

Performance Audit Report

Washington Department of Transportation Highway Maintenance and Construction Management

Report No. 1000009



January 10, 2008



Washington State Auditor Brian Sonntag, CGFM

A letter from State Auditor Brian Sonntag



Brian Sonntag, CGFM
Washington State Auditor



This report represents the final performance audit we conducted under the provisions of Engrossed Substitute Senate Bill 6839, effective July 2005 through June 2007. The bill required our Office to conduct performance audits of transportation-related agencies using auditing standards prescribed by the U.S. Government.

Our Office conducted extensive citizen outreach in 2006 and 2007, in which they expressed concern about administrative expenses across all areas of government. Citizens overwhelmingly cited transportation as one of their top three priorities for performance audits, along with education and health and social services. Citizens' main concerns about transportation are congestion relief and overall efficiency and effectiveness at the Department of Transportation.

I would like to thank the Department for its cooperation during the audit. I would also like to thank Talbot, Korvola and Warwick LLP, the firm that conducted the audit. TKW specializes in performance auditing and efficiency reviews, governmental accounting and auditing, financial reporting, internal control studies, and financial and management consulting. TKW has done other excellent work on our behalf.

TKW hired subject-matter experts PlanB Consultancy and TransTech Management to assist with the audit. TransTech specializes in management consulting to the transportation industry and works with clients in the public and private sectors. PlanB's team included experts in cost engineering, and as such, identified the most significant cost savings noted during this audit.

The audit found that, overall, the Department is a leader among state transportation departments and is already following several industry best practices. The audit identified additional opportunities for improved efficiency.

The most significant recommendations in the audit are:

- Designating construction project cost engineers whose primary function is to oversee and scrutinize project costs, including change orders. The estimated cost savings for future planned construction projects is \$36 million.
- Replacing the Department's current consumable inventory management system would result in \$5.6 million in improved efficiency, primarily through increased inventory turnover.
- Explore increasing allowable levels of recycled asphalt pavement. A Texas agency was able to save \$1.5 million per year by doing so.

Several of the recommendations in this report complement the findings and recommendations in our performance audit reports on managing and reducing congestion in the Puget Sound and improving administrative and overhead operations at the Department. The recommendations in this report free up nearly \$42 million that the Department could apply to achieving citizens' priorities in transportation.

Citizens have told us loud and clear that they care about government accountability and performance. The Legislature asked us to review transportation efficiency and effectiveness in Washington. Now it is the Legislature's and the Department's responsibility to act on the recommendations contained in this performance audit and our other performance audits of the Department.

A handwritten signature in black ink, appearing to read 'Brian Sonntag'. The signature is fluid and cursive, with a large, sweeping initial 'B'.

Audit Objectives and Scope

Objectives

The audit was designed to answer the following:

1. Is the Washington State Department of Transportation's Consumable Inventory and Supply Management system meeting the operational needs of the Department efficiently and effectively? If not, what is the effect and what actions and solutions can occur to correct these deficiencies?

The complete list of objectives in Initiative 900 and ESSB 6839 are available at www.sao.wa.gov/PerformanceAudit/PDFDocuments/i900.pdf.

2. Is the Washington State Department of Transportation's current procurement strategy for hot mix asphalt, used for road construction and maintenance, as well as current state legislation, effective in optimizing hot mix asphalt supply chain costs? If not, what is the magnitude of the possible cost savings for state and local governments and what can be done to achieve them?

3. Are the Washington State Department of Transportation's maintenance-operations as efficient as possible based on best practices identified at other state transportation agencies or the private sector? If not, what is the magnitude of the opportunity lost in terms of cost, and what can be done to correct it? Are DOT revenue opportunities from advertising and vending machines at rest areas maximized based on best practices at other state transportation agencies? If not, what is the magnitude of the opportunity lost in terms of revenue, and what can be done to correct it?

4. In the area of highway project delivery and project management, is the Washington State Department of Transportation:

- Effectively managing its highway projects in order to minimize engineering costs, environmental and permitting costs, other costs and unnecessary change orders that result in extra costs? If not, what is the magnitude of the opportunity lost in terms of cost, and what can be done to correct it?
- Effectively managing its highway projects in order to minimize unnecessary delays in project completion? If not, what is the magnitude of the opportunity lost including cost, and what can be

done to correct it?

- Accurately, completely and effectively tracking costs by project, including but not limited to:
 - Engineering
 - Contractors
 - Land acquisitions
 - Archeological efforts
 - Environmental compliance and permitting
 - Any other direct project costs which should be captured and tracked at the project level

If not, how does the absence of this information affect WSDOT efficiency, effectiveness and decision making and what can be done to better track costs?

Additionally, the audit followed the objectives contained in Engrossed Substitute Senate Bill 6839 and Initiative 900.

Scope

This audit field work was conducted from June 2006 through March 2007.

The audit does not cover consumable inventory or maintenance operations related to Washington State Ferries.

Our audit authority

Washington voters approved Initiative 900 in November 2005, giving the State Auditor's Office the authority to conduct independent performance audits of state and local government entities on behalf of citizens. The purpose of conducting these performance audits is to promote accountability and cost-effective uses of public resources.

Additionally, the Legislature passed Engrossed Substitute Senate Bill 6839 in 2005. The legislation required the Auditor's Office to hire a contractor to conduct performance audits of the transportation-related agencies.

The State Auditor's Office and its contractor, Talbot, Korvola & Warwick, LLP, conducted this performance audit in accordance with Government Auditing Standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

After the performance audit

The release of this audit report triggers a series of actions by the Legislature. The appropriate committee or committees will take the following actions:

- Hold at least one public hearing within 30 days of this report's issuance to receive public testimony on the report.
- Consider the findings and recommendations contained in this report during the state budgeting process.

- Issue an annual report by July 1 detailing the Legislature's progress in responding to the State Auditor's recommendations. The report must justify any recommendations the Legislature did not respond to and detail additional corrective measures taken.

Follow-up performance audits of any state or local government entity or program may be conducted when determined necessary by the State Auditor.

Notices of public hearings are posted with the report at www.sao.wa.gov/PerformanceAudit/audit_reports.htm.

Cost savings

The audit identified \$41.9 million in potential cost savings and unnecessary expenditures. The audit contract cost was \$438,130.

Legislative Recommendations

One recommendation in the report requires action from the State Legislature. The recommendation deals with low-bid restrictions on contract bids.

Recommendation 23:

- We recommend the Department pursue legislative

authority to use a performance contracting strategy for applicable projects.

- We recommend the Washington State Legislature modify current contracting requirements to allow performance-based contracting as appropriate.

Background about the Department

The Washington State Department of Transportation manages:

- State-owned highways, interstate highways and other highways that are part of the national highway system
- Washington State Ferries
- State-owned airports

The Department is responsible for:

- More than 20,000 lane miles of state highways
- More than 3,500 bridges
- 42 safety rest areas on highways and state routes
- Planning and administrative activities that affect:
 - Public transportation

- Freight rail
- Intercity passenger rail
- Marine ports

The Department's budget for 2005-2007 was \$4.8 billion. Funding for highway activities comes from three primary sources:

- State gas tax: 17 cents of the current 28-cent gas tax funds Department operations
- Fees: New and annual vehicle registration fees, weight-based truck license fees, vehicle inspection fees, title fees and special permits.
- Local and federal funds in excess of 785 million

The Department has more than 7,500 employees.

The audit reviewed four program areas in the Department:

- Consumable inventory and supply management: what inventory is purchased, the method by which it is purchased and stored
- Hot-mix asphalt: Purchasing practices of the material used for road repairs
- Maintenance operations and revenue opportunities
- Project delivery

The following are the results within each program.

Consumable Inventory and Supply Management

The Department's consumable inventory consists mostly of highway-specific items such as liquid de-icer, paint, signs, guardrails and controller devices. The Department is the largest state purchaser for all of these items. The audit reviewed the efficiency of the process for purchasing and storing these items.

The audit identified five findings and recommendations related to consumable inventory and supply management. The most significant recommendation is to replace the entire consumable inventory management system. Doing so would result in \$5.6 million in improved efficiency, primarily through increased inventory turnover.

Hot-mix asphalt

The Department's practices for purchasing hot-mix asphalt follow best practices in place at other states' transportation departments.

The audit did not make recommendations for substantial changes in the way the Department procures hot-mix asphalt. There are, however, a few opportunities for improvement:

- Reduce the potential for vendor risk by using and applying price adjustment clauses for all hot-mix asphalt contracts.
- Encourage Washington cities and counties to use recycled asphalt pavement, which is consistent with the Department's current practice.
- Explore increasing allowable levels of recycled asphalt pavement in non-critical mixes to save money. A large Texas district similar in size to one Department region saved up to \$1.5 million per year by doing so.
- Continue to monitor developments in warm-mix asphalt

technology as an option for increasing competition and/or conserving natural resources.

