



CITY OF

PORTLAND, OREGON

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REPORT TO COUNCIL

Accept this report to council on Portland Office of Transportation Street Preservation Implementation Report Plan.

BACKGROUND

In 2007, at the request of Portland Department of Transportation (PDOT), the Audit Services Division of the City Auditor's office conducted a series of audits of PDOT's Street Preservation Program. The audits examined four functional areas 1) compliance with least cost standards per Oregon Revised Statutes (ORS) 279C; 2) street maintenance and preservation; 3) asphalt price and supply stability; and 4) asphalt quality and city standards.

In response to the 2007 audits, Portland Transportation Commissioner Sam Adams established a Pavement Oversight Taskforce, including engineers and construction professionals from both the public and private sector. PDOT provided and discussed with the Taskforce its draft plan to implement necessary changes and create solutions to the problems highlighted in the audits. The Taskforce reviewed PDOT's draft plan and offered robust feedback, which is incorporated into this audit implementation plan. The result is the following implementation plan and analysis, which addresses each of the recommendations in the audits.

Audit #1 Street Paving: City Needs To Demonstrate Least Cost

When the City of Portland's Bureau of Maintenance (BOM) plans to perform street paving work that meets the criteria of a "public improvement," that work is governed by state statute. Under ORS 279C §305, the improvement must be reported by the City to Oregon's Bureau of Labor and Industries (BOLI). Additionally, if the City plans to internally perform the work on a project which costs more than \$125,000, the City must satisfy the statutory requirements related to "least cost" for performing public improvements. This essentially means that the City must prepare an analysis of whether performing the work in-house is the least cost alternative. Based on its findings that BOM did not follow these requirements, the Auditor's office made the following recommendations.

***Recommendation #1:** BOM should develop cost estimating procedures to determine when a planned paving project represents a public improvement, as defined by ORS 279C.305 (5).*

Audit Findings: The audit review found that 22 percent of BOM's in-house paving projects, representing \$3.6 million (58 percent) of BOM's total expenditures for the 2005 paving projects, should have been characterized as "public improvements" and reported to BOLI.

Oregon public contracting law for public improvements, set forth in ORS, Chapter 279C §305(1), contains the least-cost policy for public improvements: "It is the policy of the State of Oregon that contracting agencies shall make every effort to construct public improvements at the least cost to

the contracting agency.” In 1987 the Oregon Legislature amended ORS 279C.305: “For purposes of this section, resurfacing of highways, roads or streets at a depth of two or more inches and at an estimated cost that exceeds \$125,000 is a public improvement.”

Response: The Auditor conducted an RFP process and the City has selected Dye Management to develop the tools necessary for an effective "Least Cost Analysis" process. Dye is examining both the City's and private sector's costs. The model developed through this analysis will allow PDOT to determine a basis for estimating projects and comparing costs with an outside contractor's costs. Dye submitted their final report on Friday, April 27, 2007. Stakeholders are currently reviewing the report. After the report is reviewed, PDOT will ask Dye Management to actually perform a "least cost" analysis. This analysis would be based on the criteria in Dye Management's report and will compare actual costs for projects constructed by BOM and outside contractors. This information will allow PDOT to accurately compare cost between work performed by the Bureau of Maintenance and outside contractors.

BOM has incorporated the recommendations established in the final report for new cost estimating procedures. These procedures give PDOT more accurate data to determine when a paving project meets the statutory criteria of a public improvement and triggers BOLI's reporting requirements. *Please see Exhibit 1 Recommended Methodology of Pavement Cost Assessment Final Report produced by Dye Management.*

STATUS: *Least cost estimating procedure will be in place September 2007. Improved procedures are in place and more accurate estimates are currently being made.*

Recommendation #2: *BOM should ensure that its public improvement projects are reported to OMF for inclusion in the City's annual report to BOLI.*

Audit Findings: Because PDOT did not consider some paving projects to be public improvements as defined in statute, the City did not report them to BOLI.

