience of smoothness of streets and use this measure as a component in rating street performance.

Data Collection Limitations and Errors Were Not Disclosed to the Council

Public Works made errors in the way streets were chosen for one of the assessments, making the comparison between different years invalid. While the 2001 and 2003 samples included 323 and 231 segments of local streets from the central part of the city respectively, the 2002

sample included only seven segments from the same area. The City Auditor pointed out the error in a memo to the previous Acting Director of Public Works in March, 2003. Nevertheless, Public Works management reported the results to the City Council without disclosing the error.

The Mayor and City Council rely on information provided by staff to make policy decisions. To be useful, information needs to be accurate and limitations disclosed. The Director of Public Works should ensure that staff present accurate information and disclose data limitations so that users can interpret the data properly and make informed decisions.

Manholes and Steel Plates Affect Street Smoothness

Utility manholes that are not level with the street surface and steel plates covering open utility cuts cause bumps. During the resurfacing operation, Public Works adjusts manholes and valves that belong to Water Services. Non-city utilities adjust their manholes at the request of Public Works prior to resurfacing. Public Works told us that they do not have the correct equipment to ensure that Water Services' manholes do not rise above or sink below the roadway surface, and that non-city utilities sometimes do not respond to Public Works' requests to adjust their manholes. In addition, Public Works disregards bumps due to manholes, utility cuts covered with steel plates and uneven transitions between pavement levels on connecting streets during their annual assessment of street conditions. Until recently, Public Works did not track the number of steel plates on city streets and the length of time the plates remained in the roadway.

City Charter requires the Director of Public Works to have charge of streets and pavements. Public Works should improve pavement smoothness by reducing all causes of roughness.

Utility Cuts Continue to Damage City Streets

Utility cuts continue to contribute to premature deterioration of street surface and affect the smoothness of streets. During the last four fiscal years, city streets were cut and patched more than 7500 times. (See Exhibits 8 and 9.) Although utility excavations are backfilled and patched, they shorten the life of the street surface and cause it to be rough. In our 1994 Street Cuts audit and a 1999 follow-up, we found that street cuts, no matter how well restored, weaken the pavement and degrade the ride quality of the street. Streets damaged by cuts would deteriorate 1.5 times faster than uncut streets.

Exhibit 8. Number of Street Cuts Permitted and Inspected by Public Works, 2000-2003

Fiscal Year	Cuts Permitted and Inspected
2000	1333
2001	1803
2002	2657
2003	1718
Total	7511

Source: KIVA.

Exhibit 9. Photo of Level Placed Across Patched Utility Cut in a Residential Street Constructed in Summer of 2003

Source: Photo taken by staff from City Auditor's Office, December 29, 2003.

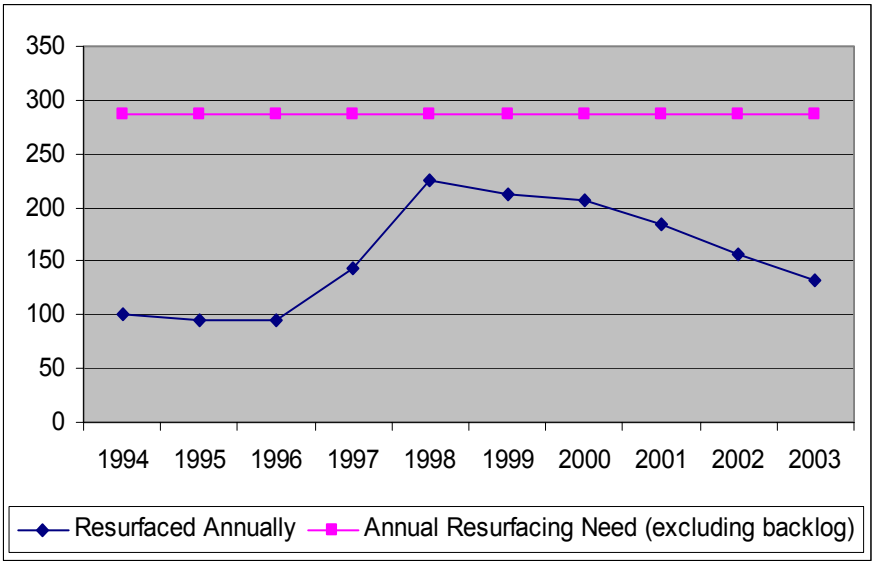
In February 2001, the City Council adopted changes to the code that require utility companies to pay a street degradation fee based on the square footage of excavations in the street. The City Council decided that the fee revenue should be used for the street preservation program. Revenue from street degradation fees amounts to $1.6 million since its introduction. Public Works staff told us that it is too soon to make a conclusion on whether the degradation fee achieves its goals of deterring utilities from cutting new streets and whether the fee revenue is sufficient to recover the damage due to the cuts.

