Seattle Department of Transportation

Operational, Management, and Efficiency Analysis

Phase I: Preliminary Analysis of Operations and Management and Identification of Short-term and Long-term Opportunities

September 2013

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TransTech
Management. Inc.

TKW

Talbot, Korvola
& Warwick, LLP

Certified Public Accountants
& Consultants

4800 Meadows Road, Suite 200
Lake Oswego, Oregon 97035-4293

P 503.274.2849
F 503.274.2853

www.tkw.com

September 2013

Ms. Jane Dunkel
Assistant City Auditor
Office of City Auditor
700 Fifth Avenue, Suite 2410
Seattle, WA 98124-4729

Dear Ms. Dunkel:

We have completed our preliminary analysis of the Seattle Department of Transportation's operations and management. This report contains our assessment and the identification of short-term and long-term opportunities for future consideration for review.

We wish to express our appreciation to SDOT and other personnel with whom we spoke for their cooperation and assistance during this analysis.

Sincerely,

Talbot, Korvola & Warwick, LLP

Seattle Department of Transportation

Operational, Management, and Efficiency Analysis

Phase I

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Introduction

The Project

The Seattle City Council initiated an assessment of the Seattle Department of Transportation's (SDOT) organizational structure and operations. The project contains two phases. The first, a preliminary analysis of SDOT's management structure and operations to identify and define short and long-term opportunities for operational efficiency, is included in this report. The result of this analysis will lead to Phase II - a more detailed analysis of specific areas that will identify and recommend changes to operational approaches and management practices that could yield budget efficiencies, increased productivity, and better outcomes for maintaining and improving the City's transportation infrastructure.

Methodology

Phase I focused on identifying SDOT's organizational structure, its approach to planning, budgeting, finance, prioritizing, and managing, and its methods to deliver expected services. Once these attributes were determined, each was benchmarked against industry standards, peer organizations, and best practices and rated as either:

- · Consistent with Best Practices,
- · Areas For Improving Efficiency and Effectiveness
- · Priority Improvements – In Process, or
- · Key Issues for Further Analysis

Our initial conclusions were based on interviews with many department employees, an evaluation of numerous documents, files, and websites, and a review of industry best practices. This analysis however, did not validate many of the practices identified as being in use, test/assess their efficiency and effectiveness, or identify specific recommendations. Those areas reviewed in Phase II will focus on further determination of opportunities for improvement.

Preliminary Analysis

The following summarizes our preliminary analysis by SDOT division:

Consistent with Best Practices	
SDOT is operating consistent with best practices or is considered a best practice leader in the industry.	
Division	**Activity or Attribute**
Director's Office	**Management Structure** Relatively "flat" organization with direct reports to deputies and Department Director. **Budget Planning and Control** Budget development, management, and control are in place. Financial performance is tracked and reported. **Communications** SDOT has developed a number of mechanisms to communicate information (through the Web-site, town halls, mailings, etc.). **Standardization of Agency Operations** Agency-wide operating procedures, division-specific practices. **Strategic Planning & Management** Robust strategic planning mechanisms.
Street Maintenance Division (SMD)	**Budget Control** Allows timely fiscal information which is critical for managing the maintenance program and staying within budget limits. **Customer Service – Best Practice Leader** Answers customer service requests in a timely manner. Established a customer request tracking system. Monitor service request status. **Bridging the Gap Reporting** Information is processed to provide specific numeric values with an associated cost. **Pothole Repairs and Emergency Staffing - Best Practice Leader** Provides 24/7/365 emergency response without paying for expensive overtime. Can respond in minutes rather than in hours. **Winter Weather Maintenance** Developed standard operating procedures (SOPs) for dealing with winter weather. Incorporates anti-icing into snow and ice response plan.
Policy and Planning Division (P&P)	**Strategic Planning** Produces a clear statement of strategic direction, policies, and desired outcomes. **SDOT Action Agenda** Communicating accomplishments to public in terms they can relate to on a personal level. **Modal Strategic Plans** Master plan determines priorities for funding standalone projects and identifies corridors for implementing modal enhancements throughout the City. **Success in Grant Funding** Grant funding helps to supplement SDOT's budgets for specific projects that would otherwise not be completed or would not have been completed as quickly.

Consistent with Best Practices
SDOT is operating consistent with best practices or is considered a best practice leader in the industry.

Division	Activity or Attribute
	Expansion of Transit Service City choice to supplement King County transit to increase Level of Service and frequency of transit routes helps reduce vehicular traffic and congestion, and provides a viable option for mobility. **CIP Prioritization - Best Practice Leader** Prioritization process is a number driven methodology that assigns points to each candidate project based on how well the project meets the core principles and objectives of the City. **Complete Streets Reviews** The division is the responsible entity for ensuring SDOT and others making street improvements comply with the 2007 enacted Town Council Complete Streets directive. Reflects best practice in that one business unit is responsible for a specific activity. **Customer Service and Stakeholder Input - Best Practice Leader** Dedicated to strong customer service philosophy, engages public in development of various modal master plans, and continually seeks input from citizens of Seattle.
Capital Projects and Roadway Structures Division (CPRS)	**Project Delivery – Process and Procedure** A standard framework has been developed to ensure efficient and effective delivery of projects from development through close-out. **Project Management Plan** Establishes process and procedures for a structured approach to project delivery. Accountability is established for scope, schedule, and budget. **Value Engineering (VE)** Provides real-time information helping to identify cost savings through use of alternative methods to determine efficiencies. Has recognized value of VE practices. **Contractor Payments** Randomly selected project was reviewed and its payments were found to be in accordance with the Construction Administration Manual (CAM). **Project Close Out** SDOT CAM dictates correct procedures to follow. Initial review found that CPRS was compliant.
Major Projects Division (MP)	**Organizational Structure** Major Projects restructured to ensure accountability and ensure SDOT stakeholders are getting value from other agencies. New structure appears to be efficient.
Traffic Management Division (TMD)	**Signal Operations – Replacement Guidelines** Establishes system performance measures. Allows resource allocation decisions to be based on defined criteria. **Parking Operations and Traffic Permits - Best Practice Leader** *Parking Guidance System, Residential Parking Permits, Shared Parking, Elderly/Disabled Parking, Travel Management Plans, "Smartphone" Usage, Demand-Based Pricing* Provides real-time information; allows more awareness of availability; reduces neighborhood impact; reduces minimum parking requirements for elderly and disabled; ensures City Council has input into new development parking needs; reduces costs through use of alternative methods to determine price increases; increased efficiency through Smartphone use.

Consistent with Best Practices	
SDOT is operating consistent with best practices or is considered a best practice leader in the industry.	
Division	**Activity or Attribute**
Street Use Operations (SUO)	**Right of Way Permitting Best Practice Leader** Supports online and direct permitting; tracks permit status online; tracks review and counter writing times. **Right of Way Manual Best Practice Leader** *Online Right-of Way Manual* - supported by appropriate hyperlinks to supporting resources.
Urban Forestry (UF)	**Urban Forestry Management Plan** Allows SDOT to better assess progress and action to efficiently manage the City's urban forests. Currently working to update 30-year Urban Forestry Management Plan. **Tree Canopy** Tree City USA, Tree Growth City 150,000 street trees with a goal to increase tree canopy from 16% to 18% by 2014

Opportunities for Improving Efficiency and Effectiveness	
Current operations vary from best practices.	
Area	**Attribute or Activity**
Director's Office	**Training** Due to Citywide reductions in training budgets, SDOT had to eliminate formal management technical training and leadership development opportunities and focus on funding mandatory, safety-related training. As a result: · Policy & Planning Division does not have a formal workforce development program. · Street Maintenance Division does not have a formalized management and technical training program for its field personnel. · Capital Projects and Roadway Structures Division's formal system for transferring knowledge and lessons learned between project managers is cumbersome and could be improved. **Labor Contracts** The sheer number of unions at SDOT and differences in contract terms create opportunities for conflict between workers and management.
Street Maintenance Division (SMD)	**Reporting Mechanisms – Summit and Hansen** The Division's Maintenance management system is able to track work activities by type of work and location in a GIS format. However, it is not electronically linked to the financial system creating inefficiencies by requiring duplicative work processes. **Formalized Work Standards** Formal Work Standards have been created but not updated since 2005. Because this drives development of the annual work plan, incorrect work standards can result in inaccurate cost estimating numbers. **Employee Individual Performance Evaluations** Agency managers and personnel are not held accountable for tangible and measurable goals that contribute to the overall mission of SDOT.

Opportunities for Improving Efficiency and Effectiveness	
Current operations vary from best practices.	
Area	**Attribute or Activity**
	Outsourcing of Work for Utility Cuts SDOT self performs pavement repairs for SPU utility cuts. If demand for utility cuts grows to the pre-2008 levels, SMD will not have the capacity to perform this service in a timely manner.
Policy and Planning Division (P&P)	**Office of Strategic Assessment** SDOT's Asset Management program has suffered from the void left from the retirement of its program manager. Based on the Asset Management self-assessment, SDOT could improve in the following areas: 1. The regular collection of condition information on all assets. 2. Using asset management decision-supported tools to forecast future system performance given a set of proposed projects. 3. Using asset management decision-supported tools to forecast future system performance under different mixes of investment levels by program category. **Scoping of Future Projects** P&P relies on other divisions to develop cost estimates and/or validate estimates prepared by consultants. Funding cuts to other divisions however, threaten its ability to obtain these estimates. If preliminary cost estimates do not accurately reflect the cost of the project, over/under estimates can occur.
Capital Projects and Roadway Structures Division (CPRS)	**Project Delivery – Implementation** Tools are in place but consistent use was not apparent. **Document Management** Process allows for personal copies of project files to be kept and requested files were not readily available. Files can be lost or unavailable. **Cost Estimate Development** Accurate estimates provide a better cost management tool enabling decisions to be made with more precise information. **Risk Management** Although CPRS has a risk template, on the project we reviewed, the template was not completely filled out and employed as per best practices. As a result, the risk related to the project may not have been adequately quantified or considered. **Change Order Management** Although CAM details the process for managing change, an inordinate percent of project cost in change orders on two projects was identified. Budget overruns could result if the change order process is not managed in accordance with best practices. This is in the area of sign maintenance, sign manufacture, street striping, road stenciling, and other miscellaneous activities.
Major Projects Division (MP)	**Knowledge Transfer** An extensive level of information and experience reside with a few key staff, some of whom are eligible for retirement in 2013. No formal knowledge transfer process currently exists. **Interagency Projects** SDOT is actively involved with other agencies in the development of an effective and efficient area-wide transportation structure. However, the City has also assumed the ownership and maintenance of projects designed and built by other jurisdictions - projects that had minimal involvement by the City. As a result, the City is at risk of assuming a greater share of the cost, especially long-term maintenance costs, than they should.

Opportunities for Improving Efficiency and Effectiveness	
Current operations vary from best practices.	
Area	**Attribute or Activity**
Urban Forestry (UF)	**Budgeting and Funding** Below industry standards for best practices.

Priority Improvements – In Process	
SDOT has taken action to improve its operations.	
Area	**Attribute or Activity**
Grant Tracking	Additional centralized management and oversight could improve SDOT's ability to efficiently and effectively manage its grants. **SDOT Action:** SDOT requested funding for a centralized grants management position in its 2014 budget.
Corridor Studies	SDOT has identified several priority corridors for improvement within the City and is beginning to undertake studies of some of them. In the absence of these studies, SDOT will continue to lack the detailed information needed to review private development plans, plan for needed improvements along the corridors, and develop successful grant proposals. **SDOT Action:** To obtain the information needed to effectively manage the City's corridors, SDOT has requested funding for eight additional corridor studies in its 2014-15 proposed budget.
Access to Field Technology	Data entry tasks are inefficient, require duplicative work processes, and reduce the supervisory time available to work in the field, monitor, and manage the workforce in Traffic Field Operations and Street Use Operations: **SDOT Action:** *Street Use Operations* is exploring whether the use of tablet-style computers and improvements in infrastructure may offer the potential for improving workforce productivity while avoiding the negative experience of a 2007 effort to implement field-based data entry technology.
Traffic Management	**Existing Parking Technologies** Current technology is approaching end of life cycle. Major investment decision looming. **SDOT Action:** SDOT has acquired limited consulting services from an industry expert to begin researching options for replacing their parking pay stations. Possible additional consulting services could be funded in Phase 2 of this project.

The Seattle Department of Transportation

SDOT's 728 employees develop, maintain, and operate the City's streets, bridges, stairways, retaining walls, seawalls, signalized intersections, bike trails, on-street bicycle facilities, street trees, parking pay stations and meters and curb ramps. The City also maintains or improves critical transportation infrastructure of regional, statewide, and national significance in cooperation with external partners. Approximately 25% of the land area within City limits is

dedicated to travel.

SDOT's annual budget of over $310 million supports nine major divisions:

· Director's Office
· Resource Management
· Human Resources
· Street Use & Urban Forestry
· Street Maintenance
· Capital Projects & Roadway Structures
· Traffic Management
· Policy & Planning
· Major Projects

In 2006, Seattle voters passed *Bridging the Gap*, a nine-year $544 million transportation funding package for maintenance and improvements. The $356 million levy component specifically funds programs to address the maintenance backlog of paving; sidewalk development and repairs; bridge repair; rehabilitation and seismic upgrades; tree pruning and planting; and transit enhancements among others.

Our Preliminary Analysis

As a mature city, Seattle currently focuses its resources on optimizing or redeveloping existing facilities to make them safer, more efficient, and supportive of current and future urban needs. The Department of Transportation has been tasked with the effective and efficient allocation of those resources. As with other public agencies, revenue constraints pose significant challenges. Although the economy is beginning to recover, infrastructure needs continue to exceed available funding. Deferred (or no) maintenance will lead to more costly repairs. Increasing demands for alternative modes of transportation will require the refocus of limited resources. It continues to be extremely important for SDOT to prioritize its services and spend its revenues efficiently. Funding is, and will continue to have a major impact on the ability of the department to meet demands.

Our preliminary assessment of SDOT has found that it appears to be an organization that has dedicated personnel focusing on meeting its stated mission of *delivering a safe, reliable, efficient, and socially equitable transportation system that enhances Seattle's environmental and economic vitality*. Many of the SDOT's current practices are either considered as best practice or are consistent with established best practices. Customer service (Street Maintenance), capital improvement prioritization (Policy and Planning), parking operations and traffic permits (Traffic Management), and right-of-way permitting (Street Use) are just a few examples of areas that serve as best practices for other organizations.

SDOT, as with most public transportation organizations, is facing the demand for maintenance, improvements, and new construction far surpassing available funding. As a result, limited resources have to be focused and used in the most efficient and effective manner possible. SDOT has developed a structure that appears to have the basic components to allow it to effectively maintain and improve the City's transportation system.

SDOT also has many opportunities to potentially increase the efficiency and effectiveness of its operations. These areas are detailed by division as follows:

Management Structure

Our preliminary analysis has determined that the Department is organized by functional units that are allocated resources based on a budget process that evaluates services provided. The structure is relatively flat and is consistent with industry identified manager-to-staff ratios. Individual divisions work within this structure and together as appropriate.

SDOT has adopted an approach to determine policies, actions, and measurements to deliver its various services within these funding constraints. Multiple strategic plans have been developed that link funding with service delivery in most cases. SDOT then uses a mix of outcome and output measures, found in its Action Agenda, Pavement Condition Report and Modal Master

Plans (transit, bike and pedestrian, freight), to measure its progress. Many of the measures are based on numerical achievement (the number of miles paved, curb ramps built, potholes filled, etc.), rather than the impact on the City's transportation system (percent of roads rated as good or better, signal timing to meet established guidelines, staffing levels adhering to national benchmarks, etc.). In addition, SDOT lacks a central dashboard where the most critical outcome-based performance measures are summarized and easily accessible. Although SDOT communicates to the City Council, general public, and other local and state agencies in a variety of ways, additional outcome measures and a central dashboard could enhance their ability to track and communicate the progress they are making in meeting transportation needs.

Street Maintenance (SMD)

The Street Maintenance Division provides a variety of services from pavement maintenance and sidewalk repairs to emergency response to landslides and winter storms. SMD has experienced professional managers in place to operate their business units, who in turn, work cooperatively together and with other SDOT divisions. Underfunding, especially in the pavement maintenance/management area, will stretch the SMD's resources to meet the needs of the City.

SMD provides many of its services either as best practice or consistent with established best practices. Although opportunities for potential improvement exist in a number of areas, four specific areas stand out:

1. Pavement Performance Measures
   SMD currently provides elected officials and key decisions makers data on how different funding options would impact the City's deferred maintenance backlog, but do not provide data on what would bring the City's streets to a specific condition (or outcome-based performance measure).The question, "how are we doing" is difficult to answer. Users do not know if the most important projects, programs, and services are being worked on.

2. Pavement Management Approach
    SDOT currently uses a "hybrid" approach to manage the City's arterial street system that combines reconstruction and mill and overlay (with asphalt) within the same street or corridor. However, a significant emphasis on fixing the pavements in the poorest condition first occurs. Pavements in good and fair condition without preventive maintenance treatments will prematurely decline into poor condition. Roads will fall into poor condition and result in significant needs and cost to bring them back to good condition.

3. Pavement Management Condition Survey
    SDOT has not conducted recent evaluations of its non-arterial streets. However, recently SDOT reported that they have requested funds to conduct the survey in the second quarter 2013 supplemental budget and in 2014. Without a current evaluation, inaccurate estimates of pavement needs and backlog will occur.

4. Backlog of Maintenance Work
    For pavement needs on the City's arterial system, the backlog is estimated based on deferred maintenance that is not being accomplished due to underfunding. For non-arterial system streets, SDOT does not assess their current condition, requiring the backlog estimate to be based on average life of various pavement materials and deterioration. The backlog, while most likely a large number, has not been based entirely on data or acceptable practices for estimating maintenance needs.

Policy & Planning (P&P)

Although P&P is one of the smallest business units within SDOT, it has responsibility for a variety of programs and services primarily in the areas of policy setting, strategic planning, and long range planning. It helps provide the linkage between Seattle's Comprehensive Plan, the Transportation Strategic Plan, system plans and the department's business plans. These various plans provide the agency with a direction based on the corporate vision. With the exception of the Strategic Asset Management position (currently vacant), P&P has professional managers, each with a number of years of experience in urban planning and design. The division appears to be dedicated to a strong customer service philosophy, engages the public in the development of the various modal master plans, and continually seeks input from the citizens of Seattle.

Of the 13 areas reviewed for P&P, six were found to be operating consistently with best

practices and two, customer service and stakeholder input, are considered leading best

practices. The five other areas have opportunities for potential improvement:

·   Strategic Asset Management
    The Asset Manager position in the Office of Strategic Asset Management currently is
    vacant. The function has suffered a void in performance as indicated by deficiencies
    noted in its self-assessment.

·   Grant Tracking
    P&P has had great success in obtaining grants. However, once a grant is obtained, it
    becomes the responsibility of the next project manager to fulfill the terms of the
    grant requirements. To date, there have not been any significant problems that
    have resulted from this approach; however, changing federal regulations increases
    the potential for non-compliance with the terms of the grant.

·   Scoping of Future Projects
    P&P must rely on engineering expertise in other divisions to develop cost estimates
    and/or validate estimates prepared by consultants for candidate CIP and grant
    projects. Funding for these other divisions to engage in project development
    activities has been nearly eliminated as part of budget cutting requirements.

·   Professional and Technical Training
    Although P&P provides on-the-job training and participates in professional
    conferences, trainings and workshops as budgets allow, similar to many other areas
    in the City of Seattle, they do not have a formal workforce development program.
    SDOT has identified management and technical training as a need and is looking to
    re-establish this effort at the department or citywide level.

·   Corridor Studies
    Through the citywide modal master plans, P&P has identified several priority
    corridors for improvement. However, until recently, these corridors had not been
    studied to determine the type of improvements that would be appropriate for the
    route. SDOT obtained funding for studies of five key transit corridors and intends to
    initiate project development activities later this year. SDOT requested funding for
    eight additional corridor studies in its 2014-15 proposed budget.

Capital Projects and Roadway Structures (CPRS)

Capital Projects and Roadway Structures acts as the project delivery arm of the department and

oversees all aspects of project management, design, planning, development, and

implementation of transportation projects. It is currently organized into a logical tiered structure with defined single points of responsibility and a system in place to measure individual performance. Over the past few years, CPRS has improved its structure to manage projects and has standardized guidelines on cost estimating, change and cost management, project management, and risk assessments. It currently has, and generally uses, the necessary tools to manage its business effectively and efficiently.

As with many capital improvement programs, opportunities to refine and enhance practices exist. Some room for improvement in CPRS operations exist in areas such as:

- Project delivery
- Document management
- Cost estimate development
- Risk management
- Change order management
- Outsourcing of work

Of these areas, the ones that potentially have the greatest impact on operations include:

- Cost estimate development
  Total project cost estimates reviewed combined design, construction, and right-of-way estimates with calculated administration costs, management reserve, construction incidentals, and miscellaneous construction elements. More accurate cost estimates provide a better cost management tool.

- Change order management
  Although a process for managing change exists, a review of two projects identified an inordinate percent of project cost in change orders.

- Knowledge transfer and lessons learned
  A formalized and user friendly system is not in place. A risk of working in a silo could result.

- Life cycle costing
  Neither the CPRS Project Delivery Manual (PDM) nor the Construction Administration Manual (CAM) reference life cycle costing. Understanding maintenance cost implications is crucial to addressing funding backlogs.

Major Projects Division (MPD)

Major Projects was separated from Policy & Planning in 2006 as SDOT realized that many of its larger projects were in the planning stage with heavy policy emphasis requiring frequent direct interaction with senior management and elected officials. The belief was that a dedicated division would better serve that purpose. It was reorganized in 2012.

Having a division focused on major projects is unique. However, this approach, in theory, is an efficient model. MPD staff are highly qualified with a hierarchical reporting structure improving communication and significantly reducing the direct reports to the Divisional Director. To ensure accountability, Major Projects measures their success as a component of meeting the overall goals of the organization.

Knowledge transfer, performance measures, and interagency projects are areas that potentially have opportunities for improvement:

- Knowledge Transfer
  Since its reorganization, a few key staff possess extensive knowledge. A loss of any of these individuals could result in a possible interruption in coordination of key interagency projects.

- Performance Measures
  To measure staff performance, a process that develops individual work programs and expectation statements has been established. However, this process focuses on general performance expectations and does not appear to use any other metric to determine the efficiency and effectiveness of its personnel. The division also does not currently benchmark itself against any other entity maintaining that the uniqueness of projects and the role of the division make metrics and comparisons very difficult.

- Interagency Projects
  MPD does not appear to have the appropriate level of control on interagency projects. Consequently, SDOT could be responsible for additional costs for project delivery by other agencies.

Traffic Management (TMD)

The Traffic Management Division operates a large and complex system responsible for deploying and monitoring 28 kinds of assets. TMD is organized into four logical units each headed by a manager. The Division is responsible for 31 of the 42 Bridging the Gap (BTG) performance measures and reported that it had met or exceeded all in 2011. However, the BTG program's current emphasis on certain activities while SDOT faces decreased funding in other areas has created some significant differences in program performance levels.

Because of significant resource limitations, many minimum system needs are not being met – specifically signal operations. The failure to sufficiently fund signalization asset replacement needs has caused maintenance activities to become increasingly remedial in nature (i.e., fix it when it breaks), which is inherently less efficient and further strains limited resources. Although TMD is consistent with best practices in the establishment of replacement guidelines and performance indicators, staffing and funding limitations have severely impacted actual signal re-timing activities. The Division is not meeting minimum guidelines for traffic signal timing and is significantly below staffing benchmarks. As a result, TMD focuses on remedial repairs rather than predictable preventive maintenance. A "fix what is broken" approach is taken rather than the objective to holistically rehabilitate the system.

Street Use and Urban Forestry

Street Use Operations (SUO)

Street Use Operations includes Street Use, Right of Way, and Business Enterprise units. Our analysis of operations found it to be a high performer, exhibiting best practice performance in several areas. One area, the use of handheld technologies, can potentially be enhanced to improve workforce productivity. Data entry is currently inefficient, requires duplicative work processes, and reduces the supervisory time available to monitor and manage.