Response: PDOT is improving the departments' cost estimating procedures. PDOT staff will create an estimate of cost for each project approaching or exceeding the \$125,000 threshold, documented costs from previous projects, and the methodology developed by Dye Management. After a project is completed, PDOT will then compare the actual costs against the estimate. This new process allows PDOT to refine the estimating process for future projects and, using the "least cost" criterion, accurately predict which projects are suitable for in-house paving work and which are appropriate for a private sector bid. PDOT is fully in compliance with BOLI's requirements.

In the future, PDOT will report all public improvement projects to OMF for inclusion in the City's annual report to BOLI. Additionally, PDOT will provide mid-year revisions to OMF. PDOT has implemented a procedure for estimating projects and is testing the system. *See Exhibit Examples of estimation documents .*

STATUS: *Complete. PDOT is in full compliance with BOLI's requirements.*

Recommendation #3: *BOM, 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.*

Audit Findings: The law requires that before constructing a “public improvement,” as defined by state statute, with its own equipment or personnel, the City must prepare plans and specifications sufficient to control the performance of the work and ensure satisfactory quality of construction. The City must also estimate the unit cost of each classification of work, including a reasonable allowance for the cost of any equipment used. Plans, specifications or unit cost estimates had not been prepared for any of PDOT’s in-house work previously.

Response: The City is currently converting the City’s Standard Construction Specifications to ODOT format. By September 2007 specifications for these projects will be included. When performing work that is categorized as a “public improvement,” PDOT will prepare adequate plans, specifications and unit cost estimates for each classification of work. These estimates, using the Dye Management methodology, will determine if projects conform to both PDOT’s and internal “least-cost” policy and the statutory requirements. Furthermore, PDOT will maintain a full, true and accurate record of actual project costs on projects that are performed in-house. The Dye Management “least cost” model is currently being tested. Completion will be September 2007.

STATUS: *Substantially complete. Full completion in September 2007.*

Audit #2 Street Paving: More Proactive Maintenance Could Preserve Additional City Streets Within Existing Funding

The City of Portland currently has a serious backlog of streets that need repair. The backlog has increased from 439 miles in 1991 to 597 in 2005. After adjusting for inflation the Auditor’s Office found that street preservation expenditures have increased slightly over the past ten years and the Street Preservation Program has not used its resources in the most cost-effective manner.

Budgeting shortfalls have forced PDOT to focus its efforts on repairing streets in poor condition rather than prolonging the life of streets in good condition. Because the prioritized repairs are more extensive and costly, PDOT is able to repair fewer miles of streets with the limited funding available. *Please see exhibit 3 PDOT Five Year Revenue Budget and Forecast.*

Recommendation #1: *Develop a proactive preventative maintenance program to be applied to newly constructed and resurfaced streets and other streets in good condition.*

Audit Findings: The audit found that PDOT’s Street Preservation Program has concentrated its efforts on repairing streets in poor condition, including short-term fixes of badly deteriorated streets. PDOT has not incorporated sufficient proactive, preventative techniques designed to prolong the lives of streets in good condition. This approach has resulted in higher costs for repair of fewer streets and an inability to improve the overall condition of streets. *See Exhibit 4 Pavement Life Cycle.*

Response: PDOT agrees with the Auditor that the criteria and management system used for selecting candidate streets for resurfacing needs revision. It is necessary to replace the old system because it is so outdated that PDOT’s Information Technology staff purchases replacement parts using EBAY. Additionally, the old system is very labor intensive, inefficient, and does not have the capabilities available with modern systems. The old system is only applicable for asphalt streets, does not account for concrete or composite pavements and recognizes only local and

collector/arterial streets, which limits its usefulness. Additionally, the old system does not differentiate between streets used for transit or freight routes. This information is crucial because freight and transit routes deteriorate more rapidly due to heavy freight loads and the weight of buses. The old system is limited further because it can not be tied directly to PDOT's GIS system and does not have predictive model capabilities.

