STREET PAVING:
Office of Transportation improved quality assurance, but is resurfacing fewer streets

A REPORT FROM THE CITY AUDITOR
August 2008

Office of the City Auditor
Portland, Oregon

CITY OF

PORTLAND, OREGON

OFFICE OF THE CITY AUDITOR
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August 26, 2008

TO: Tom Potter, Mayor
Sam Adams, Commissioner
Nick Fish, Commissioner
Randy Leonard, Commissioner
Dan Saltzman, Commissioner
Susan Keil, Director, Portland Office of Transportation
Ken Rust, Chief Administrative Officer, Office of Management and Finance

SUBJECT: Audit – *Street Paving: Office of Transportation improved quality assurance, but is resurfacing fewer streets* (Report #359)

Attached is Report #359 containing the results of our follow-up on four audit reports we issued in 2006 concerning the Office of Transportation's street paving program. The 2006 reports contained 13 recommendations for the Office of Transportation and two for the Office of Management and Finance.

Commissioner Sam Adams and Transportation Director Susan Keil submitted written responses to the audit, and their responses are included at the back of this report. No response was requested from the Office of Management and Finance since the two relevant recommendations have been resolved.

We ask the Office of Transportation, through its commissioner-in-charge, to provide us with a status report in one year detailing steps taken to address those recommendations we have reported as not yet resolved.

We appreciate the cooperation and assistance we received from personnel in the Office of Transportation and the Office of Management and Finance as we conducted this audit.

GARY BLACKMER
City Auditor

Audit Team: Drummond Kahn
Doug Norman
Beth Woodward

Attachment

STREET PAVING:

Office of Transportation improved quality assurance, but is resurfacing fewer streets

Summary

One quarter of the value of all City assets lies in the City's street system. Maintaining streets is an essential service of the Office of Transportation (PDOT). We audited PDOT's Street Preservation Program in 2006, and issued 13 recommendations for PDOT in four reports. In this follow-up review requested by the Commissioner of Public Utilities, we found that PDOT implemented eight of the 13 recommendations we made, and is taking steps to implement the others.

PDOT has established new, clearer asphalt supply contracts that require suppliers to perform quality control. PDOT and City laboratory staff perform quality assurance (QA) tests in accordance with a new QA plan. In addition, PDOT has assigned an experienced engineer to manage the processes of selecting streets for treatment and developing new information management and decision making tools.

PDOT is now complying with Oregon law that requires the City to demonstrate that if it performs "public improvement" projects (as defined by law), it performs them at least-cost (ORS 279C). To comply, PDOT is refraining from doing projects that may be considered a public improvement under this legal definition, at least until its consultant completes a means of comparing PDOT costs to those of private contractors to determine least-cost. Meanwhile, by limiting the size of its Street Preservation projects over such a long period, PDOT has reduced the efficiency of work it performs.

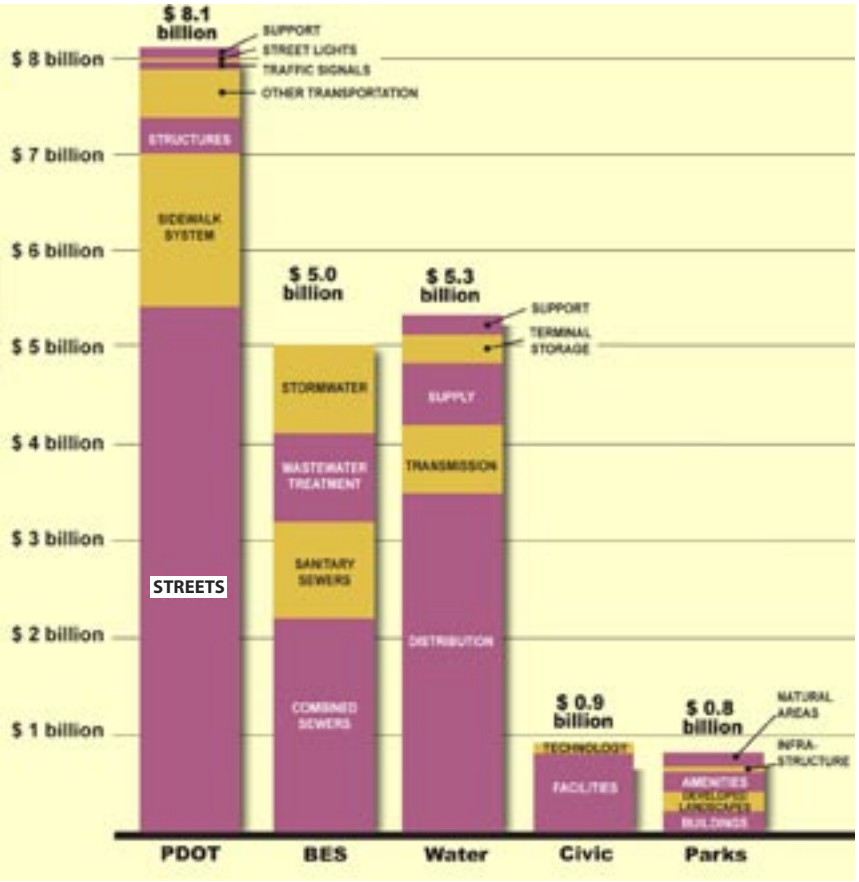
PDOT's reduced spending on street preservation has also contributed to a decrease in the amount of street preservation work. This decline in work quantity has in turn reduced capability and increased the backlog of unmet street repair needs and costs.

We urge the Commissioner of Public Utilities to direct PDOT to give higher funding priority to the Street Preservation Program, to expedite least-cost comparisons to increase the quantity and efficiency of street preservation work, and to continue improvements that are currently in process.

Background

The City of Portland has 3,949 lane-miles of improved streets, valued at $5.4 billion, not including traffic signals, street lights and sidewalks. This value is 25 percent of the value of all City assets, shown in Figure 1, and represents 66 percent of the assets PDOT maintains to protect the investment Portland residents have already made.

Figure 1 Street assets relative to City assets



Note: Affordable Housing not shown, $1.4 billion

Source: *City of Portland Asset Status and Conditions Report,* December 2007

PDOT maintains the City's asphalt concrete streets primarily by resurfacing arterials and applying slurry treatment to local streets. The Bureau uses contractors to perform reconstruction when streets are deteriorated; this work is not part of the Street Preservation Program.

PDOT primarily funds Street Preservation using gas tax revenue, which increases only with the volume of gas purchased and has, therefore, not increased at the rate of inflation. PDOT managers told us gas tax revenue is decreasing because less gas is being purchased. Parking meter revenue, which has increased, is the other major component of the General Transportation Revenue Fund (GTR). PDOT uses the GTR for operations, capital improvements, transit mall, and streetcar operating in addition to Street Preservation and other asset maintenance. PDOT managers explained that some GTR expenditures are directed by City Council.

In 2006, we audited the City's in-house Street Preservation program and reported our findings and recommendations in the series of reports listed in Figure 2.

Figure 2 2006 Audit Reports on Street Paving

Date released	Number	Title and web link
May 15, 2006	#324A	**Street Paving: City Needs to demostrate least cost** *http://www.portlandonline.com/shared/cfm/image.cfm?id=116286*
July 24, 2006	#324B	**Street Paving: More proactive maintenance could preserve additional city streets within existing funding** *http://www.portlandonline.com/shared/cfm/image.cfm?id=125242*
Sept. 27, 2006	#324C	**Street Paving: Current contract management practices put asphalt price and supply stability at risk** *http://www.portlandonline.com/shared/cfm/image.cfm?id=131943*
Oct. 6, 2006	#324D	**Street Paving: City work not meeting pavement quality standards** *http://www.portlandonline.com/shared/cfm/image.cfm?id=132962*

Source: Audit Services Division

In 2007, the Commissioner of Public Utilities requested that the Audit Services Division review PDOT's plan for implementing the recommendations published in those reports.

Objectives, Scope and Methodology

Our objective in conducting this review was to follow-up on recommendations we made in the four audit reports listed in Figure 2. Our purpose was to determine and report the current status of implementation of each recommendation.

To achieve this objective, we reviewed PDOT's January 2008 update of its Pavement Audit Status Report, and other PDOT documents, including financial plans and records, project records, contract records, the quality assurance plan, quality assurance test reports, and training descriptions. We also reviewed documents prepared for PDOT by its consultants, Applied Pavement Technology, Inc., and Dye Management Group, Inc. We interviewed PDOT managers and PDOT staff, and consultants.

We reviewed the City's December 2007 Asset Status and Conditions Report, and interviewed an asset manager for the City of Salem. We analyzed records of expenditure on street preservation and of work completed.