Maintenance Operations and Revenue Opportunities

The audit identified a number of opportunities to increase the efficiency and effectiveness of maintenance and operations of the state's safety rest areas, maintenance facilities and state-owned highways and interstates. The Department has well-planned and well-defined service levels for each of those areas and improvements are routinely sought by workers and management.

The Department generally carries out maintenance and operations in an innovative and effective manner. However, the audit found:

- The Department lacks the financial and technological resources to track which rest areas, maintenance facilities and highways need maintenance. There is a risk that structures and roadways will fall into a state of disrepair so extensive that they will require replacement.
- The Department is facing a significant shortage of engineers and project managers in its maintenance and operations division. Department management estimates the need for up to 450 new engineers and project managers for planned highway construction. In addition, 405 maintenance and operations staff are eligible for retirement between 2006 and 2016. More than 56 percent of those employees are eligible to retire now.

Project Delivery and Capital Project Management

The Department has made a significant investment in improving project delivery and following best practices. Many state transportation organizations and the American Association of State Highway and Transportation Officials have identified the Department's practices as innovative.

The Department uses a wide range of tools and formats to manage projects. Some projects have been more successful in controlling costs and schedules than others. Inconsistent practices have resulted in variances in cost tracking, change order management and documentation practices.

The most significant recommendation in this area is that the Department designate cost engineers whose main job is to track and scrutinize project costs and change orders. We reviewed one project in which a cost engineer would have saved the project \$394,361. The auditors conservatively estimated \$36 million in potential cost savings for all future planned construction projects.

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
Consumable Inventory Supply Management		
1. The consumable inventory management system does not support the use of automated business processes, relying on non-automated, burdensome business processes to perform routine tasks	We recommend WSDOT: <ul style="list-style-type: none"> • pursue the development of an integrated purchasing-inventory management system linked to the Department's accounting system. • consider the use of M4 as a short-term solution. 	<ul style="list-style-type: none"> • Enhanced service delivery • Increased accountability • Improved public safety and avoidance of liability • \$5.6 million in tangible benefits through increased inventory turns
2. Current practices in some regions have prevented the processing of inventory and accounting transactions to leverage its inventory management system	We recommend WSDOT assure inventory is managed only by appropriately trained personnel.	<ul style="list-style-type: none"> • Increased leverage • Improved effectiveness and accuracy in inventory processing
3. Inventory records are not consistently adjusted, creating inaccuracies in the consumable inventory system and impeding efforts to more effectively manage inventory	We recommend WSDOT: <ul style="list-style-type: none"> • adopt the inventory level recommendations from the Cisco Systems report. • direct all field operations to maintain accurate information in the consumable inventory system. • redistribute high-value and/or critical-need materials among regions. 	<ul style="list-style-type: none"> • Increased efficiency and effectiveness • Reduced repair delays • Improved accuracy of consumable inventory
4. Timeliness of procurements through the Department of General Administration was unable to be determined, inhibiting the ability to assess purchasing power and future economics	We recommend WSDOT work directly with GA to: <ul style="list-style-type: none"> • obtain detailed information identifying timeliness of service. • establish reasonable benchmarks. • monitor service levels. 	<ul style="list-style-type: none"> • Improved performance • Decreased time to award contracts • Decreased vendor complaints
5. WSDOT regional purchasing practices for quantity contracts may be inconsistent potentially reducing public visibility, requiring additional work for bidders, restricting price adjustment provisions, and inappropriately using liquidated damage clauses	We recommend WSDOT: <ul style="list-style-type: none"> • increase department-level oversight of regional "Q" contract practices to promote more efficient bidding and contract administration. • continue and expand its training and certification program for procurement and inventory management personnel. • revise the WSDOT Purchasing Manual to provide specific guidance price adjustments during the term of a contract and at the time of contract renewal. 	<ul style="list-style-type: none"> • Increased consistency • Increased procurement transparency • Decrease in bidder's risk
Hot-mix Asphalt Procurement		
6. WSDOT does not use price adjustment clauses for all hot-mix asphalt, resulting in increased vendor risk	We recommend WSDOT pursue the use of price adjustment clauses for hot-mix asphalt to include all future hot-mix asphalt-related contracts.	<ul style="list-style-type: none"> • Decreased vendor risk • Improved product pricing • Increased competition

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
7. WSDOT can educate and encourage local agencies on the use of reclaimed asphalt pavement, potentially resulting in cost-saving opportunities	We recommend WSDOT: <ul style="list-style-type: none"> encourage local governments to allow the use of reclaimed asphalt pavement, consistent with WSDOT practices. explore increasing allowable reclaimed asphalt pavement levels in noncritical mixes. 	<ul style="list-style-type: none"> Decreased costs Reduced consumption of natural resources Increased use of recycled materials
8. Potential opportunities exist to use warm-mix asphalt technology to reduce the cost of installed asphalt	We recommend WSDOT continue to monitor warm-mix asphalt research and current U.S. evaluations.	<ul style="list-style-type: none"> Reduced energy requirements and emissions Lower costs and reduced environmental impact Increase haul times Increased working time
9. Although WSDOT does not own hot-mix asphalt plants, WSDOT direct ownership may be appropriate given specific conditions	We recommend WSDOT and other public entities monitor hot-mix asphalt competition and service levels to determine whether direct ownership is appropriate.	<ul style="list-style-type: none"> Potential opportunity for reduced costs Potential for increased availability
Maintenance Operations and Revenue Opportunities		
10. WSDOT has not strategically considered safety rest area use and operations nor maintained historical records regarding the number of travelers served annually	We recommend WSDOT: <ul style="list-style-type: none"> undertake a comprehensive strategic and operational review of the safety rest area program. maintain historical records and develop a trending log to assist in determining budgetary requirements. 	<ul style="list-style-type: none"> Improved ability to quantify deficiencies Improved assessment of required resources Improved efficiency and effectiveness Enhanced ability to identify strategic investments
11. Unclear WSDOT safety rest area roles and responsibilities and no single program-level leader with full accountability have resulted in non-collection of contract amounts, capacity issues and limited planning.	We recommend WSDOT: <ul style="list-style-type: none"> conduct a comprehensive organizational review of its safety rest area program. establish milestones and key performance indicators. 	<ul style="list-style-type: none"> Improved decision making Improved vendor invoicing: \$150,000 under-billed over five years Increased revenue flow Improved communication and operational efficiency and effectiveness
12. Essential WSDOT maintenance and repair of safety rest areas is not consistently prioritized or adequately funded, resulting in a deteriorating infrastructure	We recommend WSDOT: <ul style="list-style-type: none"> pursue statutory changes to allow safety rest area revenues to be dedicated to their maintenance activities. prioritize preservation of the safety rest area system and fund appropriately. 	<ul style="list-style-type: none"> Increased level of maintenance Slowing in deterioration of infrastructure

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
<p>13. WSDOT is facing an engineer and project manager labor shortage, potentially resulting in increased costs and the loss of institutional knowledge</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • determine the types of skills by timeframe that the maintenance and operations program will need to replace as experienced personnel retire. • determine what types of work schedules — project, part-time, job-sharing, job rotation — could be offered in order to retain persons eligible to retire or nearing retirement eligibility. • adopt statewide successful recruiting and educational initiatives being used within the regions. • regularly schedule and conduct competitive contracting analyses, including the process improvement steps for improving the efficiency and effectiveness of current operations. 	<ul style="list-style-type: none"> • Enhanced recruitment • Enhanced ability to replace experienced staff
<p>14. WSDOT does not compile essential facility maintenance and repair for all activities, limiting the ability to estimate the degree of risk concerning the condition of the infrastructure.</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • determine from the respective maintenance management systems the current backlogs of essential maintenance and repair. • prepare a comprehensive listing of the backlogs of essential maintenance and repair and assess the risk that the backlogs may pose, if any. • include the backlogs of essential maintenance and repair as one element of the maintenance and operations budget justification. 	<ul style="list-style-type: none"> • Increased ability to determine actual maintenance need • Ability to determine impact on workloads • Ability to estimate degree of risk posed by infrastructure condition
<p>15. WSDOT's maintenance management system does not measure the backlog of essential maintenance, limiting the ability to determine effectiveness of effort</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • prioritize the development of a centralized maintenance management system. • annually calculate an estimate of the current replacement cost of the infrastructure. • establish a maintenance and operations minimum. • include each measurement in its performance measures program. 	<ul style="list-style-type: none"> • Ability to estimate extent of essential maintenance and repair backlog • Ability to determine estimated cost of maintenance and repair backlog
<p>16. WSDOT does not maintain summary information concerning past and future unfunded mandates, reducing the ability to determine budget requirements</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • research, document and maintain summary information concerning past and future unfunded mandates. • record budget ramifications. 	<ul style="list-style-type: none"> • Ability to determine capability to meet maintenance requirements • Ability to identify and communicate cumulative effects of maintenance requirements