PDOT is transitioning to a new Pavement Management System (PMS) which will identify and recommend potential candidates for maintenance, based on the classification of a street (local, collector or arterial) as well as the type of traffic (freight, transit, or automobile). These recommendations will not eliminate the need for specific testing or visual inspections. The PMS will provide an additional tool for selection of streets for maintenance. The system will predict what the overall condition of the system is, and will allow PDOT to prioritize based upon different budgeting scenarios. The PMS will assist PDOT in calculating the funds needed to raise the condition of the streets to a desired level. The PMS is tied to a Geographic Information System (GIS), which allows the program to seamlessly map projects and to comprehensively plan. The PMS will analyze the condition of different types of pavement including asphalt, concrete and composite pavements. The selected system is standard in the industry and is expandable for the future. *See Exhibit 5 Applied Pavement Technology, Inc., Executive Summary, Pavement Management Business Practices Analysis.*

The new PMS identifies collectors and arterials and prioritizes projects automatically. Because of their importance to the economy and city as a whole, projects on major freight or transit routes are the Bureau's highest priority. Given the department's limited resources, PDOT is unable to provide adequate maintenance for the entire system and needs to prioritize its work; streets carrying primarily automobile traffic are PDOT's lowest priority. PDOT has found 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. *See exhibit 4 Pavement Life Cycle.*

STATUS: *Pavement Management System in place fall of 2008. Revised criteria for street prioritization adopted.*

Recommendation #2: *Adopt the remaining service life (RSL) approach to planning and budgeting the street preservation program.*

Audit Findings: The audit found that PDOT was focusing on its repair backlog and needed to proactively identify a combination of treatments it could apply to gain the most years of street life over the entire street system. The auditor determined that a larger number of streets can be maintained with lower-cost preventative maintenance.

Response: PDOT is committed to maintaining streets with lower cost preventative maintenance. RSL is one of the many theories on how best to preserve street function and is used by the federal government specifically in relation to highway projects. However, PDOT believes that RSL is best applied when analyzing a product with a predetermined "useful life." For example, RSL is used when discussing a piece of equipment that will be used up and replaced at the end of its use. RSL is appropriate when discussing a factory, but is less useful for streets or bridges. PDOT and the Pavement Oversight Taskforce found no comparable jurisdiction with similar infrastructure using RSL; instead, they use "optimization" methodology.

Most streets in Portland were built over 80 years ago, at the time when there was no science to street design. Streets were primarily laid so the newly invented automobile could stay out of the mud. Consequently, no predetermined specifications existed. Successive layers of asphalt were put down, over time. When many of Portland's streets were built, nobody planned there would be as many vehicles as there are today, or that buses and trucks would be so heavy. It wasn't until the 1960's that an industry standard was established for street design. Most of Portland's collector/arterials are much older than that and were never actually designed. If PDOT used RSL, it would show almost all of the City's collector/arterials and local streets are past the "service life." In reality these streets still have many years of useful life and they are still used today. RSL is not flexible for a city street system and is more appropriate for an object that is entirely exhausted.

As discussed above, Dye Management is assisting PDOT in the development of a maintenance approach that "optimizes" pavement life and is appropriate to Portland's circumstances. The new software will apply the "optimization" paradigm and allows PDOT to consider multiple factors, such as use, street type, and pavement material. The new software will be in place in Fall of 2008.

The audit also noted that "We believe an appropriate type of slurry seal or other preservation treatment should be utilized to extend the life of arterial as well as local streets." PDOT disagrees; it uses a variety of preservation techniques for local streets such as crack seal, slurry seal, base repair, and minor overlay. For collector and arterials streets, PDOT uses crack seal, base repair, grind and inlay, overlay, and reconstruction. Slurry seal is used as a preservation technique only on local streets. Due to the heavy traffic volumes on arterials, slurry seal would wear in a very short amount of time. Experts in the community and nationally agree that PDOT's use of slurry seal on local streets, as well as the variety of other appropriate preservation techniques are successful tools for preserving the life of Portland's streets.

PDOT plans to continue to improve its efforts to preserve streets in good condition, while addressing the declining streets. The implementation of the new PMS will allow PDOT to improve its ability to maintain the City's street system. By prioritizing streets according to their importance, considering the use of the street, and applying appropriate maintenance procedures at the appropriate time, PDOT will be able to better analyze the conditions of the streets and preserve City assets.