The Director of Public Works should determine whether their street cut regulation adequately protects city streets from damage caused by utility cuts.

Resurfacing Backlog Is Growing

Public Works tries to improve the smoothness and the condition of street surface by resurfacing city streets. Each year, Public Works identifies streets that have deteriorated to the point where the pavement has to be replaced. But the department has been unable to resurface all streets that need to be resurfaced.[12] (See Exhibit 10.) A backlog of deteriorated streets has been growing, and according to Public Works estimates, the pavement replacement backlog now amounts to $70 million.

Exhibit 10. Miles Resurfaced and the Resurfacing Need for Fiscal Years 1994-2003



Source: Public Works CPIS reports and CAO estimates.

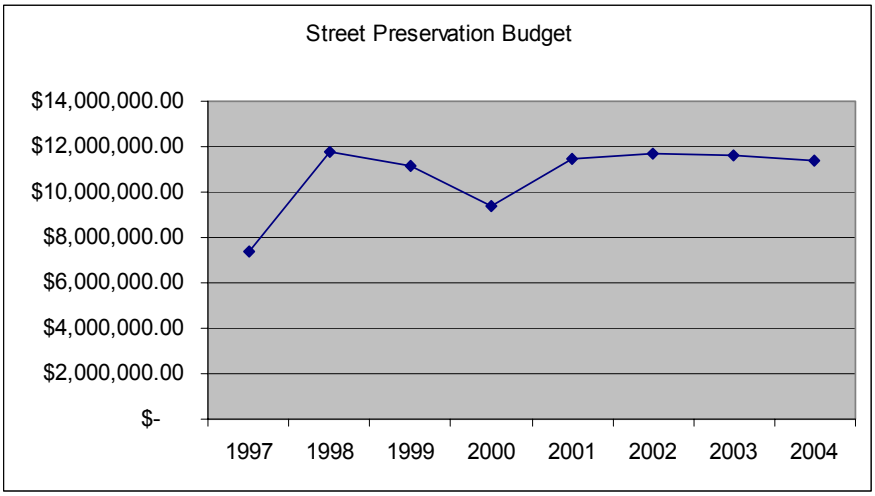
In 1997, the City Council adopted a resolution to annually increase funding of deferred maintenance including street preservation with a goal of eliminating the backlog by 2006. However, since fiscal year 2003, the city has been unable to increase funding and instead started to cut funding for deferred maintenance projects. As a result, streets do not get resurfaced when needed and continue to deteriorate.

[12] In its "windshield survey", Public Works inspects all streets that were not resurfaced for at least eight years. Without taking into consideration the resurfacing backlog and an uneven deterioration rate for different streets, we assumed that to resurface all streets in the city, Public Works should resurface one-eighth of all streets (or about 288 centerline miles) every year.

Resurfacing Decreased in Recent Years

Although the street preservation budget remained fairly constant since fiscal year 1998, the number of miles resurfaced each year significantly decreased. (See Exhibit 11.)

Exhibit 11. Street Preservation Budget, Fiscal Years 1997-2004



Source: Public Works Department Budget.

In 2003, the department resurfaced only about half the number of miles resurfaced in 1998, while unit prices charged by asphalt companies increased by an average of 12 percent over the same 5-year period.[13]

This trend results in an increasing number of streets in potentially bad condition and a growing number of streets that deteriorate beyond the point where resurfacing would be enough to restore them.

Resurfacing more streets would improve the smoothness of city streets.

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[13] This includes prices for asphalt mix, asphalt binder mix, cold mill, and slurry seal.

Recommendations

1. The Director of Public Works should ensure that staff present accurate information on street conditions to the City Council and the public and disclose data limitations.

2. The Director of Public Works should ensure that staff measure the drivers' experience of smoothness of streets and use this measure as a component in rating street performance.

3. The Director of Public Works should improve pavement smoothness by reducing causes of roughness.

4. The Director of Public Works should monitor street cuts regulation's impact to determine whether the regulation adequately protects city streets from damage caused by utility cuts.

5. The City Manager and the Director of Public Works should take steps to increase the number of miles of city streets resurfaced each year.

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Appendix A

Test of Street Smoothness

To test the smoothness of city streets, we assessed the ride comfort by conducting road roughness tests on 25 Area Transportation Authority bus routes. We used a pedometer to count jolts a driver experiences during the car ride.

Pedometer Provides a Valid and Consistent Measurement of Jolts

A pedometer is an electronic device worn by a walker or runner for recording the number of steps taken. It works by registering the up and down movements of the surface it is attached to. If correctly attached to a vehicle, it will record the up and down movements of the car or jolts. Jolts are caused primarily by driving over uneven surface or bumps.