Urban Forestry (UF)

SDOT's Urban Forestry efforts have resulted in the City being named an Arbor Day Foundation "Tree City USA" for the past 25 years as well as a Tree Growth City for 11 years. The City continuously focuses on its trees and landscape through updates to its Urban Forestry Management Plan (UFMP), a 30-year management strategy to efficiently manage its urban forests. UF is generally following industry standards and identified best practices. Although its internal operations and organizational structure are different from other jurisdictions, it appears to be resourceful and effective when compared to other cities.

With expanding backlogs of work, Urban Forestry is challenged to achieve its' goals within budget. The potential for more innovative partnering opportunities with other agencies might be an avenue to explore potential staffing efficiencies. A thorough review of contract staffing could also identify whether savings can be achieved.

Next Steps

Our preliminary analysis of SDOT operations found a number of activities that were consistent with best practices or identified as best practices by various industry organizations. Many areas were also identified as having opportunity for improvement. Because a number of these areas have the potential to have a major impact on the efficiency, effectiveness, and cost of operations, we believe Phase II should focus on the following:

Key Issues for Further Analysis	
Further study in Phase 2 could result in significant improvements to SDOT's management or operations.	
Area	**Issue**
Historic Underinvestment in Infrastructure Maintenance	**Funding** Although successful with the BTG Levy, funding has not kept pace with physical needs. **Pavement Sustainability** Lack of funding for low cost pavement preservation treatments. **Signal Operations, Timing, Re-timing and Staffing** Lack of funding to retime signals in line with industry standards results in increased annual maintenance, increased remedial repairs, increased traffic congestion, traffic delays, and

Key Issues for Further Analysis
Further study in Phase 2 could result in significant improvements to SDOT's management or operations.

Area	Issue
	increased liability. SDOT does not meet staffing level benchmarks for the number of traffic engineers and technicians needed to support their signal inventory.
	Signal Maintenance Unpredictable, remedial repairs rather than predictable preventive maintenance. The current approach is fix what is broken rather than holistically rehabilitate the system.
	Key Issues for Further Analysis Consolidation of information concerning infrastructure maintenance needs based on a current and accurate inventory of all assets, a mix of the most current and cost-effective preservation treatments, and cost estimates based on principles of asset sustainability.
	Analysis of the costs and benefits of retiming signals more frequently. Develop alternatives for securing additional temporary and contracted resources. Explore strategies for teaming with adjacent public sector entities to perform this work on a coordinated basis. Analyze costs and benefits of a holistic maintenance approach.
	Exploration of all sources of potential funding for infrastructure maintenance (federal and state grants, levy, etc.) and development of both short and long-term funding plans to allow the City to maintain its assets at a level that will reduce its backlog of deferred maintenance. Prioritize projects based on this plan.
	Application of life cycle costing to all new projects and inclusion of planning for long-term maintenance needs as part of project planning.
Measuring and Communicating Performance	SDOT lacks a central dashboard where the most critical outcome-based performance measures are summarized and easily accessible. In some areas, additional outcome measures should be used to track and communicate progress.
	SDOT's Major Projects works with external agencies to protect the City's interests on interagency projects. Additional/revised performance measures, for both the external agencies and SDOT divisions, are needed to ensure value is achieved.
	Key Issues for Further Analysis Identification of appropriate outcome-based performance measures based on industry-wide best practices and the determination of SDOT's ability to effectively measure against these standards.
	Creation of a centralized dashboard where the most critical outcome-based performance measures are summarized and easily accessible.
	Evaluation of performance measures used to determine effectiveness of the Sidewalk Repair and Construction Program and how these are linked to the overall goals and objectives of the Pedestrian Master Plan.

	Ensure all SDOT Divisions have performance measures in place that:
	    1. Are linked to Seattle's Comprehensive Plan
	    2. Are linked to SDOT's Strategic Plan
	    3. Include specific targets for business units to achieve

Pavement Management	Lack of low cost pavement preservation treatments in pavement management programs.
	For pavement needs on the arterial system, backlog is estimated based on the difference between the current condition of the asset and the condition if all the deferred maintenance is eliminated over a 20 year horizon as estimated by their StreetSaver software. Because these outcomes are not transparent to policymakers or the general

Key Issues for Further Analysis	
Further study in Phase 2 could result in significant improvements to SDOT's management or operations.	
Area	**Issue**
	public, those without access to this data do not have a quick and easy way to understand how the backlog is calculated. SDOT has not conducted a recent pavement evaluation of non-arterials. Since no current condition data exists for non-arterial system streets, backlog estimate is based on average life of various pavement materials and deterioration. **Key Issues for Further Analysis** Determination of SDOT's ability to develop a preventative maintenance program that includes a wider range of low cost preservation treatment options and a recommendation on the funds needed to support this program. Identify a cost-effective method for collecting data on the pavement condition of Seattle's non-arterial streets. Determine the information needed to adequately quantify a backlog that is both reasonable and can be easily explained to stakeholders and City leaders based on outcome-based performance targets. Incorporate data from the non-arterial pavement evaluation within the existing pavement management system and include low cost pavement preservation treatment decisions to more accurately estimate the value of the deferred maintenance backlog.
Project Management	**Life Cycle Costing** Neither the PDM nor the CAM reference lifecycle costing. Understanding the maintenance cost implication is crucial to address funding backlogs. **Key Issues for Further Analysis** Determine to what extent SDOT is currently using life cycle costing (LCC), identify and document the benefits for applying LCC to capital projects, including the potential for cost savings and more efficient and sustainable design choices.
Scoping Future Projects	Project sample reviewed found major changes to project scope and costs. No detailed description/justification of the changes were found in the project file. It was stated by SDOT that scope changes were out of the department's control. **Key Issues for Further Analysis** Determine the extent to which SDOT's preliminary cost estimates reflect the accurate cost or scope of the project, how this impacts SDOT's resources, what additional funding would be needed to allow for more rigorous preliminary cost estimates. Also identify how these estimates are coordinated with other departments.

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Introduction and Background

Introduction

The Seattle City Council, in partnership with the City Budget Office and the Office of City Auditor, competitively sought a consultant to assess SDOT's organizational structure and operations to identify and recommend changes to operational approaches and management practices that could yield budget efficiencies, productivity, and better outcomes for maintaining and improving the City's transportation infrastructure. The project contains two phases. The first includes a preliminary analysis of SDOT's operations and management to identify and define short and long-term opportunities for operational efficiency that could lead to Phase II - a more detailed analysis. Any apparent opportunities for improvement identified in Phase I were communicated to applicable SDOT personnel. However, specific recommendations are intended to be developed after a more thorough review and assessment in Phase II.

Specific activities of Phase I included:

- an initial assessment of SDOT's management, including an analysis of the efficiency and effectiveness of its organizational structure and span of control,
- benchmarking of performance, for practices within divisions and the department as a whole, against industry standards, peer organizations, and best practices,
- a review of how SDOT measures performance and productivity across all its divisions,
- how SDOT informs decision makers in regard to planning, budgeting, finance, prioritizing, contracting, and delivering capital improvements and maintenance projects, and
- how SDOT communicates with the public.

This assessment focused on the following divisions and programs:

Capital Projects and Roadway Structures
- Bridge maintenance and replacement
- Stairway maintenance and replacement
- Project control and construction management

Traffic Management
- Parking equipment and technologies
- Signs and marking
- Signal and controller installation and maintenance
- Traffic Management Center

Street Maintenance
- · Scheduling and project management for street maintenance
- · Sidewalk paving
- · Snow/ice control and storm response
- · Street cleaning
- · Street preservation and restoration

Street Use and Urban Forestry
- · Landscape/tree maintenance
- · Urban forest management
- · Utility coordination

Methodology

Our team interviewed many department employees, obtained and reviewed industry best practices, contacted and obtained comparative information from selected city transportation departments, and evaluated numerous documents, files, and websites including:

- · Position descriptions
- · Division overviews
- · Organizational charts
- · SDOT financial information
- · Performance indicators/standards
- · Annual work plans, goals, budgets, and expenditures
- · Past reviews and assessments
- · White Papers
- · Strategic plans
- · Numerous division/section specific documents
- · Other applicable information

Additionally, for the Capital Projects and Roadway Structures and Street Maintenance divisions, questionnaires/surveys were developed and submitted to division personnel to solicit their views and perspectives on such areas as:

- · Management and reporting
- · Procurement
- · Resource allocation
- · Project delivery
- · Duplication of services
- · Development of budgets
- · Risk assessment

- · Performance indicators
- · Comparable jurisdictions
- · Staff experience
- · Documented practices and procedures
- · Project management

Responses were compiled and summarized and used to identify specific areas to assess and focus additional questions.

Benchmarking

A specific objective of this assessment was to benchmark department and division practices against industry standards, peer organizations, and best practices. Although peer organizations can provide common measures, identifying and obtaining valid benchmarks is difficult. Because organizations differ in approaches, practices, geographic locations, etc. developing comparable measures can be problematic. Additionally, the validity of the information provided by other jurisdictions cannot always be determined.

Because of this difficulty, we focused on the use of industry standards and best practices to compare to division activities. Organizations contacted included:

- · National Center for Pavement Preservation
- · *The Gray Notebook*, Washington Department of Transportation (WSDOT)
- · Federal Highway Administration (FHWA)
- · Federal Transit Administration (FTA)
- · American Association of State Highway and Transportation Officials (AASHTO)
- · Association of Public Works Administrators (APWA)
- · National Transportation Operations Coalition (NTOC)
- · Urban Forestry Best Management Practices
- · International Society of Arboriculture

For selected SDOT functions, we also contacted other jurisdictions to obtain available information to identify current approaches and practices. This information was used primarily to identify opportunities for the individual functions based on the successful use by others.

Industry standards and best practices and information obtained from other organizations are identified in the applicable division assessments.

Background

> **SDOT Mission**
>
> To deliver a safe, reliable, efficient, and socially equitable transportation system that enhances Seattle's environmental and economic vitality.

The City of Seattle's Department of Transportation develops, maintains, and operates over 1,540 lane-miles of arterial streets, 2,412 lane-miles of non-arterial streets, 135 bridges, 494 stairways, 587 retaining walls, 22 miles of seawalls, 1,060 signalized intersections, 47 miles of bike trails, more than 200 miles of on-street bicycle facilities, 35,000 street trees, 2,150 pay stations, 40 parking meters, and 26,200 curb ramps. Approximately 25% of the land area within City limits is dedicated to travel.

Because Seattle is a mature city, its focus is on optimizing or redeveloping existing facilities to make them safer, more efficient, and supportive of current and future urban needs. The City also maintains or improves critical transportation infrastructure of regional, statewide, and national significance in cooperation with external partners. Its current transportation infrastructure is valued at over $13 billion.

SDOT's services include:

- · major maintenance and replacement of the City's transportation capital assets;
- · the development and construction of additions to the City's transportation infrastructure; and
- · operations and routine maintenance needed to keep people and goods moving through the City. This includes operation of the City's movable bridges, traffic signals, street cleaning, pothole repairs, street use permit issuance, tree maintenance, engineering and transportation planning.

The department has over 720 employees, organized in nine major divisions:

Director's Office
Oversees all of the functions, staff, and services of the department and manages centralized administrative services, community relations, Street Use appeals, and coordinates development and implementation of major transportation projects.

Resource Management
Manages SDOT's finances including development and oversight of the budget and capital improvement program. Prepares short and long range forecasts and develops rate and fee proposals for Street Use, Traffic Management, and Street Maintenance operations. Provides department-wide accounting, payroll, risk management and claims administration. Manages the department's safety, health, and environmental programs. Supervises federal and state audits and oversees legal and regulatory compliance. Manages SDOT's fleet, facilities, and mobile communications network. Provides information technology systems and customized software applications to facilitate the management of the City's transportation infrastructure.

Human Resources
Provides expertise in the areas of hiring and selection, labor and employee relations, performance management, employee development, legal and administrative compliance, benefits, training, and administrative support services.

Street Use & Urban Forestry
Issues permits for work to be done in street areas, and monitors to make sure all City specifications are met. Typical uses of street areas are for storage of construction materials and sidewalk sales; work on underground utilities; work on buildings that could affect the street; and events such as parades.

Street Maintenance
Cleaning street pavement and making repairs, clearing snow and ice, filling potholes and taking care of minor asphalt and concrete paving jobs, monitoring the condition of City streets, cleaning up after landslides.

Capital Projects & Roadway Structures
Oversees all aspects of project management, design, planning, and development, and implementation of transportation projects. Oversees City bridges, retaining walls, public stairways and other structures and operates the City's four movable bridges.

Traffic Management
Responsible for the day-to-day operation of the street system. Places and maintains lane markings and up to 100,000 street signs, operates 1,000 traffic signals, and coordinates all through an automated Traffic Management Center. Helps build bicycle, pedestrian, freight, and transit facilities, manages curb space, issues permits for parking, installs and operates pay stations, assigns spaces for commercial loading and for buses, and approves traffic control arrangements at construction sites.

Policy & Planning

Responsible for long-range and strategic transportation planning, developing transportation policy for the City of Seattle, implementing mobility programs including citywide Commute Trip Reduction programs, transit service and capital programs, grant development, and large capital project programming.

Major Projects

Responsible for the planning, oversight, and completion of large, complex, capital projects and provides coordination of high profile projects.

Bridging the Gap

In 2006, Seattle voters passed a nine-year $544 million transportation funding package for maintenance and improvements. The $365 million levy component of Bridging the Gap funds programs to address the maintenance backlog of paving, sidewalk development and repairs, bridge repair, rehabilitation and seismic upgrades, tree pruning and planting, and transit enhancements among others. Specifically, the levy's goals and objectives include:

- Maintenance
    - Rehabilitate 40-50 stairways
    - Prune 25,000 street trees
    - Plant 8,000 new street trees
    - Replace over 50,000 small, faded street and regulatory signs
    - Resurface, restore, or replace approximately 200 lane-miles of arterial streets
    - Rehabilitate or replace 3-5 bridges and seismically retrofit 5 additional bridges
- Transit
    - Enhance transit and safety improvements on three key transit corridors
    - Secure up to 45,000 hours of new Metro Transit service
- Pedestrian/Bike/Safety
    - Build 117 blocks of new sidewalks
    - Restripe 5,000 crosswalks
    - Create "safe routes to schools" near 30 elementary schools
    - Support the development and implementation of a Pedestrian Master Plan
    - Provide funding to implement the Bicycle Master Plan
    - Add 4 miles of new multi-use paths
    - Repair or restore 144 blocks of sidewalks
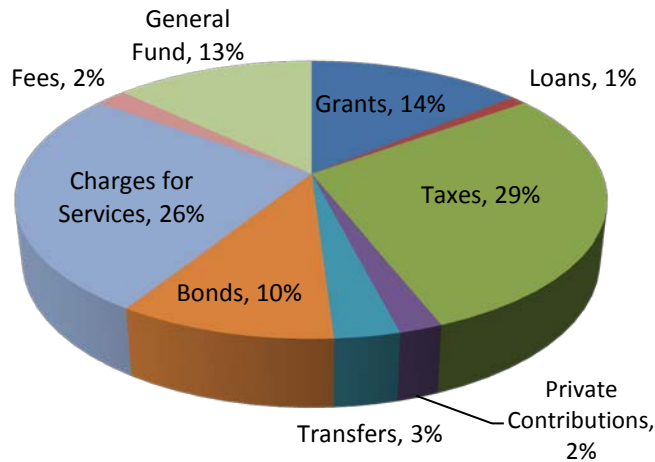   - Provide funding for neighborhood-identified street improvements

Revenues and Expenditures

The Seattle Department of Transportation spent over $310 million in 2012 to develop, maintain, and operate its transportation system. As the following illustrations indicate, revenue

is received from a variety of sources with taxes and service charges accounting for over 55%.

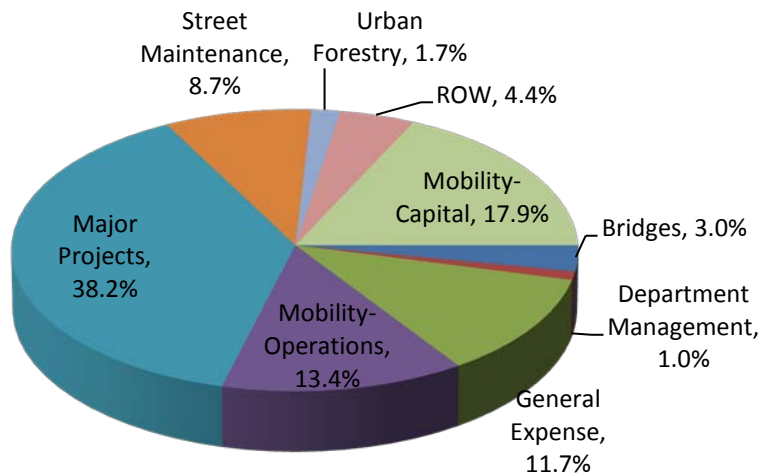Capital Improvement Program comprises almost two-thirds of expenditures:

**2012 Transportation Budget (Adopted)
Revenue by Source**

General
Fund, 13%

Fees, 2%

Loans, 1%

Grants, 14%

Charges for
Services, 26%

Taxes, 29%

Bonds, 10%

Transfers, 3%

Private
Contributions,
2%

Source: City of Seattle 2012 Adopted Budget

Illustration 1

**2012 Transportation Budget (Adopted)
Expenditures by Function**

Street
Maintenance,
8.7%

Urban
Forestry, 1.7%

ROW, 4.4%

Mobility-
Capital, 17.9%

Bridges, 3.0%

Major
Projects,
38.2%

Mobility-
Operations,
13.4%

Department
Management,
1.0%

General
Expense,
11.7%

Source: City of Seattle 2012 Adopted Budget

Illustration 2

The following details our preliminary analysis of the Seattle Department of Transportation's

operations and management and the identification of short-term and long-term opportunities.

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Preliminary Analysis

Management Structure

Background - Management Structure

Organizational Structure

To effectively meet its mission of *developing, maintaining, and operating a transportation system that promotes the safety and efficient mobility of people and goods, and enhances the quality of life, environment, and economy of Seattle and the surrounding region*, SDOT has established a common organizational structure headed by its Director:

SDOT's Organizational Structure
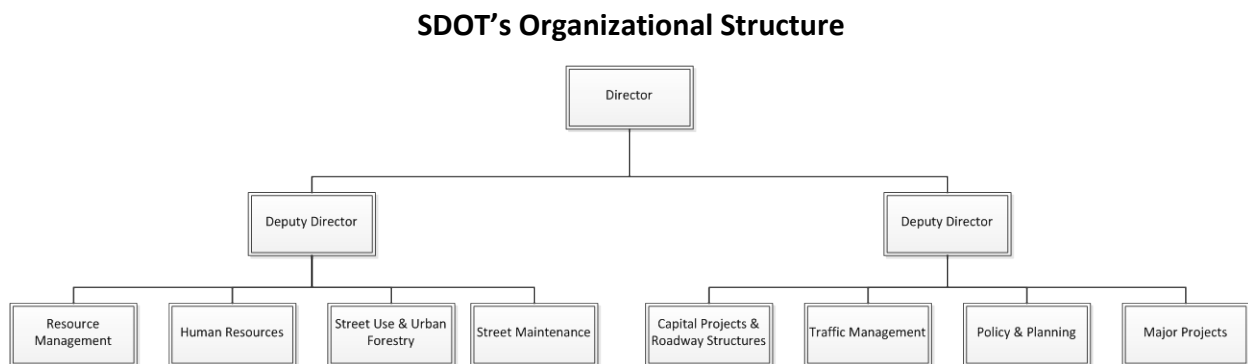
Source: November 2012 Organizational Chart obtained from SDOT website

Each division is organized around a logical line of service and is managed by a director reporting to one of two deputy directors. Organizationally, the Director's Office and the divisions of Resource Management and Human Resources provide all support services to SDOT's operational divisions.

Director's Office

The Director is appointed by the Mayor and is responsible for overseeing all functions, staff, and services of SDOT, and ensures resources are used to address the values, vision, mission, and goals of the Department, the City, and the region. It also manages centralized administrative services, community relations, street use appeals, and coordinates development and implementation of major transportation projects.

In addition to the two deputy directors, the Director's Office includes five direct reports varying widely in function:

· Communications Manager
· Executive Assistant
· Emergency Management Coordinator
· Legislative Liaison
· Strategic Projects (Assistant Director)

Resource Management & Human Resources

These divisions support the Department by managing SDOT's assets and by providing expertise in human resource management. Support areas include Human Resources, Finance, Accounting, Information Technology, Safety & Logistics, and Contract Equity Compliance.

Human Resources Division (HRD)

HRD provides expertise in the areas of hiring and selection, benefits, training, and administrative support services. It ensures that SDOT has a skilled and trained workforce.

Diversity in hiring has been a primary SDOT initiative. SDOT reports that its current workforce is made up of approximately 33% women and 41% minorities. According to the 2010 U.S. Census, Seattle has approximately 50% women and almost 34% minorities living in the area.

HRD is also responsible for managing labor relations between management and employees. It administers collective bargaining agreements for the 80% of employees that are represented by eight different unions.

Finance

Finance is responsible for SDOT's financial and capital improvement plan budgets, rate setting, and financial forecasting.

Accounting

Accounting provides accounting and reporting, payroll and accounts payable, billings, and audits and reviews.

Information Technology

The IT function focuses on systems and applications and the Geographic Information Systems (GIS).

Safety & Logistics

Safety & Logistics provides safety and health, claims, and logistics support. Safety ensures a safe workplace for SDOT personnel.

Contracting Equity Compliance

Contracting Equity Compliance ensures that minority-owned and women-owned businesses do not face unfair barriers in their competition for City contracts and sets voluntary targets for consulting contracts and goods and services that reasonably achieve the goal.

Preliminary Analysis

The Seattle Department of Transportation is a large, diverse, and extremely visible agency. The multiple modes of transportation SDOT is responsible for are used daily by thousands of individuals. As with most public transportation organizations, demand for maintenance, improvements, and new construction have far outstripped available funding. As a result, limited resources have to be focused and used in the most efficient and effective manner possible. SDOT has developed a structure that appears to have the basic components to allow it to effectively maintain and improve the City's transportation system.

Our preliminary analysis reviewed nine basic management guidelines:

1. Management Structure
2. Span of Control
3. Budget Planning and Control

4. Communications
5. Funding
6. Performance Measurement
7. Political Influence
8. Standardization of Agency Practices
9. Strategic Planning and Management

The following discusses each in greater detail:

Management Structure

As mentioned previously, SDOT is a relatively "flat" organization. It is logically organized around services provided. Our assessment of each division found that communication and cooperation occurred in and between divisions, activities were coordinated, and SDOT's objectives were known.

The American Public Works Association has identified a guideline for the number of organizational layers (the number of layers an employee would have to move through to reach the Department Director) as being five. SDOT, in most divisions, does not exceed the guideline. Typically, SDOT divisions are staffed with a division director, department manager, program leads/supervisors, and line staff. Street Use & Urban Forestry, Street Maintenance, Traffic Management, and Capital Projects & Roadway Structures may have one additional layer, due to crew leaders or other supervisory positions for certain programs.

Span of Control

Span of control, the number of individuals that a manager can effectively supervise, is a key management tool. Span of control determines how tasks are assigned to employees and can impact work flow. A wide span of control (single manager with more employees) usually indicates a flatter organization.

SDOT is led by a Department Director that reports directly to the Mayor. Two Deputy Directors report to the Director and each oversees four programs. One program - Resource

Management, is led by one of the Department Deputy Directors, whereas each of the other seven divisions has a Division Director.

Programs vary in size and, depending upon the roles and responsibilities of each program, may have managers, supervisors, and crew leaders that direct staff. The following provides a summary of the position hierarchy, based on the November 2012 organization chart:

- · 1 Department Director
- · 2 Deputy Directors
- · 7 Division Directors
- · 29 Program Managers
- · 689 Staff

This equates to approximately 16.8 staff per manager. The American Public Works Association has identified the recommended span of control of staff to managers as approximately eight to one. The City of Portland reports a span of control of approximately 8.9 staff to each manager. Boston and Sacramento were within the eight to one ratio; Milwaukee, WI has a 10>1 ratio.