STATUS: *In process with Implementation of the Pavement Management System. Completion estimated fall of 2008.*

Recommendation #3: *Establish better procedures for categorizing and tracking street preservation work activities.*

Audit Findings: The audit found that PDOT should segregate structural overlays from preservation overlays and arterial streets from local streets when tracking work activities and their associated costs. The audit also states that PDOT should do a better job of distinguishing preventive maintenance from rehabilitation and reconstruction work. In addition, the audit found that PDOT should track the number, location, timing, and cost of pothole repairs. This data would allow PDOT to do a better job understanding actual street conditions and evaluating best maintenance activities.

Response: PDOT will develop a cost reporting system that will track individual work activities and associated cost. This will provide PDOT more detailed information about the work performed, location of work performed and distinguish between preventative maintenance and rehabilitation work. In addition, PDOT will track the location and costs of the potholes patched. The new tracking system should be in place by Fall of 2007.

STATUS: *In process. Complete fall 2007. Tracking is occurring presently.*

Recommendation #4: Evaluate the need to establish a Pavement Engineer Position

Audit Findings: PDOT needs the expertise of an engineer to specialize in pavement design and maintenance. A Pavement Engineer within PDOT would assist in decision-making regarding all phases of pavement design and maintenance. With the new Pavement Management System under development, the involvement of a Pavement Engineer is essential to gain full value for the City.

Response: PDOT agrees and is engaged in hiring a skilled engineer with extensive and current knowledge of paving techniques and systems. The Pavement Engineer will report directly to PDOT's Chief Engineer and will implement all design and maintenance decisions. This position will support the development and implementation of the new Pavement Management System.

STATUS: *In process. The position has been posted and PDOT is actively recruiting for this position.*

Audit # 4 Street Paving: Current Contract Management Practices Put Asphalt Price And Supply Stability At Risk

The City entered into a new strategy for negotiating asphalt supply contracts in an effort to lower asphalt prices and obtain volume discounts. Each year the City plans to pave about 50 miles of streets. This work requires approximately 100,000 tons of asphalt, which is purchased from local suppliers. The City developed a multi-round bidding strategy, which granted two vendors primary status and two vendors secondary status. The secondary vendors are permitted to re-bid on an annual basis.

The strategy created a competitive pricing environment and had the potential to lower asphalt prices. Prices paid by the city were well below the prices paid by other jurisdictions. However, the contracts allowed vendors to cancel the contracts on 30 days notice at their discretion, thereby undermining the reliability of the City's asphalt supply. Furthermore, while the contracts also allowed for price adjustments, other adjustments had been made. While these price adjustments were relatively small, their approval of adjustments outside the terms of the contract had a negative affect on price integrity.

The contracts allowed for purchases from a secondary supplier when the primary is not able to meet the needs of the City. The reasoning behind the provision is that it ensures the City a low price in exchange for a guarantee of a primary position for filling the order. There were occasions where a secondary vendor was used due to the close proximity of the supplier to the work site, rather than the inability of the primary to meet the needs of the City.

Another provision of the contract allowed for rebates if a certain amount of asphalt was purchased from a particular supplier. The City did not maximize the use of rebates because of competing concerns about the cost of waiting time and the distance of the supplier from the work site.

Recommendation #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.*

Audit Findings: The City's current asphalt supply contracts do not ensure that vendors will provide asphalt to the City for the duration of the contracts. Contract amendments should limit the suppliers' rights to early termination for cause.

Response: In August 2006, contract amendments limiting asphalt suppliers' rights to early termination were prepared and delivered to the four contracted asphalt suppliers. Three of the four suppliers have signed and returned the amendments. The City's current contracts with three of the suppliers ensure that PDOT will have a constant source of quality asphalt at a competitive price.