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
17. WSDOT is favorably organized to respond regionally or statewide to emergencies or disasters	We recommend WSDOT: <ul style="list-style-type: none"> • identify safety rest area deficiencies in acreage, motor vehicle parking capacity, water supply and distribution, emergency power, and the means for disposing of sewage during the surge conditions of a major emergency. • seek federal funding to support safety rest area disaster preparedness upgrades and the construction of additional sites for the most likely risk scenarios. 	Improved ability to respond to statewide emergencies
18. WSDOT can improve safety rest area safety to help deter illegal activities	We recommend WSDOT consider adding cameras and monitoring equipment to the broadband capabilities of current and future safety rest area installations.	Improved rest area safety
19. WSDOT sampling plans can potentially be reduced to help decrease costs	We recommend WSDOT determine if information needs will permit the reduction of the size of the required random samples for the Maintenance Accountability Process.	Decrease in cost
20. WSDOT Maintenance Accountability Process organizational review level achievements do not provide detailed indication of accomplishments	We recommend WSDOT increase the detail of Maintenance Accountability Process organizational review level achievements to provide additional indication of accomplishments.	<ul style="list-style-type: none"> • Improved performance measurement • Enhanced understanding of variability
Project Delivery and Capital Project Management		
21. WSDOT implementation of Statewide Project Management Group recommendations will eliminate many management and reporting inconsistencies	We recommend WSDOT: <ul style="list-style-type: none"> • ensure Statewide Project Management Group recommendations are followed and published management practices are implemented. • follow up with activities to assure expected outcomes are realized. 	<ul style="list-style-type: none"> • Successful delivery of projects • Improved program management, control, and reporting systems • Enhanced workforce improvements
22. Many sampled projects contained planning inconsistencies and deficiencies, resulting in project inconsistencies	We recommend WSDOT: <ul style="list-style-type: none"> • ensure all aspects of the Project Management On-Line Guide are applied consistently to each project. • require consistent entry of “lessons learned” into the agency’s centralized database. 	<ul style="list-style-type: none"> • Increased consistency in project management • Decreased mistakes • Enhanced innovation • Increased accountability
23. WSDOT’s primary procurement strategy of low bid can limit its ability to receive best value.	We recommend <ul style="list-style-type: none"> • WSDOT pursue legislative authority to use a performance contracting strategy for applicable projects. • the Washington State Legislature modify current contracting requirements to allow performance-based contracting as appropriate. 	<ul style="list-style-type: none"> • Decreased project risk • Increased opportunities for “best value”

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
<p>24. WSDOT has minimal consistency in procedures and schedules, limiting the ability to effectively manage projects</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • identify required scheduling software. • stipulate in its standard specifications, the required scheduling software program to be used by contractors. 	<ul style="list-style-type: none"> • Improved scheduling • Enhanced control of contractor progress • Increased focus on critical path • Increased ability to manage scope changes • Enhance use of resources • Enhanced ability for on-time project delivery
<p>25. WSDOT has had difficulty in identifying trends in high-risk quantity growth items, resulting in unnecessary costs</p>	<p>We recommend WSDOT continuously review cost changes and manage as appropriate.</p>	<ul style="list-style-type: none"> • Increased ability for independent, objective estimates • Improved cost effectiveness • Decreased project conflicts • Increased ability to identify pricing trends
<p>26. WSDOT's bid evaluation and award approach does not incorporate actual costs and quantities, potentially increasing costs</p>	<p>We recommend WSDOT incorporate actual costs and quantities into EBASE to develop cost benchmarks and cost metrics that can be used for estimating future projects and determining cost overrun trends.</p>	<ul style="list-style-type: none"> • Mitigation of premium costs • Increased accountability • Enhanced ability to identify potential overcharges
<p>27. WSDOT's does not participate in an electronic bid evaluation and award forum, potentially limiting perspective vendors</p>	<p>We recommend WSDOT continue investigating electronic bidding systems to streamline the process, increase competition among vendors and reduce paper use.</p>	<ul style="list-style-type: none"> • Increased competition • Potential for decreased costs
<p>28. Sampled WSDOT projects found no consistency of total project cost forecasting, decreasing the ability to determine the volume of change orders and other categories of cost growth</p>	<p>We recommend WSDOT:</p> <ul style="list-style-type: none"> • standardize cost reporting practices for all project phases. • utilize cost engineers or business managers who are responsible for projects on a collective or regional basis. 	<ul style="list-style-type: none"> • Improved accuracy of forecasts • Enhanced budgeting ability • Increased accountability
<p>29. WSDOT change order logs varied extensively in format and level of detail, potentially increasing risk of higher project cost</p>	<p>We recommend WSDOT standardize Change Order Logs and integrate each into Project Cost Reports.</p>	<ul style="list-style-type: none"> • Decrease in likelihood of claims • Increase in timeliness of claims processing
<p>30. WSDOT does not use rate adjustments based upon a pro-rata of bid contract unit rates, resulting in increased costs</p>	<p>We recommend WSDOT use, where appropriate, rate adjustments based upon a pro-rata of the bid contract unit rates to assure the optimization of the value of changes.</p>	<p>Potential cost savings: \$394,361 in opportunity lost</p>

Audit Results at a Glance

Findings	Recommendations	Potential Outcome
31. WSDOT does not aggressively manage change orders, resulting in increased project costs	We recommend WSDOT use, where appropriate, cost engineers or quantity surveyors to aggressively manage all change costs during construction, and maximize the cost-benefit of deployment through integrating activities such as cost report management and budget estimating.	Decreased project costs — \$36 million in potential savings for project reviewed
32. WSDOT's categorization of change costs limits the ability to effectively track and manage	We recommend WSDOT use change source categories to provide a basis for understanding changes on all projects.	Improved ability to effectively track and manage costs
33. WSDOT's independent engineer's estimates do not optimize value of change orders, limiting the ability to determine fairness and reasonableness of prices	We recommend WSDOT require greater price transparency from contractors for proposed change costs.	Increased ability to determine price fairness and reasonableness
34. WSDOT's current performance measures could be enhanced to provided additional indicators of performance	We recommend WSDOT continue to develop and maintain project performance indicators that can be monitored at state and project levels.	<ul style="list-style-type: none"> • Increased ability to identify potential areas for improvement • Enhanced ability to mitigate crises • Enhanced identification of trends
Total potential cost savings and unnecessary expenditures: \$41,994,361		

Initiative 900 cross-reference

Initiative 900 Elements	Audit Findings
1. Identification of cost savings.	1, 7, 11, 31, 32
2. Identification of services that can be reduced or eliminated.	4
3. Identification of programs or services that can be transferred to the private sector.	13
4. Analysis of gaps or overlaps in programs or services and recommendations to correct gaps or overlaps.	1, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34
5. Feasibility of pooling information technology systems.	1, 15, 26
6. Analysis of the roles and functions at the Department and recommendations to change or eliminate roles or functions.	2, 4, 31
7. Recommendations for statutory or regulatory changes that may be necessary for the Department to properly carry out its functions.	12, 23
8. Analysis of the Department's performance data, performance measures and self-assessment systems.	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21, 22, 24, 25, 26, 34
9. Identification of best practices.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34



Construction Management/Highway Maintenance Performance Audit

December 2007

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December 2007

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We have completed our performance audit of the Washington State Department of Transportation's Construction Management/Highway Maintenance. This report contains our detailed analysis and conclusions based on our review.

We wish to express our appreciation to WSDOT employees and managers and those persons from other organizations we spoke with for their cooperation and assistance during this analysis.

Talbot, Korvola & Warwick, LLP

Talbot, Korvola & Warwick, LLP

Table of Contents

	Page
Introduction	1
Audit Purpose and Objectives	1
Project Purpose	1
Objectives	3
Project Approach and Methodology	4
Evaluation Criteria and Standards	4
Public Accountability Criteria	5
Efficiency, Effectiveness, and Economy Criteria	6
Legal Requirements	7
Prior Years' Performance	7
Performance of Similar Organizations	7
Methodology	8
Audit Team Perspective	9
Scope Limitations	10
Standards	11
Compliance	11
WSDOT	12
Consumable Inventory and Supply	15
Procurement Strategy for Hot Mix Asphalt	37
Maintenance Operations/Revenue Opportunities	53
Project Delivery and Capital Project Management	128
Appendix	
A. Maintenance Operations/Revenue Opportunities	
A-1 Relevant Statutes and Regulations	
A-2 MAP LOS Targets	
B. Project Delivery and Capital Project Management	
B-1 Contracting Strategies	
B-2 Traffic Control Hours	
B-3 Sample Cost Report	
B-4 Hood Canal Bridge Performance Indicators	
C. I-900 Elements	
D. Legislative Actions	
E. Audit Response	



Introduction



Washington State
Department of Transportation

Construction Management/Highway Maintenance Performance Audit

INTRODUCTION

On behalf of the Washington State Auditor's Office (SAO), Talbot, Korvola & Warwick, LLP (TKW) in conjunction with TransTech Management and PlanB Consultancy, conducted a performance audit of the Washington State Department of Transportation's (WSDOT) Construction Management/Highway Maintenance. This report outlines the analysis and conclusions based on our work.