We conducted this performance audit in accordance with generally accepted government auditing standards. These standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Results

Our four 2006 audit reports on PDOT's Street Preservation Program contain 13 recommendations for PDOT. Two additional recommendations for the Office of Management and Finance (OMF) were resolved. PDOT implemented or otherwise resolved eight of its 13 recommendations, and has taken some steps to implement the other five. However, the extent of PDOT's street preservation work has decreased, rather than increased as we recommended. PDOT is working on new information management and decision making tools for future application. Each of the recommendations and their implementation status is listed in Figure 3.

We describe implementation status as "in-process" when the recommendation is not yet fully implemented but some actions have been taken. A general discussion of PDOT's progress is provided after Figure 3. Appendix A provides a more detailed description of actions taken in response to each recommendation.

Figure 3 Status of Recommended Actions

Report #324A - Street Paving: City Needs to demonstrate least cost

	Recommendation	Status	Comment
A-1	Bureau of Maintenance should develop cost estimating procedures needed to determine when a planned paving project represents a public improvement as defined by ORS 279C.305(5).	In-Process	PDOT performs limited cost estimating; is developing a cost model for more complete estimating under Statute
A-2	Bureau of Maintenance should ensure that its public improvement projects are reported to OMF for inclusion in the City's annual report to Bureau of Labor and Industries (BOLI).	Resolved	New management policy forbids such projects (leading to new problems; see B-1)
A-3	Bureau of Maintenance, if it intends to perform such projects in-house, should prepare adequate plans and specifications, estimate the unit cost of each classification of work, show that its decision conforms to the least-cost policy, and keep a full, true and accurate record of actual project costs.	In-Process	Plans, cost estimating, and cost tracking have improved; show that no "public improvements" are being done; PDOT is developing a model to show least cost, with external assistance
A-4	OMF should develop a process for timely and complete reporting of all public improvements to BOLI, as required by state law.	Resolved	

Report #324B - Street Paving: More proactive maintenance could preserve additional city streets within existing funding

	Recommendation	Status	Comment
B-1	Develop a proactive preventive maintenance program to be applied to newly constructed and resurfaced streets, and other streets in good condition.	In-Process	Spending reduced; Efficiency is impacted by PDOT policy not to perform public improvements (A-2)
B-2	Adopt the remaining service life approach to planning and budgeting the street preservation program.	In-Process	PDOT's planned optimization method meets intent
B-3	Establish better procedures for categorizing and tracking street preservation work activities.	Resolved	
B-4	Evaluate the need to establish a Pavement Engineer position.	Resolved	PDOT assigned experienced engineer

Report #324C - Street Paving: Current contract management practices put asphalt price and supply stability at risk

	Recommendation	Status	Comment
C-1	PDOT should ask the City Attorney to recommend a contract amendment that would prevent early termination by contractors except for breach of contract by the City.	Resolved	Contracts amended, then new contracts executed
C-2	Bureau of Purchases should not approve price increases beyond the adjustments provided for in the contracts	Resolved	
C-3	PDOT should abide by the City's contractual commitment to the primary vendors.	Resolved	No primary vendors in new contracts
C-4	PDOT should develop an accurate process for identifying the most cost-effective primary asphalt vendor for each paving job.	Resolved	PDOT established formula for selecting the best vendor for each job

Report #324D - Street Paving: City work not meeting pavement quality standards

	Recommendation	Status	Comment
D-1	Prepare and follow a pavement quality assurance plan that outlines procuedures and individual responsibilities for monitoring asphalt quality and taking remedial action when asphalt is found to be substandard.	Resolved	New plan is in use
D-2	Develop clear and complete specifications for the desired quality of asphalt mix.	Resolved	New specifications included in contracts
D-3	Increase in-house technical expertise on pavement design and quality; provide more training of Street Preservation personnel; and include pavement quality in performance measures and employee evaluations.	In-Process	Loss of experienced personnel has increased challenge; evaluations are planned

Quality Control and Quality Assurance Improved

The most significant improvements we found were the combination of new, clearer asphalt supply contracts that require suppliers to perform quality control, and improved quality assurance actions in accordance with the new QA plan. PDOT's Materials Quality Compliance Specialist worked with Street Preservation managers and staff to prepare the plan and is training staff to carry out QA testing and analysis in accordance with the plan.

Street Preservation managers are providing technical training for staff, and are in the process of incorporating pavement quality into performance measures and employee evaluations. Documentation of work planned and performed has also improved.

Steps Taken Toward Preventive Maintenance

To emphasize preventive maintenance PDOT revised its street condition criteria for selecting streets for maintenance treatment, and assigned an experienced engineer to manage the selection process. This Pavement Services Manager is also overseeing the contract to develop new software for the pavement management system (PMS). PDOT began planning for new PMS software prior to our 2006 audits, and told us it will include preventive maintenance in the treatment and cost variables used in the analysis when it is complete in 2009. PDOT is also adopting a new street condition rating methodology to improve PMS inputs.

PDOT agrees that when maintenance is not performed in a timely manner, streets deteriorate faster, driving up repair costs by as much as four times. Thus, timely preventive maintenance can lower the overall cost of maintaining City streets. PDOT reports that it will use the new PMS system to implement our recommendation to plan and budget systematically for optimal maintenance of all streets, or at least optimal management of a constrained budget.

PDOT Complying with Least-Cost Law by Avoiding Public Improvement Projects

PDOT is complying with Oregon law (ORS 279C), which defines what a "public improvement" project is and requires the City to document that it can perform the project at "least cost" if it does the work. To comply, however, PDOT has chosen to simply refrain from doing

projects that may be considered a public improvement under this legal definition, at least until after it has developed a new cost model to show whether a project can be performed for least cost by City crews or by a contractor.

PDOT's consultant, selected with input from external parties, completed a methodology for estimating the costs in April 2007, and is under contract to develop the model. PDOT is not yet using the new methodology to compare its own costs to those of private contractors. PDOT managers told us that developing the model takes time because it involves determining some unit costs that PDOT did not have, and obtaining independent review by external parties (such as the Asphalt Paving Association) as the model is developed. The model has also been delayed by staff turnover. It is scheduled to be complete in September 2008.

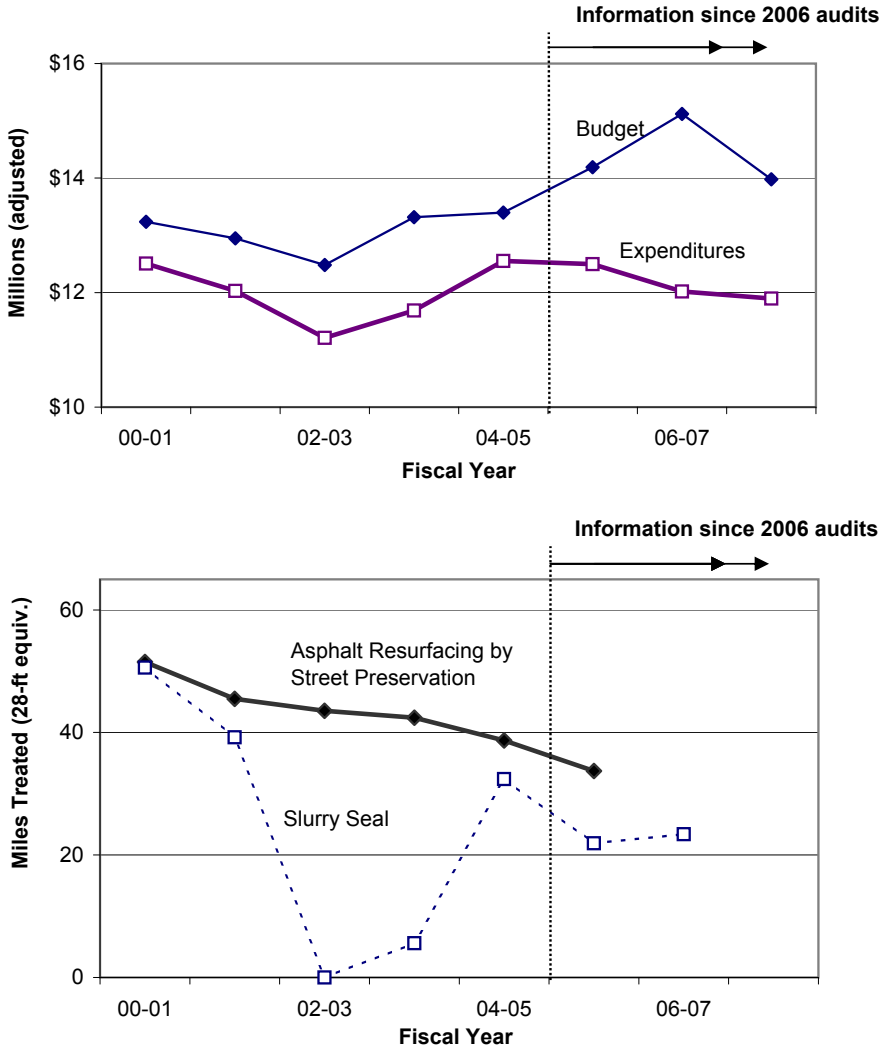
In contrast, the City of Salem has done least-cost analysis in-house and found that it can perform resurfacing for $2 per square yard less than it would cost to have a contractor do the work. However, the City of Salem does not perform any paving projects legally defined as public improvements.