Although this is interesting information, it should be noted that the definition of a manager may be different in each organization making direct comparisons inaccurate. Additionally, span of control is impacted by many factors including the type and size of the organization, similarities and complexities of jobs, skill levels required, competencies of staff, and impact of technology - none of which are understood in detail for other entities.

Because there is no specific range that matches all organizations, it is difficult to determine what SDOT's current ratio actually implies. However, given that the organization is relatively flat and business processes are in place, the range may be appropriate.

Budget Planning and Control

SDOT has in place a financial management system that tracks each division's expenditures and provides quarterly reports for division managers and SDOT executive staff. The mechanism involved in this process appears to work well.

As with all City departments, SDOT's operating budget is prepared based on current service levels. This includes continuing programs and services provided the previous year in addition to previous commitments that will affect costs in the next year or two. SDOT continually monitors its position in receiving expected revenues and that its debt obligations and cash flow requirement are being met. To assure the department is financially prepared to pay for future services; multi-year forecasts are prepared to assess the sustainability of its budget. These forecasts alert SDOT management to any financial issues that may be emerging so that the department can adjust its resources and make corrective actions before the issue becomes a serious problem.

Financial performance is tracked and reported on a daily, monthly, quarterly, and annual basis. In addition, financial reporting is provided to a variety of stakeholders, such as the Mayor, City Council, City Budget Office, and SDOT management and its divisions.

Communications

SDOT uses a variety of ways to communicate with Seattle leadership, such as the mayor, city council, other department-heads, regional partners, and its constituents. The SDOT website is very comprehensive and in some cases interactive, with links that identify services, status of various projects, planning documents, resources such as SDOT Facts, interactive maps, and news that relates to SDOT and the City of Seattle.

The website allows citizens to report potholes, damaged sidewalks, overgrown vegetation, and street sign and traffic signal maintenance needs. In addition, there is a hotline that citizens can call to report complaints or maintenance requests. Citizens can also request improvements with curb ramps, accessible pedestrian signals, and new technology evaluations for those with disabilities.

A list of phone numbers, emails, and web links are identified on SDOT's website that allows citizens to follow progress on projects, provide feedback, and contact those responsible for the

various aspects of street maintenance and operations, such as street permits, highway information, and parking enforcement. A phone number has even been identified for those who need assistance but speak a language other than English.

There are several boards and committees that relate to certain aspects of transportation including the Bicycle Advisory Board, Citizens Transportation Advisory Committee, Pedestrian Advisory Board, and the Freight Advisory Board. Each includes citizen involvement that allows decision makers to take into consideration citizen input.

The Planning & Policy Division incorporates input from the City Council, Mayor, other departments, regional partners, and local citizens when developing SDOT's strategic and system plans.

When developing the budget, SDOT works with the City Budget Office, the Department of Finance and Administrative Services, the Mayor's Office, and City Council to assure it is in line with the City's mission and goals.

SDOT interacts with regional partners, such as King County, Sound Transit, WSDOT, and the Puget Sound Regional Council to combine efforts, learn new techniques, understand broader regional issues, and discuss how duplication of effort can be reduced by splitting work efforts between entities.

Funding

As mentioned previously, funding for transportation projects in most organizations is unable to keep up with demand. In 2006, City voters passed a nine-year $544 million package, "Bridging the Gap," for infrastructure maintenance. This substantial investment indicated the awareness of the City and its residents that funding is necessary to ensure that a safe and secure transportation system is in place - something most cities and counties have been unable to do during the same period.

Performance Measurement

SDOT has implemented performance measurement systems throughout the department. However, these measures are primarily focused on *output* measures, rather than measures of *outcome*. Outcome based measures connect the strategic initiatives of SDOT much more closely with the public's notion of what needs to be accomplished, in what priority, and at what level of probable expenditure. Measures of output, while sometimes appropriate, typically identify items such as cubic feet of concrete poured, miles of roads paved, trees pruned, etc., none of which informs the public regarding the success of efforts on the City's transportation system. Output measures also do not tie staff and management performance with its strategic plans.

As demand for services increase, revenues decrease, program delivery becomes more complex, and citizens demand more accountability, many organizations are moving toward a formal performance measurement program. Outcome-based measures provide a method of evaluating how well programs are operating and ensuring funding is spent in a cost-effective manner. WSDOT has been considered a nationally-recognized performance measurement leader and other local governments (Metro (Portland), San Francisco, San Mateo County) have implemented systems.

Political Influence

Practically every infrastructure agency is faced with political influence at some level. There is a point at which, however, political decisions undermine solid technical decisions or even the decisions of appointed or elected oversight boards. Although peripheral comments were made regarding political influence, a number of statements were made regarding issues with the many unions engaged by the City. Specifically, the number (eight), inability to effectively cross-train, difficulty in internally filling open positions, layoff issues, and hours were mentioned.

Standardization of Agency Practices

SDOT has identified the need for standard procedures and has established agency-wide protocols. Some SDOT units also have very well-developed standard operating procedures (SOPs) which contribute to the standardization of agency practices at each organizational level. Standardized practices ensure that employees are aware of daily work practices and new employees can quickly get up to speed on division functions. SDOT, for most applicable practices, has developed formal procedures – many consistent with industry best standards (e.g.: Project Delivery Manual, Construction Administration Manual, and Consultant Contracts Guidebook).

Strategic Planning

Strategic planning helps an organization focus on its mission, vision, goals, and objectives. For those that provide service to its constituents, such as a transportation agency where funding and other resources are often limited, strategic planning can help decision-makers identify priorities for assuring the needs of the community are being met.

The State of Washington, through the passage of the Growth Management Act in 1990, has required that government agencies within the state develop and implement plans to focus efforts on assuring the region grows in a manner that will maintain the quality of life of the citizens of the state by managing where populations centers will be developed and working to improve mobility.

Seattle has responded by developing a 20-year comprehensive plan – *Toward a Sustainable Seattle* (1994 – 2014). This plan outlines the basic policies of the City and is designed to communicate a vision of how Seattle will grow in ways that sustain its citizens' values. It provides a flexible framework for adapting to changing circumstances. The plan was updated in 2004 and the City Council considers amendments for change annually.

SDOT has also developed multiple plans to address various aspects of service delivery. In addition to specific neighborhood plans that address the needs and desires of constituents within specific areas of the City, citywide plans include:

· Transportation Strategic Plan (TSP)
· 2012-2014 Action Agenda
· Alaskan Way Viaduct Emergency Traffic Management and Closure
· The Transit Master Plan
· SDOT Freight Mobility Action Plan
· SDOT Art Plan
· Bicycle Master Plan
· Pedestrian Master Plan
· ITS Strategic Plan
· UVTN Performance Monitoring and Implementation.

SDOT's Transportation Strategic Plan (TSP) identifies specific strategies, projects, and programs that address citywide goals and policies for transportation in the City. SDOT has used the TSP to guide its work since 1998. The TSP was updated in 2005 to correspond with changes made during the City's 10-year update of the Comprehensive Plan that occurred in 2004. In concert with the state-mandated 2015 update to the City's Comprehensive Plan and in the context of the 2012-2014 Action Agenda, the Department is identifying updated needs for the TSP to address City policy and direction changes. Overall, these documents focus on the development of alternative modes of transportation to help address issues with congestion, pollution, social equity, economic productivity and quality of life. In addition, it is believed that focusing on other modes of transportation for regional mobility will save time and money.

In 2007, the City Council passed the Complete Streets ordinance, which "directs SDOT to design streets for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting safe operation for all users including freight." SDOT uses a data-driven process to evaluate planned projects consistent with the policy.

The plans that have been developed incorporated City planners, leaders, citizens, partnering agencies, and other stakeholders in the process. In addition, SDOT has scanned the internal

and external environment to assure planners understand what's going on in the community and the region. This helps the agency prepare for external threats and identify potential opportunities. Looking within allows SDOT to allocate staff and resources, prepare for any budgetary shortfalls, and gauge its capacity to produce services. The agency's plans are designed to prepare SDOT for the future.

Although performance measures are identified in the various system and strategic plans, interviews with staff in operational departments indicated that performance metrics for individual programs have not been consistently developed that tie staff and management performance with its strategic plans. Exploring how performance relates to its planning efforts could increase the efficiency and effectiveness of the agency and increase accountability.

SDOT's approach to developing, implementing, and updating its strategic and business plans are in line with the process used by typical government sector organizations[1].

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[1] Making Room for the Future: Rebuilding California's Infrastructure, 2003, David E. Dowall, Jan Whittington

Street Maintenance

Background – Street Maintenance Division (SMD)

SDOT's Street Maintenance Division is the third largest business unit within SDOT based on the number of full time employees (143 FTE) and is responsible for maintaining the City's roadways and sidewalks. SMD's $22 million budget[2] is allocated as follows:
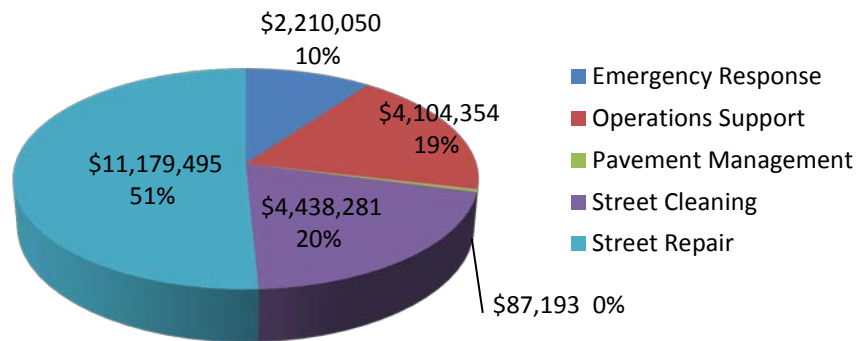
Source: City of Seattle 2012 Adopted Budget

Illustration 3

Activities of this division include street pavement maintenance and repairs, street cleaning, sidewalk maintenance and repairs, mowing, emergency response to unforeseen events like severe weather, pavement collapses and landslides, and other similar activities within the street right of way. The SMD uses Hansen Enterprise data management software system to plan and record activities and track work accomplishments of field forces. Summit is the financial management system that is used to track budget and expenditures. There are four sub-groups that report to the Street Maintenance Division:

Pavement Management

The Pavement Management section consists of eight FTE and is responsible for providing technical support within the Street Maintenance Division on pavement and sidewalk

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[2] 2012 Adopted budget

management. This group is responsible for monitoring the condition of City street pavement and City sidewalks, developing pavement management plans and treatment options, developing pavement recommendations for the CIP program and SDOT paving crew's annual paving program, and landslide repairs. The Pavement Management section serves as technical experts on pavement design, evaluation, condition assessments, strategies, prioritization, and treatments.

The group utilizes a pavement management software system (StreetSaver) developed by the Metropolitan Transportation Commission (MTC), to conduct its analysis and to help with prioritization of work. The City is responsible for 3,952 lane miles of pavement which is comprised of 1,540 lane miles of arterials and 2,412 lane miles of non-arterials i.e. residential, collectors, and other minor streets. Condition of the pavement for arterial streets is determined using an automated system with high resolution cameras and sensors mounted on a van. This information is input into StreetSaver and provides the core data for analysis purposes. Unfortunately, the City only has a minimal program to address pavement needs on non-arterial streets and does not have current condition data for those streets. According to department records, the replacement value of Seattle's streets compromise almost one-half the value of all SDOT assets - approximately $5.85 billion; 48% of the value of all listed assets.

The Pavement Management group is also responsible for the inventory of Seattle's sidewalks and monitoring their condition. Sidewalks have the second largest asset replacement value at $2.65 billion (22% of listed asset value.) In combination, pavements and sidewalks account for 70% of the replacement value of all listed SDOT assets.

Paving

The Paving section consists of 67 FTE and is responsible for making minor and spot repairs to Seattle's street pavement network and sidewalks. The section consists of four fully functional paving crews, two for asphalt and two for concrete. The demand for work is

driven either due to the condition of the pavement or the need to repair the pavement following new construction work activities like utility cuts, traffic improvement projects, the Neighborhood Project Fund, and similar projects. For condition demand paving, the work is primarily seen as a stop gap measure as it addresses those sections of pavement that are in the worst condition in specific locations as identified by the Pavement Management section in conjunction with identification of sections requiring constant pothole repairs from the Pothole Ranger crews. The work completed by these crews are larger than spot pavement repairs but smaller than major projects which are required to be accomplished by private contractors.

For pavement repairs following utility cuts or new projects, the work is performed in coordination with other Seattle or SDOT program offices. For utility cuts, the work is completed primarily for Seattle Public Utilities (SPU) and Seattle City Light on a demand basis and fluctuates with the local economy and private development that necessitates new utility installation. SDOT Maintenance Division crews also perform additional demand driven work due to construction projects managed by other SDOT offices. The amount of work performed by these crews is dependent on the available budget or the amount of reimbursable work from the SPU or other SDOT project areas. Since 2008 SPU utility cuts have dropped by over 75% resulting in the forced downsizing and elimination of three repair crews that responded to this work.

Maintenance Operations

The Maintenance Operations section consists of 40 FTE performing general street maintenance activities on Seattle's streets to keep them in serviceable condition. Although the section's primary responsibility is pothole patching with Pothole Ranger forces, it also performs other general maintenance activities such as: sidewalk shimming, alley cleaning and flushing, street sweeping, vegetation management, and stairway, pathway and bike path maintenance. These forces are located in three difference offices spread around the City which provides good geographic coverage and reduces non-productive drive times. In

addition to routine maintenance activities, this section has first responder responsibilities for daytime emergencies like spills, winter weather response, landslides, etc.

24/7/365 Operations & Emergency Response

The 24/7/365 Operations section consists of 25 FTE and provides around the clock emergency response to off hours hazardous conditions or emergencies. The Dispatch Center serves as the single point of contact for citywide emergency response coordination and support services for SDOT's divisions of Street Maintenance, Traffic Management, Roadway Structures, and Street Use & Urban Forestry. The section has the capability to immediately respond to emergency events during non-working hours with appropriate equipment and material to help prevent costly overtime response of regular SDOT forces. The section also has non-emergency maintenance activity responsibility for things that are required to be done at night and on weekends such as street sweeping and pothole patching.

Preliminary Analysis

The Street Maintenance Division (SMD) is a key component in SDOT's organization and one of the most visible to the public. It provides a variety of services from pavement maintenance and sidewalk repairs to emergency response to landslides and winter storms. SMD has experienced professional managers in place to operate their business units who work cooperatively together to try to achieve the best service possible for the City of Seattle. The division appears to work in harmony with other SDOT divisions to accomplish the mission of the Department. However, underfunding, especially in the pavement maintenance/management area, will stretch SMD's resources to meet the needs of the City.

Basis for Comparisons

To identify best practices that could provide valid comparisons of the division's operations, information was acquired from Washington, D.C., Portland, San Francisco, Chicago, Minneapolis, and the Virginia and North Carolina Departments of Transportation. Additionally,

a number of industry best practices were obtained from the National Cooperative Highway Research Program (NCHRP), the Washington Department of Transportation's "Gray Notebook," the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), the Association of Public Works Administrators (APWA), and the National Center for Pavement Preservation.

Budget Control

The division practices good budget control for sub-groups under its authority. The financial management system, Summit, provides accurate and timely accounting information of the division's expenditures. The division establishes an annual budget for each sub-group and tracks expenditures against that budget on a monthly basis to ensure they stay on track.
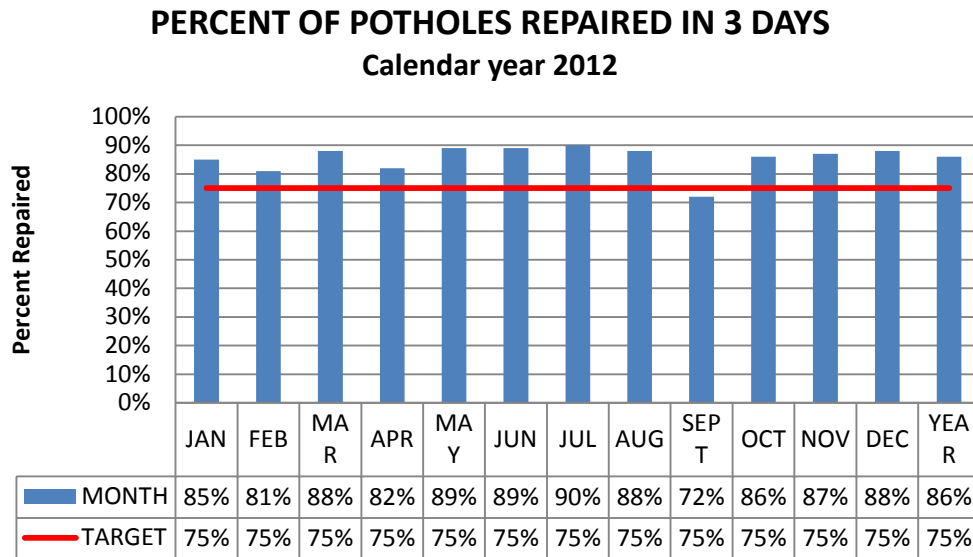
Reporting Mechanism – Summit, Hansen

As a companion to Summit, SDOT has implemented a management software system, Hansen, which serves as an administrative tool for reporting work crews' activities and tracks work progress and accomplishments. The system also has a GIS component such that work activities of the crews can be geo-located on a city map. The system relies on input from SDOT personnel and has basic reporting capability for estimated cost for labor, equipment, material, and total cost by work activity for each project.

Customer Service

The division appears to be dedicated to a strong customer service philosophy. All customer service requests are logged and assigned to the appropriate manager for investigation and resolution. The most visible example of good customer service is the method used to handle pothole complaints. SDOT has dedicated a website specifically for pothole repair with an interactive map that displays repair status along with a history of how long it takes to patch each pothole. The department has a goal to repair 75% of reported potholes within three (3) business days. Customers and the public can monitor SDOT's performance through the website. In addition, the division keeps good internal records on the number of potholes

reported and the number repaired which serves as a performance indicator for how well the streets are being maintained. For calendar year 2012, the division stated it had repaired 86% of reported potholes within three (3) business days:

PERCENT OF POTHOLES REPAIRED IN 3 DAYS
Calendar year 2012

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	YEAR
MONTH	85%	81%	88%	82%	89%	89%	90%	88%	72%	86%	87%	88%	86%
TARGET	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%

Source: SDOT

Illustration 4

Bridging the Gap Reporting

The division has developed good business rules and processes to track its progress in meeting the goals and work effort for BTG projects. The division can provide an accurate accounting of how much work has been done and at what cost.

Pothole repairs and emergency staffing of 24/7/365

Like many cities, SDOT has developed a pothole repair tracking system and established a website for stakeholders and interested citizens to report and track how long it takes to accomplish the repair. A unique strategic practice has been established to provide a round-the-clock, work response capability. This work force was established to both eliminate costly overtime and call back pay problems, but to also provide a presence for emergency response during nights and weekends when the regular crews go home. These forces also accomplish in-

street work that has to be done at nights or on weekends. Examples would be street sweeping in the downtown district and patching potholes on a busy arterial.

Formalized Work Standards

SDOT has established formal work standards for many of its common work activities. These standards consists of an estimate of the number and type of personnel needed for the activity, the number and type of equipment needed, the amount of material, and the approximate daily production that is expected.

Winter Weather Maintenance

The division has implemented a proactive process to effectively prepare and respond to severe winter weather. Proactive practices include:

· Anti-icing

   The division has incorporated an anti-icing component, similar to other progressive highway agencies. In advance of a winter snow or ice event, a thin coat of anti-icing agent is applied to prevent frozen precipitation from sticking to the pavement surface. Many advanced highway agencies have adopted similar practices and are realizing significant benefits in efforts to keep streets and highways clear of snow and ice. One drawback to this practice is if the event begins as rain, the water can dilute the concentration of the agent and make it less effective. The division has also implemented the use of an environmental friendly anti-icing agent. Many highway agencies use salt brine which is more corrosive than the magnesium chloride that SDOT uses.

· Staffing

   The division has developed an agreement with other Seattle departments to hire truck drivers to help push snow in order to fully staff two shifts of workers to respond to snow and ice events. This innovative approach keeps operators on the job 24 hours a day whereas before, there were times when it was difficult to fully staff both shifts.

Pavement Performance Measures

SDOT has created goals and identified annual measures for many of its business units to achieve. However, most guidance for establishing performance measures in the transportation field rely on key performance measures or indicators that are outcome based.[3] NCHRP Report 660, "Transportation Performance Management: Insight from Practitioners" states:

> *Whether performance measures are selected in conjunction with strategic plan development or in a separate process, the strategic plan should serve as the guiding document in selecting performance measures. Measures should reflect agency goals and objectives, providing the data needed to answer the question, "how are we doing?" To the extent possible, measures should be outcome-oriented, meaning that they examine the impact of decisions made, rather than simply the amount of resources being devoted to a particular practice.*

Typically, there are certain "inputs" - labor, material, contracts, etc., that generate "outputs" - number of lane miles paved or number of blocks of sidewalks repaired that achieve an "outcome." Outcomes are typically high-level, overarching descriptors such as "percent of pavements in good and fair condition" or "percent of sidewalks in good and fair condition" that can be annually set or may be a multi-year target or goal. An example would be to set a target such that SDOT will have 80% of the lane miles of pavements in good and fair condition by 2018 on the arterial system. Then, each year, an annual target can be set and a specific output value for the number of lane miles to be resurfaced can be identified. If the current level of service provided by SDOT is 74%, the agency will have to program enough lane miles each year to gain a one percentage point annually over the next six years to reach the 80% target by 2018. Washington State Department of Transportation (WSDOT) for example, has established a goal for pavement condition as follows: "Maintain 90% fair or better condition rating for WSDOT-owned pavement."[4]

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[3] *NCHRP Report 660: Transportation Performance Management: Insight from Practitioners*, Transportation Research Board of the National Academies, Washington, D.C., 2010.

[4] Washington State Department of Transportation. 2012. *The Gray Notebook, 47.* Washington State Department of Transportation, Olympia, Washington.