AUDIT PURPOSE AND OBJECTIVES

Project Purpose

The Washington State Legislature granted the Washington State Auditor's Office with the authority to audit transportation agencies through the passage of ESSB 6839. The legislation states: "Citizens demand and deserve accountability of transportation-related programs and expenditures. Transportation-related programs must continuously improve in quality, efficiency, and effectiveness in order to increase public trust." In addition, the legislation states that each performance audit may include the following 14 elements:

1. Identification of programs and services that can be eliminated, reduced, consolidated, or enhanced;
2. Identification of funding sources to the transportation-related agency, to programs, and to services that can be eliminated, reduced, consolidated, or enhanced;
3. Analysis of gaps and overlaps in programs and services and recommendations for improving, dropping, blending, or separating functions to correct gaps or overlaps;
4. Analysis and recommendations for pooling information technology systems used within the transportation-related agency, and evaluation of

- information processing and telecommunications policy, organization, and management;
5. Analysis of the roles and functions of the transportation- related agency, its programs, and its services and their compliance with statutory authority and recommendations for eliminating or changing those roles and functions and ensuring compliance with statutory authority;
 6. Recommendations for eliminating or changing statutes, rules, and policy directives as may be necessary to ensure that the transportation-related agency carry out reasonably and properly those functions vested in the agency by statute;
 7. Verification of the reliability and validity of transportation-related agency performance data, self-assessments, and performance measurement systems as required under RCW 43.88.090;
 8. Identification of potential cost savings in the transportation- related agency, its programs, and its services;
 9. Identification and recognition of best practices;
 10. Evaluation of planning, budgeting, and program evaluation policies and practices;
 11. Evaluation of personnel systems operation and management;
 12. Evaluation of purchasing operations and management policies and practices;
 13. Evaluation of organizational structure and staffing levels, particularly in terms of the ratio of managers and supervisors to non-management personnel; and
 14. Evaluation of transportation-related project costs, including but not limited to environmental mitigation, competitive bidding practices, permitting processes, and capital project management.

In response to its new authority, the Auditor's Office commissioned a series of citizen forums to shape the direction of performance audits. The Office contracted with Elway Research, Inc., to hold town hall meetings and focus groups with Washington voters across the state. The public surveys identified the Washington State Department

of Transportation's capital and maintenance operations as areas of interest for performance audits.

This performance audit was conducted on behalf of the Washington State Auditor's Office. We conducted this performance audit in accordance with generally accepted Government Auditing Standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The Washington State Legislature regularly performs studies of the Washington State Department of Transportation. These studies, which are not subject to the independence, evidence and planning standards required by Government Auditing Standards, were considered during the planning of this audit.

Objectives

The SAO commissioned this audit with the intent of answering four specific questions:

1. Is the Washington State Department of Transportation's Consumable Inventory and Supply Management function meeting the operational needs of the department efficiently and effectively? If not, what is the effect and what actions and solutions can be implemented to correct these deficiencies?
2. Is the Washington State Department of Transportation's current procurement strategy for hot mix asphalt, used for road construction and

- maintenance, as well as current state legislation, effective in optimizing hot mix asphalt supply chain costs? If not, what is the magnitude of the possible cost savings for state and local governments and what can be done to achieve them?
3. Are the Washington State Department of Transportation's maintenance-operations as efficient as possible based on best practices identified at other state transportation agencies or the private sector? If not, what is the magnitude of the opportunity lost in terms of cost, and what can be done to correct it? Are DOT revenue opportunities from advertising and vending machines at rest areas maximized based on best practices at other state transportation agencies? If not, what is the magnitude of the opportunity lost in terms of revenue, and what can be done to correct it?
 4. In the area of highway project delivery and project management, is the Washington State Department of Transportation:
 - Effectively managing its highway projects in order to minimize engineering costs, environmental and permitting costs, other costs and unnecessary change orders that result in extra costs? If not, what is the magnitude of the opportunity lost in terms of cost, and what can be done to correct it?
 - Effectively managing its highway projects in order to minimize unnecessary delays in project completion? If not, what is the magnitude of the opportunity lost including cost, and what can be done to correct it?
 - Accurately, completely and effectively tracking costs by project, including but not limited to:
 - Engineering
 - Contractors
 - Land acquisitions
 - Archeological efforts
 - Environmental compliance and permitting
 - Any other direct project costs which should be captured and tracked at the project levelIf not, how does the absence of this information affect WSDOT efficiency, effectiveness and

decision making and what can be done to better track costs?

PROJECT APPROACH AND METHODOLOGY

Evaluation Criteria and Standards

Conceptually, the best way to determine the efficiency and effectiveness of an organization and its functions is to compare actual practices with both agreed upon standards and specific criteria. Many sources of criteria were available for the four areas reviewed including:

- WSDOT policies and procedures
- Revised Code of Washington (RCW)
- Federal Highway Administration (FHWA) policy
- Code of Federal Regulations (CFR)
- WSDOT studies/reports - Condition Assessment Program
- WSDOT Competitive Contracting Manual
- Relevant national studies
- Other state DOTs
- WSDOT Project Management web site
- WSDOT Project Management online guide
- Statewide Program Management Group (SPMG) Final Report
- SPMG Baseline Assessment Process
- Construction manual
- WSDOT Progress Report (JLARC Report Response)
- Base line budget information
- WSDOT *Measures, Markers and Mileposts*
- Association for Advancement of Cost Engineering (AACE)
- American Society of Professional Estimators (ASPE)

However, for certain areas under review, no specific standards exist to allow for meaningful comparison. In those situations, the performance audit team determines specific criteria on which to base efficiency and effectiveness. Criteria that typically apply include:

Public Accountability Criteria

A primary criterion for the responsiveness of a governmental organization to its mission is public accountability. This responsibility has been expressed completely yet succinctly by the Comptroller General, United States General Accountability Office, in the Government Auditing Standards, the "Yellow Book," which sets forth public sector evaluation criteria familiar to all federal, state, and local government auditors. This public accountability criterion, an underlying premise of our study approach, states:

Our system of managing public programs today rests on an elaborate structure of relationships among all levels of government. Officials and employees who manage these programs need to render an account of their activities to the public. While not always specified by law, this accountability concept is inherent in the governing process of this nation.

The need for accountability has caused a demand for more information about government programs and services. Public officials, legislators, and citizens want and need to know whether government funds are handled properly and in compliance with laws and regulations. They also want and need to know whether government organizations, programs, and services are achieving their purposes and whether these organizations, programs, and services are operating economically and efficiently.

* * *

Public officials and others entrusted with handling public resources:

...are responsible for applying those resources efficiently, economically, and effectively to achieve the purposes for which the resources were furnished. This responsibility applies to all resources, whether entrusted to public officials or others by their own constituencies or by other levels of government.

...are responsible for complying with applicable laws and regulations. That responsibility encompasses identifying the requirements with which the entity and the official must comply and implementing systems designed to achieve that compliance.

...are responsible for establishing and maintaining effective controls to ensure that appropriate goals and objectives are met; resources are safeguarded; laws and regulations are followed; and reliable data is obtained, maintained, and fairly disclosed.

...are accountable both to the public and to other levels and branches of government for the resources provided to carry out government programs and services. Consequently, they should provide appropriate reports to those to whom they are accountable.

Efficiency, Effectiveness, and Economy Criteria

The efficiency, effectiveness, and economy of a governmental operation are inherent responsibilities of those charged with its management. The overall "effectiveness" of an organization is the determination of how well predetermined goals and objectives for a particular activity or program are achieved. Effectiveness signifies the result of effort rather than the effort itself. It is sometimes characterized as impact, results, or outcome. Efficiency focuses on the maximization of output at minimal costs or the use of minimal input of resources for the achievable output. Economy signifies the acquisition of resources of appropriate quality and quantity at the lowest reasonable cost.

Legal Requirements

Legal requirements include any purpose or goals prescribed by law or regulation. Statutes, rules, and ordinances establish a measure for evaluation.

Prior Years' Performance

Historical information on accomplishments, services provided, timeframes, etc. provide the audit team with a basis to determine whether a program or activity is meeting or exceeding expectations.