Pedometer Measurements are Valid

A pedometer gives a valid measure of the bumps someone in a car feels. Those bumps are related to the condition of the street surface, but can be affected by other factors such as driving style. The pedometer gives reliable results. The results are more reliable for longer trips. To test the reliability and validity of using a pedometer to measure jolts experienced by a driver, two different drivers drove a city car at least five laps of four different routes. We found that smoothness of the street surface is clearly related to movement of the car. We also found that driving the same route more than once results in a different number of jolts because you cannot quite drive in exactly the same manner and the same lane. However, the average number of jolts recorded by each driver on the same lap was about the same. Also, we made an effort to try to drive without either avoiding bumps or hitting bumps.

Pedometer Measurements are Consistent

To test the consistency of measurements recorded by a pedometer, we tracked the measurements for the period of 9/24 through 10/3. We kept track of the routes driven and compared the measurements for all of the trips where measurement was done at least twice. We found that the pedometer gives generally consistent measures when the same route is driven repeatedly.

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Appendix B

Management's Response

Public Works Department
Administration Division

DATE: August 3, 2004

TO: Mark Funkhouser, City Auditor

FROM: Stanley J. Harris, P.E., Acting Director of Public Works

SUBJECT: Response on Street Maintenance Audit

Below you will find our response to the recommendations in your Report on Street Maintenance.

1. The Director of Public Works should ensure that staff present accurate information on street conditions to the City Council and the public and disclose data limitations.

   We agree. We have always tried to provide accurate information to the City Council, citizens or any other agency and would not intentionally give false information. We often rely on agencies external to our department to provide information which may or may not be correct. There were two errors mentioned in the report. They are addressed below.

   First, the report states the Public Works Department reported incorrect information to the City Council regarding the percent of State versus City roads in Kansas City. We reported a 45% State and 55% City split on Kansas City roads. This information was obtained from an agency which tracks road miles and was not verified by public works staff. The Auditor estimates the split to be 10% State, 80% City and 10% "Other" roads, which, after review, we believe is more nearly accurate.

   Secondly, there was an error in the sampling for the 2002 condition assessment survey. The city is divided into 3 areas and 2 types of streets in each. This results in 6 populations of numbers. Inadvertently, one area was under-sampled greatly, and one area was over-sampled. This error has been corrected in recent surveys.

   Condition assessment is a systematic method of measuring street conditions over a long period of time. It is a method used to determine if proper maintenance is being applied, it does not measure driver experience.

2. The Director of Public Works should ensure that staff measure the drivers' experience of smoothness of streets and use this measure as a component in rating street performance.

   We agree. We are in the process of changing the way streets are evaluated for resurfacing. We are changing to a pavement distress survey which measures the amount of alligator cracking, distortion, potholes, patches, raveling, rutting, and cracking on each segment of

city maintained streets. The amount of each one of these pavement defects are compiled into our pavement management database and a pavement condition index (PCI) is computed. This method is an indirect measure of the drivers' experience of smoothness of the street.

3. The Director of Public Works should improve pavement smoothness by reducing causes of roughness.

   We agree. Surface roughness has many causes and a leading one is utility cuts. Because of the age of the utility infrastructure, these will be impossible to eliminate, but the recently imposed degradation fee will encourage the use of less destructive repair and construction techniques such as boring. This should reduce the number of cuts. We will continue to work with the utilities in an effort to achieve smoother surface repairs.

   The expanded street resurfacing program this year, and we anticipate a higher level of funding from bond monies the next several years, will also add several hundred miles of smooth surfaces.

4. The Director of Public Works should monitor street cuts regulation's impact to determine whether the regulation adequately protects city streets from damage caused by utility cuts.

   We agree. We are in the process of completing a pavement distress survey of all City maintained streets. This survey will measure every defect in the pavement and generate a pavement condition index (PCI). This survey will allow us to determine the impact of street cuts and whether street degradation fees are effective. In the future, streets to be resurfaced will be selected based on the PCI from this survey, and on-going pavement distress surveys.

5. The City Manager and the Director of Public Works should take steps to increase the number of miles of city streets resurfaced each year.

   We agree. The number of miles resurfaced is directly related to the availability of funding for the program. The funding level has remained fairly constant over the last several years, but with the recent public approval of bonding for infrastructure, we expect to see more money for this program. City Council approved a resurfacing program of approximately $18 million for FY05 which is about 80% more than the amount expended in recent years. Also, as part of the recently approved GO Bond, 30% or $75 million has been earmarked for street preservation and street reconstruction. Currently, we are also expanding the crack and slurry seal programs and as more bond funds become available will begin a reconstruction program for those streets suffering base and subgrade failures. Implementation of a replacement/reconstruction program is essential if we expect to provide a high quality street system.

   These programs, e.g., expanded resurfacing, crack and slurry seal, and replacement/reconstruction, will do much to improve the riding quality of Kansas City's streets.

cc: Wayne A. Cauthen, City Manager
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