In lieu of establishing specific outcome based performance targets for arterial pavements and the cost to achieve those targets, SDOT presents to elected officials and key decision makers the results of the three different funding options ($20.3 million, $37 million, and $65 million per year) as calculated by their pavement management software (StreetSaver.) StreetSaver has the capability to calculate the overall Pavement Condition Index (PCI) and the value of "Deferred Maintenance" for each funding option. The following illustration identifies the resulting PCI while Illustration 6 reports the monetary value of Deferred Maintenance for the three funding strategies.
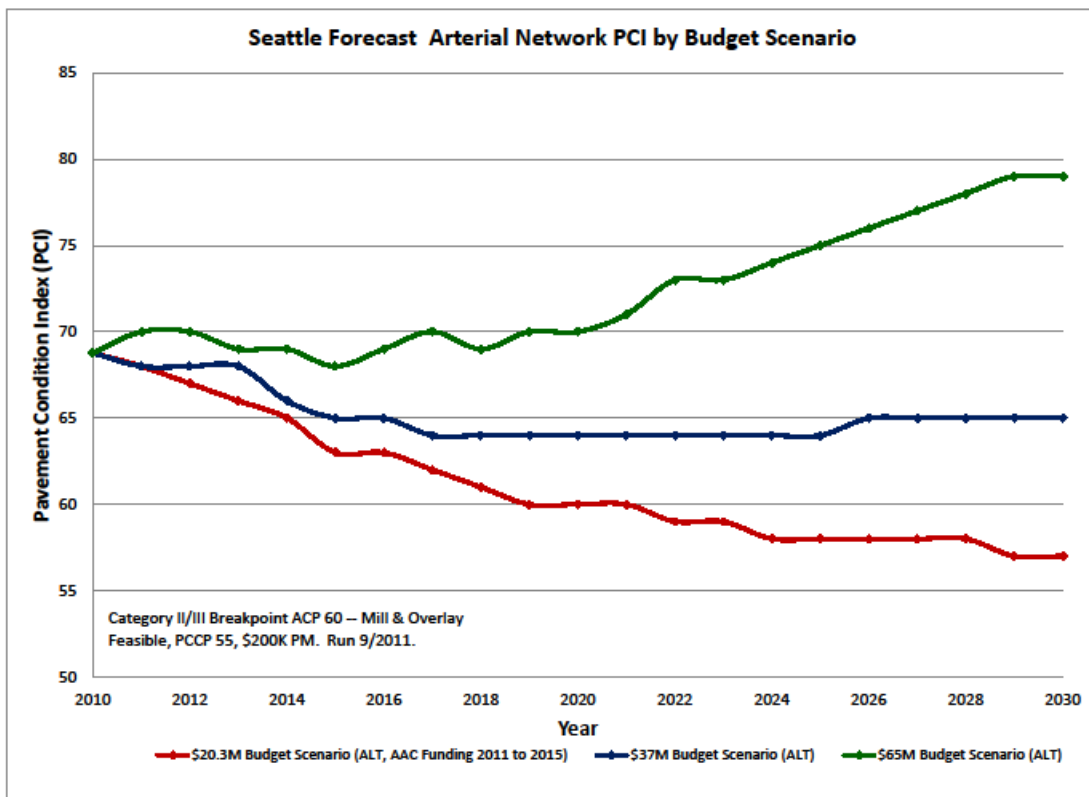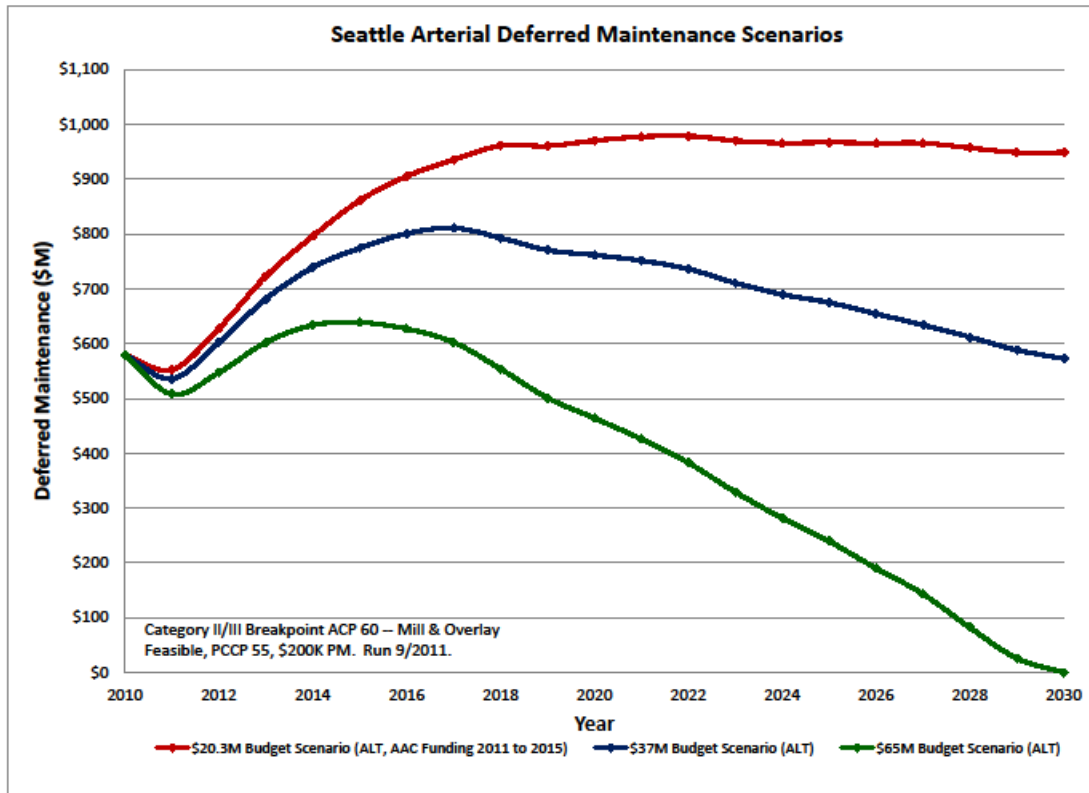

Illustration 5

Illustration 6

Based on SDOT's records, the three options can be summarized as follows:

- $20.3 million Budget Scenario – The deferred maintenance and pavement condition trajectory at the current funding level
- $37 million Budget Scenario – Stabilize the deferred maintenance and pavement condition
- $65 million Budget Scenario – Eliminate deferred maintenance and improve the pavement condition to an average PCI of approximately 79

SDOT Pavement Management Engineers report that *"These three data points allow decision makers to set budgets knowing what it will take to maintain the current direction, hold conditions steady, or improve conditions over time. A funding level between any of the points will achieve an outcome in between (further analysis can be performed once the funding level is set, as it has been for the $20 million BTG level)."*

Pavement Management

Pavements represent the largest value of any asset listed by SDOT and as such should be managed to achieve the highest level of service for the lowest life-cycle cost. As a part of this review, an analysis was conducted on the state of the condition of SDOT pavements, the strategy for the use of funds, and the level of investment.

Pavement Condition

As previously mentioned, SDOT has conducted assessments of its arterial system for several years. However, there has not been an evaluation of the condition of the non-arterial street system due to a lack of funds. SDOT uses a pavement assessment methodology consistent with that of the San Francisco Bay Area Metropolitan Transportation Commission along with American Society of Testing and Material (ASTM) standard D6433. These methodologies are used by many other public agencies for pavement management and pavement condition assessment and provide a sound and repeatable process. The process includes a rating of the existing pavement condition on a scale from 0 to 100 (0 being *totally failed* and 100 being *perfect*). Consistent with other transportation agencies, SDOT has categorized the existing condition of the City's pavement into the following categories based on condition:

Pavement Condition Rating and Pavement Condition Index

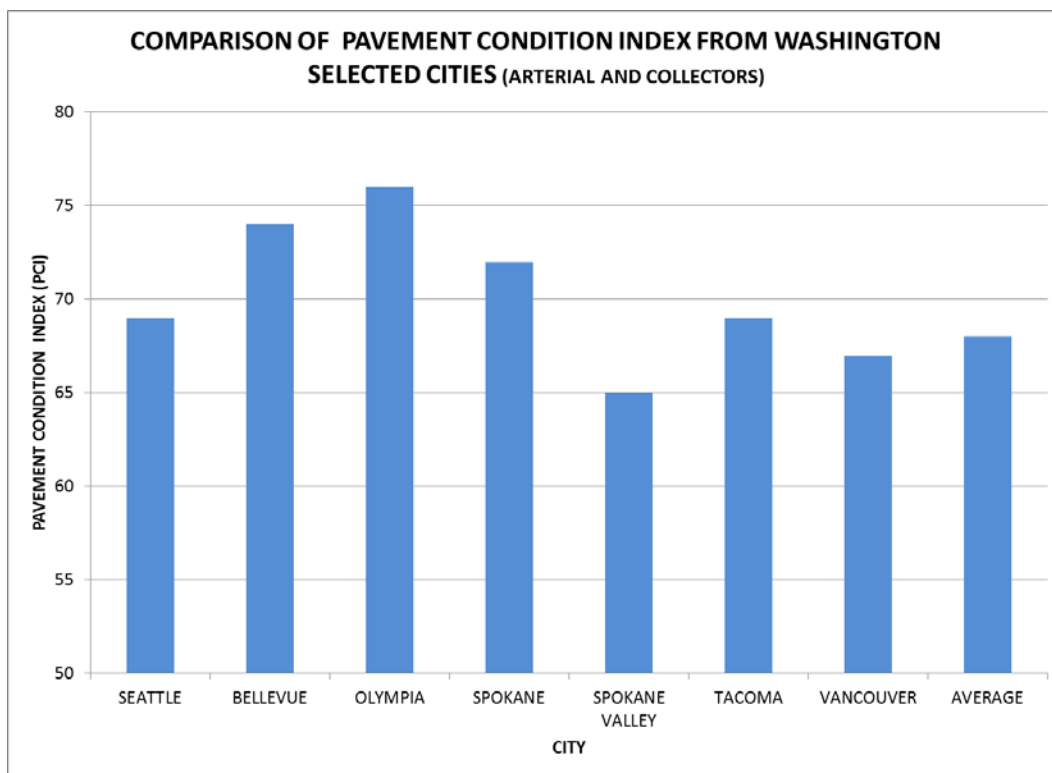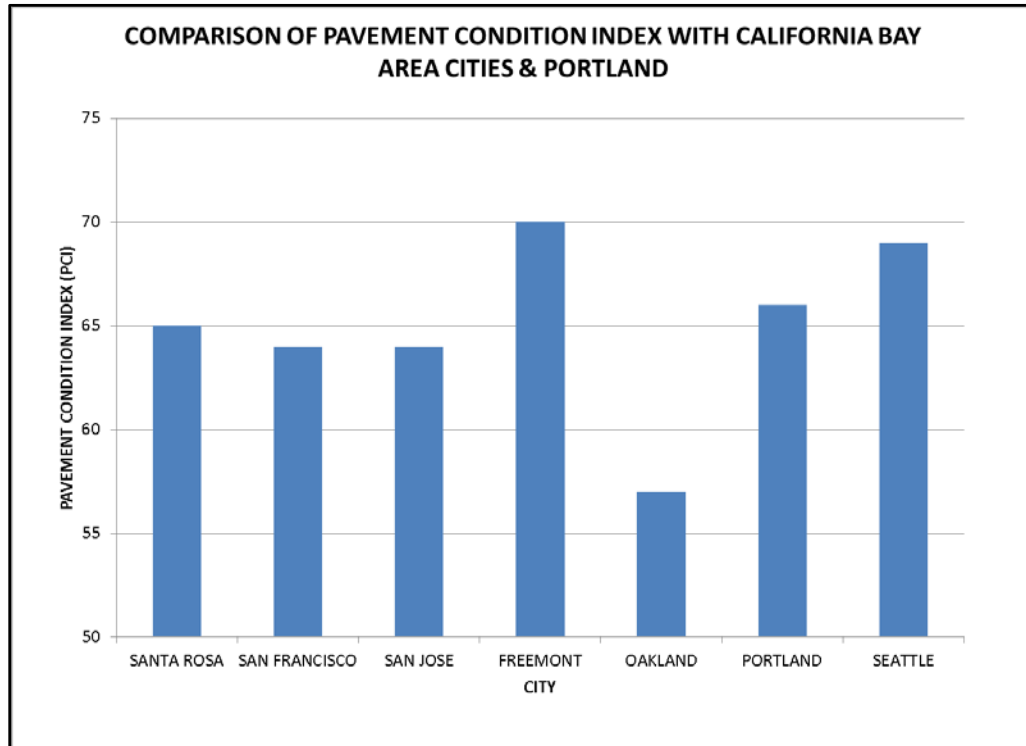| Pavement Condition Rating (PCR)	Pavement Condition Index (PCI)
Good	86 - 100
Satisfactory	71 - 85
Fair	56 – 70
Poor	41 – 55
Very Poor	26 – 40
Serious/Failed	0 - 25

Source: SDOT

Illustration 7

The following illustrations provide a comparison of the average PCI between Seattle and selected Washington cities (Illustration 8) and between Seattle and cities in the California Bay Area (similar size by lane miles) and Portland, Oregon (Illustration 9). While it should be noted that Seattle's street system, environment, and traffic conditions are not the same as these selected public agencies, it does provide useful information in terms of how well SDOT compares with neighboring entities. Illustration 8 indicates that Seattle's Arterial pavements, on average, are better that two of the selected cities (Spokane Valley, Vancouver), even with one (Tacoma), and lower than three others (Bellevue, Olympia, Spokane). Illustration 9 indicates that Seattle's Arterial pavements, on average, are better than the comparison cities except for the City of Fremont.

Source: *Washington's City Arterials Condition Report 2010,* Bob Brooks, WSDOT
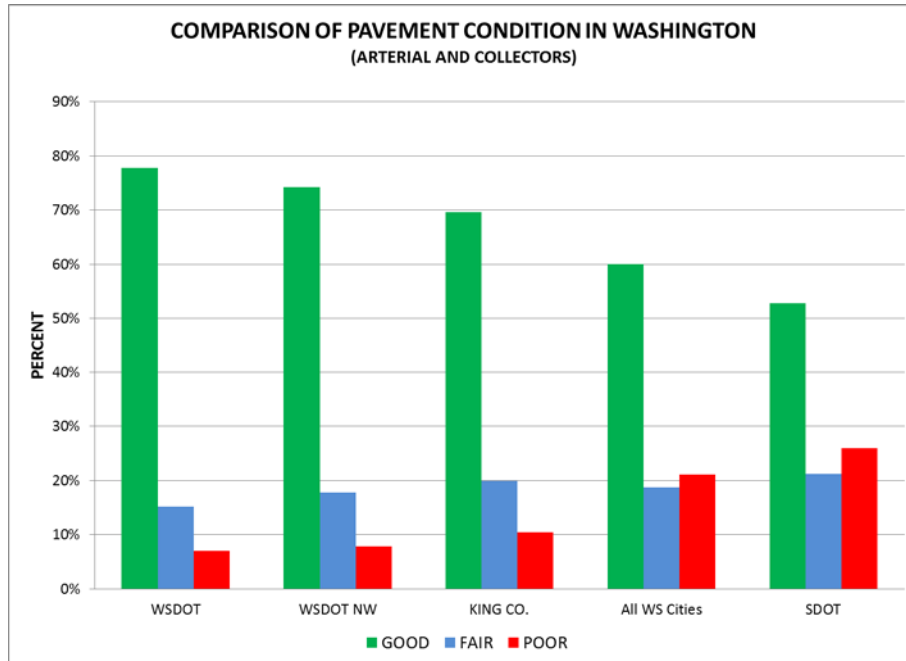
Illustration 8

Source: *MTC Pavement Condition of Bay Area Jurisdictions, 2011* & *City of Portland Bureau of Transportation Asset Status and Condition Report 2012*

Illustration 9

An additional comparison commonly used by other public agencies is to group the pavement network into categories of Good, Fair, and Poor. Illustration 10 provides a comparison between the pavement conditions of Seattle Arterial streets versus a subset of public agencies in Washington. This chart points out that Seattle has a higher percentage of pavements in Poor condition and a lower percentage of pavements in Good condition than other entities in Washington.   As previously mentioned, WSDOT has set a performance goal of achieving a fair or better pavement condition on 90% of their system. By contrast, the City of Portland has a goal of achieving a fair or better pavement condition on 80% of their Arterial/Collector system (actual results for FY 2011-2012 were 60%). The greater the percentage of pavements in poor condition, the more SDOT will spend on getting them back to a reasonable condition. Many studies have shown that a significant cost savings can be realized by keeping good pavements in good condition.

Source: *Washington's City Arterials Condition Report 2010,* Bob Brooks, WSDOT

Illustration 10

Pavement Management Strategy – Arterial System

SDOT currently uses a "hybrid" approach to manage the City's arterial street system which combines a mix of major rehabilitation (reconstruction) of failed pavement sections with the preservation (mill and overlay, select concrete panel replacement, and profile grinding) of pavement sections in need of maintenance often within the same corridor. It is used to reconstruct the inadequate pavement structure within the "bus" lanes while preserving, when possible, the portion of the street where cars travel. There are also stand alone projects that are solely major rehabilitation or preservation. SDOT staff report that many of the City's streets were not built to withstand the heavy loadings from modern day transit buses and that the additional loading is the primary cause of many of the major arterial street failures. The following Illustration provides a summary of the number of lane miles of pavement that were completed by type of treatment from 2007 to 2012.

LANE MILES OF PAVEMENT TREATMENT BY TYPE (2007 - 2012)								
TREATMENT	2007	2008	2009	2010	2011	2012	AVERAGE	PERCENT
Mill & Overlay ACP	26.90	41.50	14.10	19.30	29.20	12.10	23.85	77%
Select Panel Replacement and/or Diamond Grind PCCP	0.00	0.00	4.40	4.90	1.00	0.00	1.72	6%
Reconstruct PCCP	0.00	0.00	3.20	7.60	3.40	4.30	3.08	10%
Reconstruct ACP	1.90	0.00	6.70	1.50	3.40	0.00	2.25	7%
TOTAL	28.80	41.50	28.40	33.30	37.00	16.40	30.90	100%
ACP - Asphalt Concrete Program PCCP - Portland Cement Concrete Program								

Illustration 11

As the illustration indicates, four basic treatments were used during the 2007 – 2012 time period:

· Mill and Overlay of Asphalt Concrete Surfaces – 77%
· Selected Concrete Panel Replacement and/or Diamond Grind – 6%
· Reconstruct Portland Cement Concrete Pavement – 10%
· Reconstruct Asphalt Concrete Surfaces – 7%

The following Illustration provides additional detailed information on the type and condition of projects selected for improvement. Based on the current rating methodology adopted by ASTM, a majority of the pavements (69.7%) selected for improvement fall into the Poor, Very Poor, and Serious categories, while 25.5% and 4.6% fall into the Fair and Satisfactory categories respectively.

LANE MILES TREATMENT BY PAVEMENT CONDITION RATING (2007 - 2012)									
PAVEMENT CONDITION RATING (ASTM)	**PAVEMENT CONDITION INDEX (PCI)**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**AVERAGE**	**PERCENT**
Good	86 to 100	0.00	0.30	0.00	0.00	0.00	0.00	**0.05**	**0.2%**
Satisfactory	71 to 85	0.00	4.60	2.20	1.70	0.00	0.00	**1.42**	**4.6%**
Fair	56 to 70	4.10	23.70	7.10	2.70	6.80	2.90	**7.88**	**25.5%**
Poor	41 to 55	21.90	0.00	14.80	12.80	10.40	5.10	**10.83**	**35.0%**
Very Poor	26 to 40	2.80	12.90	4.60	9.90	19.80	8.40	**9.73**	**31.4%**
Serious	11 to 25	0.00	0.00	0.00	6.20	0.00	0.00	**1.03**	**3.3%**
Failed	0 to 10	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.0%**
	TOTAL	**28.80**	**41.50**	**28.70**	**33.30**	**37.00**	**16.40**	**30.95**	**100%**

Illustration 12

Over the same time period, SDOT has performed only a small amount of low cost preventive maintenance treatments[5] such as crack sealing, micro-surfacing, thin overlays, etc. (identified as cost effective treatments by the National Center on Pavement Preservation at Michigan State University). As stated previously, many studies have shown that a significant cost savings can be realized by keeping good pavements in good condition, i.e. have a preventative maintenance program for those pavements in the "Satisfactory" PCR range (PCI 71 to 85). A recent study on the condition of local streets in California by Nichols Consulting Engineers, Chtd. concluded that unit cost for preventive maintenance treatments were about one-quarter of the cost of a thin asphalt concrete overlay[6]. Additionally it is reported that of the 211 local California agencies surveyed "...*approximately 17 percent of future pavement expenditures are for preventive maintenance, which indicates that many agencies are cognizant of the need to preserve pavements.*" Other public transportation agencies have established low cost pavement preventive maintenance programs to complement resurfacing programs and

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[5] SDOT recently reported that its chip seal program for non-arterial streets ($1.75 million) and a crack seal program for arterial streets ($0.25 million) had been reinstated in the 2013 budget year.

[6] *California Statewide Local Streets and Roads Needs Assessment,* by Nichols Consulting Engineers, Chtd., January 2013

discovered that more miles of their system can be treated and kept in a fair or good condition without a lot more funding[7.] For example, WSDOT reports in its Gray Notebook that pavement technology and preventive maintenance strategies have enabled them to meet pavement condition goals:

> *WSDOT has been at the forefront of pavement technology to implement cost saving methods to make the state's roads last longer and cost less…It focuses on alternative preservation strategies based on lowest life-cycle costs (LLCC), and has succeeded in maintaining 93% of pavement in fair or better condition despite reduced paving budgets over the last 12 years (about $732 million below historic levels).*

A challenge that SDOT faces is the selection of pavement improvement projects. With limited funds, SDOT is under pressure to program the projects that provide the most benefit to the most people. The basic criteria SDOT uses to establish paving priorities are:

> *"…street condition (specifically the current 2011 Pavement Condition Index Survey); cost and cost effectiveness of treatment (using life cycle costs to weigh preservation opportunities against full street reconstruction); traffic volume; transit, freight, bicycle and pedestrian use; citizen complaints and claims; grant funding opportunities; and geographic balance across the city. The AAC program aims to deliver over time the greatest area of improved street surface to the largest number and widest array of users."[8]*

Paving projects are selected based on a multitude of factors and variables, but there are two overarching selection principles: cost effectiveness and user benefit. An initial list of paving candidates is developed based on Pavement Management System (StreetSaver) output which applies life-cycle cost analysis (LCCA) at the network level, estimating deterioration and prioritizing segment-by-segment the most cost effective treatment based upon condition, distress, and street classification. The Pavement Engineer refines the system's output, grouping street segments into continuous projects suitable for contracting. This process includes site visits to validate the pavement management system output and to identify the specific work that will be required along

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[7] Washington State Department of Transportation, 2011, *The Gray Notebook, 44.* Washington State Department of Transportation, Olympia, Washington.
[8] City of Seattle, City Budget Office. Capital Improvement Program (CIP) White Paper, Seattle Department of Transportation, Seattle, Washington.

each corridor. Next, the projects that benefit the greatest number of users and those which align with the City's transportation objectives are identified. Candidate projects are further examined using geographic information systems (GIS). This allows pavement management staff to evaluate pavement condition data against the backdrop of traffic (including auto, transit, freight, bike, and pedestrian), citizen complaints (correspondence, claims, pothole reports), major projects planned by utilities and others, and geographic balance across the City's neighborhoods. A final list of projects is proposed to fit the approved paving budget and it is submitted to the Street Maintenance Division Director and the SDOT Director for approval. The following illustrates this process:

SDOT Pavement Project Selection Process
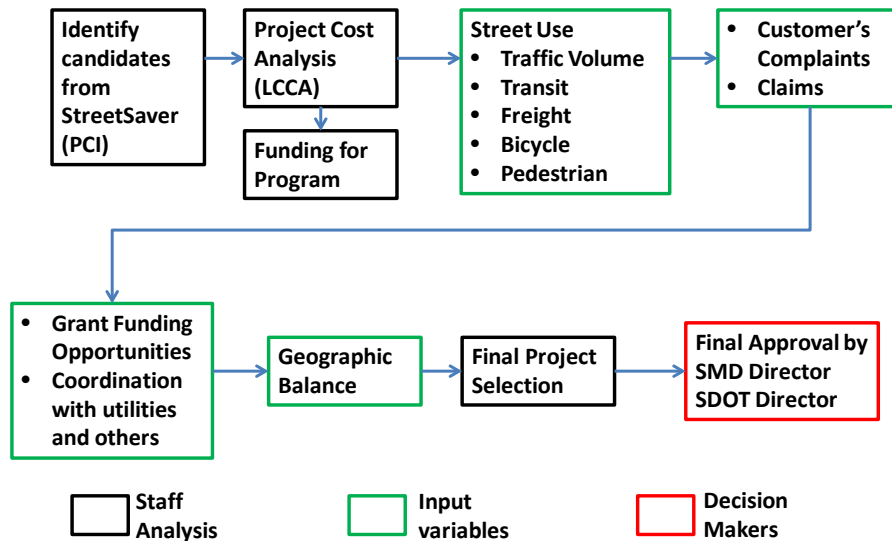
Funding Assessment

A review of the investment practices of Seattle was also conducted to determine if funding of the pavement program is significant enough to adequately sustain the condition of its streets. For non-arterial streets there is no formal program to access the condition nor is there a recurring budget to maintain this network. Without a significant increase in funding for non-arterial streets they will continue to deteriorate to the point where total reconstruction will be required.

For the arterial network, an evaluation was conducted using the Pavement Sustainability Index (PSI).   Australia and New Zealand road administrations have used this kind of analysis extensively to provide a quick gauge to see if they are investing in assets at a level that would sustain current (or target) condition. FHWA has also conducted research on a similar approach in the US for Pavements, Bridges, and Maintenance. The report[9] provides the methodology to create a Pavement Sustainability Index.