Managers of Street Preservation work told us that the policy to refrain from doing public improvement projects increases the unit cost of asphalt concrete resurfacing work. Smaller areas are selected for treatment to limit total project cost or stay within the 2-inch depth limit; however, the cost of moving labor and equipment to and from sites is the same regardless of project area. Furthermore, this decision to stop performing improvement work altogether, appears to be undermining the positive steps PDOT has taken to improve its Street Preservation Program.

Street Preservation Funding and Work Declining

We recommended that PDOT perform more preventive maintenance to help preserve streets while reducing the overall long-term cost of street maintenance. As shown in Figure 4, however, PDOT has reduced its expenditures on Street Preservation, and the amount of resurfacing and slurry seal treatments has also diminished. (Because PDOT changed the way it measures paving, the comparable amount for resurfacing in FY 06-07 is not available.)

Figure 4 Street Preservation Program[1]

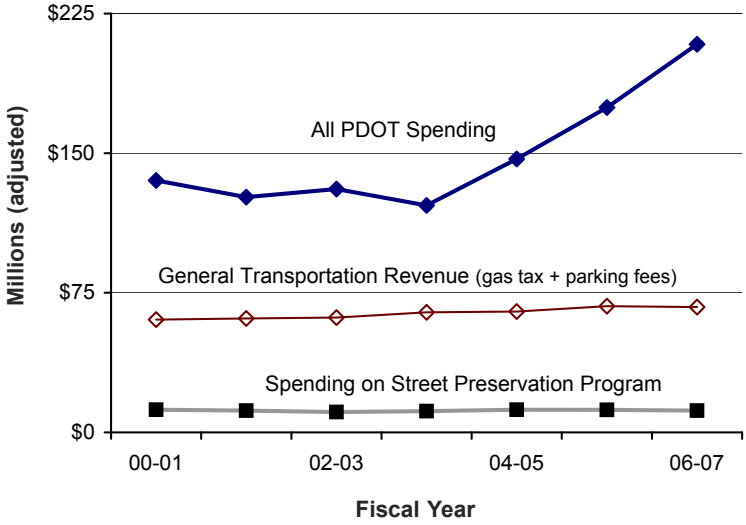


Source: PDOT Records

Note: 1. Street paving work done by contract is not included in budget and expenditures shown.

2. PDOT changed method of measuring asphalt resurfacing during FY 2006-07; therefore measure for that year is not comparable to prior years and is not shown.

Figure 5 Street Preservation Program spending relative to all PDOT spending

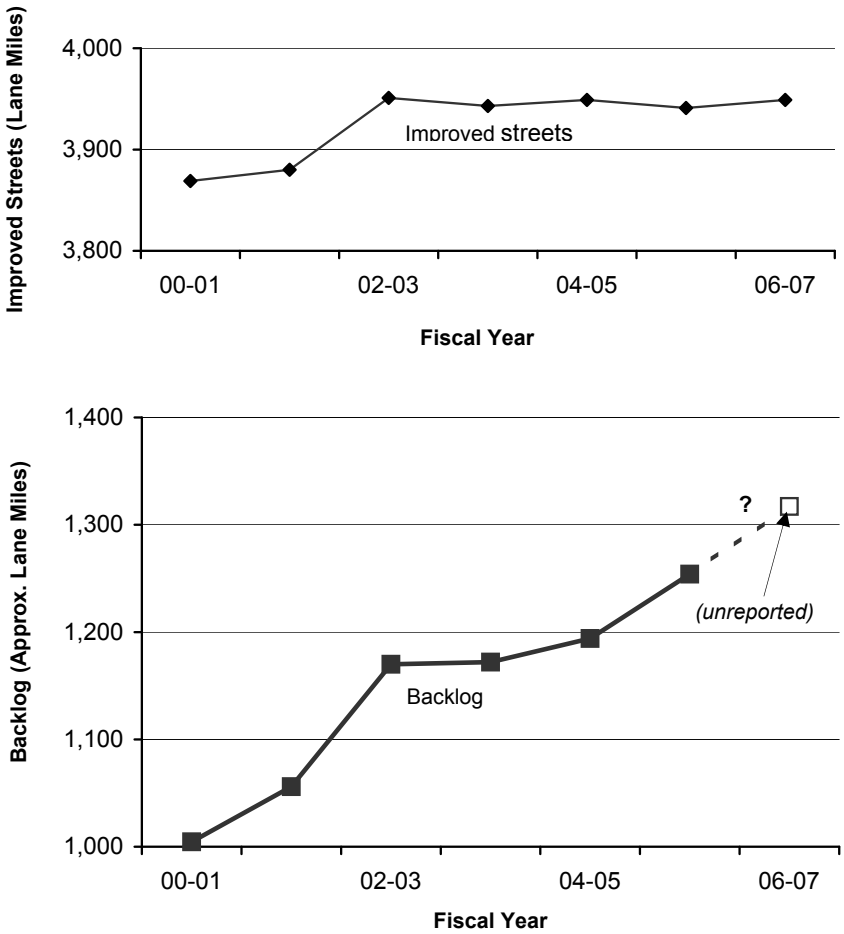


Source: Comprehensive Annual Financial Reports, and PDOT

Total PDOT expenditures, including capital projects, have increased significantly as shown in Figure 5. Street Preservation expenditures in FY 2006-07 were 6 percent of total expenditures, and 17 percent of PDOT's revenue from gas tax and parking fees. PDOT managers explained that paving costs have risen while gas tax revenue has fallen, and they were counting on revenue from the Safe Sound and Green Streets fee proposal (which was repealed prior to final passage by Council).

PDOT's reduction in street preservation work is contributing to an ever-increasing backlog of unmet street repair needs. PDOT last reported the backlog as equivalent to 627 miles of 28-feet wide streets, in FY 2005-06. Today, this amount would be approximately 1,250 lane miles and over 30 percent of the City's improved streets, shown in Figure 6.

Figure 6 Maintenance deferred



Source: PDOT

Note: Lane miles of backlog are approximate. PDOT reported backlog miles in units of 28-ft equivalent miles. This graph shows backlog converted to lane miles by doubling the number of 28-ft equivalent miles reported.

Reasons for Decrease in Street Preservation Expenditures and Work

PDOT reports it has been forced to cut budgets in recent years because the City's share of gas tax revenue is limited. However, PDOT continues to add maintenance obligations through new capital projects such as the streetcar, and it uses parking revenue on many projects other than street maintenance. PDOT managers explained that some major expenditures were directed by City Council.

Financial experts in PDOT and OMF told us that when PDOT has needed to reduce spending, the Street Preservation Program has been the easiest to cut. It is relatively large and when positions are vacant, spending on paving and slurry materials is also reduced, thus increasing budget savings. PDOT has used budget savings (i.e. unspent budget dollars) in Street Preservation to fund other transportation activities, such as the purchase of new parking meters in FY 2002-03.

PDOT has not received any revenue from Utility License Fees since 1993, although the City's transportation funding policy states that 28 percent of those fees are to go to PDOT for repairing and resurfacing City streets. In FY 2006-07, 28 percent of the fees would have been $17.9 million.

PDOT reported that equipment problems reduced productivity in FY 2005-06. Street Preservation Program managers told us that another reason for the decrease in street miles treated has been the high rate of vacant positions in recent years, due partly to hiring constraints and partly to difficulty attracting experienced workers. A number of experienced Street Preservation personnel have left, and managers have had difficulty filling the vacancies created.

Based on our interviews with several managers, we believe management authority over the Street Preservation Program may be fragmented among managers of the Maintenance Group and other organizational groups of PDOT. This fragmentation appears to be affecting the efficiency and effectiveness of the Street Preservation Program. In addition, two key positions tasked with implementing the audit recommendations – Pavement Services Manager and Materials Quality Compliance Specialist – are only partly dedicated to Street Preservation Program responsibilities. Because each has other significant responsibilities, they may not be able to make sure the recommendations are consistently followed in the future without trained technical support.