STATUS: *Amendments preventing early termination of contracts have been signed by three of the City's asphalt contractors. New contracts have been drafted. Bid documents will be released in June 2007.*

Recommendation #2: *Purchasing should not approve price increases beyond the adjustments provided for in the contracts.*

Audit Findings: Granting price increases outside of the contract provisions eliminated the price stability the contracts were intended to provide. If vendors believe a price increase will regularly be approved, the city loses its ability to ensure stable pricing in the future. Only contractually agreed-upon price adjustments based on the cost of liquid asphalt will be approved.

Response: As of August 2006, the Bureau of Purchases staff is operating in conformance with the asphalt contracts. Adjustments will only be allowed under outlined standards in the supply contracts.

STATUS: *Completed August 2006.*

Recommendation #3: *PDOT should abide by the City's contractual commitment to the primary vendors.*

Audit Findings: The Street Preservation Program has used secondary vendors in a manner that violates contract provisions. The program should purchase all of its asphalt from the primary vendors, unless the supplier cannot meet the City's needs. There should also be adequate documentation of the justification for purchases from other vendors.

Response: Supervisors have historically calculated the waiting time of the crew and the probable temperature of the asphalt into the decision of where to obtain asphalt. The use of secondary vendors was influenced by the cost associated with every minute of staff and equipment time. PDOT has developed criteria to assist supervisors in determining if the use of a secondary supplier is justified. As of October 2006, all purchases are documented. Supervisors document reasoning behind purchase of asphalt from secondary suppliers. Due to the rebate system, it is

difficult to calculate a formula that is applicable to the wide variety of circumstances involved in a project.

Following recommendations for the Taskforce, the City is revising its contracting strategies. In order to give PDOT and the Bureau of Purchases sufficient time to develop a new contract form and specifications, the existing contracts were extended under the one year option form March 2007; however, the current suppliers and potential future suppliers were informed of PDOT's intention to prepare and issue a new solicitation as soon as possible, and to then terminate the existing agreements. PDOT and Purchases have worked together to prepare the new solicitation which will be issued in June 2007.

The new elements of the revised solicitation are:

- A. Incorporate ODOT specifications, which include monetary penalties for quality shortcomings, price escalation/de-escalation provisions, and a Quality Assurance/Quality Control program.
- B. No quantity rebates will be included. The Taskforce felt that quantity rebates unnecessarily complicated the choice of vendor for a particular project and that, if rebates were not to be considered, vendors would offer their best prices in the base bid.
- C. There will be no primary/secondary vendor distinction. PDOT staff will have access to all approved vendors and will choose the best vendor for a particular project based on price and location.

STATUS: *Completed October 2006.*

Recommendation #4: *Develop an accurate process for identifying the most cost-effective primary asphalt vendor for each paving job.*

Audit Findings: PDOT's Street Preservation Program overestimated the impact of the distance of asphalt vendors from job sites and failed to obtain all possible rebates during the first year of the new asphalt supply contracts. In addition to the costs associated with job location, PDOT should have considered the price of asphalt and the value of annual rebates in selecting which primary vendor to use.

Response: PDOT has developed a system to identify the most cost-effective primary asphalt vendor for each paving job. The most cost-effective vendor depends on the price of asphalt and the travel time to the project, in addition to rebates under the contract. The system is currently in place for the 2007 paving season.

However, the Taskforce believed that quantity rebates unnecessarily complicate the choice of vendor for a particular project and that, if rebates were not to be considered, vendors would offer their best prices in the base bid. Consequently, rebates will not be incorporated into the new vendor contracts.

STATUS: *Complete, system currently being used.*

Audit #4 Street Paving: PDOT Work Not Meeting Pavement Quality Standards

Pavement life depends on the quality of materials and the processes used during construction. Poor quality pavement deteriorates more rapidly, increasing costs to the City and inconveniencing the public. Testing and inspection is essential to quality assurance. Asphalt supply companies are responsible for checking the quality of asphalt in order to provide a mix that conforms to the specifications of the contract. PDOT checks the quality of the asphalt by taking samples at the paving site and having them tested at the City's Materials Testing Laboratory. In addition to checking the mix gradation against the ODOT standards, laboratory personnel calculate each sample's maximum possible density. This calculation allows street preservation inspectors to determine adherence to pavement density standards.