Illustration 13 provides Seattle's PSI for the previous ten years and a projection for the next two based on maintaining the current pavement condition of a 65 PSI. Based on this evaluation, the PSI exceeded the target of "1" only once during the previous 10 years - 2009 due to BTG funding. The PSI slightly increased and the percent of pavements in the Fair to Good category improved by 2% from 72% to 74%. However, in the years following 2009, the PSI has fallen below "1" indicating that funding for pavement management is also decreasing. This will further reduce the overall condition of the pavement of the arterial street network.
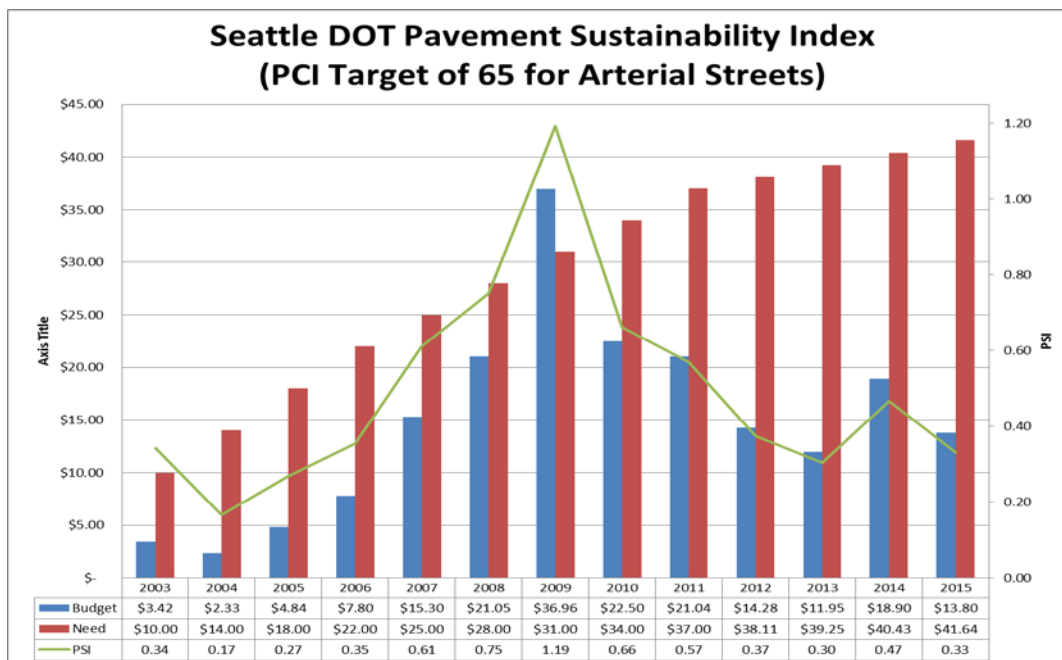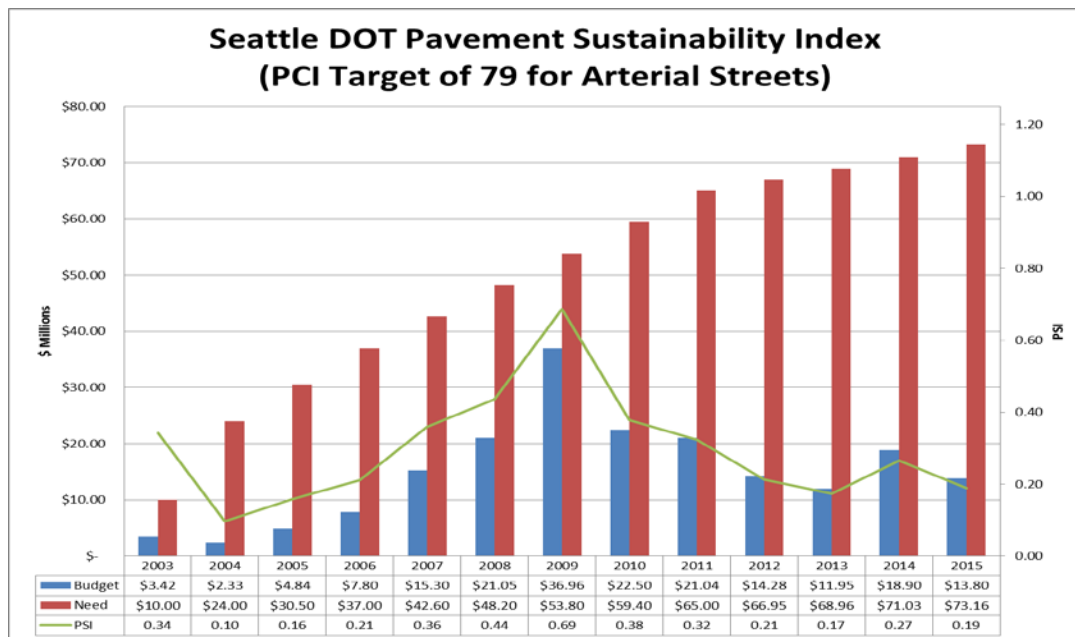

Source: Compiled by Review Team

Illustration 13

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[9] FHWA, 2012, *Asset Sustainability Index: A Proposed Measure for Long-Term Performance*. U.S. Department of Transportation, Washington, DC

The following illustration demonstrates what the PSI would be if the pavement needs grew to $65 million (based on 2011 SDOT Pavement Management Report to eliminate the $578 million backlog of arterial deferred maintenance needs over a 20 year period) in order to achieve a pavement condition target of 79. Obviously, in order to achieve the higher targeted pavement score (79) requires a much higher outlay of dollars which results in a PSI that is about one-half the value of that in the previous illustration:

Seattle DOT Pavement Sustainability Index
(PCI Target of 79 for Arterial Streets)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Budget	$3.42	$2.33	$4.84	$7.80	$15.30	$21.05	$36.96	$22.50	$21.04	$14.28	$11.95	$18.90	$13.80
Need	$10.00	$24.00	$30.50	$37.00	$42.60	$48.20	$53.80	$59.40	$65.00	$66.95	$68.96	$71.03	$73.16
PSI	0.34	0.10	0.16	0.21	0.36	0.44	0.69	0.38	0.32	0.21	0.17	0.27	0.19

Source: Compiled by Review Team

Illustration 14

A review of both figures indicate that since 2009 there has been an under investment of funding for pavements. Additionally, a continued practice of under investment will erode the benefits realized from the BTG levy and the division will fall further behind in meeting the pavement needs of the City.

Condition of Non-Arterial System

Over 61% of SDOT's pavement system consists of non-arterial streets. Unfortunately, the City does not have current condition data on non-arterial streets and only has a minimal program to

address the needs on this system.[10] SDOT managers cite a lack of funding as the reason for not

having updated condition information on this system and stated that funding a pavement

condition survey could be wasted money if there is no follow up action taken.[11] However, the

information obtained through this survey would enable SDOT to estimate the pavement needs

on this system, predict the value of the backlog of maintenance needs, and establish a more

comprehensive program to better manage this system. According to FHWA publication,

"Pavement Management Primer:"

> *Pavements represent the largest capital investment in any modern highway system.*
> *Maintaining and operating pavements on a large highway system typically involves complex*
> *decisions about how and when to resurface or apply other treatments to keep the highway*
> *performing and operating costs at a reasonable level….Pavement management brings more*
> *science into this process. A pavement management system consists of three major*
> *components:*
> 1. *a system to regularly collect highway condition data*
> 2. *a computer database to sort and store the collected data*
> 3. *an analysis program to evaluate repair or preservation strategies and suggest*
>   *cost effective projects to maintain highway conditions*

Management and Technical Training Program

As budgets are constrained, training becomes one of the first programs cut in an attempt to

save money. While an agency can make do on a short term basis without detrimental effects,

long term suspension of training can have negative impact on the skill level and proficiency of

the work force. SMD has identified management and technical training as a need and is looking

to reestablish this effort.

Software Enhancements

SDOT utilizes three main management software systems: HRIS (the citywide Human Resource

Information System), Summit (the citywide financial management system), and Hansen (SDOT's

work and asset management system). Hansen is the primary system for maintenance

management, Summit for fiscal management and HRIS for personnel management. Although

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[10] SDOT recently reported that its chip seal program for non-arterial streets ($1.75 million) and a crack seal
program for arterial streets ($0.25 million) had been reinstated in the 2013 budget year.
[11] SDOT recently reported that they have requested funding as part of the City's 2013 second quarter supplement
as well as in the 2014 budget to conduct a non-arterial survey.

these three systems operate primarily independently (there is some integration or interface between them) for certain functions, SDOT personnel may have to enter data into each system. Unnecessary resources are wasted in double entry of data to support effective management of SMD's workforce. We recommend that SDOT study whether creating interoperability for these two systems (Summit and Hansen) would be cost effective, and if so, that they pursue this option.

Work Activity Standards

SDOT has established formal work activity standards to help guide field forces in accurately estimating the resource needs of work crews, daily production goals, and accurate reporting of work accomplishments. These guidelines help provide clarity in data reporting and help crew leaders accurately report the work they do, which in turn feeds into the software systems to help improve management of SMD forces. However, since these have not been updated since 2005, some of the standards may not accurately reflect crew composition, equipment types, material usage, productivity standards, and work methods.

Outsourcing of Work

Except for the Arterial Asphalt and Concrete Paving Program, SDOT Street Maintenance Division accomplishes most of its activities with internal staff and personnel resources. Many public agencies have established specific practices/criteria that provide opportunities to outsource certain services such as staffing for the workload valleys and contracting for the peaks. As an example, the utility patching program is one that has been downsized over time due to the reduction in the demand and funding of the program. Should the economy rebound to the levels of 2008, SMD may not have the personnel resources to meet the increase in demand.

Employee Evaluations

Currently, there is no direct linkage between SMD's organization mission and goals and those of the managers and employees. The City is in the process of updating the employee evaluation process so this would be a good time to revamp this methodology to link the two together and

would make managers and employees more accountable for achieving the department's objectives.[12] According to NCHRP Report 660, "Transportation Performance Management: Insight from Practitioners":

> ***Hold staff accountable for agency performance.***
> *When employees understand that their job performance is gauged in part by the outcomes of appropriate performance measures, they are much more apt to see the "big picture" in their work and to find management strategies that influence results. A crucial component of performance-based management is cultivating an agency philosophy that stresses the idea that "we're all in this together." Increasingly transportation agencies are using system performance outcomes as one metric of employee performance. This helps staff understand the ultimate system outcomes to which they contribute.*

Sidewalk Performance Measures

In 2008-09, SDOT conducted an assessment of the condition of the sidewalks in the City's Urban Villages and established a three level grading system, Good, Fair, and Poor. At that time, SDOT estimated the condition results as follows: Good - 76.8%, Fair - 19.6%, Poor - 3.6%. Additionally, in the 2012 Action Agenda SDOT reports on four additional measures related to sidewalks:

MEASURE	2010 BASELINE	2014 GOAL
Pedestrian collisions per 100,000 residents	87	<75
Percent of pothole repair and sidewalk shim requests responded to within 3 business days	59%	80%
Percent of requested curb ramps completed to date	65%	80%
Pedestrian volumes	25,700	26,500

For comparison purposes, other major cities have developed performance indicators for sidewalk condition. For example the City of Washington, DC has developed two performance measures: 1) number of reported pedestrian deaths and injuries citywide, and 2) number of pedestrians walking and using transit to work. The targets are: 1) reduce pedestrian deaths and injuries by 5% every 3 years, adjusting for exposure, and 2) measurable increases annually through 2018.

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[12] *NCHRP Report 660: Transportation Performance Management: Insight from Practitioners*, Transportation Research Board of the National Academies, Washington, D.C., 2010.

The City of Portland has developed two performance measures: 1) ADA Corners - % of corners in the City with corner ramps, and 2) sidewalk condition - % in fair or better condition. The targets are 1) 100% and 2) 65%.

Conversely, other large cities place the responsibility for maintenance and repairs of sidewalks on the abutting property owner (San Francisco, Chicago, Minneapolis are examples). The City of Chicago has a cost share program for sidewalk repairs call "Shared Cost Sidewalk Program" whereby the City pays a portion of the cost and the property owner pays a set amount.

Sidewalk Repair and Construction

Since sidewalk repair and construction projects are not as expensive and do not impact traffic movement as much as large street projects do, they have a tendency to be less visible and are easily overlooked. While they may be overshadowed by larger CIP projects, sidewalk repair and construction projects make up a key component of Seattle's multimodal choice philosophy by providing an alternate to vehicular travel.

Sidewalk repair and construction is the responsibility of two separate Divisions within SDOT; repairs of existing sidewalks are primarily the responsibility of Street Maintenance Division while the construction of new sidewalks is the responsibility of Traffic Management Division.

The Street Maintenance Division is responsible for managing the Sidewalk Safety Repair Program which amounts to approximately $2 million per year. The program is focused on the repair of existing sidewalks, in particular where the City has a liability for the walkway's condition. A majority of the work accomplished with these funds is performed by SMD crews, tracked in the agency's Maintenance Management System (Hansen), and reported on a quarterly basis as part of the BTG initiative.

The Traffic Management Division is responsible for managing the Sidewalk Development Program (SDP), Pedestrian Master Plan Implementation (PMP), and Neighborhood Project Fund

(NPF). The SDP and the PMP is used to construct new sidewalks and project selection is primarily based on the criteria identified in the Pedestrian Master Plan, but may also be identified through the complete streets checklist process, neighborhood plans, requests from the community, and partnering opportunities. Under the NPF, candidate projects are initially identified by City residents. City staff reviews each one for feasibility of funding and obtains Neighborhood District Councils' confirmation for a final list of approved projects. Once approved for funding through any of the three programs, projects are scheduled for design and construction. Projects are tracked through existing management systems and reported on a quarterly base in accordance with the BTG initiative.

Backlog of Maintenance Work

Backlog is something that is very hard to determine and many transportation agencies struggle with quantifying this value. For arterial pavements SDOT has estimated the difference between the current condition of the asset and the condition if all deferred maintenance is eliminated over a 20-year horizon as estimated by their StreetSaver software. Because these outcomes are not transparent to policymakers or the general public, those without access to this data or expertise in transportation engineering do not have a quick and easy way to understand how the backlog is calculated.

As an alternative, the North Carolina Department of Transportation (NCDOT) has approached calculating and communicating its deferred maintenance backlog in this way: 1) defined the targeted level of service (less than perfect) through various performance measures, 2) estimated the cost to achieve this level of service, and 3) calculated the difference between the targeted funding level and the actual budget. This value is the "backlog" of work that NCDOT is unable to fund.

Policy and Planning

Background - Policy and Planning Division (P&P)

SDOT's Policy and Planning Division is one of the smallest business units within the Department with 32 full time employees. P&P is responsible for a variety of programs and services primarily in the areas of policy setting, strategic planning, and long range planning. It helps to provide linkage between the City of Seattle's Comprehensive Plan, SDOT's Transportation Strategic Plan, and SDOT's long-term and short-term work programs. P&P produces a variety of reports and studies for SDOT as well as coordinating functions for major program areas and City Council directives. A key focus area is in the promotion of modal choices to encourage mobility through non-vehicular options like walking, biking, and transit.

P&P is comprised of five sections and a Director's Office:

Planning & Urban Design (PUD)

The Planning & Urban Design section consists of eight FTE and is responsible for a number of planning activities and program areas which help shape transportation investments in concert with urban land use and planning activities. For example, such activities may include: citywide and Neighborhood Planning, Urban Design, the Complete Streets Program, and GIS Analysis and Data Management. PUD provides updates to the Comprehensive Plan and is responsible for developing and implementing elements of modal master plans for transit, bicycle, pedestrians, and freight. PUD works with subareas and neighborhoods in the development of plans and stewardship initiatives and conducts corridor studies for enhancements and mobility improvements. This section also provides conceptual designs to enhance the streets right of way within the context and guidance set forth in the Comprehensive Plan. In addition, it provides oversight for SDOT in complying with the requirements of the Complete Streets Program. PUD includes a GIS unit that provides data management and analysis support through GIS mapping services and data standards.

Transit Programs (TP)

The Transit Programs section consists of five FTE and is responsible for Transit Planning and System Development, Transit Service Programs, and Speed and Reliability Improvement Programs. TP provides services that enhance and promote the implementation of SDOT's Transit Master Plan including:

1. Policy and plan development,
2. Interagency coordination, and
3. CIP project design reviews.

Staff coordinates with King County Metro and Sound Transit to further the objectives of the Transit Master Plan and oversee the additional investment of SDOT funds to expand transit services with Metro for Seattle citizens. TP also oversees the Priority Bus Corridor program to improve speed and reliability and the Spot improvement program that makes minor infrastructure enhancements at spot locations that improve the safety or functionality of the transit environment.

Mobility Programs (MoPro)

The eleven FTE in the Mobility Programs section are responsible for enhancing mobility throughout the City within the context of Parking Management Programs, Travel Options, Trip Reduction Programs, and Freight Mobility Programs. Under the Parking Management Program, MP staff works in concert with Parking Operations of the Traffic Management Division to help establish:

· Parking policy and implementation,
· Center City parking programs
· Community parking and access programs,
· Light rail parking programs and
· Studies to determine parking rates.

MoPro also develops strategic plans for travel options and to educate the public on the various modal options. The Commuter Trip Reduction program, as mandated by the State of Washington, is monitored by this section to ensure the City of Seattle and other major employers are in compliance with this act. MP has facilitated the implementation of the

Freight Mobility Strategic Action Plan and coordinates with other freight partners such as the Washington State Department of Transportation (WSDOT), the Puget Sound Regional Council (PSRC), and the Port of Seattle.

Revenue & Capital Development (RCD)

The Revenue & Capital Development section consists of four FTE and is responsible for large capital planning and programming, revenue development, and regional planning. One of the major activities of this section is developing grant applications and securing revenue for Seattle transportation projects. RCD provides support to SDOT in the ranking, prioritization, and funding of major CIP projects and seeks grant funds to help leverage SDOT funds to the greatest extent possible. RCD also serves as a coordination partner with PSRC in the development of transportation project needs, travel demand modeling verification, and other Seattle specific transportation issues in the Puget Sound region.

Strategic Asset Management (SAM)

The Strategic Asset Management section's one FTE is responsible for the Department's Asset Management Program. The manager of this section recently retired and SDOT is in the process of replacing the position. SAM integrates the concepts of Asset Management within relevant SDOT activities and divisions and serves as the focal point, technical expert, and coordinator for this activity. As the new federal transportation bill (MAP-21), which places an emphasis on asset management, goes into effect, and the PSRC implements its recently established grant set aside program - specifically for asset preservation - the work of SAM will become increasingly important to SDOT.

Preliminary Analysis

The Policy & Planning Division is one of the department's most important business units as it helps to provide the linkage between Settle's Comprehensive Plan, Transportation Strategic Plan, and the agency's business plans. These various plans provide the agency with a direction based on its corporate vision.

P&P has professional managers in place to operate its business units. With the exception of the Strategic Asset Management position which is currently vacant, each has a number of years of experience in urban planning and design and understands their role in the organization and what is expected of their business unit. The division appears to be dedicated to a strong customer service philosophy, engages the public in the development of the various modal master plans, and continually seeks input from the citizens of Seattle.

Basis for Comparisons

To identify best practices that could provide valid comparisons of P&P's operations, a number of industry standards were obtained from the American Association of State Highway and Transportation Officials (AASHTO), the National Cooperative Highway Research Program (NCHRP), and the Federal Highway Administration (FHWA). Additionally information was acquired from San Francisco County and the Washington Department of Transportation's "Gray Notebook".

Strategic Planning

Strategic planning is a critical component in SDOT's effort to be an effective and progressive transportation agency. The Policy & Planning Division provides support in the development of a variety of strategic plans (e.g., pedestrian, bicycle, and transit master plans, Action Agenda, etc.) that provide short-term and long-term direction for the agency. The plans serve as the agency's compass to provide guidance and direction among the multitude of transportation demands that are placed on the City. The plans provide the linkage between the City's Comprehensive Plan, the SDOT Transportation Strategic Plan, and the department's programs, projects, and services. This linkage is critical to SDOT's ability to coordinate its mission with the City's overarching mission and priorities, and provides the openness and transparency needed to set SDOT's transportation agenda.

SDOT Action Agenda

The SDOT "2012 Action Agenda, Laying the Groundwork" is a public document produced by the agency which serves as a tactical business plan for the two-year period from 2012 to 2014. It identifies the policies, actions, and measures of success that SDOT intends to accomplish by 2014 and demonstrates the agency's commitment to accountability and transparency. While the document could provide more specificity in terms of performance outcomes, it does serve as a communication tool in establishing a foundation for the keys to SDOT's success through specific and measurable performance targets and objectives. Through the Action Agenda, the City Council, Mayor, and other stakeholders know what to expect from SDOT and the agency's business unit managers and employees know what they will be responsible for delivering. The document also establishes the amount of work that will have to be accomplished to meet the commitments set forth in the Bridging the Gap (BTG) program.

Modal Strategic Plans

The P&P Division has produced several modal master plans (pedestrian, bicycle, and transit) that provide the framework for improving modal alternatives for Seattle. The master plans establish priorities for funding standalone projects and identify corridors for implementing modal enhancements throughout the City. This allows the City to incorporate modal enhancements with the scope of individual projects as they reconstruct or expand streets through the normal course of their Capital Improvement Program.

Success in Grant Funding

P&P has enjoyed success in applying for and obtaining grant funding that helps to supplement SDOT's budgets for specific projects that would otherwise not be undertaken, or would not have been completed or started as quickly. Over the last 5 years, P&P has been successful in obtaining $ 210 million to fund much needed City transportation projects. In addition, according the agency's Action Agenda, P&P has established a target goal of obtaining $19 million in grant funding for transportation projects for 2012 and 2013. In 2012, SDOT

requested nearly $98 million in grants and has either received or been recommended for awards of $55.4 million.

Expansion of Transit Service

The P&P Division has successfully negotiated an agreement with King County Metro for the expansion of bus service, funded through the City's Bridging the Gap transportation package. The added service provides for 45,000 additional service hours per year which is equivalent to about 10 additional buses running 12 hours a day, 365 days a year. These additional buses help to reduce vehicular traffic which in turn, reduces congestion and also provides for alternative option for achieving mobility. Additionally, the City invests in transit speed and reliability improvements (e.g., transit signal priority, curb bulbs, queue jumps, and bus-only lanes) within the City rights of way to make transit a competitive option to driving.

CIP Prioritization

P&P has established a data driven process for the prioritization of large CIP projects for the City. The prioritization process is a number driven methodology that assigns points to each candidate project based on how well it meets the objectives of the core principles of the City. Candidate projects receive points based on specific attributes:

1. Enhance Public Safety (total collision rate, bike and pedestrian collisions, improve infrastructure conditions),
2. Promote Environmental Stewardship,
3. Support Equity and Health,
4. Support Priority Corridors,
5. Advance Complete Streets, and
6. Support Future Growth.

P&P compiles all data for each project and does the initial scoring and ranking. The ranking process considers project scopes as well as qualitative factors such as leveraging opportunities and geographic distribution. The results of this analysis are presented to the CIP Working Group which consists of SDOT division directors and senior managers. The CIP Working Group

reviews the project scores and rankings before the final list is given to the Department Director for approval.

Complete Streets Reviews

The P&P Division is responsible for ensuring SDOT and others making street improvements comply with the 2007 enacted City Council Complete Streets ordinance. This ordinance requires the implementation of specific elements within each street project that enhance multimodal options. The elements can be minor in nature such as bicycle racks, bike sharrows (lane markings), and pedestrian islands or can be more major improvements like curb bulbs, sidewalks or bike lanes buffered from traffic, street trees, and landscaping (see Appendix A). These elements are helping to transform the City of Seattle into one of the most walkable and bike friendly cities in the nation. P&P has developed a Complete Streets checklist that SDOT staff use to evaluate whether City projects comply with the Complete Street ordinance.

Office of Strategic Asset Management

The Office of Strategic Asset Management serves as the champion for the implementation of asset management concepts and philosophy within SDOT. SAM has established a plan which includes the formation of an Asset Management Steering Committee, an Asset Owners Users Group, and the development of an asset registry.

As a part of this preliminary assessment, a survey was administered to SDOT's division directors and senior leadership. The survey was based on questions developed as a part of NCHRP (National Cooperative Highway Research Program) Project 20-24(11) titled "Transportation Asset Management Guide" and was intended to provide insight on how SDOT leadership views progress toward achieving an "asset management culture[13]" within the organization. The

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[13] A culture that embraces the principles of asset management as defined in NCHRP Project 20-24(11), ie. a strategic approach to managing transportation infrastructure assets focusing on business processes for resource allocation and utilization with the objective of better decision-making based upon quality information and well-defined objectives.

survey covered four broad topics of Policy Guidance, Planning & Programming, Program Delivery, and Information & Analysis[14].