Performance of Similar Organizations

Information gathered on operations, service delivery methods, results, etc. of similar organizations provide a basis for comparison. Although organizational differences may prohibit direct comparisons, information obtained can assist an audit team with identifying other effective methods to provide services.

In the absence of specific, measurable, and realistic criteria, a performance audit team may assess an organization and its activities using these factors as a baseline. In addition, a variety of criteria based on team members' extensive experience working with governmental and private sector organizations and professional literature are applied.

Methodology

To gain a comprehensive understanding of each of the WSDOT program areas under review, we interviewed various individuals in Engineering and Regional Operations

departments including representatives from each of the Agency's six regions.

The focus of our objectives evolved as the audit progressed. The final scope and focus is the product of our initial study orientation and the identification of significant issues and opportunities not recognized or whose significance may not have been fully appreciated prior to commencement of work.

Information provided during interviews became one source for observations found within this report. The information gained from these individuals and from other corroborative sources provided insight into the issues, needs, and expectations surrounding the study and was invaluable in reaching the conclusions and recommendations presented within this report. However, not all of the issues raised by WSDOT personnel fell within the scope of this project. Where possible, those issues have been addressed through means other than this report.

We also evaluated numerous documents and files. Included in this review was information relevant to program operations, specific goals, objectives, and expectations, organizational charts, job descriptions, regional information, project plans and specifications, national publications, and other relevant documents.

Additionally, through interviews and surveys, we contacted vendors, suppliers, and contractors who serve WSDOT as

well as other states to solicit information regarding current practices.

Specific methodologies are described in further detail in the following chapters.

AUDIT TEAM PERSPECTIVE

Our team began this audit with an expectation of governmental excellence, a benchmark that all organizations should have as a primary objective. Holding governmental entities to the highest standards of efficiency and effectiveness serves the best interests of both the citizen and government. When those expectations are not met, we attempt to identify opportunities to move toward an organization's own vision of excellence. However, this vision must be recognized, accepted, and internalized before significant organizational change can occur.

It is for this reason that many of the observations found within this report are *exception-based*. That is, they are oriented toward resolving problems or concerns. Although many aspects of operations are performed efficiently and effectively, the greatest benefits to an organization are typically derived from the identification of methods to achieve excellence.

SCOPE LIMITATIONS

In contrast to the limited compliance review portion of this audit, audit team assessments of efficiency and effectiveness contained within this report are qualitative in nature and rely

on documented information. The criteria and standards described above were used extensively throughout this study. Likewise, quantitative and qualitative analyses were undertaken as appropriate to understand the particular issue being addressed.

This audit does not cover consumable inventory or maintenance operations related to Washington State Ferries.

STANDARDS

This audit was conducted from June 2006 - March 2007 and was conducted in accordance with generally accepted government performance auditing standards.

COMPLIANCE

As part of our audit, we examined compliance with applicable state statutes and department rules and regulations as they pertained to the specific objectives of the performance audit. We found WSDOT activities in compliance with all specific areas reviewed. For those items we did not specifically test for compliance, nothing came to our attention that would indicate significant instances of non-compliance.



WSDOT



**Washington State
Department of Transportation**

Construction Management/Highway Maintenance Performance Audit

WSDOT

WSDOT Mission:

To keep people and business moving by operating and improving the state's transportation systems vital to taxpayers and communities

The Washington Department of Transportation (WSDOT) manages state-owned facilities including state highways, interstates, and other highways that are part of the national highway system, the Washington State Ferries, and state-owned airports. WSDOT's responsibilities also include planning and administrative activities that affect public transportation, freight rail, intercity passenger rail, and marine ports.

HIGHWAYS AND BRIDGES

BRIDGES

Type	WSDOT Responsibility
Pedestrian	57
Railroad	84
Buildings	1
Structures under 20 feet	309
Culverts over 20 feet	84
Tunnels	38
Vehicular Bridges over 20 feet	2,973
Total	3,546

Source: WSDOT

Highways, roads, and bridges are an integral component of the state's transportation system. WSDOT is responsible for over 20,000 lane miles of state highways and more than 3,500 bridges. The system of roads and bridges under the responsibility of WSDOT carries over half of the state's traffic volume.

WSDOT also maintains 42 Safety Rest Areas - 27 on interstate highways, 11 on U.S. highways, and four on state routes. Safety Rest Areas provide a place for drivers to leave the highway to stop and rest or relax. During the 1960s, the federal government provided significant funding for the construction of Safety Rest Areas as an integral part of the interstate system. Most of Washington State's Safety Rest Areas were built during this time.

FUNDING

WSDOT's \$4.8 billion budget¹ allocates resources to the programs and activities that operate, maintain, and support Washington's transportation system. Highway

¹ 2005-07

maintenance and operations and capital improvements account for over \$3.2 billion of total funding.

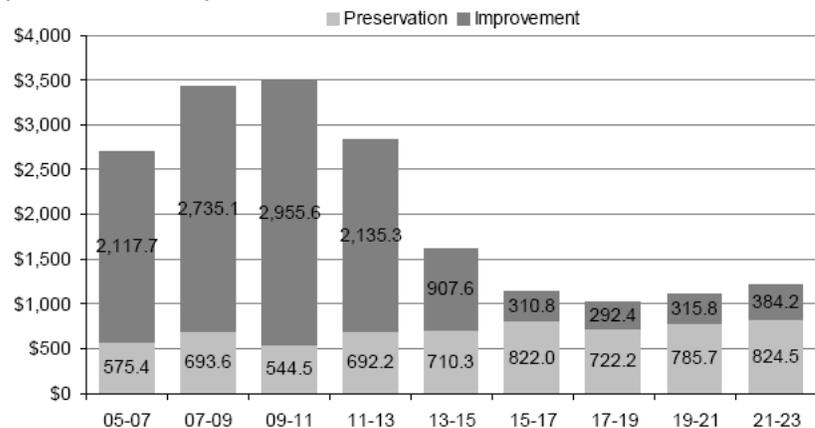
Funding for highway activities comes from three primary sources:

- State gas tax
Approximately \$.17 of Washington’s current \$.28 gas tax goes to WSDOT operations.
- Licenses, permits and fees
New and annual vehicle registration fees, weight-based truck license fees, vehicle inspection fees, title fees, and special permits.
- Local and federal funds
Over \$785 million.

HIGHWAY CONSTRUCTION

The Highway’s component of WSDOT’s Capital Program includes improvements to, and preservation of, the state’s highway system.

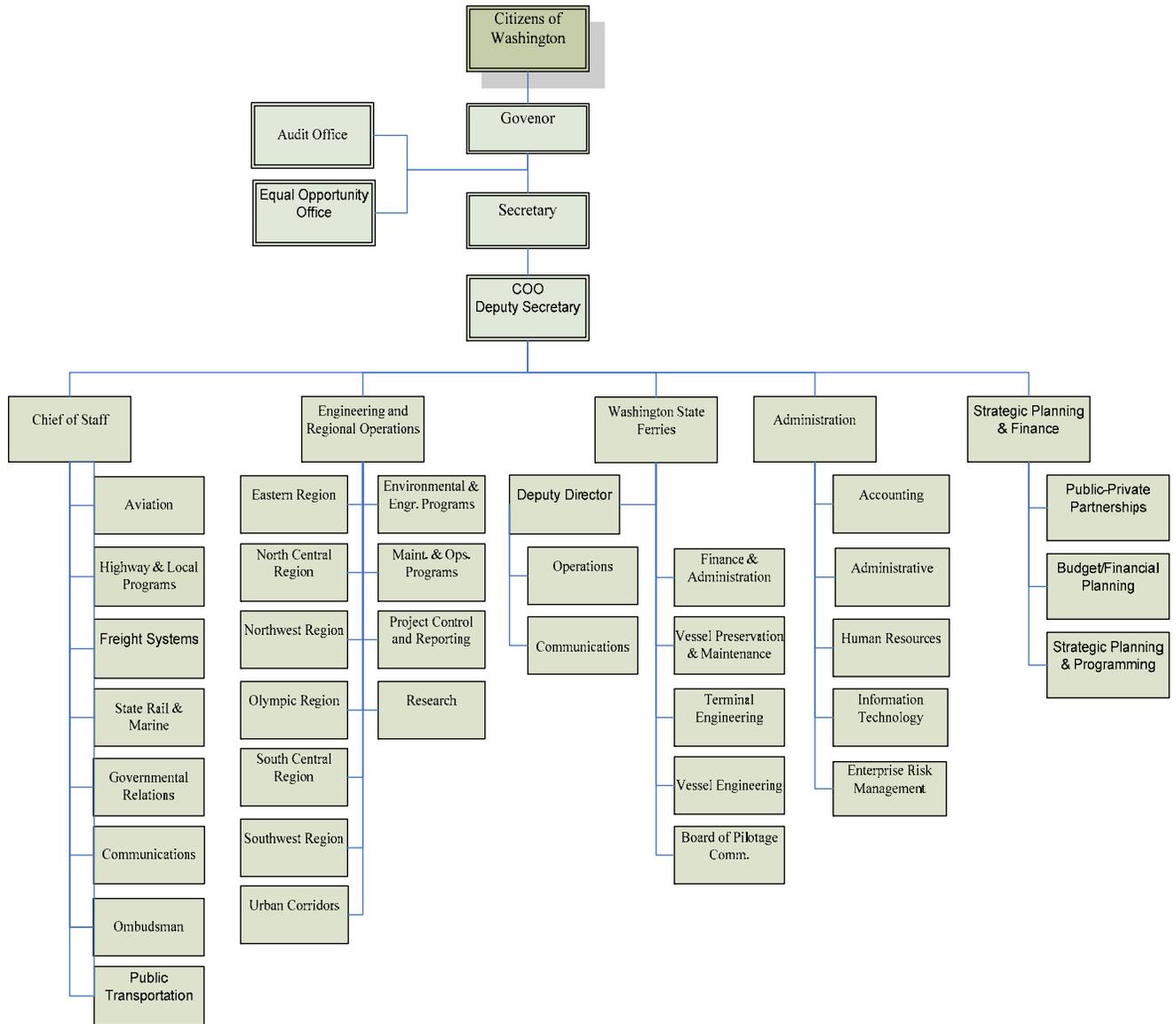
**Highway Construction Program
16 Year Plan for Highway Preservation and Improvement
(Dollars in Millions)**