Conclusions

PDOT improved many Street Preservation practices, such as choosing preventive maintenance over rehabilitation, preparing plans, recording actual costs, and performing quality assurance. However, the continuing policy to limit project size, and reduced expenditures contributed to reducing the extent of Street Preservation work. PDOT's decision to outsource the development of a model to perform project cost comparisons, and to incorporate views of external parties in that process, has resulted in a long delay in performing least cost comparison. Meanwhile, Street Preservation is not allowed to perform public improvements, even in combination with preventive maintenance, although it may be cost-effective for the City.

In 2006, we recommended that PDOT perform more preventive maintenance to help preserve streets while reducing the overall long-term cost of street maintenance. However, the amount of preservation work PDOT has performed on City streets has declined since we issued our reports in 2006. As PDOT reduces maintenance of street assets – two thirds of the assets for which it is responsible – the immediate and long-term costs grow quickly.

PDOT's current policies and funding priorities will make it difficult for PDOT to fully implement all the recommendations in our 2006 audit reports. Even after least cost analysis begins, full implementation depends on successful use of the new Pavement Management System and on management's funding and treatment decisions using PMS output.

We urge the Commissioner of Public Utilities to direct PDOT to give higher funding priority to the Street Preservation Program, to expedite least-cost evaluations to increase the quantity and efficiency of street preservation work, and to continue improvements that are currently in process, as described in this report.

APPENDIX A

Street Paving: Implementation reported by audit recommendation

Audit Report #324A **Street Paving: City needs to demonstrate least cost**

Oregon Revised Statute (ORS) 279C.305(5) defines "public improvement" as, "…resurfacing of highways, roads, or streets at a depth of two or more inches and at an estimated cost that exceeds $125,000." (i.e. a project meeting only one of these tests would not be a public improvement under the Statute). The Statute requires the City to perform public improvement projects at the "least cost" to the City, which means that unless the City could perform the work at a lower cost, it should do the work through a private contractor. Our report addressed the City's compliance with the Statute.

Recommendation A-1: The Bureau of Maintenance should develop cost estimating procedures needed to determine when a planned paving project represents a public improvement as defined by ORS 279C.305(5).
Status: In-process

To incorporate an independent perspective, PDOT hired a consultant to develop tools necessary for an effective least cost analysis process and model. In April 2007, the consultant issued "Pavement Cost Assessment Final Report," describing the steps for comparing estimated costs for the City and for contractors to do the same work. PDOT states that it has incorporated the consultant's recommendations for modifying cost estimating procedures to give PDOT more accurate data to determine when a paving project meets the statutory criteria of a public improvement and triggers the requirement to report the project to the Oregon Bureau of Labor and Industries.

PDOT is using the same consultant to create a model to calculate least-cost for proposed projects. PDOT managers told us that developing the model takes time because it involves determining some unit costs that PDOT did not have, and obtaining independent review by external parties (such as the Asphalt Paving Association) as the model is developed. The model has also been delayed by staff turnover. It is scheduled to be complete in September 2008.

Recommendation A-2: The Bureau of Maintenance should ensure that its public improvement projects are reported to the Office of Management and Finance for inclusion in the City's annual report to the Bureau of Labor and Industries (BOLI).
Status: Resolved

PDOT has adopted a policy to not perform any public improvements as defined by ORS 279C.305(5), even if they could be done at least cost to the City by City crews. Therefore, no street maintenance projects were or needed to be reported to the Office of Management and Finance for inclusion in the City's report to BOLI.

PDOT limits the size of each maintenance project to no more than $125,000 or less than 2-inches in depth of asphalt concrete resurfacing.

Recommendation A-3: The Bureau of Maintenance, if it intends to perform such projects in-house, should prepare adequate plans and specifications, estimate the unit cost of each classification of work, show that its decision conforms to the least-cost policy, and keep a full, true and accurate record of actual project costs.
Status: In Process

PDOT's current policy is to not perform public improvements in-house. PDOT management states that when its new least cost model is completed by a consultant in September 2008, it may choose to do improvements in-house if the model shows that PDOT can perform public improvements at less cost than private contractors.

Managers said that if they do the work in-house in the future, they intend to fully comply with the requirements of ORS 279.305. That is, they will demonstrate that the decision to do the work in-house conforms to the State's least cost policy; they will prepare appropriate plans and specifications; they will estimate unit costs for each work classification; and they will keep a full and accurate record of actual project costs. Most of these tasks are currently being done for maintenance projects that do not meet the definition of public improvement. Documentation of work planned and performed has improved.

Recommendation A-4: The Office of Management and Finance should develop a process for timely and complete reporting of all public improvements to BOLI, as required by state law.
Status: Resolved

Since we issued our paving audit reports in 2006, the responsibility for reporting public improvement projects to BOLI was transferred from the Bureau of Financial Services to the Bureau of Purchases. We reviewed the "Planned Public Improvement Summary" submitted to BOLI for FY 2007-08 and spoke with BOLI representatives who stated that the City's report was acceptable and submitted properly.

Audit Report #324B

Street Paving: More proactive maintenance could preserve additional streets within existing funding

PDOT manages its Street Preservation Program using a customized pavement management system (PMS) that analyzes information about street condition and recommends treatment. To PDOT's credit, this programmatic approach to maintenance puts the City ahead of many others. PDOT has used a PMS for so long that the system software is now outdated, and prior to our 2006 audits PDOT began planning for new PMS software with expanded capabilities. A contractor was awarded the work in Spring 2008 to develop the replacement software, which will incorporate traffic loads, treatment variables, geographic information and cost factors in the analyses, as well as street condition. PDOT is also adopting a new system for rating the condition of pavement to provide more consistent and accurate data for the new PMS.

Recommendation B-1: Develop a proactive preventive maintenance program to be applied to newly constructed and resurfaced streets, and other streets in good condition.
Status: In-process

Our 2006 audit found that although PDOT was using a systematic approach to selecting locations for street preservation work, it was focused primarily on repairing severely deteriorated streets in its backlog. PDOT was not including more cost-effective preventive maintenance that could prolong pavement life, on backlog or on other streets. We recommended a proactive preventive maintenance program to help PDOT get more maintenance value from the funds it was expending. PDOT agrees that when street maintenance is not performed in a timely manner, repair costs increase by as much as

four times because degradation accelerates as conditions worsen. Thus, timely preventive maintenance can lower the overall cost of maintaining City streets.

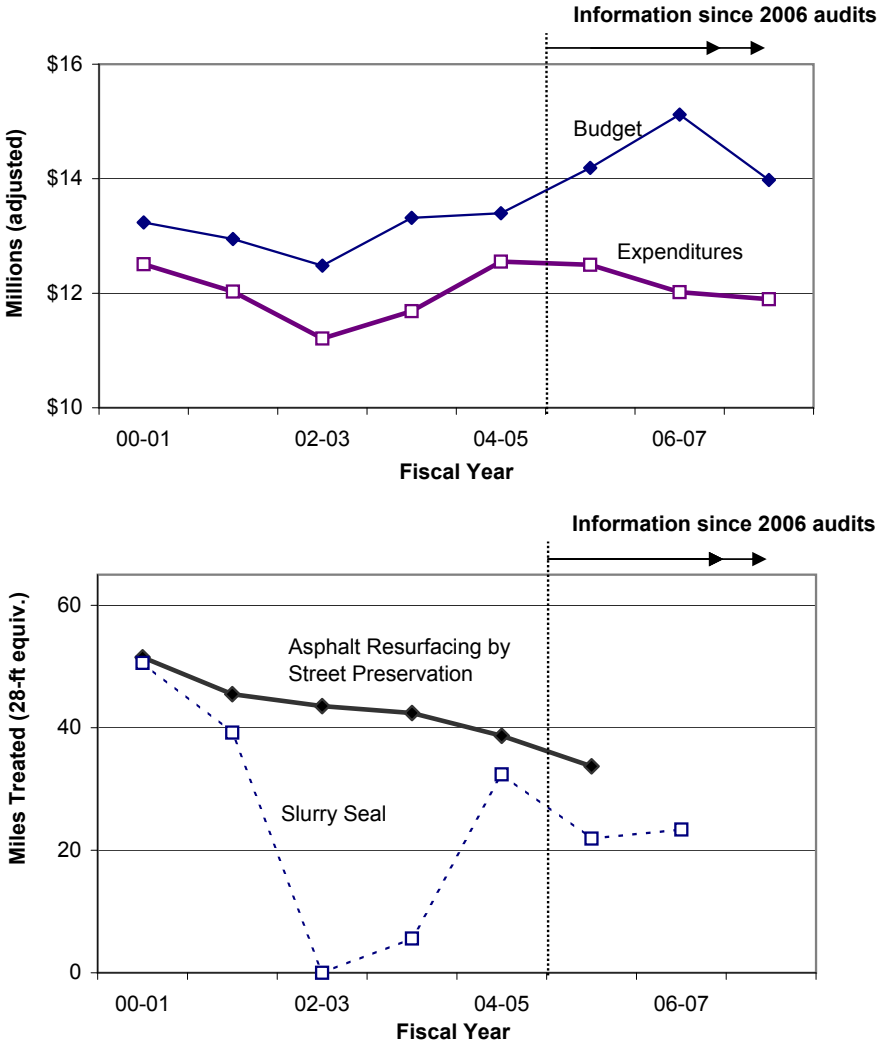
Steps Taken Toward Implementation - Evidence that PDOT is in the process of developing a proactive preventive maintenance program to protect streets in good condition includes:

- Staff reported using more appropriate condition criteria when selecting streets for resurfacing and slurry treatments in 2007 and 2008.
- Street preservation staff members understand the principles of preventive maintenance. They told us they are working on streets before they "go bad," and are testing possible new preventive maintenance treatments.
- PDOT has assigned an experienced engineer to manage the process of selecting streets for treatment using criteria that have been revised to emphasize preventive maintenance (responding to recommendation B-4).
- Specifications for contract work to develop the new PMS software include incorporating pavement deterioration curves for use in the analysis, preventive maintenance treatment options, and training City staff. A separate contract is underway to improve street condition data that are also used as inputs to the PMS.
- PDOT has been working with highly regarded experts in preventive maintenance to plan for, specify, and customize the new PMS software to provide the most cost-effective street preservation plans for the City.
- PDOT states that "the best practice is to use our limited resources to keep as many streets as possible towards the top of the deterioration curve, rather than spending considerable funds on streets that are already low on the deterioration curve."

Full implementation depends on completion of the new PMS system, on inputs to that system, and on management's future treatment and funding decisions using PMS output.

Street Preservation Declined - Management decisions, including the current policy to not perform work that might be defined as public improvement (discussed under status of recommendations in audit report #324A), have limited the amount of street preservation accomplished during 2007 and planned for 2008. As shown in Figure A-1, both street preservation funding and preservation work have decreased. This decline in street preservation work is contributing to an ever-increasing backlog of deferred maintenance needs. PDOT reported that 60 miles of paving per year are needed to avoid an increase in backlog.

Figure A-1 Street Preservation Program[1]



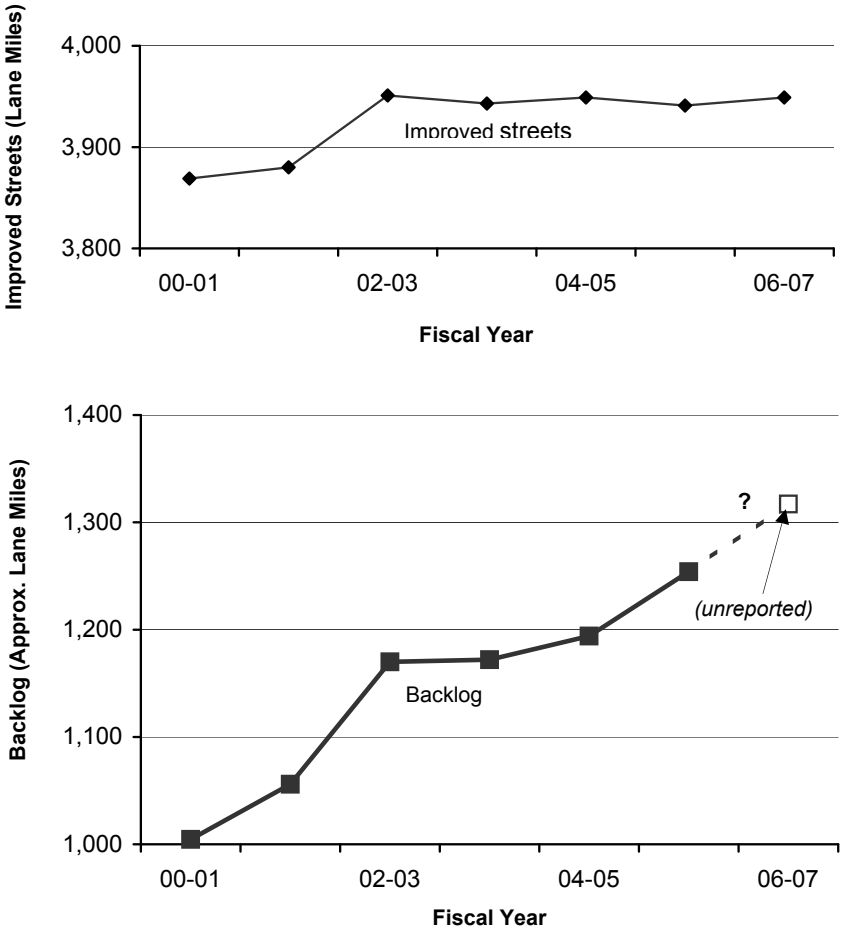
Source: PDOT Records

Note: 1. Street paving work done by contract is not included in budget and expenditures shown.

2. PDOT changed method of measuring asphalt resurfacing during FY 2006-07; therefore measure for that year is not comparable to prior years and is not shown.

PDOT last reported the backlog in FY 2005-06 as equivalent to 627 miles of 28-ft wide streets, which would be at least 1250 lane miles and over 30 percent of the City's improved streets, as shown in Figure A-2. In 2006, PDOT estimated the unmet need to be $90 million, and since then has reported that it will not estimate unmet need again until July 2009, because of the transition to new rating methods and software for the PMS.

Figure A-2 Maintenance deferred



Source: PDOT

Note: Lane miles of backlog are approximate. PDOT reported backlog miles in units of 28-ft equivalent miles. This graph shows backlog converted to lane miles by doubling the number of 28-ft equivalent miles reported.

While limiting expenditures in the Street Preservation Program as a whole, PDOT management has provided funding for filling potholes in response to resident requests as directed by City Council. Potholes occur where water has entered and damaged a street's subgrade structure, so they are good indicators of deteriorated streets. Filling potholes shows responsiveness to resident concerns about comfort and safety but does not repair structural damage. Crews sometimes return to the same location to fill potholes after just a few months. The photograph in Figure A-3 shows a filled pothole in an area where potholes had been filled only four months earlier. Cracks in the surrounding pavement are visible. It is unlikely that the life of this street was prolonged by either trip to fill potholes.

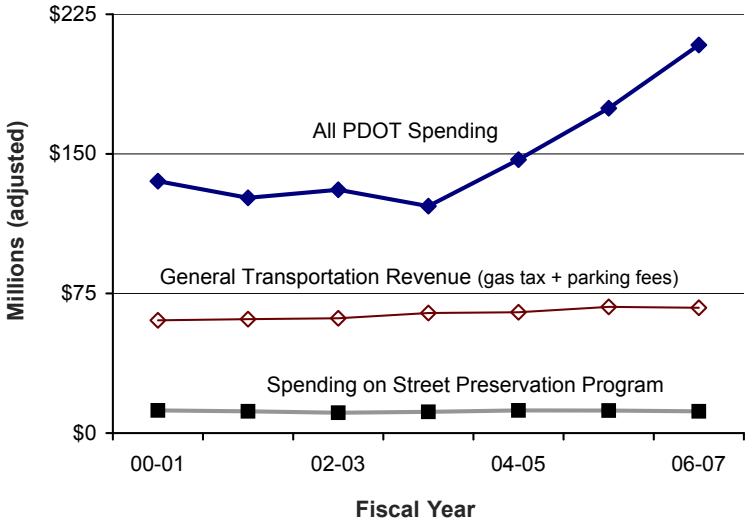
Figure A-3 Pothole filled in deteriorated street

Source: Audit Services Division photo, April 2008

Surveys conducted by PDOT in December 2005 and June 2007 showed that street maintenance is of high importance to the public. Although we did not evaluate the validity of these survey results, we believe they provide an indication of the priority that the public would like PDOT to attach to street preservation. Our own Resident Survey, conducted in 2007, showed that 28 percent of Portland residents rate the overall quality of the City's street maintenance as "bad" or "very bad." This was an increase of 7 percent in 10 years. Residents rating street maintenance as "good" or "very good" declined by 7 percent in 10 years.

Reasons for Decrease in Street Preservation - PDOT reports it has been forced to cut budgets in recent years because the City's share of gas tax revenue is limited, but PDOT continues to add maintenance obligations through new capital projects such as the streetcar. Expenditures on Street Preservation were 6 percent of total PDOT expenditures and 17 percent of revenue from gas tax and parking fees in FY 2006-07, as shown in Figure A-4. PDOT could use a greater share of parking revenue to fund street preservation.