Participants were asked to rank their answers from "Strongly Disagree" (score of 1) to "Strongly Agree" (score of 4) for each question in the four topic areas. Numerical scores based on these answers were averaged for all participants (see Charts 1 through Chart 13 at the end of this section). For each area, a score of 3 or 4 would indicate an organization with a mature and advanced asset management program. A score of 1 to 2 would indicate an area that should be considered for improvement. The scores are not intended to be absolute values, rather as indicators of areas an agency or department should consider for further review.

For comparison purposes, data is provided from a recent research project completed through NCHRP (Synthesis 439) which included a survey of state transportation agencies asked the same basic questions as the ones for the SDOT survey. The results from this survey are shown in Charts 1 through Chart 13 and identified as "STATE DOTS". As evident in these charts, in most categories, the scores from the SDOT self-assessment are higher than those from other states. The exceptions to this are the questions in two areas: data collection (questions D1, D2, D3, D5) and decision support tools (questions D12, D13, D14, D15, D16). Notably, with one exception, the state DOT scores in these areas were also below 3.0. The three questions for which the state DOT responses were more than 0.5 points higher than SDOT's were:

- D2. Our agency regularly collects information on the condition of our assets.
- D15. Our agency uses asset management decision-supported tools to forecast future system performance given a proposed program of projects.
- D16. Our agency uses asset management decision-supported tools to forecast future system performance under different mixes of investment levels by program category.

Customer Service and Stakeholder Input

The P &P Division appears to be dedicated to a strong customer service philosophy as evidenced by the way it has engaged the public in the development of the various modal

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[14] See Appendix B for the survey instrument

master plans and the numerous methods used to continually seek input from Seattle and Puget Sound residents on transportation issues.

Grant tracking

As mentioned previously, P&P has been successful at applying for and obtaining grant funding ($210 million over the last five years) for SDOT transportation projects. Once a project moves from grant funding approval to project development, responsibility for ensuring that the project meets all grant funding requirements shifts to the individual project or program manager supported by the project controls and financial management staff. While SDOT managers indicated that this decentralized approach has been effective in the past, it was put into place when there were fewer grants from a limited set of grant agencies. Centralized oversight would provide better coordination among the different teams, as well as create a single point of contact for federal, state and other funding agencies; and help ensure that quarterly progress reporting and the execution of grant agreements are well coordinated. Changing federal regulations, such as the passage of the new transportation authorization act (MAP-21)[15], set in place stronger accountability and enforcement mechanisms. Future success in securing these funds is reliant on SDOT's ability to be fully accountable. In our view, additional centralized management and oversight could improve SDOT's' ability to efficiently and effectively manage its grants and ensure compliance with grant requirements. To this end, SDOT requested a centralized grant management position in the 2013 budget (it was not approved). SDOT has also requested this position in the 2014 budget.

Scoping of Future Projects

As is typical in most transportation agencies, projects begin as an initial idea to solve a transportation need or gap in the system without a lot of clarity on the features that will be included in the project. During the development of a project's scope, there are many decisions that will be made to determine the type of improvements to be included in the project. For

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[15] MAP 21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112.141), was signed into law by President Obama on July 6, 2012. Funding surface transportation programs at over $105 billion for fiscal years (FY) 2013 and 2014. MAP 21 is the first long-term highway authorization enacted since 2005.

example, planners will need to consider the number of lanes of traffic there will be, whether there will be parking lanes or bus shelters as part of the project, whether the project will require revisions in the signal system (or a new signal system altogether), what pedestrian improvements to include, what accommodations will need to be made for street drainage, and more.

To estimate the cost of each of these project components and further refine project scopes, P&P must rely on engineering expertise in other SDOT divisions to develop cost estimates and/or validate estimates prepared by consultants. Over the years, the funding to support the work staff in other divisions related to project development has been nearly eliminated as part of budget cutting requirements. This lack of technical support can result in a lack of information to support competitive grant applications or preliminary cost estimates that do not accurately reflect the cost of the project and/or may require later adjustments in capital funding once the project is approved and the project scope is better defined. If the project cost is under estimated, the department may need to find additional capital dollars to fully fund the project, which in turn can reduce or delay fully funding other capital projects. If the project cost is over estimated, other projects may not be programmed and/or the agency may have excess funds at the end of the year.

National studies have identified project cost escalation as a major concern in all forms of governments within the transportation sector. NCHRP Report 574, "Guidance for Cost Estimation and Management for Highway Projects during Planning, Programming, and Preconstruction" was developed as a guidebook that presents approaches to develop project cost estimation and management control. This guidance helps provide more accurate cost estimates through all phases of a project's life from initial conception to completion. While the guidebook does not specify one single methodology to estimate project costs, it provides a variety of cost estimation methods that vary based on the purpose of the estimate and the complexity of the project. The report further states that "The percent design completion that

supports the baseline varies depending on project type, size, and complexity…. Some projects may be included in the priority program with as little as 5% design completion.

In another example, WSDOT has developed a formal process for project cost estimating which identifies four main phases of project development:

1. Planning - For long range planning (0% to 15% design completion)
2. Scoping - For budget authorization of capital project candidates (10% to 30% design completion)
3. Design - For project control of scope, schedule, and budget (30% to 90% design completion)
4. Plans, Specifications, and Estimate - Engineer's Estimate prior to formal bidding (90% to 100% design completion)

Corridor and Subarea Planning Studies

With the initiation of Freight Master Plan in 2013, SDOT will have completed a suite of modal master plans. Following on these citywide efforts, corridor and subarea planning studies are needed to:

1. Provide the opportunity to integrate modal plan recommendations and resolve modal conflicts within a specific geography,
2. Provide the detailed information needed to review private development plans,
3. Identify the improvements that are necessary along the corridors, and
4. Support the development of complete and accurate grant applications.

To accomplish these objectives, SDOT has identified several priority corridors for improvement within the City and is beginning to undertake studies of some of them. For example, studies of five key Transit Master Plan corridors were funded in SDOT's 2013 budget. SDOT intends to initiate project development activities on the five projects later this year. SDOT has also requested funding for eight additional corridor studies in its 2014-15 proposed budget. In the absence of these studies, SDOT will continue to lack the detailed information needed to review private development plans, plan for needed improvements in the corridors, and develop successful grant proposals.
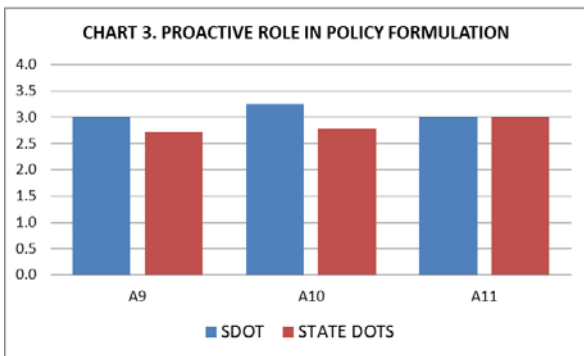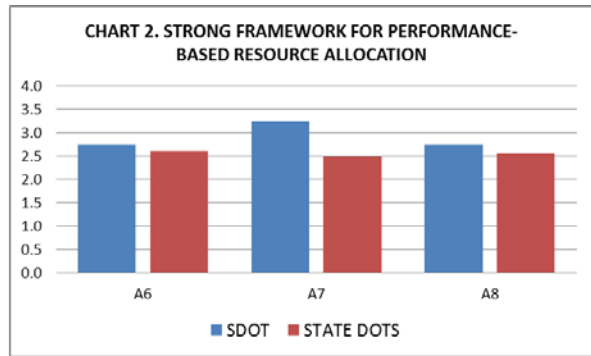
Management and Technical Training Programs

As budgets are constrained, training becomes one of the first programs cut in an attempt to save money. Due to a citywide budget initiative reducing training budgets, SDOT had to eliminate formal management training and leadership development activities and focus on funding mandatory, safety-related training. In addition, City sponsored training classes, which are generally offered at little to no cost to the departments, were also reduced during this period. While an agency can manage on a short-term basis without detrimental effects, long-term suspension of training can have negative impacts on the skill level and proficiency of the work force. SDOT has identified management and technical training as a need and is looking to re-establish this effort at the department and/or citywide level.

PART A. POLICY GUIDANCE

CHART 1. POLICY GUIDANCE BENEFITING FROM GOOD ASSET MANAGEMENT PRACTICE

CHART 2. STRONG FRAMEWORK FOR PERFORMANCE-BASED RESOURCE ALLOCATION

CHART 3. PROACTIVE ROLE IN POLICY FORMULATION

PART B. PLANNING AND PROGRAMMING

CHART 4. CONSIDERATION OF ALTERNATIVES IN PLANNING AND PROGRAMMING

CHART 5. PERFORMANCE-BASED PLANNING AND A CLEAR LINKAGE AMONG POLICY, PLANNING, AND PROGRAMMING

CHART 6. PERFORMANCE-BASED PROGRAMMING PROCESS

PART C. PROGRAM DELIVERY

CHART 7. CONSIDERATION OF ALTERNATIVE PROJECT DELIVERY MECHANISMS

CHART 8. EFFECTIVE PROGRAM MANAGEMENT

CHART 9. COST TRACKING AND ESTIMATING

PART D. INFORMATION AND ANALYSIS

CHART 10. EFFECTIVE AND EFFICIENT DATA COLLECTION

CHART 11. INFORMATION INTEGRATION AND ACCESS

CHART 12. USE OF DECISION-SUPPORT TOOLS

CHART 13. SYSTEM MONITORING AND FEEDBACK

Capital Projects and Roadway Structures

Background – Capital Projects and Roadway Structures (CPRS)

Capital Projects and Roadway Structures is responsible for developing, maintaining and operating a transportation system that promotes and delivers safe, reliable and efficient transportation to enhance Seattle's environment and increase the economic vitality of the City and the surrounding region. In 2008, the construction administration of SDOT projects was transferred from Seattle Public Utilities (SPU) to SDOT.

CPRS is currently organized into four sub-divisions with each having a manager reporting to the Division Director:

- · Capital Improvement Program
- · Project Controls & Consultant Contracts
- · Real Property & Environment
- · Roadway Structures

There are currently 163 positions within CPRS[16] and it accounts for annual expenditures of over $54 million[17]. Performance is measured using a process that annually develops individual work programs and expectation statements for each staff member. Each is reviewed by the individual and the applicable supervisor at least quarterly to ensure that expectations are being met.

CPRS acts as the project delivery arm of the department with construction management as a major component. Its involvement in the construction management process includes the planning, design and construction phases of the work. Project scopes are outlined by other divisions within SDOT. CPRS then works on behalf of, and in association with, each to develop project budgets and schedules.

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[16] As identified on CPRS' organization chart
[17] 2012 Adopted budget

Preliminary Analysis

Capital Projects and Roadway Structures oversees all aspects of project management, design, planning, and development, and implementation of transportation projects. As with other SDOT services, CPRS has been impacted by the economic recession. In the past five years, its funding has fluctuated widely each year.

CPRS is currently organized into a logical tiered structure with defined single points of responsibility and a system in place to measure individual performances. Over the past few years, the division has improved its structure to manage projects and has standardized guidelines on cost estimating, change and cost management, project management, and risk assessments. It currently has, and generally uses, the necessary tools to manage its business effectively and efficiently.

Basis for Comparisons

To identify best practices that could provide valid comparisons of the division's operations, information was acquired from the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the American Association of State Highway and Transportation Officials (AASHTO), the National Cooperative Highway Research Program (NCHRP), the Washington Department of Transportation's "Gray Notebook", the Oregon Department of Transportation, Sound Transit, the Tennessee Department of Transportation, and private sector companies in Hi-Tech, Pharmaceutical and Oil and Gas.

Project Delivery - Process and Procedures

CPRS has recognized the need for a robust yet flexible project delivery framework that provides a foundation for systematically and efficiently delivering projects on time and within scope and budget. As part of the program to ensure SDOT is efficient and effective, CPRS management and staff collaborated with outside consultants to develop a comprehensive Project Delivery Manual (PDM) and a complementary Construction Administration Manual (CAM). Used in conjunction with the City's Standard Specifications for Road, Bridge, and Municipal

Construction, the formal contract, and current local, state, and federal laws and regulations, these manuals provide a general roadmap for all division staff and consultants involved in capital project delivery. Additionally, they form the standard framework for delivering transportation projects from development through close-out and provide guidance to SDOT's construction engineering staff and consultants during the construction phase of any project.

In addition to the comprehensive Construction Administration Manual used during construction, SDOT has assembled a guidebook of procedures to ensure the organization is compliant with all laws, policies and guidelines regarding contracting rules and regulations, selection procedures, invoice processing and contract documentation when engaging outside consultants. Titled, *The Consultant Contracts Guidebook*, it offers a general framework of the required processes, policies, requirements, and documentation needed but refers the reader to the staff of the Consultant Contracts Unit (CCU) to provide more detailed instructions throughout the process.

The division has also created mechanisms for early and timely communication and coordination and developed systems to generate and collect information in a consistent manner to enable performance to be accurately analyzed, improved, and reported. Roles and responsibilities are clearly defined and published and processes are in place to reduce the learning curve of new staff members.

Project Delivery – Implementation

To ensure the Capital Projects & Structures Division is adhering to practices and procedures detailed in the Project Delivery Manual, a sample project was selected and the following areas examined:

- · Project Management Plan
- · Construction Administration Manual
- · Document Management
- · Knowledge Transfer and Lessons Learned
- · Value Engineering
- · Cost Estimate Development

- Contractor Payments
- Risk Management
- Change Order Management
- Project Close Out
- Life Cycle Costing
- Interagency Projects

Both the division's Project Delivery Manual and Construction Administration Manual were reviewed and compared favorably to industry best practices.   These practices were obtained from:

- *The Gray Notebook*, Washington Department of Transportation (WSDOT),
- Federal Highway Administration (FHWA),
- Federal Transit Administration (FTA), and
- American Association of State Highway and Transportation Officials (AASHTO).

Project Management Plan

The Project Management Plan (PMP) is used to take the broad objectives and parameters set forth in the Project Charter and translate them into a detailed work plan. It is designed to establish a systematic project management structure for each project, including the development of a detailed scope, schedule, and budget. Additionally, it defines project roles and responsibilities and ensures the engagement of all individuals responsible for project delivery in an early and timely manner. The Project Delivery Manual states that a project's PMP shall be approved and signed by CPRS management by the 30% design review submittal and shall comprise the following documents:

- Scope of Work
- Schedule
- Cost Estimate
- Environmental Matrix
- Risk Registry
- Public Involvement Plan
- Complete Streets Checklist

Our review of the documents provided confirmed that a PMP had been prepared for the Greenwood Avenue N Street Improvements project (Project # 35033). It identified that the

PMP had been signed by the proper authorities at the appropriate time and that each of the documents listed above was present and contained in a single package.

Construction Administration Manual (CAM)

The Construction Administration Manual only details processes, forms, and approvals for Design-Build-Bid projects. The State Legislature did modify RCW 39.10 in 2007 to allow a much wider use of alternative methods of project delivery but the Construction Administration Manual currently does not specifically address the nuances of delivery methods such as Design-Build or GCCM.

Document Management

While reviewing the documentation for the Greenwood Avenue N Street Improvements project selected for analysis, not all were found to be complete, organized, and available for examination. Individuals within the organization appear to be maintaining their own files and requests to obtain documents meant having to seek out that individual to retrieve the information. The review team did not have access to any electronic version of these specific files and at initial glance, the storage and management of those documents did not appear to comply with the practices and procedures set out in Section 6 of the Construction Administration Manual.

Knowledge Transfer and Lessons Learned

Several manuals and procedures exist within the Division dictating administrative processes, technical procedures, and purchasing rules and limits to enable projects to be handled in a consistent professional manner. Staff has access to hard copies of these manuals as well as a link to electronic versions. Regular reviews appear to be conducted by management to ensure that the staff is aware of these manuals and procedures and is using them correctly. Most are live documents which are updated as the internal processes and procedures are refined.

The division has recognized the value of a lessons learned process and developed a formal database. However, the consensus of opinion from SDOT is that the database is cumbersome to enter information into and is not used consistently. An informal transfer of knowledge process does exist between the various groups in the division and within each group. For example, lessons learned are transferred at the end of the project in team meetings with the project manager, management meetings, and during project manager quarterly reviews. Other organizations[18] have established lessons learned practices as a repository for knowledge and experience gained from project activities, which are then used to benefit current and future projects by revising procedures and work products to eliminate non-value added activities and identify areas where cost and schedule performance can be improved.

Value Engineering

The Washington State Transportation Improvement Board (TIB) requires a Value Engineering (VE) study be performed for projects that exceed $2.5 million in which TIB participates in the funding thereof. The intent of this study is to evaluate all aspects of the preliminary design, to propose design improvements, and offer cost reduction ideas for the project. The chosen project was subject to TIB funding and exceeded the financial threshold necessitating a VE study. The documentation provided showed that a VE study had been carried out in accordance with the guidelines contained within the PDM.

Cost Estimate Development

The PDM mandates that the Project Manager, in conjunction with the Project Engineer, prepare a cost estimate once a project has reached 30% design. This estimate is required to be updated as the design reaches both 60% and 90% completion before being finally revised on completion of the design. These completion percentages follow industry guidelines as established by the AACE Cost Estimate Classification System and the Cost Estimating Manual for WSDOT projects. Although Division personnel indicated that licensed professional engineers are used to prepare and/or review estimates, professional estimators are not used perform this task.

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[18] Including WSDOT and Sound Transit

The PDM states that each estimate should include contingencies to account for unknown factors or changes to the project scope, budget, or schedule. These contingencies should include the following, which are further elaborated on in the PDM:

· Management Reserve
· Construction Incidentals
· Miscellaneous Construction Elements
· Administrative Costs

As part of our preliminary analysis of this process at SDOT, we reviewed two projects completed by CPRS in 2009 and 2010. It is important to note that, out of the approximately 29 projects SDOT completed in 2009 and 2010, our preliminary analysis examined two of them. Further analysis, including a review of a larger sample of projects, is needed to determine whether these two projects are representative of SDOT's cost estimates in general.

Project One

A summary of the estimates prepared for the Greenwood Avenue N Street Improvements project are identified in the following table. The accepted bid for the project is shown for comparison. The table identifies the amount of the estimate and the amount of contingency added to the estimate, calculates the accuracy of each estimate compared to the successful bidder, and shows the estimated accuracy expected at each design stage. This accuracy range is obtained from the Cost Estimating Manual for WSDOT Projects[19] which is consistent with the expected accuracies stated by both the American Association of Cost Engineers (AACE) and the American Society of Professional Estimators (ASPE)[20].

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[19] November 2008

[20] The AACE and ASPE expected cost estimate accuracies were developed by averaging cost estimation data from many different projects in many different jurisdictions throughout the U.S., any of which may have been impacted by circumstances such as unforeseen conditions discovered during the design phase, stakeholder requests that change project scopes, or changes in grant funding.

Design Stage	Cost of Work	Contingency	Total Cost	Contingency (%)	Estimate Accuracy	Expected Estimate Range
Preliminary (30%)	$4,039,267	$807,853	$4,847,120	20%	+49%	-30% to +50%
60% Design	$4,962,035	$992,407	$5,954,442	20%	+83%	-10% to +25%
90% Design	$5,049,551	$0	$5,049,551	0%	+55%	-10% to +25%
Construction Drawings (100%)	$3,818,454	$0	$3,818,454	0%	+17%	-5% to +10%
Successful Bidder	$3,255,027	$0	$3,255,027			

Contractor Payments

SDOT pays its contractors on a monthly basis for work completed in the prior month. It is the Resident Engineer's responsibility to monitor and assess whether the contractor meets contract requirements and ensure that progress is properly documented. The monthly progress payments can include:

· Bid Items
· Materials on Hand
· Change Orders
· Miscellaneous Deductions
· Retainage (or Retainage Bond)

Section 3.06 of the Construction Administration Manual explains in specific detail what is allowable under each of these categories. Listed below is the minimum documentation the Construction Administration Manual dictates is needed to accompany each progress payment as:

· Progress Payment Quantities Cover Sheet
· Progress Payment Quantities Data Entry Check
· Field Construction Records
· Invoices for Materials on Hand
· Documentation of any Force Account Work
· Documentation for any Change Orders Approved over the Progress Period
· Certification of Prevailing Wages

Progress Payment #14 was selected at random from the Greenwood Avenue N Street Improvements project to see if it complied with the requirements of Section 3.06. The analysis concluded that the required documentation was in place, had been reviewed by appropriate personnel, and had the necessary signatures to enable SDOT to make a proper payment to the contractor in accordance with the monthly payment calendar contained in the Construction Administration Manual.

Risk Management

The purpose of risk management is to identify potential problems before they occur so that risk handling activities can be planned and invoked as needed across the life of the project to mitigate adverse impacts on achieving objectives[21]. SDOT recognizes this as being a best practice and requires the PMP for each project include a Risk Registry listing for all known project risks and strategies for addressing and managing each. A risk management template has been developed by CPRS to assist in this process which indicates whether a risk is currently active, the project phase in which the risk was identified, the event that would trigger the risk, the risk type (cost, schedule), the probability of the risk occurring, and the magnitude of loss should that risk occur. The template also includes columns to analyze the risk's impact in terms of dollars or days.

Change Order Management

A change is a modification to the executed construction contract scope, budget, or schedule. Changes are considered to be an accepted part of the construction process as they are inevitable and necessary on most major complex projects. Section 3.09 of the Construction Administration Manual details how SDOT manages this process. It contains required templates, processes, and procedures and lists approval authority limits as well as showing flow charts that visually demonstrate both the Request for Information (RFI) and Change Order processes.

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[21] Project Risk Management Guidance for WSDOT Projects, PMBOK Guide

The Greenwood Avenue N Street Improvements project (referred to in this document as Project One) listed twenty-eight change orders in its Change Order Log. The individual folders for each were filed numerically and stored together. We reviewed a random selection of change orders (Change Orders #1, #13, and #21) and found two in compliance with all requirements. However, Change Order #13 had no paperwork in the folder.

Best practices[22] state that contract changes should be kept to a minimum as they are both time-consuming and costly to manage. The Change Order Log for this project shows that the current contract amount is $3,719,650, a delta of $464,623 from the original contract amount of $3,255,027. What this overview masks is that this change is the cumulative effect of adding $1,373,186 of additional scope and removing $908,563 of the original contracted scope. This indicates a significant change of scope which had to be administered during the life of this project. To determine whether the extent of change experienced was unique to this project, the Change Order Log for the NE 45th Street Viaduct: West Approach Replacement project (Project Two) was analyzed. The review found a similar rate of change. At the time of the review the original contract amount of $4,510,199 had been revised to $4,987,804, a difference of $477,605. This delta was the result of adding $2,750,406 of new scope and removing $2,272,801 of original scope, suggesting again that the original contracted scope has been significantly changed as the project has developed.

Project Close Out

The SDOT Construction Administration Manual defines Project Close Out as the act of taking a project from completion of actual construction through all the documentation, organization, audit, and archiving needed to receive full funding and meet governmental regulations and policies. The manual tabulates the current expected durations for close out activities targeting a timespan of sixteen to twenty four weeks between Substantial Completion to the Acceptance Recommendation Letter. The following table identifies these durations together with the

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[22] Federal Transit Administration (FTA) Circulars and FTA Best Procurement Practices Manual (BPPM)
    FHWA Construction Program Guide

actual time elapsed on the Greenwood Avenue N Street Improvements project and shows that the process appears to flow correctly:

| | CAM RECOMMENDATIONS | | PROJECT ACTUAL DURATIONS | | |
From	To	Elapsed Time	From	TO	Duration
Substantial Completion	Final Inspection	2 weeks	2.4.10	2.18.10	2 weeks
Final Inspection	Punch-list Transmittal	2 weeks	2.18.10	3.2.10	2 weeks
Punch-list Transmittal	Punch-list Completion	2 to 4 weeks	3.2.10	4.27.10	5 weeks
Punch-list Completion	Notice of Physical Completion	2 to 3 days	4.27.10	4.27.10	1 day
Notice of Physical Completion	Acceptance Recommendation	6 to 8 weeks	NA	NA	NA
Acceptance Recommendation	Certificate of Completion	2 weeks	NA	NA	NA
Certificate of Completion	Retainage Release	60 days	NA	NA	NA
Retainage Release	Construction Phase Close Out	2 to 6 weeks	NA	NA	NA

As the table indicates, the final four stages of the project have yet to be completed. This apparent extended contract duration is because the project was partially FDA funded and during the latter stages of construction WSDOT revised ADA requirements which necessitated scope changes to accommodate them. These changes are currently nearing completion.