ORGANIZATION

WSDOT employs over 7,500 full and part-time employees with over 60 percent focused on transportation.

WSDOT 2005-2007 Organization



Source: WSDOT



CONSUMABLE INVENTORY and SUPPLY



**Washington State
Department of Transportation
Construction Management/Highway Maintenance Performance Audit**

CONSUMABLE INVENTORY SUPPLY MANAGEMENT

APPROACH

The Washington State Department of Transportation (WSDOT) maintains and manages the largest inventory of any state agency. Consumables, those items purchased by the Department for use as part of its ongoing operations, are placed in warehouses, yards, or stockpile sites until needed. These items are continuously consumed and replaced throughout the year.

To determine how well WSDOT's Consumable Inventory and Supply Management function is meeting its operational needs, an eight-step review process was followed:

1. Reviewed background materials, including prior reports and other information related to this topic,
2. Performed an ABC analysis² of the WSDOT consumable inventory,
3. Conducted field reviews of WSDOT's supply chain function and supporting business processes at selected WSDOT locations,
4. Conducted telephone interviews and/or direct meetings with key WSDOT vendors,
5. Reviewed the timeliness and value added of purchasing performed by the Department of General Administration (GA) on behalf of WSDOT,
6. Reviewed selected of "Q" contracts³ issued by WSDOT,

² ABC analysis is a management tool based on the tenets of Pareto Analysis and categorizes inventory by its highest value and greatest volume.

³ WSDOT has specific authority to purchase certain mission-critical materials for which WSDOT is a primary consumer. The WSDOT designation for these contracts "Q" (as in "quantity").

7. Benchmarked WSDOT supply chain and related functions against best practice, and
8. Identified performance gaps against best practice and recommended changes.

Other Studies

WSDOT identified and provided a significant volume of existing information related to efforts to improve its supply chain function. Accordingly, the following material was reviewed:

- Background material on the WSDOT supply chain function provided with the RFP for this project.
- The WSDOT Purchasing and Materials Management (PMM) business plan.
- The State of Washington’s *Roadmap* Business Initiative.
- The “Procure-to-Pay Value Proposition” report (Eclipse Report).
- Previous reports on WSDOT’s supply chain, including:
 - “State of Washington Supply Chain Optimization: Initial Results from DOT Assessment” (Cisco Report).
 - “Consumable Inventory System Feasibility Study” (Dye Report).

Our review included assessing the findings and recommendations from these reports, comparing them to our observations and analysis, and benchmarking WSDOT progress towards meeting these recommendations (where appropriate) and against other best practice supply chain benchmarks.

“Best Practices”

Project efforts focused on identifying WSDOT’s supply chain business processes including requisition, inventory management, purchasing, order receipt, and payment. The information obtained was benchmarked against supply chain “best practices” from information sources that included the following:

- The Association for Operations Management (APICS)
- Supply Chain Council
- Procurement and Supply Chain Benchmarking Association
- Enterprise Business Process and Data Modeling for the Roadmap for Financial and Administrative Policies, Processes, Systems and Data, Procure-to-Pay Value Proposition
- Results from a survey of purchasing and supply chain practices at state DOTs, prepared and collected by the consulting team with the support of the National Institute of Governmental Purchasing (NIGP)
- Procurement service benchmarks identified by the Administrative Resource Center, U.S. Department of Treasury's Bureau of the Public Debt
- Institute of Supply Management and Arizona State University (CAPS Research)
- Additional, direct contacts with other state DOTs.

DOT Survey

As part of our benchmarking efforts, we secured the assistance of the National Institute of Governmental Purchasing (NIGP) in conducting a survey of state DOT purchasing and supply chain practices. The following 11 state DOTs (22 percent of total) provided responses:

1. Arizona
2. Kentucky
3. Louisiana
4. Mississippi
5. New Mexico
6. New York
7. North Carolina
8. Oregon
9. Texas
10. Utah
11. Washington

Survey responses provided limited data to support performance benchmarking. The most noteworthy finding was that, of the survey respondents, only Washington and Texas DOTs have organized the purchasing and materials management functions in an integrated manner, an approach typically considered best practice for supply chain management.

Methodology

Our project approach included a series of field visits and interviews of WSDOT personnel at various WSDOT locations across the state. Additionally, we surveyed, interviewed, and met a number of key WSDOT vendors.

Because procurements performed by the Department of General Administration (GA) represent the majority of WSDOT's consumable inventory value, the efficiency and effectiveness of the GA purchasing function is a key variable in optimizing WSDOT's supply chain. Accordingly, we also met with a representative of GA.

To guide our field work and project focus, we performed an ABC analysis⁴ of the data from the WSDOT Consumable

⁴ Analysis of inventory items according to the principle developed by Pareto commonly called the 80/20 rule, an example of which is that 20% of inventory items account for 80% of the total value of the inventory.

Inventory System with results as identified in the following illustration.

Rank	Description	Annual Usage	% of Total Value
1	Liquid De-icer	\$6,037,093	39%
2	Traffic Paint & Related	\$3,371,531	22%
3	Guardrail & Related	\$928,073	6%
4	Herbicide	\$582,325	4%
5	Sand & Aggregate*	\$437,154	3%
6	Controller Devices	\$383,995	2%
7	Signs/Signage	\$244,102	2%
8	Paper	\$89,315	1%
9	Diesel Fuel	\$72,192	0%
10	Aerial Film	\$59,586	0%
11	Light Posts and Poles	\$57,931	0%
12	Highway Lighting	\$25,676	0%
	Balance of Consumable Inventory Purchases	\$3,095,178	20%
	Total Annual Consumable Inventory Purchases	\$15,384,150	100%

*WSDOT has specific delegated authority to procure items in this category.
Source: WSDOT

Major observations from this analysis include the following:

1. The 12 categories identified in the table represent 80 percent of the value of the WSDOT inventory.
2. The Department of General Administration (GA) procures 11 of these 12 items.
3. With the exception of paper, WSDOT is the dominant (or exclusive) buyer and/or establishes statewide standards for the remainder of these items.
4. WSDOT's equipment management operations, known within WSDOT as "TEF" (the Transportation Equipment Fund), maintains a separate inventory that is not included in WSDOT's consumable inventory.

Based on the above factors, the consumable inventory review focused on the 12 items indicated plus the TEF inventory. Other areas targeted for examination included the following:

- The “quality⁵” of WSDOT purchases made through its delegated authority to purchase transportation-based materials.⁶
- Vendor management/interactions.
- Logistics (including shipping and receiving processes).
- How well information is integrated between and within the Consumable Inventory System and accounting systems to help WSDOT manage its inventory.
- The current affect of having GA procure transportation-centric items on WSDOT’s consumable inventory levels, including the quality and value of the GA procurement services provided to WSDOT by fee.
- Whether current procurement practices represent the most efficient and effective use of WSDOT and state resources.
- The case for change and the likely affect of any recommended change.

RESULTS

Best practice in the organization of public sector supply chain management involves combining the supply chain and purchasing functions within a single group, staffed by individuals with the appropriate professional certifications.

⁵ As benchmarked against compliance with state purchasing guidelines and National Institute of Governmental Purchasing (NIGP) best practice guidelines.