Figure A-4 Street Preservation Program spending relative to all PDOT spending



Source: Comprehensive Annual Financial Reports, and PDOT

In addition, PDOT has not received any Utility License Fees since 1993, although the City's transportation funding policy includes providing 28 percent of those fees to PDOT for repairing and resurfacing City streets. In FY 2006-07, 28 percent of the fees would have been $17.9 million.

PDOT reported that equipment problems reduced productivity in FY 2005-06. Street Preservation Program managers told us that another reason for the decrease in street miles treated has been the high rate of vacant positions in recent years. Managers told us the vacancy rate has increased for several reasons. Some experienced employees retired when retirement benefits were changed; other employees left because of low morale, and management has limited hiring authority. When filling positions is authorized, it has been difficult to recruit experienced workers.

In late March, 2008, 13 percent of Street Preservation staff positions were vacant. PDOT was not able to provide earlier vacancy records specifically for Street Preservation. However, financial analysts told us that when PDOT has needed to reduce spending, the Street Preservation Program has been the easiest to cut because it is a large amount. In addition, when positions are vacant, spending on paving and slurry materials is also reduced, increasing the budget savings that result. PDOT has used budget savings (the difference between the amount budgeted and the amount actually spent on the work) in Street Preservation to fund other transportation activities, such as the purchase of new parking meters in FY 2002-03.

Recommendation B-2: Adopt the remaining service life approach to planning and budgeting the street preservation program.
Status: In-process

Our audit report #324B recommended that PDOT adopt an approach to street preservation that is more inclusive of all streets and more cost effective, and incorporate it into the new pavement management system software. The report also recommended that PDOT make preventive maintenance an integral part of its street preservation strategy.

PDOT is incorporating the "optimization paradigm" in its new PMS, and reports that it is committed to using preventive maintenance, as recommended by Applied Pavement Technology (APTech) in its May 2007 report to PDOT, Pavement Management System Software Replacement Business Practices Analysis. We believe the optimization approach, as APTech and PDOT have described it, meets the intent of this recommendation provided that PDOT follows the recommendations made by APTech.

Recommendation B-3: Establish better procedures for categorizing and tracking street preservation work activities
Status: Resolved

PDOT has improved categorizing and tracking work activities and their associated costs as recommended. It now distinguishes among structural overlays and thinner preservation overlays; arterials and local streets; preventive maintenance and rehabilitation and reconstruction; and pothole repairs.

Recommendation B-4: Evaluate the need to establish a Pavement Engineer position.
Status: Resolved

Following an unsuccessful attempt to recruit a full time pavement design and maintenance specialist, PDOT assigned an experienced engineer to take on management, design, and advisory responsibilities for the Street Preservation Program and to get full value from the new PMS. Although this new Pavement Services Manager also retains responsibility for quality assurance during construction of capital projects, PDOT is currently providing staff support to allow the Pavement Services Manager to focus on technical improvements to Street Preservation.

The Pavement Services Manager is overseeing the contracts to assist PDOT with the new street rating system and to develop the new PMS software, and will manage the PMS when it is complete.

Audit Report #324C

Street Paving: Current contract management practices put asphalt price and supply stability at risk

In addition to Report #324C, we identified problems with PDOT's asphalt contracts in Report #349, Strategic Sourcing: Projected Savings Not Achieved, issued in July 2007. We found that asphalt concrete was one of several commodities purchased under Strategic Sourcing that was not a good application of this alternative procurement strategy due to product and logistical complexities. In early 2008, responding to both audits, PDOT entered into new contracts with three vendors to supply asphalt concrete. The new contracts have resolved all of the issues we raised concerning asphalt contracts in Report #324C and Report #349.

Recommendation C-1: The Portland Office of Transportation should ask the City Attorney to recommend a contract amendment that would prevent early termination by contractors except for breach of contract by the City.
Status: Resolved

PDOT amended contracts to supply asphalt concrete to prevent early termination of the contracts by the asphalt contractors, except by mutual agreement or for breach of contract. The new contracts likewise disallow early termination by contractors without cause or mutual agreement with the City.

Recommendation C-2: Bureau of Purchases should not approve price increases beyond the adjustments provided for in the contracts.
Status: Resolved

Current contracts to supply asphalt concrete allow contractors to seek a unit price increase reflecting increased operating and raw materials costs such as for asphalt cement ("Production Costs") after the initial year of the contract. Managers in the Bureau of Purchases told us they would not make any price adjustments outside contract provisions and that each price adjustment would be authorized by a contract amendment.

Recommendation C-3: The Portland Office of Transportation should abide by the City's contractual commitment to the primary vendors.
Status: Resolved

This recommendation is no longer applicable. Current contracts do not designate primary and secondary vendors as the old contracts did.

Recommendation C-4: The Portland Office of Transportation should develop an accurate process for identifying the most cost effective primary asphalt vendor for each paving job.
Status: Resolved

Current contracts to supply asphalt concrete do not designate primary vendor. Nevertheless, Street Preservation managers have developed a formula which they apply to each paving project to identify the most cost-effective vendor for supplying asphalt concrete to that job. The formula factors in travel times, material costs, and plant delay times of the three competing vendors.

Audit Report #324D Street Paving: City work not meeting pavement quality standards

Figure A-5 PDOT crew resurfacing a Portland street

Source: PDOT

Recommendation D-1: Prepare and follow a pavement quality assurance plan that outlines procedures and individual responsibilities for monitoring asphalt quality and taking remedial action when asphalt is found to be substandard.
Status: Resolved

PDOT's Material Quality Compliance Specialist assisted managers and staff in identifying appropriate quality assurance processes and actions, and documenting them in the 2008 Hot Mix Asphalt Concrete HMAC Paving Program Quality Control / Quality Assurance Program Manual (QC/QA Manual). The QC/QA Manual describes quality assurance responsibilities as they have been modified in response to audit report #324D.

As part of her duties for all of Engineering Services, the Materials Quality Compliance Specialist provides technical support to Street Preservation staff to ensure that programs meet required standards, provides training and helps to solve problems as they arise. Staff from the Materials Testing Laboratory come to the paving site to take asphalt samples for testing and assist operators of compaction roller equipment (pictured in Figure A-5) with establishing roller patterns to achieve the density needed. PDOT staff and Laboratory staff together determine ideal roller patterns for each work site by repeated testing using a nuclear density gauge to find the highest relative density on a test strip. The crew then uses that roller pattern for other work done at that site. The QC/QA Manual also documents quality assurance responsibilities of supervisors, crew leaders, and equipment operators.

Another significant change in procedures to assure product quality is the requirements for suppliers to perform and document quality control tests at production intervals specified by PDOT – once per every 500 tons of material supplied. This requirement is part of the suppliers' contractual obligations and is described in the QC/QA Manual. The asphalt tests performed by City staff are quality assurance checks of the suppliers' testing. Although the new contracts were not executed until January 2008, the Material Quality Compliance Specialist asked suppliers to perform quality control testing in 2007, and they cooperated by performing some testing.

Street Preservation Program managers and staff told us that in addition to provisions in the manual, each crew member is empowered to reject asphalt concrete mix as it arrives if it does not appear to meet quality requirements. Test results for work performed in 2007 and other documentation show that the newly developed quality assurance procedures have been followed.

Recommendation D-2: Develop clear and complete specifications for the desired quality of asphalt mix.
Status: Resolved

The 2008 asphalt concrete supply contracts described above incorporate clear and complete specifications that are consistent with those of the Oregon Department of Transportation (ODOT). The Pavement Services Manager modified ODOT specifications for the City's street preservation work. Current specifications require suppliers to perform and report quality control testing, and clarify the method for computing quality level and the associated pay factor.

Recommendation D-3: Increase in-house technical expertise on pavement design and quality; provide more training of Street Preservation personnel; and include pavement quality in performance measures and employee evaluations.
Status: In-process

PDOT has increased in-house technical expertise through the new position of Pavement Services Manager and the assignment of an experienced engineer in that position to determine appropriate treatments for various streets. The engineer will work with PDOT's technical consultant, Applied Pavement Technology, to gain specific expertise. PDOT has also involved the Material Quality Compliance Specialist in increasing the technical understanding of staff responsible for quality assurance activities.

PDOT's contract for the new street condition rating system includes training for staff who will do the rating. PDOT has also brought an expert in construction techniques to Portland for the purpose of

observing asphalt paving and slurry work and explaining how to improve the work. In addition, Street Preservation managers have provided locally available technical training for staff. Managers told us more training is needed for which expenditures have not been approved, and the loss of experienced staff has increased the need for training new staff. Also, PDOT Maintenance Operations does not have an ODOT-Certified Asphalt Technician on staff.