Life Cycle Costing

Neither the SDOT Project Delivery Manual nor its Construction Administration Manual contains any references to adopting life-cycle costing techniques or procedures within contracts to require their use. Life-cycle cost analysis quantifies the costs needed to maintain the asset overtime, identifies how this cost may vary based on project alternatives, and allows managers to consider who will be responsible for the maintenance of the asset during its planning phase. Although SDOT managers told us that they apply life cycle costing "where appropriate," no formal policy on the use of life cycle costing nor guidance on its application has been defined.

The financial impact of a project is evaluated based on an analysis of all initial costs and discounted future costs throughout the life of an alternative. By taking into account all costs that would occur throughout the life of each option, life-cycle costing helps identify the lowest cost alternative and provides other critical information for project decision-making.

The Federal Highway Administration (FHWA) promotes life-cycle costing as a useful tool. The FHWA believes that this analysis can help transportation agencies choose the most cost-effective project alternatives and communicate the value of those choices to the public. Life-cycle cost analysis can be used to study new construction projects or to examine preservation strategies for existing transportation assets.[23]

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[23] FHWA – *Improving Transportation Investment Decisions Through Life-Cycle Cost Analysis*

Major Projects

Background – Major Projects Division (MPD)

The Major Projects Division evolved from the previously combined Policy, Planning & Major Projects Division which was created when the Strategic Planning Office was disbanded in 2002. The decision to separate Major Projects from Policy and Planning stemmed from the realization that many of SDOT's larger projects were in the planning stage and had a heavy policy emphasis, requiring frequent direct interaction with senior management and elected officials. It was determined that a dedicated division would be better positioned to manage this work.

MPD is actively engaged in three distinct aspects of work undertaken by SDOT:

- Major interagency projects
- Major SDOT projects
- Rail projects

In each of these project types, MPD has a defined function. It is responsible for the planning, oversight, and completion of large, complex capital projects such as the Seattle Streetcar, the Elliott Bay Seawall replacement, the Waterfront Seattle project, and the King Street Station restoration. It also provides coordination of high profile projects such as the Alaskan Way Viaduct replacement program, Sound Transit Link light rail, and the SR 520 bridge replacement. These projects typically involve significant work with other agencies, including Sound Transit, the Washington State Department of Transportation, King County, and the federal government, to ensure the City of Seattle's stakeholder needs are met. In 2012, budget expenditures included:
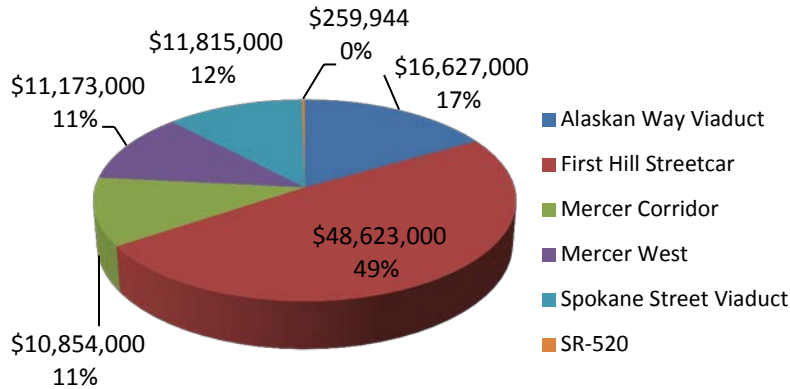
Source: City of Seattle 2012 Adopted Budget

Illustration 15

The function of MPD necessitates that its staff interface with both external and internal organizations. For major interagency projects, Major Projects is a frequent collaborator with Seattle Public Utilities (SPU), Seattle City Light (SCL), and other City departments. This interface is typically structured through tiered coordination meetings at staff, management, and executive levels. For major SDOT projects and rail projects this interface is more analogous to the Capital Projects & Railway Structures Division (CPRS) that assumes the role as the primary source to deliver these projects. The division did confirm that there is no duplication of services across these entities as the responsibilities of each are clearly defined.

Preliminary Analysis

The Major Projects Division is a unique function. Our identification of various best practices and peer organizations found no similar structure. SDOT's reorganization to establish Major Projects as an independent division was, in theory, a logical move and appears to be an efficient model. Personnel within MPD are highly qualified and work within a hierarchical reporting structure that helps improve communication and significantly reduces direct reports to the Divisional Director.

To ensure accountability, MP measures success as a component of meeting the overall goals of the organization. Each section within MPD (Interagency Projects, Central Waterfront/Seawall,

Rail Program, and Project Controls) develops an annual work program that aligns tasks to the overall goals of SDOT. Progress toward accomplishing these work programs is reviewed between MPD's director and each section manager at least quarterly. Each section's success in executing the work program is a key consideration in each manager's performance evaluation.

In addition to ensuring appropriate resources are used efficiently and effectively, MPD conducts internal organizational assessments to determine organizational needs. The Director regularly reviews work program progress with each section manager, including reviewing staff assignments and resource utilization and needs. If additional resources are required, the first look is internal to determine if resources can be re-allocated. If that is not possible, *Budget Issue Papers* are submitted through the annual budget process for review and approval by the Mayor.

The division appears to be meeting its established expectations providing for the planning, oversight, and completion of large, complex capital projects. However, when working in conjunction with other governmental agencies, this effectiveness and efficiency appears to be weakened by each participant having a bias towards their own agenda and a reluctance to properly identify more efficient ways to work together to better utilize available resources.

Knowledge Transfer

MPD has recognized the need to focus its management structure to ensure the efficient and effective delivery of its services. There are currently twenty four positions in the division with four being vacant. Active recruiting for three of these vacancies is taking place while the fourth vacancy will be transferred to another SDOT division. Two of the current staff have over thirty years of service and will be eligible for full retirement in 2013. MPD also expects to turn over one or two other positions during the year. An extensive level of information and experience resides with a few key staff. The Division is in the process of implementing changes to address this issue. Given this potential loss of staff, MPD recognizes the need to ensure that knowledge is not lost with their departure. However, no formal knowledge transfer process currently

exists. This has been recognized by the management who are working to establish a more robust management structure and reporting processes to ensure ongoing knowledge transfer.

Evaluating Staff Performance: Performance Measures and Indicators

To measure staff performance, MPD has initiated a process that develops individual work programs and expectation statements for each staff member at the beginning of each year. This is reviewed by the individual and their supervisor at least quarterly to ensure that expectations are being met. The division uses SDOT'S overall performance review process to accomplish this with the following key areas addressed:

- · Accomplishment of job tasks
- · Personal working relationships
- · Communication
- · Job reliability
- · Job initiative
- · Safety
- · Race & social justice
- · Supervision and management

Although this review process provides general performance expectations for staff, the division does not appear to use any other metric to determine the efficiency and effectiveness of its personnel. The division also does not currently benchmark itself against any other entity maintaining that the uniqueness of projects and the role of the division make metrics and comparisons very difficult.

Interagency Projects

SDOT is actively involved with other agencies in the development of an effective and efficient area-wide transportation structure. However, the City has also assumed the ownership and maintenance of projects designed and built by other jurisdictions – projects that had minimal involvement by the City. For one project we examined, it was not evident from the documentation provided whether SDOT was adequately consulted during the design and construction phase of a project, so they could ensure that maintenance and operational considerations were addressed and that the City was getting the highest value.

Specifically, a bridge construction project with King County appeared to have very little city participation. However, the ownership and maintenance of the bridge is now the responsibility of the City. For interagency projects, decision-makers should consult SDOT to ensure ongoing maintenance costs are fully considered in the negotiating process.

Traffic Management

Background – Traffic Management Division (TMD)

The Traffic Management Division's 162 FTE reside in four sections:

- **Traffic Operations** is responsible for the fundamental design and operation of the roadway,
- **Signal Operations** operates traffic signals and Intelligent Transportation System features such as traffic cameras and digital message signs. The Traffic Management Center monitors and manages the City's busiest roadways,
- **Parking and Traffic Permits** operates the paid parking system, regulates the use of curb space, and administers permit system for Residential Parking Zones, Commercial Vehicle Load Zones, and oversize vehicles, and
- **Traffic Maintenance** is organized into Signs and Markings and Electrical teams. In addition, the section operates a sign print shop.

Traffic Management operates a large and complex system and is responsible for deploying and monitoring 28 kinds of assets. Its $45 million budget[24] accounted for approximately 15% of SDOT's total. The division's largest budget areas include:
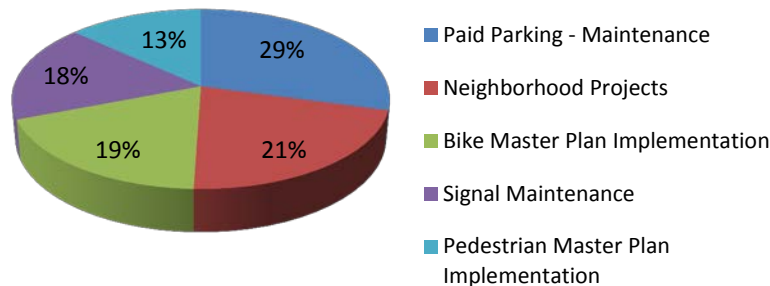
Source: City of Seattle 2012 Adopted Budget

Illustration 16

TMD Accomplishments

As indicated, in 2011, TMD met its 31 Bridging the Gap deliverables. Also in 2011, TMD implemented performance-based parking pricing, issued over 30,000 traffic permits, and

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[24] 2012

implemented live streaming images from 150 traffic cameras. Additionally, ePark, the City's electronic guidance system was expanded and pay-by-cell parking was developed.

TMD's largest spending items are for Operations and Maintenance and Capital Improvements. Major funding sources for these activities are as follows:

TMD Funding Sources	Percent of Total
General Fund and Gas Tax	38%
Bridging the Gap	35%
Other	27%

General Fund and Gas Tax revenue provides funds for most of the division's safety and preservation activities. Accordingly, reductions to SDOT's budget have had a significant, negative impact on the volume of activities in these areas, as detailed in the specific discussions that follow. In contrast, capital funds available from Bridging the Gap, grants, and other funding sources have held relatively steady or increased slightly.

Preliminary Analysis

SDOT's Traffic Management Division is tasked to maintain, operate and improve Seattle's street system. TMD is organized into four logical units, each headed by a SDOT manager.
The Traffic Management Division is responsible for delivering the largest portion of SDOT's "Bridging the Gap" (BTG) program, with 31 of the 42 specific BTG performance measures assigned to this division. TMD reports meeting or exceeding all of these BTG performance measures in 2011. However, the BTG program's emphasis is on certain activities (e.g.: curb and pavement marking, street sign replacement, street name sign replacement) while SDOT faces decreased funding in other areas (additional details provided below); this has created some significant differences in program performance levels.

TMD staff and managers indicated that many of the areas of suboptimal performance are the result of "triage-type thinking" when faced with significant resource constraints that, in several areas, prevent SDOT from meeting minimum system needs. This is particularly true in the area

of signalization asset replacement. Predictably, the failure to sufficiently fund the asset replacement needs in this area has caused maintenance activities to become increasingly remedial in nature (fix it when it breaks), which is inherently less efficient and further strains limited resources.

Basis for Comparisons

To identify best practices that could provide valid comparisons of the division's operations, a number of industry best practices were obtained from the Federal Highway Administration (FHWA), National Cooperative Highway Research Program (NCHRP), the US Department of Transportation (USDOT), the National Workforce Assistance Collaborative, and the National Transportation Operations Coalition. Additionally, information was acquired from New York City; Washington, DC; San Francisco; Los Angeles; and Calgary, Alberta; and Caltrans.

Signal Operations

The Signal Operations group primarily is responsible for the following activities:

- · Traffic signal timing
- · Construction and plan review
- · Signal design work

This group also handles the smaller traffic signal/operation-related maintenance and replacement projects while larger projects are managed by the Capital Projects group. This unit effectively creates the workload for the Traffic Field Operations group.

Many resource documents exist to support benchmarking SDOT's traffic signalization asset management practices, traffic operations staffing and practices, and maintenance staffing. Information from Federal Highway Administration (FHWA)-funded research reports, the Transportation Research Board programs of the National Academies, and other transportation research institutions were obtained and used as basic benchmarks for current division operations.

A number of the best practices and comparative information obtained recognize the practical difference in the level of support that larger entities (such as SDOT) can and should provide to traffic management, especially given the traffic congestion management issues that typically accompany larger system needs, compared to smaller, less complex systems. Accordingly, where the reference materials identify multiple target standards, we have applied those standards/peer comparisons that are more appropriate to SDOT.

In addition, we reviewed the "National Traffic Signal Report Card", an annual report that is compiled from the self-assessment responses of various cities, states, and provinces across the US and Canada (more than 240 in 2011). In the 2012 version of this report[25], an aggregate national score of "D+" was assigned to transportation agencies in the U.S. and Canada based on the self-assessed survey responses of all 240 entities' compliance with traffic system maintenance and operating benchmark standards. This suggests that Seattle is not alone in struggling to meet optimal investment targets for traffic management. However, the survey results from larger systems (defined as entities with over 1,000 signals in operation, which SDOT exceeds) were notably higher in various measurement categories. Although these larger entity categories are more relevant comparisons to SDOT, as with any benchmarking data, such information should be used with considerable care and professional judgment when drawing direct comparisons.

Replacement Guidelines and Funding

Signal Operations has established replacement guidelines for major asset categories that are consistent with FHWA guidelines[26] and with peer practices[27]. However, SDOT replacement funding for these assets is significantly below the levels required to support the established replacement criteria. The result is that the average age of SDOT's traffic signalization infrastructure is rapidly aging:

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[25] "2012 National Traffic Signal Report Card," National Transportation Operations Coalition, 2012.
[26] "Elements of a Comprehensive Signals Asset Management System', FHWA-HOP-05-006, December 2004.
[27] "NCHRP Synthesis 371, "Managing Selected Transportation Assets: Signals, Lighting, Signs, Pavement Markings, Culverts, And Sidewalks", 2007.

Asset	Inventory	Replacement Standard (years)	Target Replacement Volume	Actual Replacement Volume
Signal Cabinets	1,073	30	36	12
Signal Controllers	1,073	15	72	12
Traffic Signal Span Wire	853 miles	15	21	8
Communications switches[28]	600	7	86	0

In fact, SDOT acknowledges that 70 percent of its traffic signals have at least one element that is in poor condition[29]. In 2011, SDOT's shortfall in traffic controls asset replacement funding, staffing, and operations combined for an estimated total funding shortfall of over $5.7 million, which nearly matched the $6.3 million funding provided to support these activities during that year[30].

The impact of failing to adequately fund the replacement of SDOT's signal operations infrastructure is to increase annual maintenance demands, which already exceed available resources. The predictable outcome of this underinvestment in replacement asset is an increasing focus of SDOT field maintenance activities on remedial repairs rather than preventative maintenance. This "fix it when it breaks" approach is inherently inefficient as it is unpredictable in terms of both where some repairs are needed as well as when these repairs need to occur. Some examples from 2012 that illustrate how the signal system infrastructure is trending toward failure include the following:

- · 42 intersections went into flash mode due to failing controllers;
- · The intersection of Fauntleroy Way SW & 35 Ave SW went into flash several times. The fault was determined to be a frayed wire within overhead wires feeding the intersection. These kinds of wiring problem issues are difficult to diagnose and repair problems are likely to become more common as wiring ages.

The impact on the public of such failures is increased traffic congestion, delays, and, potentially, accidents, with the associated potential for increased liability exposure by the City. Supporting

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[28] Units are being replaced as they fail.
[29] 2012 Budget Issue Paper, Seattle Department of Transportation, Signal Major Maintenance Reduction.
[30] Per "ITS O&M&MM for RTOC.xlsx" spreadsheet, provided by SDOT.

this latter concern (increased liability) is a 1995 report produced for the U.S. Department of Transportation, Federal Highway Administration, which warns that the failure of public sector entities to take "reasonable care" in association with operating and maintaining its traffic signalization infrastructure can increase the potential for legal judgment against the entity[31]. We perceive that "reasonable care" could credibly be interpreted as providing adequate funding for its traffic management asset management program as to comply with the national standards appropriate for an entity like SDOT.

Signal Timing Activities

SDOT's performance target for re-timing signal timing is once every three years but its actual performance cycle is seven years. Guidance from the "Intelligent Transportation Systems for Traffic Signal Control"[32] suggests that retiming signals every two-three years is considered a minimum requirement and is consistent with only a "C" level of performance under National Traffic Signal Report guidelines[33] (which SDOT is not achieving). In fact, to earn a "B" rating, SDOT would be expected to retime signals annually and an "A" rating would require retiming signals more than once per year. Given the level of congestion in the Seattle area and the impact that accurate signal timing can have on reducing such congestion, this is an area with significant opportunity for improvement.

USDOT guidelines for signal timing operations recommend the following staffing benchmarks for signal timing operations[34]:

·   One traffic engineer for every 75-100 signals
·   One technician for every 40-50 signals.

Based on an existing SDOT inventory of approximately 1,073 signals and using the minimal (more signals per person) staffing guidelines, SDOT should have approximately 11 traffic

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[31] "Improving Traffic Signal Operations: A Primer", U.S. Department of Transportation, Federal Highway Administration, Institute of Transportation Engineers, 1995, page 17.
[32] www.its.dot.gov
[33] "2012 National Traffic Signal Report Card," National Transportation Operations Coalition, 2012.
[34] "Intelligent Transportation Systems for Traffic Signal Control" (www.its.dot.gov)

engineers and 22 technicians to support its signal retiming program. In comparison, SDOT actually has 3.5 engineering FTE devoted to this activity and approximately 14 technician FTE. This resource deficiency gap contributes to the department's ability to retime signals on a more frequent basis resulting in increased congestion and longer travel times.

Parking Operations and Traffic Permits

Seattle was one of 12 cities identified in a 2011 report on parking best practice that was prepared by the New York City Department of City Planning[35]. In that report, Seattle was cited for its practices in several areas including the following:

·   Seattle's parking guidance system, ePark
·   Allowing developers to pay in lieu of fees as an alternative to providing parking
·   Use of neighborhood-based residential parking permits
·   Support for shared parking
·   Reduced parking requirement for elderly and disabled
·   Use of travel demand management plans for major institutions or higher education facilities.

Although not cited in the 2011 NYC report, Seattle's application of demand-based pricing is considered by its peers to be particularly innovative for its use of manual parking surveys as the basis for price adjustments rather than costly sensor technology. SDOT provided a presentation on this practice at the 2011 annual meeting of the Transportation Research Board (TRB) and also participated in a poster session on this practice at the 2012 TRB meeting.

Other progressive parking practices being implemented by SDOT include the following:

·   Implementing citywide systems to allow parking payment by "Smartphone".
·   Providing private vendors redacted access to parking pay station data for developing Smartphone applications to predict the location of available parking.

Additionally, SDOT recently received a federal grant to conduct a pilot program for using parking sensors to explore how they can be used to promote and enforce commercial parking

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[35] "Parking Best Practices: A Review of Zoning Regulations and Policies in Select US and International Cities", NYC Department of City Planning, 2011.

restrictions. SDOT anticipates the information gathered through this project to be a valuable resource as it explores options for replacing its aging parking pay station technology.

In addition to the New York City report, other organizations contacted to obtain comparative information included San Francisco, Los Angeles, Washington DC, and Calgary, AB (Canada). New York City, San Francisco, Los Angeles and Washington DC were selected for comparison for their use of demand-based pricing, supported by the use of sensor-based technology. Calgary was selected because of its use of license plate reader technology, located on roaming parking enforcement vehicles that provide direct, (near) real time information on parking availability and an automated system for parking citation issuance.

SDOT parking permit operations are supported by a robust website that provided detailed information on how to apply for the various other types of permits issued by the department as well as providing download links to many of the application forms for these services. The instructions provided include information on fees and details on how to submit these forms by mail or in person. This website includes allow Seattle residents to renew neighborhood parking permits online, including supporting online fee payment.

Existing Parking Technologies

SDOT's existing parking technologies limit its options for emulating some of the capabilities of systems such as San Francisco or Los Angeles, which have benefited from major federal investments. The City currently faces significant questions as to what type of parking technologies it should implement as a replacement to existing systems. Pay stations currently in use are rapidly nearing their useful life. It is anticipated that over 1,400 current stations will need to be replaced in the next two years. However, SDOT has determined that pay by cell is a viable parking technology. Pay by cell will be implemented downtown in July 2013 and citywide a few months after that.

The City is faced with major investments in its parking infrastructure. However, several competing parking technologies offer varying tradeoffs in terms of cost, capability, ease of use,

customer friendliness, enforcement, etc. These trade-offs represent choices that, once implemented, restrict any number of future options and alternatives. Additionally, alternate asset sourcing options for parking technology such as lease-to-own, inevitably embeds financing costs within the cost of securing the asset. By separating any necessary borrowing and purchasing costs into separate transactions, it is easier to identify the true costs for each and attempt to negotiate for the most favorable terms in both cases.

Traffic Field Operations Section

Traffic Field Operations is responsible for performing all maintenance activities associated with the various traffic management assets, including painting traffic crossings, servicing traffic controller boxes, replacing traffic signal heads, repairing wiring, etc. Per State of Washington law, maintenance projects with a projected cost of $90,000 or more are designated to private contractors.

Labor Contracts

The Traffic Field Operations section consists of 51 FTE within the following groups:

· 21 in the non-electrical group - 2 supervisors, 19 labors
· 22 in electrical group - 2 supervisors, 20 electricians
· 4 in the sign group - 2 sign makers, 2 helpers (roaming workers that assist with other work areas)
· 3 administrative staff.

These groups are represented by five unions with contracts that vary significantly in specific terms, as illustrated by the following examples:

· One employee group gets paid for lunch when training while others units do not.
· One employee group receives double time for emergency call-ins and mileage reimbursement while the other units do not.

Multiple collective bargaining agreements impact the ability to manage the section. Differing terms require management to know in detail what roles and responsibilities can, and cannot, be taken on by individual employees. A lack of flexibility makes it difficult for managers to bring

in new ways of working, as all changes need to be agreed with the union first. This inflexibility can also impact cross-training[36].

Maintenance

SDOT currently performs traffic maintenance work that often addresses only one aspect of the traffic management asset without addressing other related issues (e.g., replace a signal head without replacing the connecting wiring). This practice is consistent with a "fix it when it breaks" approach that often results when maintenance demands exceed available resources. A significant contributing factor tends to be when asset replacement cycles are not followed which tends to shift the focus of maintenance operations from predictable, preventative maintenance to unpredictable, remedial repairs.

Applying the best practice research lessons from transportation asset management[37] to the question on traffic infrastructure maintenance suggests viewing maintenance in a holistic manner, where the need to replace traffic signal heads, controller boxes or any other major maintenance or asset replacement need would be examined as an opportunity to extend the lifecycle of the whole network of assets at a given location. In practice, this would potentially mean replacing assets somewhat early rather than waiting for them to fail or require another visit to address. While this approach would increase per location project spending in the short term, it would be anticipated to pay long-term benefits in several areas including the following:

· More efficient maintenance operations due to more time being spent "on task" rather that moving from location to location to "put out fires" (address unpredictable asset failures);
· User benefits in terms of less long-term congestion (due to traffic management assets performing as designed for longer periods without subsystem failures), and
· Potential reduction in accidents through both fewer signal failures and traffic diversions that would be in place longer per area but less frequent, providing drivers greater opportunity to adjust to any temporary traffic pattern changes.