After a 1988 audit revealed that 83 percent of newly-paved streets had low pavement density, PDOT began testing the mix of asphalt obtained from suppliers, added inspectors to paving crews and began testing the density of newly paved streets. A review of paving tests kept on file for the last three years revealed that two-thirds of tested asphalt did not meet mix contract requirements and 60 percent of new pavement tested did not meet City density requirements.

As a result of this audit PDOT has invested significant time and energy in training. After the current paving season, PDOT will provide a comprehensive report of the department's quality assurance results.

In addition, the new vendor contracts will incorporate ODOT specifications, which include monetary penalties for quality shortcomings, and a mandated Quality Assurance/Quality Control program.

PDOT improved its testing procedures, and all testing will be performed by qualified and skilled staff. When the quality assurance plan is finalized, the appropriate staff will be fully trained on methodology. Training is already occurring.

***Recommendation #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.*

Audit Findings: The street preservation program needs a written plan that explains the specific actions staff and managers should take to assure the quality of the asphalt. The plan should identify the roles and responsibilities of all personnel involved in verifying quality and responding to substandard quality. The plan should describe key activities such as testing and notification procedures by both the City and the asphalt suppliers. Furthermore, the plan should also list acceptance and rejection criteria for asphalt, as well as corrective measures.

Response: PDOT has developed a quality assurance plan that delineates procedures and responsibilities for monitoring quality control and for taking corrective actions when deficiencies are discovered. Unfortunately, until the new vendor/supplier contracts are entered into, not all of the items listed in the plan can be implemented. The crews and supervisors have reviewed the quality control plan and the Quality Assurance/Quality Control technician is working with the crews in the field to follow the procedures developed to assure asphalt quality. PDOT is training personnel on the elements of the quality assurance plan and compliance procedures. PDOT has significantly improved its testing procedures, and all testing will be performed by qualified and

skilled staff. *See Exhibit 6 City of Portland Office of Transportation Draft Paving Program Quality Assurance Plan.*

STATUS: *Drafted Quality Assurance Plan. PDOT expects plan to be in place with the new asphalt supply contracts. September 2007.*

Recommendation #2: *Develop clear and complete specifications for the desired quality of asphalt mix.*

Response: PDOT adopted the Oregon Department of Transportation (ODOT) specifications for asphalt over ten years ago. Purchasing has updated PDOT's contracts to include the revised ODOT specifications. The ODOT specifications will be used in all new bids for asphalt.

STATUS: *ODOT Specifications have been adopted by PDOT. Full completion will happen with new asphalt contracts in September 2007.*

Recommendation #3: *Increase in-house technical expertise on pavement design and quality; provide more training for Street Preservation personnel; and include pavement quality in performance measures and employee evaluations.*

Audit Findings: Past acceptance of substandard asphalt mix and problems with the current specifications indicate that street preservation needs additional technical expertise to protect the City's investment in its pavement assets. A paving engineer specializing in maintenance could help address technical issues. Additionally, a technical specialist could determine the training needs for the paving staff. Street preservation's employee evaluation could include performance measures relating to quality assurance.

Response: PDOT will provide additional quality assurance training for street paving personnel. In-house expertise will be increased, and the new Pavement System Manager will provide additional knowledge of pavement design and quality. Lab staff, trained in collecting data and performing testing, will be solely responsible for testing the quality of the asphalt.

Testing procedures are now uniform, and quality is being closely monitored. However, not all items in the quality assurance plan can be implemented until the new asphalt supply contracts are in place. Employee evaluations of staff responsible for quality assurance will include performance measures on skill and compliance. Quality assurance training is ongoing and lab staff members are currently the only employees who measure quality. PDOT will release a report of testing results after the 2007 paving season.

STATUS: *Training has been implemented. Testing procedures have changed and are in effect. A Paving System Manager candidate is being recruited. Quality related performance measures will be included in personnel evaluations by December 2007.*