Street Preservation Program managers are in the process of incorporating pavement quality into performance measures and employee evaluations. This process will take additional time to implement because it is dependent on completing evaluation cycles for the employees to whom it applies.

RESPONSES TO THE AUDIT

CITY OF

PORTLAND, OREGON

OFFICE OF PUBLIC UTILITIES

Sam Adams, Commissioner
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August 15, 2008

Gary Blackmer
City Auditor
1221 SW 5th Ave
Portland, OR 97204

Dear Gary,

Thank you for your Follow-up Audit of Street Paving. I am pleased with the progress that has been made by the Portland Office of Transportation in the last fifteen months. Your report documents a wide range of improvements as well as the timeline for implementation of the new paving management system, which will add significant capability to our paving program.

The Audit also underscores the need for additional funding to address the huge deferred maintenance backlog and to properly and cost- effectively maintains our existing streets.

City Council recently approved an ordinance, which I introduced, to dedicate a portion of the Utility License Fee revenue to begin to fill the funding gap for Transportation, created by escalating petroleum related costs and a precipitous decline in gas tax revenues. As the gas tax no longer serves as an adequate source of funding for transportation, we will pursue solutions at the state and regional level. In addition, we strive to improve or cost effectiveness and our quality of performance. By identifying areas for improvement and in raising awareness of the relationship of maintenance of streets to inadequate funding, your services assist the Office of Transportation in our goals.

Sincerely,

Sam Adams, Office of Public Utilities
City Commissioner

CITY OF
PORTLAND
OFFICE OF
TRANSPORTATION

Sam Adams
Commissioner

Susan D. Keil
Director

Don Gardner
Engineering & Development

Lavinia Gordon
System Management

Suzanne Kahn & Eric Peterson
Maintenance

John Rist
Business Services

Paul Smith
Planning

August 14, 2008

Gary Blackmer
City Auditor
1221 SW 4th Avenue
Portland, OR 97204

Dear Mr. Blackmer:

The Portland Office of Transportation is pleased to respond to the Follow-up Audit of Street Paving (Report #359). I appreciate the independent review work of the Audit Services Division and believe that the information provided in the audits has helped us improve our paving program.

As this report points out, we have completed eight of the thirteen recommendations in the previous audits and are taking steps to implement all the others. We anticipate that we will have two more recommendations completed by the end of September when our consultant is projected to have completed the Least Cost Model. This should provide us with sufficient information to determine if the City is least cost on paving projects that are defined as a public improvement by ORS 279.030 (greater than 2" in depth, and greater than $125K). If the city is found to be least cost on these types of projects it would greatly increase our flexibility and efficiency on small projects with paving requirements greater than two inches in depth. In addition, we will have the three remaining recommendations from the audits completed by summer 2009 when our new Pavement Management Software system comes on-line.

However, PDOT is facing challenges. As you show in your report, PDOT's General Transportation Revenue (GTR), which is made up of gas tax and parking revenue, has only slightly increased over the past seven years. (See Figure 5 on Page 11) These revenues have not kept pace with inflation. The state gas tax has not been increased since 1993, while the price of oil has increased dramatically. As a result, recently, people have been driving less. Consequently, gas tax revenue for PDOT has been declining at the same time our material costs for paving, particularly asphalt and fuel have increased markedly. Attached are graphs of BOM's cost to purchase asphalt and also of fuel costs and liquid asphalt costs from the Oregon Department of Transportation's website.

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As the graphs show, since October 2003, fuel costs have increased 339% and liquid asphalt costs have increased 280%. Due to increasing costs and declining revenue we have completed fewer miles of preventative paving. Our own tracking of fuels costs since July of 2007 show that bio-diesel is 69% higher and unleaded fuel has increased by 40%. In addition, our records show that the price per ton of asphalt that we purchase has increased 113% since February 2005.

PDOT's management is currently going through a process of reviewing and prioritizing every dollar of GTR expenditures. In addition, City Council is helping to cover our immediate funding problems by allocating a portion of increases in the Utility License Fees to PDOT. However, without a long-term funding solution, the amount of preventative maintenance paving being performed will continue to decline and the city's backlog of streets needing maintenance will continue to increase as shown in your report.

I appreciate your thorough reviews and the range of issues your staff has examined. I believe that, because of your audits, we have improved our paving program more rapidly than we would have otherwise.

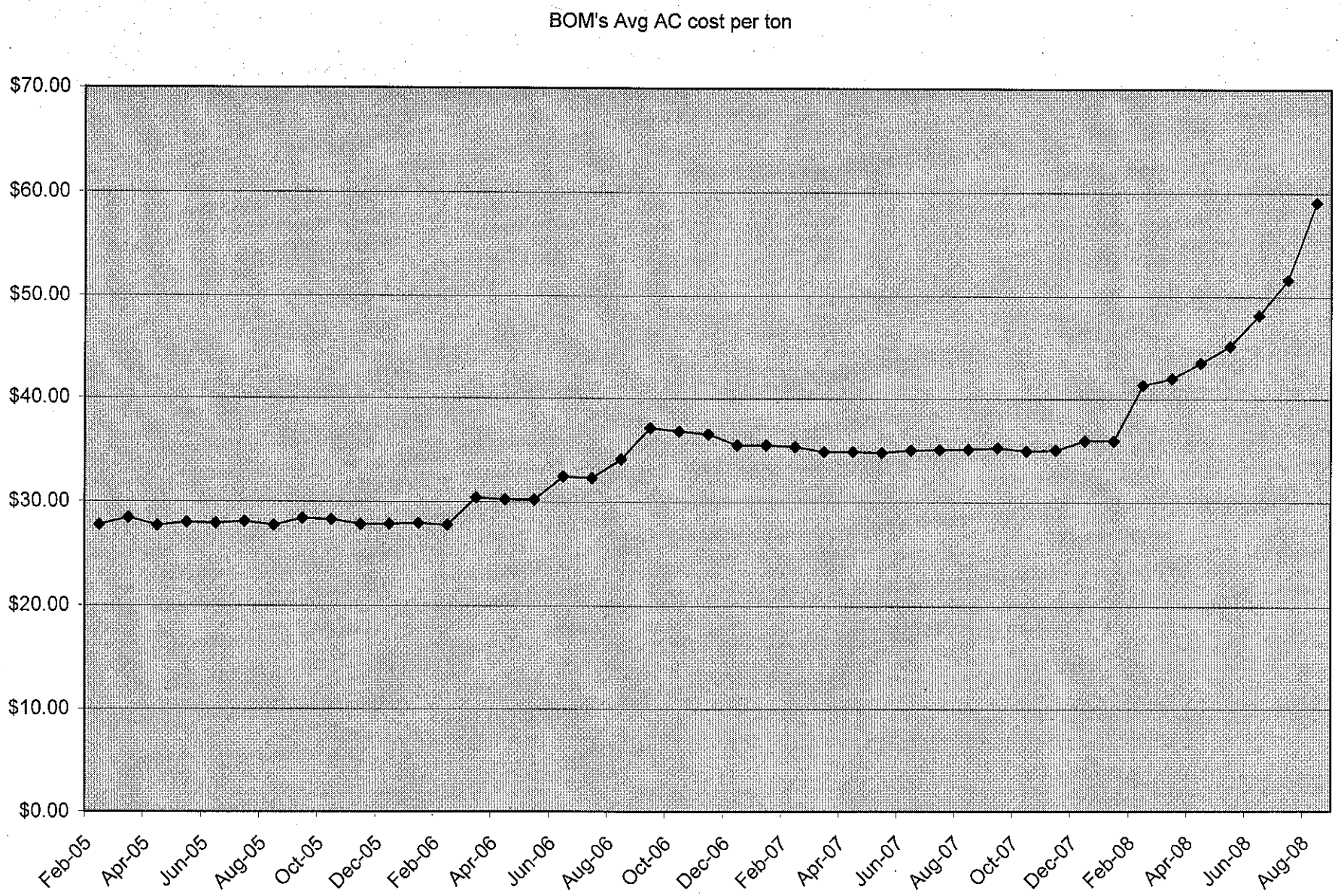
Sincerely,

Susan D. Keil

Susan D. Keil
Director

Attachments

CC: Commissioner Sam Adams
City Council
Suzanne Kahn (BOM)
Eric Peterson (BOM)
John Rist (Finance)
Ken Kinoshita (Finance)
Steve Townsen (PDOT)
Brian Oberding (PDOT)