⁶ Products represented by the “Sand and Aggregate” category and are commonly referred to as “Q” (as in quantity) contracts.

This is a model that WSDOT has emulated within its Purchasing and Materials Management Office (PMMO).

Our audit of PMMO activities indicated its current efforts are focused on optimizing the WSDOT supply chain. However, our review also identified several areas in which WSDOT's supply chain investment could be reduced while simultaneously improving the ability of its supply chain to support the organization. Major areas identified for improvement include the following:

- Replace the existing consumable inventory management system. Previous studies have indicated that substantial benefits would result including:
 - \$5.6 million in tangible benefits (primarily through the increase of inventory turns).
 - Improved public safety and avoidance of liability.
 - Enhanced service delivery.
 - Improved accountability.
- Require that all consumable inventories be managed by personnel with the appropriate training.
- Reduce regional variance in business practices.
- Place greater top management emphasis on supply chain performance measures.
- Increase efficiency in purchasing processes.
- Address vendor quality issues.

The following table summarizes observations regarding the quality of inventory management practices noted during visits to WSDOT field locations:

Inventory Category	Category Observations				
	Physical Inventory	Inventory Management	Processes	Automated System	Regional Variances
Consumable Inventory - Stores operations	Excellent	Excellent	Excellent	Poor	Minimal
Signals Inventory	Excellent	Excellent	Excellent Source: Comp	Poor Compiled by TKW	Some variance in practices, significantly differing levels of use among regions
Stockpiles	Good	Fair to Good	Variable	Poor	High
Sign Operations	Excellent	Excellent	Excellent	Excellent	Not applicable (single location)
2. TEF	Excellent	Excellent	Excellent	Excellent	Low

Specific findings and detailed recommendations to address these issues are found in the sections below.

WSDOT’s Consumable Inventory Management System does not Support the use of Automated Business Processes Relying on Non-Automated, Burdensome Business Processes to Perform Routine Tasks

The WSDOT consumable inventory system is more than 20 years old and has been leveraged through various reporting enhancements by the PMMO group. However, it does not support the use of automated business processes (such as bar codes and/or other materials management technologies), relying on non-automated, burdensome business processes to perform routine tasks such as receiving and issuing of materials. As such, the system does not support the effective collection and maintenance of accurate consumable inventory information necessary to

ensure efficient, accountable, and successful service delivery.

In contrast to the WSDOT consumable inventory management system, its TEF operations use a commercial off-the-shelf fleet management system (*M4*) to manage its parts and inventory information. This is considered a “best practice” fleet management system with full inventory management capabilities, support for bar coding, automated fuel reporting, and is completely integrated with WSDOT’s accounting system. The TEF inventory was consistently well managed at all location levels examined, with minimal inventories, reflecting a relatively new, PM-focused fleet.

WSDOT’s sign operations also exhibited excellent inventory management and business process practices, using a WSDOT-developed online system for ordering signs and processing these orders.

The burdensome business processes associated with the existing consumable inventory system have resulted in WSDOT personnel directly charging consumable inventory items to projects or activities to reduce their administrative burden. The 2006 Cisco Report indicated that 46 percent of WSDOT consumption was directly charged. Interviews and field visits suggest this practice remains a problem at some WSDOT locations - especially for items such as deicing materials, which are high value and typically

ordered and consumed within a relatively short period of time. Results of this practice include a significant understatement of actual inventory turns and a negative effect on overall inventory management efforts. Additional enhancement to the existing consumable inventory system existing system is not practical and multiple reports support the business need to replace this system and the potential to achieve significant savings through better inventory management and/or increased agency efficiency.

To assure WSDOT is managing consumable inventory in the most efficient and cost-effective manner possible, WSDOT should pursue the development of an integrated purchasing-inventory management system. Previous studies (Dye Management and Cisco Systems reports) have indicated that substantial benefits would result:

- \$5.6 million in tangible benefits (primarily through the increase of inventory turns).
- Improved public safety and avoidance of liability through the ability to provide detailed records of chemical applications, including when applied and age and quantity at application.
- Enhanced service delivery by improving analytical and strategic information required to support supply decisions and efficient operations.
- Improved ability to assure materials are properly used and accounted for.

WSDOT should also consider adapting its existing *M4* fleet system to serve as its interim consumable inventory management system until an integrated solution can be

implemented. However, it should be noted that while *M4* provides a short-term option for improving consumable inventory business processes, it is not designed to perform governmental procurement. Accordingly, *M4* cannot be considered a replacement for the recommended procurement/inventory system.

Recommendation #1:**We recommend WSDOT:**

- **pursue the development of an integrated purchasing-inventory management system linked to the Department's accounting system.**
 - **consider the use of *M4* as a short-term solution.**
-

WSDOT Response:

We agree. This recommendation supports a course of action recommended to WSDOT in the *Consumable Inventory Feasibility Study (Dye Management Group, Inc.)*, a report we commissioned in September 2004.⁷ The study estimated the cost of a new consumable inventory system to be \$4.5 million.

WSDOT's consumable inventory system is over 30 years old. It is very labor intensive and uses dated technology to account for \$80 to \$100 million in annual transactions. WSDOT has taken a lead role with other state agencies to develop solid business requirements for a replacement system that will meet statewide needs. WSDOT will continue to work with the Office of Financial Management (OFM), Department of Information Services (DIS), and others to implement a modern inventory accountability system within the "Roadmap" framework that has been established to integrate policies, processes, information tools and data for state agencies. In the meantime, we have assigned more staff to train inventory system users and managers to more consistently use the full capabilities of the existing system. We also are using new data mart

⁷ <http://www.wsdot.wa.gov/fasc/adminservices/PandMM/feasibilitydye.pdf>

technology to provide better and timelier access to consumable inventory information.

OFM Response:

Many of the department's systems are out-of-date and need to be replaced. In a recent study, *Critical Applications Modernization and Integration Strategy, December 30, 2005*, eleven core systems were identified. The consumable inventory system was not one of these. Given the competing demands for scarce funds, the consumable inventory systems needs to be evaluated against the eleven core projects identified in the study.

Action Steps and Timeframe:

- Provide user training in both the consumable inventory system and data mart. Ongoing.
- Participate in the OFM Roadmap process to position consumable inventory as an early implementation module. Ongoing.
- Evaluate the fleet management system (M4) for possible short-term application to meet consumable inventory needs. Complete by June 30, 2008.
- Evaluate options for financing a new system. Complete by June 30, 2008.

Current Practices in Some WSDOT Regions have Prevented the Processing of Inventory and Accounting Transactions to Leverage its Inventory Management System

Regional Inventory Managers should have primary responsibility for managing all field consumable inventories. These individuals should ensure consumable inventory is managed in the most efficient and effective manner available.

Current practices in some regions/areas do not always ensure this occurs. A lack of trained personnel and/or the preference of local management in some WSDOT regions/areas have prevented the processing of inventory and accounting transactions when key individuals are unavailable. These practices compromise the ability of

WSDOT personnel to leverage the inventory management system.

Providing staff with a clear understanding of inventory management will help assure the current system is appropriately administered and all applicable staff have the ability to effectively and accurately process inventory.

Recommendation #2: **We recommend WSDOT assure inventory is managed only by appropriately trained personnel.**

WSDOT Response: We agree, and have been working to establish more functional oversight of regional inventory management procedures. We have a professional certification and training program in place for regional supply officers that has resulted in eight regional staff earning their Certified Professional Public Buyer (CPPB) credential. Training for over 200 system users is provided jointly by regional and headquarters staff. The department is constantly analyzing information to identify more ways to eliminate regional variations in supply processes.

OFM Response: OFM supports the training and certification program WSDOT is deploying and encourages the idea of having at least two individuals in each region with such certification.

Action Steps and Timeframe:

- Support and encourage professional certification and continuing education for both regional and headquarters staff. Ongoing.
- Conduct a detailed analysis of the different procedures used in each region to determine which practices achieve the best results. Complete by March 15, 2008.
- Provide on-site training and technical assistance to inventory system users. Ongoing.
- Develop a professional certification and training registrar at headquarters in order to track progress

towards the goal of at least two professionally trained and certified supply officers per region. Complete by July 2008.

**WSDOT Inventory
Records are Not
Consistently Adjusted
Creating Inaccuracies in
the Consumable Inventory
System and Impeding
Efforts to More Effectively
Manage Inventory**

The consumable inventory records are seldom updated to reflect materials issued but not used and/or materials salvaged during agency operations (e.g., used guardrails, attenuators and light poles.) This results in materials being held at one facility when they are needed at another, delaying repairs and/or requiring additional purchases.

Sand and aggregate inventory levels were found to remain in excess of current needs, consistent with the findings of the Cisco Report. Changes in snow and ice treatment practices have contributed to this problem but action is needed to adjust these inventories to sustainable levels. In the interim, the items continue to absorb valuable agency resources.