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[36] National Workforce Assistance Collaborative, Labor-Management Relations Best Practice Guidelines
[37] "NCHRP Synthesis 371, "Managing Selected Transportation Assets: Signals, Lighting, Signs, Pavement Markings, Culverts, and Sidewalks", 2007
"NCHRP 20-68, Domestic Scan Pilot Program, Best Practice in Transportation Asset Management", Cambridge Systematics and Michael Meyer, Georgia Institute of Technology, February 2007.

Data Entry

Data entry tasks have reduced the amount of time SDOT Maintenance supervisors spend in the field. Instead, supervisors must transcribe information captured on paper forms, notes or otherwise for subsequent entry into SDOT's asset management system. In some cases, a second person is entering this information.

The traditional standard for best practice data entry is single entry, by the person originating the information. However, the advent of handheld technology has expanded this standard to include automating as many work processes as possible and taking advantage of mobile technologies to allow more of this work to occur in the field.

Ideally, some form of handheld technology or other types of workforce automation could reduce the amount of time spent on such activities. Other jurisdictions such as the City of Calgary that also use the Hansen software application for project tracking, have employed to use of smartphone applications to capture basic work activities and import into the Hansen application.

Street Use and Urban Forestry

Street Use and Urban Forestry includes two primary functions, Street Use Operations and Urban Forestry:

Street Use Operations

Background – Street Use Operations (SUO)

Street Use Operations monitors the activities for which permits have been issued as well as shutting down non-permitted activities identified through district inspection. Other than transportation related construction improvements, typical uses of street rights-of-way (ROW) include non-transportation related construction activities such as utility work, construction materials storage, work on buildings that could affect the street, and events like block parties. SUO is also responsible for ensuring that any project involving some form of construction in the public right-of-way meets City specifications and ensures protection and quality control for design and construction of SDOT owned infrastructure assets. The ROW Management section is responsible for issuing permits for work to be done in public spaces.

Preliminary Analysis

SUO includes the Street Use, Right of Way, and Business Enterprise units. Each is self-funded through various permits and use fees (approximately $9 million annually). As described in the following sections, we generally found Street Use Operations to be a high performer, exhibiting best practice performance in several areas. However, we found some opportunities for improvement, particularly in the application and use of handheld technologies for improving workforce productivity.

Basis for Comparisons

To identify best practices that could provide valid comparisons of the division's operations, information was acquired from Calgary, Alberta; New York City, Los Angeles, San Francisco, Phoenix, and Dallas; and Caltrans. Additionally, a number of industry best practices were

obtained from the National Cooperative Highway Research Program (NCHRP), the Washington Department of Transportation's "Gray Notebook", and the Association of Public Works Administrators (APWA).

Data Entry

As with several other SDOT units, SUO has a number of employees that are involved in field operations and need to enter data into the various City and SDOT information systems. In 2007, in an attempt to improve workforce efficiency, Street Use Operations initiated a pilot program to provide its inspectors with the ability to remotely enter data. Laptop computers equipped with cellular modems were purchased to support real time access to SDOT information systems and encourage field data entry. This effort proved unsuccessful due to slow and unreliable communications connectivity and subsequently was abandoned. Currently, SUO is exploring whether the use of tablet-style computers and improvements in communications infrastructure may offer the potential for improving workforce productivity while avoiding the negative experience of the 2007 effort.

Right of Way Manual

The SDOT ROW manual serves as the master document for describing the City's overall approach to managing the public right of way. The manual is directly accessible on the SDOT website and is clearly organized, well-written, and contains hyperlinks to various referenced resources documents as well as the City and SDOT webpages and contact information. This document clearly defines the roles between the City departments in a way that is helpful to taxpayer and other users.

SDOT's ROW manual and website represent "best practice" efforts to communicate a complicated subject to a broad range of end-users. Our review of a number of other city websites found no examples of organizations providing better communication.

Right-of-Way Permitting

The Right-of-Way permitting unit supports SUO Management by measuring performance in two key areas:

- · Counter wait times
- · Major and OTC plan review times

The information for each is tracked and used as a measure of how efficiently SUO serves its customers.

A new major permit review process has been established. After two years of full implementation (and additionally as a regulatory reform requirement), an outreach/survey will be conducted to obtain external feedback from the development/engineering community. This is in effort to adjust process improvements as needed based on "lessons learned" and will begin in 2013.

SDOT's Right of Way permitting processes and procedures are also extremely well-documented on the SDOT website. The "Right-of-Way Management Program Overview" webpage provides a concise overview of this unit, its programs, purposes, objectives and targeted benefits. It describes key changes and enhancements made to the program over time, allows users to understand the progress achieved, and identifies current and upcoming enhancements. A high-level flow chart is provided that illustrates how the Right of Way Management Program operates and identifies how it serves as the umbrella structure for related permitting activities. A link on the web page provides access to the SDOT Right-of-Way manual. However, links to other ROW management units described in the flow chart do not have direct hyperlinks and are accessible only by selecting the "Services" tab from the main web page main menu and selecting "Street Use & Permits" form the drop-down menu that appears.

In addition to supporting the use of on online permitting, SUO embraces a number of "leading edge" right-of-way management concepts including the following:

·   "Street vacations" (where an adjacent property owner can petition for the private use of public right-of-way), and
·   The "Shoreline Street Ends" program, which encourages residents and community groups to improve the areas for increased waterfront access and enjoyment.

SUO's application of unit performance measures for the permitting unit is reflective of public sector best practice for promoting responsiveness and efficiency. The online permitting process reflects public sector best practice for customer friendliness and process efficiency. The application of innovative right-of-way programs is indicative of public sector best practice in encouraging the use of underutilized public assets.

Urban Forestry

Background – Urban Forestry (UF)

SDOT's Urban Forestry's 34 FTE maintain SDOT-owned street trees and landscapes, design landscapes in the right of way, and perform emergency services, permitting, regulation enforcement, and volunteer management. In 2012, Urban Forestry had an operating budget of $4.4 million:

Arborist
Services
$970,067
22%

Maintenance
$3,432,561
78%
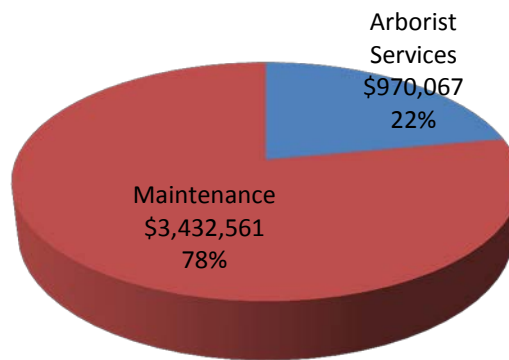
Source: City of Seattle 2012 Adopted Budget

Illustration 17

Urban Forestry is comprised of three units:

· Landscape Architect Office,
· Operations Unit, and
· Arborist's Office.

All units work to implement and oversee the management, preservation, and restoration of SDOT-owned trees within the right of way to sustain the value and public benefit of existing trees and landscapes. Urban Forestry works closely with the Office of Sustainability and the Environment (OSE).

Seattle's canopy is made up of approximately 150,000 street trees and UF works actively to increase this through the Bridging the Gap initiative. UF works with neighborhoods to plant more than 800 new street trees per year and has partnered with Seattle's electric and water

utilities to plant more street trees and protect wildlife habitats. The City has been an Arbor Day

Foundation[38] *Tree City USA* for 25 years as well as a *Tree Growth City* for 11 years.

Goals of Urban Forestry include:

· Increase the current 16% of tree canopy coverage within the ROW to 18% by 2014.
· Improve from being able to respond to 90% of customer inquiries on 684-TREE hotline within 2 business days to 95% by 2014.
· Continue to maintain a tree maintenance pruning cycle of every 13.4 years even as Seattle's tree inventory continues to grow each year.

Seattle is currently working on updating its Urban Forestry Management Plan to better assess

progress and ensure that all SDOT departments are working towards the same goal. The Plan is

a 30-year management plan of recommended action to efficiently manage the City's urban

forests. The plan highlights the environmental, economic, and social importance of a healthy,

well-managed urban forest. One of the main goals of this plan is to increase Seattle's tree

canopy.

Previously, in 2012, Urban Forestry worked with the City Auditor to identify efficiency measures

over the last several years for which UF has estimated annual savings of approximately $4.4

million. Identified efficiency measures included:

· schedule change (four 10-hour workdays),
· leaf pick-up,
· summer watering, and
· tree pruning in proximity to overhead power lines.

Preliminary Analysis

SDOT's Urban Forestry efforts have resulted in the City being named an Arbor Day Foundation

"Tree City USA" for 25 years as well as a Tree Growth City for 11 years. The City continuously

focuses on its trees and landscape through updates to its Urban Forestry Management Plan

(UFMP), a 30-year management strategy to efficiently manage its urban forests. This Plan

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[38] Seattle Department of Transportation

assists in the assessment of progress and helps ensure all SDOT departments are working towards the same goal.

UF is generally following industry standards and identified best practices. Although its internal operations and organizational structure are different than other jurisdictions, it does appear to be resourceful and effective when compared to other cities. Seattle is currently identified as an "Urban Forestry Partnership City" as well as being noted for its "green initiatives"[39]. The City also has been recognized as one of "12 cities that have begun - or are continuing to - make an investment in urban forests in order to reap future gains".

With expanding backlogs of work, Urban Forestry is challenged to achieve its goals within budget. The potential for more innovative partnering opportunities with other agencies might be an avenue to explore staffing efficiencies. A thorough review of contract staffing could also identify whether savings can be achieved.

Basis for Comparisons

Many current activities of Urban Forestry are comparable to industry best practices[40] and other jurisdictions. Urban forestry departments in Milwaukee, Portland, Denver, Sacramento, Philadelphia, and Vancouver BC were contacted to obtain descriptions and metrics used in various areas as was information obtained from the Association of Public Works Administrators (APWA).

Budgeting and Funding

Comparable organizations can typically be used to identify opportunities to find new ways manage budgets and funding. Our research found that the City of Milwaukee focuses on obtaining grants. With a grant writer on staff, over the past five years the City has been awarded $2.4 million in grant funds for forestry projects. One grant gave the division funding to "convert asphalt parking lots at Milwaukee public schools into green spaces with turf and

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[39] Urban Forests Case Studies: Challenges, Potential and Success in a Dozen Cities.
[40] Urban Forestry Best Management Practices for Public Works Managers, APWA

trees". Another was awarded to the division with "funds to conduct a public relations campaign geared toward educating Milwaukee's residents about the benefits that the city's trees provide, such as one billboard's statement that Milwaukee's trees provide a $900,000 cooling benefit. The goal of this campaign, which has been conducted in the last few years, is to increase public awareness of the ecological-service benefits of trees, while also garnering support and funding for Environmental Services' work"[41].

Staffing

Previously, in 2012, SDOT worked with the City Auditor to identify efficiency measures over the last several years for which SDOT has estimated annual savings of approximately $4.4 million. One efficiency measure is an Urban Forestry Schedule Change suggesting moving to four 10-hour workdays saving set-up and breakdown time and estimating an annual budget reduction of $48,000.

Another efficiency measure in the area of staffing is for all Urban Forestry employees to be trained on current industry standards and safe work practices[42]. The City of Milwaukee has implemented an environmental services training program for all employees. This helps maintain a cross-disciplinary approach, where employees can do more than just one thing. All new employees to the forestry team must conduct a six-month training program, where every member of the forestry team is equipped with the skills to handle a myriad of functions[43].

The use, or non-use, of contracted labor is an area of extensive discussion. A recent U.S. Conference of Mayors Survey indicated that, of the 135 participating cities in the survey, 29% of all urban forestry work in those cites was performed by contractors, with an additional 1% performed by volunteers.[44] In contrast, in 2012, SDOT expended $29,329.53 for contracted

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[41] Urban Forests Case Studies: Challenges, Potential and Success in a Dozen Cities.
[42] Urban Forestry Best Management Practices for Public Works Managers: Staffing
[43] Urban Forests Case Studies: Challenges, Potential and Success in a Dozen Cities.
[44] *Protecting and Developing the Urban Tree Canopy: A 135-City Survey*

tree trimming work, and $949,591.50 for internal equipment and labor. This equates to an expenditure of about 3.0% on contractors and 97.0% on internal labor and equipment.

The infrequent use of contractors by SDOT's Urban Forestry Section is, to a large degree, related to the relatively large in-house staff available to perform the work that many other cities do not possess. A 1994 study, "Municipal Tree Management in the United States" indicated that cities with populations between 500,000 and 1,000,000 had, on average, 22 Urban Forestry employees. With a population of 620,778 in 2011, the City of Seattle falls within this category. SDOT's Urban Forestry Section has 43 employees compared to the average of 22 in the study.

Urban Forestry Management Plan

Seattle is currently working on updating its Urban Forestry Management Plan (UFMP) in order to better assess progress and ensure that all departments within SDOT are working towards the same goal. The Plan is a 30-year management plan of recommended action, to efficiently manage the City's urban forests. The plan highlights the environmental, economic, and social importance of a healthy, well-managed urban forest. One of the main goals of this plan is to increase Seattle's tree canopy.

Tree Canopy

Seattle's canopy is made up of approximately 150,000 street trees and UF works actively to increase this through the Bridging the Gap initiative, by partnering with neighborhoods to plant more than 800 new street trees per year. SDOT has partnered with the City's electric and water utilities to plant more street trees and protect wildlife habitats. Seattle has been a Tree City USA for 25 years, as well as a Tree Growth City for 11 years, meeting all the qualifications for this award, provided by the Arbor Day Foundation[45].

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[45] Seattle Department of Transportation.

SDOT has a goal to increase the current 16% of tree canopy coverage within the ROW to 18% by 2014. This goal will increase Seattle's recognition as a more sustainable city.

Appendix

APPENDIX A

COMPLETE STREETS CHECKLIST

Seattle Department of Transportation
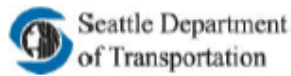
Complete Streets Checklist
April 2011

Priority Elements Matrix

Legend:
- Preferred (green)
- Consider (orange)
- Preferred in Center City (light blue)

Primary Design Features	Regional Connector	Main Street	Green Street	Commercial Connector	Mixed Use Street	Neighborhood Green Street	Local Connector	Industrial Access
Sidewalks buffered from moving traffic by additional sidewalk width or planting strip	Preferred							
Street trees and landscaping		Preferred	Preferred	Preferred	Preferred	Preferred	Preferred	
Low landscaping or high branching trees in planting strip	Preferred							Preferred
Weather protection integrated with buildings for street level uses and at transit zones	Preferred	Preferred			Preferred			
Pedestrian scaled lighting	Preferred in Center City	Preferred	Preferred		Preferred	Preferred		
Emphasis on coordinated street furniture	Preferred in Center City	Preferred	Preferred		Preferred			
Short-term, on-street parking		Preferred			Preferred			
Curb bulbs where there is on-street parking		Preferred	Preferred		Preferred	Preferred		
Emphasis on small curb radii and curb bulbs where on-street parking exists			Preferred			Preferred		
Load zones to support delivery activities		Consider						Preferred
Striped bicycle lanes or sharrows, and signage on designated bicycle routes	Consider	Preferred		Preferred	Preferred		Preferred	
Bicycle access accommodated if parallel route is not feasible	Preferred							
Bicycle route appropriate to share with motor vehicles			Preferred			Preferred		
Emphasis on bicycle parking in business districts	Preferred	Preferred	Preferred		Preferred			
Truck route signage								Preferred
Traffic calming			Consider			Consider	Consider	
Bus shelters at transit stops				Preferred			Preferred	
Minimize curb cuts and driveways to create continuous sidewalk		Consider	Preferred			Preferred		
Natural Drainage encouraged			Preferred	Consider		Preferred	Preferred	

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SELF-ASSESSMENT GUIDE

PART A. POLICY GUIDANCE

How Does Policy Guidance Benefit from Improved Asset Management Practice?

POLICY GUIDANCE BENEFITING FROM
GOOD ASSET MANAGEMENT PRACTICE

		Strongly Disagree			Strongly Agree
A1.	Policy guidance supports preservation of existing infrastructure assets.	1	2	3	4
A2.	Policy guidance encourages resource allocation and project selection based on cost-effectiveness or benefit/cost analysis.	1	2	3	4
A3.	Policies support a long-term, life-cycle approach to evaluating investment benefits and costs.	1	2	3	4
A4	Policy guidance considers customer perceptions and expectations.	1	2	3	4
A5	Our customers contribute to the process that formulates policy goals and objectives.	1	2	3	4

STRONG FRAMEWORK FOR PERFORMANCE-
BASED RESOURCE ALLOCATION

		Strongly Disagree			Strongly Agree
A6.	Policy guidance on resource allocation allows our agency suffi- cient flexibility to pursue a performance-based approach.	1	2	3	4
A7.	Our agency has a business plan or strategic plan with compre- hensive, well-defined goals and objectives to guide resource allocation.	1	2	3	4
A8.	Our agency's goals and objectives are linked to specific per- formance measures and evaluation criteria for resource allocation.	1	2	3	4

PROACTIVE ROLE IN POLICY FORMULATION

		Strongly Disagree			Strongly Agree
A9.	Our agency estimates the resources needed to accomplish par- ticular objectives as part of policy development.	1	2	3	4
A10.	Our agency regularly communicates to customers and other stakeholders our accomplishments in meeting policy objectives.	1	2	3	4
A11.	Our agency works with political leaders and other stakeholders to present funding options and consequences as part of our budget proposal.	1	2	3	4

PART B. PLANNING AND PROGRAMMING
Do Resource Allocation Decisions Reflect Good Practice in Asset Management?

		Strongly Disagree			Strongly Agree

CONSIDERATION OF ALTERNATIVES IN
PLANNING AND PROGRAMMING

B1.	Our agency's long-range plan includes an evaluation of capital, operational, and modal alternatives to meet system deficiencies.	1	2	3	4
B2.	Capital versus maintenance expenditure tradeoffs are explicitly considered in the preservation of assets like pavements and bridges.	1	2	3	4
B3.	Capital versus operations tradeoffs are explicitly considered in seeking to improve traffic movement.	1	2	3	4

PERFORMANCE-BASED PLANNING AND A CLEAR LINKAGE
AMONG POLICY, PLANNING, AND PROGRAMMING

B4.	Our agency's long-range plan(s), by mode, are consistent with currently established policy goals and objectives.	1	2	3	4
B5.	Our agency's long-range plan(s), by mode, includes strategies that are consistent with plausible projections of future revenues.	1	2	3	4
B6.	Our agency's long-range plan(s), by mode, provides clear and specific guidance for the capital program development process.	1	2	3	4
B7.	Our agency periodically updates its planning and programming methods to keep abreast of current policy guidance, customer expectations, and critical performance criteria.	1	2	3	4

PERFORMANCE-BASED PROGRAMMING PROCESS

B8.	Criteria used to set program priorities, select projects, and allo- cate resources are consistent with stated policy objectives and defined performance measures.	1	2	3	4
B9.	Our agency's programs are consistent with realistic projections of future revenues.	1	2	3	4
B10.	Our agency's programs are based on realistic estimates of costs, benefits, and impacts on system performance.	1	2	3	4
B11.	Project selection is based primarily on an objective assessment of relative merits and the ability to meet performance targets.	1	2	3	4
B12.	The preservation program budget is based upon analyses of least- life-cycle cost rather than exclusive reliance on worst-first strategies.	1	2	3	4
B13.	A maintenance quality assurance study has been implemented to define levels of service for transportation system maintenance.	1	2	3	4

PART C. PROGRAM DELIVERY

Are Appropriate Program Delivery Processes that Reflect Industry Good Practices Being Implemented?

CONSIDERATION OF ALTERNATIVE PROJECT DELIVERY MECHANISMS

		Strongly Disagree			Strongly Agree
C1.	Our agency periodically evaluates the use of alternative delivery options such as maintenance outsourcing, intergovernmental agreements, design-build, design-build-maintain, and similar options.	1	2	3	4
C2.	Our agency has an incentive program for recognizing or rewarding outstanding performance in improving upon schedule, quality, and cost objectives.	1	2	3	4

EFFECTIVE PROGRAM MANAGEMENT

C3.	Our agency solicits input from all affected parties to ensure that project scope is consistent with objectives of the project.	1	2	3	4
C4.	Our agency uses well-defined program delivery measures to track adherence to project scope, schedule, and budget.	1	2	3	4
C5.	Our agency has a well-established and functioning process to approve project changes and program adjustments.	1	2	3	4
C6.	When adding projects or changing project schedules, our agency considers effects on the delivery of other projects in the program.	1	2	3	4
C7.	Projects with significant changes to scope, schedule, or cost are reprioritized to ensure that they are still competitive in cost and performance.	1	2	3	4
C8.	Agency executives and program managers are regularly kept informed of program delivery status.	1	2	3	4
C9.	External stakeholders and policy-makers feel that they are sufficiently updated on program delivery status.	1	2	3	4

COST TRACKING AND ESTIMATING

C10.	Our agency maintains and uses information on the full unit costs of construction activities.	1	2	3	4
C11.	Our agency maintains and uses information on the full unit costs of maintenance activities.	1	2	3	4

PART D. INFORMATION AND ANALYSIS

Do Information Resources Effectively Support Asset Management Policies and Decisions?

		Strongly Disagree			Strongly Agree

EFFECTIVE AND EFFICIENT DATA COLLECTION

D1.	Our agency has a complete and up-to-date inventory of our major assets.	1	2	3	4
D2.	Our agency regularly collects information on the condition of our assets.	1	2	3	4
D3.	Our agency regularly collects information on the performance of our assets (e.g., serviceability, ride quality, capacity, operations, and safety improvements).	1	2	3	4
D4.	Our agency regularly collects customer perceptions of asset condition and performance.	1	2	3	4
D5.	Our agency continually seeks to improve the efficiency of data collection (e.g., through sampling techniques, use of automated equipment, other methods appropriate to our transportation systems).	1	2	3	4

INFORMATION INTEGRATION AND ACCESS

D6.	Agency managers and staff at different levels can quickly and conveniently obtain information they need about asset characteristics, location, usage, condition, or performance.	1	2	3	4
D7.	Our agency has established standards for geographic referencing that allow us to bring together information for different asset classes.	1	2	3	4
D8.	Our agency can easily produce map displays showing needs/deficiencies for different asset classes and planned/programmed projects.	1	2	3	4
D9.	Our agency has established data standards to promote consistent treatment of existing asset-related data and guide development of future applications.	1	2	3	4

USE OF DECISION-SUPPORT TOOLS

D10.	Information on actual work accomplishments and costs is used to improve the cost-projection capabilities of our asset management systems.	1	2	3	4
D11.	Information on changes in asset condition over time is used to improve forecasts of asset life and deterioration in our asset management systems.	1	2	3	4

PART D. INFORMATION AND ANALYSIS (CONTINUED)

Do Information Resources Effectively Support Asset Management Policies and Decisions?

USE OF DECISION-SUPPORT TOOLS (CONTINUED)

		Strongly Disagree			Strongly Agree
D12.	Our agency uses asset management decision-supported tools to calculate and report actual system performance;	**1**	**2**	**3**	**4**
D13.	Our agency uses asset management decision-supported tools to identify system deficiencies or needs;	**1**	**2**	**3**	**4**
D14.	Our agency uses asset management decision-supported tools to rank candidate projects for the capital program;	**1**	**2**	**3**	**4**
D15.	Our agency uses asset management decision-supported tools to forecast future system performance given a proposed program of projects;	**1**	**2**	**3**	**4**
D16.	Our agency uses asset management decision-supported tools to forecast future system performance under different mixes of investment levels by program category.	**1**	**2**	**3**	**4**

SYSTEM MONITORING AND FEEDBACK

		Strongly Disagree			Strongly Agree
D17.	Our agency monitors actual system performance and compares these values to targets projected for its capital preservation program.	**1**	**2**	**3**	**4**
D18.	Our agency monitors actual system performance and compares these values to targets projected for its capital improvement program.	**1**	**2**	**3**	**4**
D19.	Our agency monitors actual system performance and compares these values to targets projected for its maintenance and operations program.	**1**	**2**	**3**	**4**
D20.	We periodically distribute reports of performance measures relevant to customer/stakeholder satisfaction with transportation system and services.	**1**	**2**	**3**	**4**