BOM's Avg AC cost per ton
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
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Feb-05
Apr-05
Jun-05
Aug-05
Oct-05
Dec-05
Feb-06
Apr-06
Jun-06
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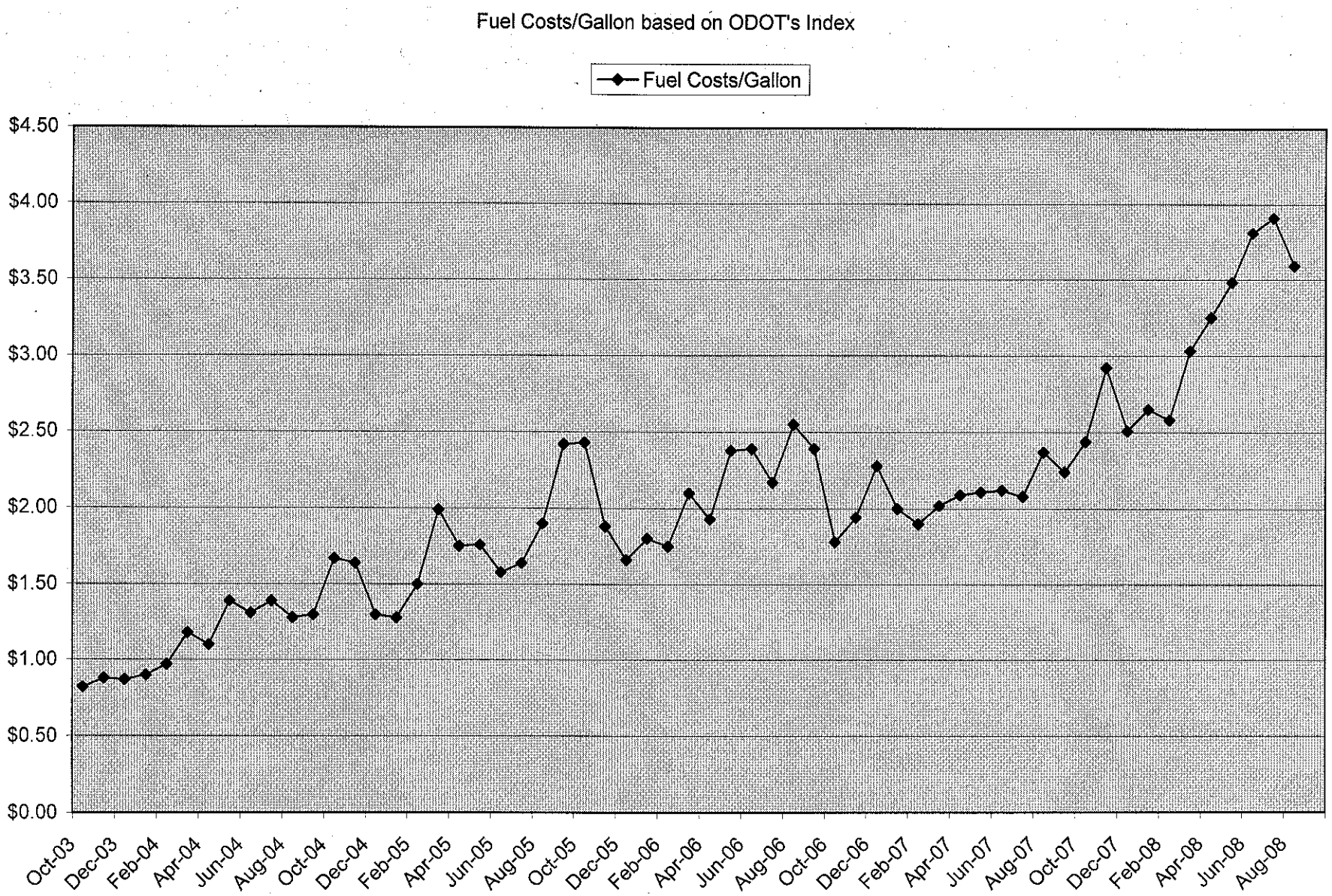
Fuel Costs/Gallon based on ODOT's Index
Fuel Costs/Gallon
$4.50
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Oct-03
Dec-03
Feb-04
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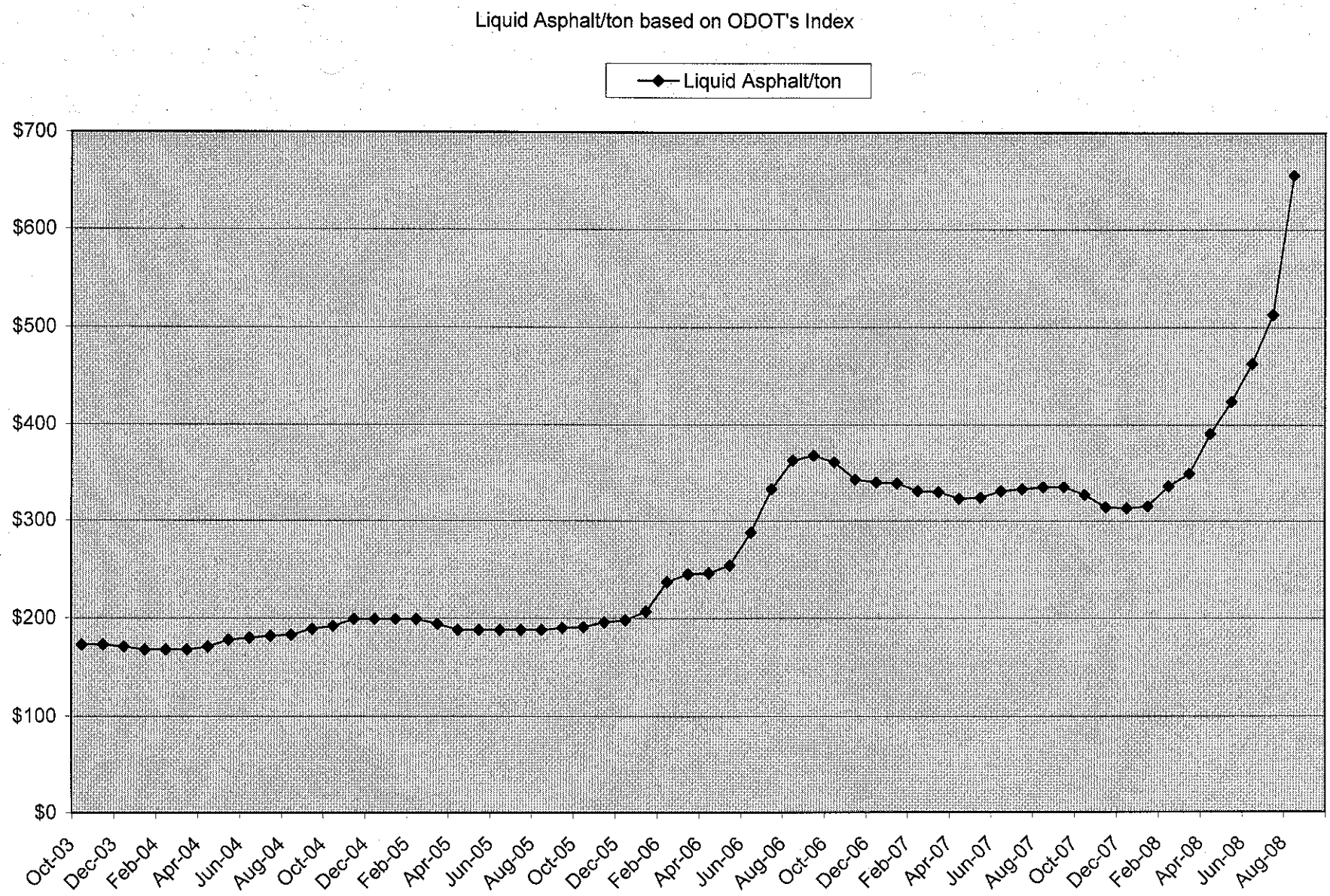
Liquid Asphalt/ton based on ODOT's Index
Liquid Asphalt/ton
$700
$600
$500
$400
$300
$200
$100
$0
Oct-03
Dec-03
Feb-04
Apr-04
Jun-04
Aug-04
Oct-04
Dec-04
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Street Paving: Office of Transportation improved quality assurance, but is resurfacing fewer streets

Report #359, August 2008

Audit Team Members: Doug Norman
Beth Woodward

Gary Blackmer, City Auditor
Drummond Kahn, Director of Audit Services

Other recent audit reports:

Downtown SmartMeters: Most goals met, but cost-benefits and reliability need further review (#352B, July 2008)

Housing Tax Abatements: Oversight inadequate to ensure program goals (#362, July 2008)

Office of Neighborhood Involvement: Clearer goals and more comprehensive measures needed to improve accountability (#363, June 2008)

Public Participation in Capital Projects: Bureau processes align with best practices but should be formalized and available to residents (#347, March 2008)

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