WSDOT should adopt inventory level recommendations from the Cisco Systems report, including the one-time and/or near-term steps to adjust the item inventories to appropriate levels.

In addition, certain business practices in some WSDOT regions/areas strongly discourage processing a partial receipt of goods into the inventory and accounting systems because of the additional accounting work required. This

practice has created inaccuracies in the consumable inventory system and impeded efforts to more effectively manage inventory.

WSDOT should require all goods to be entered into the consumable inventory system upon receipt. The practice of charging consumable inventory items to projects and/or activities should be discouraged. Used and/or salvaged materials should be included in the consumable inventory system. In addition, when appropriate, WSDOT should redistribute high-value and/or critical-need materials between regions to minimize inventory investments while ensuring the safe operation of the state's transportation system.

Recommendation #3:**We recommend WSDOT:**

- **adopt the inventory level recommendations from the Cisco Systems report.**
 - **direct all field operations to maintain accurate information in the consumable inventory system.**
 - **redistribute high-value and/or critical-need materials among regions.**
-

WSDOT Response:

WSDOT suggested this recommendation for strengthening our program to the audit team, and supports its implementation.

OFM Response:

We agree with the recommendations and all of the action steps.

Action Steps and Timeframe:

- Implement the action steps associated with recommendations 1 and 2.

- Require appropriate orders, receipts, and issues of inventory to be entered into the consumable inventory system in a timely manner. Complete an implementation plan to balance recording of inventory transactions with business requirements for the use of inventory materials. Complete by September 2008.
- Encourage used material that is in serviceable condition (e.g. guardrail, light poles) to be added to inventory so it is visible for redistribution and reuse between regions. Complete in FY09.

**Department of General
Administration
Purchasing**

The Department of General Administration (GA) is the Washington agency that has primary responsibility for establishing purchase contracts for use by state agencies.

**Timeliness of WSDOT
Procurements Through the
Department of General
Administration was Unable
to be Determined
Inhibiting the Ability to
Assess Purchasing Power
and Future Economics**

GA establishes and maintains approximately 333 master statewide contracts for items used by many state and local government agencies. To perform these and other agency-specific procurements, GA has a staff of 26 purchasers supported through fees charged to users at other agencies. As one of the GA's largest customers, WSDOT uses more than 200 GA contracts for its purchases. WSDOT will pay approximately \$1.5 million in fees to GA during the 07-09 biennium.

At the request of the audit team, WSDOT identified 48 specific contracts for which it is either the largest single purchaser or has effectively established the statewide contract specifications. These include items in which highly specific quality, service, and delivery specifications must be included in the contract terms and conditions.

Such items include highway striping paint, guardrails, traffic signal equipment, de-icer, etc.

WSDOT has experienced product quality difficulties with traffic signal controller cabinets purchased through contracts established by GA, resulting in both time and monetary expenses. A significant number of service and delivery complaints were directed toward a single vendor that holds a statewide contract for replacement guardrails and related items. Based on our analysis and discussions with vendors, these problems could be reduced through better communications, more interactions between parties, and application of technology (for example, online product ordering, e-mailed orders coupled with the use of digital pictures and/or use of electronic product directories).

Monthly reports provided by GA to WSDOT were reviewed to determine the average number of days GA took to fulfill WSDOT purchasing requests. However, the information was inaccurate and, as a result, we were unable to ascertain the average number of days it takes GA to fulfill purchasing requests.

A major component of WSDOT's consumable inventory and supply management process is the ability to obtain crucial items efficiently and effectively. Timeliness of the procurement process is a key element and has an extensive affect on operations. Receiving ordered supplies that meet

the established quality, service and delivery standards is also necessary for WSDOT to perform its job in the most efficient and effective manner.

WSDOT believes it does not receive ordered goods in a timely manner. However, actual timeliness is difficult to determine. As mention previously, information obtained from GA could not provide a basis for determination. Additionally, WSDOT is not measuring the number of days between purchase requests and placing orders.

If WSDOT does not measure and monitor the service it receives from GA, the Department cannot be assured that necessary supplies are being received in a timely manner. Currently, WSDOT cannot demonstrate insufficient service from GA.

WSDOT should work directly with GA to ascertain timeliness of service, establish reasonable benchmarks, and monitor service levels to ensure that the most efficient methods possible are in place to procure the 48 items it primarily uses.

Recommendation #4:

We recommend WSDOT work directly with GA to:

- **obtain detailed information identifying timeliness of service.**
 - **establish reasonable benchmarks.**
 - **monitor service levels.**
-

**WSDOT/OFM/GA
Response:**

We agree with the recommendation to review and improve appropriate performance measures and benchmarks and to monitor performance against them. The three agencies are committed to working together to ensure efficient procurement and supply chain management. The agencies will improve documentation of when purchase requests are made, orders are placed, and goods are delivered. However, it is important to recognize that WSDOT and GA already regularly monitor service and meet together quarterly to address performance questions and current topics. Further, the purchasing services agreement between both WSDOT and GA also identifies service level expectations and protocols for both agencies. A quality and timely procurement process is the goal for all of the parties. Receiving ordered supplies that meet quality service and delivery standards is a shared responsibility of WSDOT and GA.

Action Steps and Timeframe:

- WSDOT will continue to monitor critical contract matters and work with GA to continually improve service and resolve issues. Ongoing.
- To enhance current monitoring of service quality and timeliness, GA and WSDOT will ensure appropriate performance measures are in place to assess actual performance against these measures. This work will commence immediately and be ongoing.

**WSDOT Regional
Purchasing Practices for
Quantity “Q” Contracts May
be Inconsistent Potentially
Reducing Public Visibility,
Requiring Additional Work
for Bidders, Restricting Price
Adjustment Provisions, and
Inappropriately Using
Liquidated Damage Clauses**

WSDOT has specific authority to establish contracts for certain transportation-specific products, such as sand and gravel. WSDOT contracts established to purchase these items are referred to “Q” (“quantity”) contracts. The Agency establishes terms and conditions to meet specific requirements of the U. S. Code, state laws, Department of General Administration, or WSDOT rules.

Based on the review of the “Q” Contracts from the North Central and Northwest Regions, it is neither possible nor

prudent to infer that the other four regions operate under similar policies and processes. However, the North Central Region contracts reviewed tended to be more consistent with standard procurement practices than the Northwest Region contracts.

The contracts include asphalt, sand and rock contracts from the Northwest Region, and gravel contracts from the North Central Region. Areas for improvement are identified below:

Procurement practices

Purchasing officers at each region used inconsistent WSDOT *General Terms and Conditions*, inappropriate contract renewal terms and processes, and made a number of minor errors in the solicitation and contract award that could have created problems in case of a dispute with the vendors.

Reduced public visibility on large annual procurement requirements

Issuing invitations to bid at the commodity line-item level reduces public visibility on procurements of basic materials larger than \$690,000 for rock contracts in one region alone.

Inefficiencies for the bidders and contract administration

Issuing invitations to bid at the commodity line-item level forces bidders to submit a separate bid for each type of material instead of one bid that includes all materials WSDOT needs. The resulting contract awards

are made individually at the line item level rather than collectively to the vendor.

Ambiguous contract price adjustment provisions

With the exception of bituminous mixes, the WSDOT Purchasing Manual does not provide for points of reference to allow price changes during the term of the contracts or at the time of renewal. The terms used, based on documented industry-wide raises in material costs, are ambiguous and subject to individual interpretation. The uncertainty of the terms increases bidders' risks in a changing market.

Inappropriate use of liquidated damage clauses

Some WSDOT-issued "Q" contracts include clauses that provide for liquidated damages as a percentage value of the purchase order or contract. This practice is not allowed under National Institute of Governmental Purchasing (NIGP) standards, which limits damages to demonstrated costs.

Recommendation #5:

We recommend WSDOT:

- **increase department-level oversight of regional "Q" contract practices to promote more efficient bidding and contract administration.**
 - **continue and expand its training and certification program for procurement and inventory management personnel.**
 - **revise the WSDOT Purchasing Manual to provide specific guidance price adjustments during the term of a contract and at the time of contract renewal.**
-

WSDOT Response: WSDOT agrees, and will work to implement consistent “Q” contract practices across the state. WSDOT supply managers apply competitive contracting tools and techniques that they believe provide the best value to the department under specific market conditions. There may be some unique circumstances that result in some unique contract provisions.

OFM Response: Extraordinary cost increases in steel, copper, asphalt, and other resources has created a need to reconsider how risks are shared between the state and contractors. Contract price adjustments should be closely tracked in order to inform future contracting, project cost estimating, and budget development.

Action Steps and Timeframe:

- WSDOT will evaluate additional oversight measures that can be implemented at the department-level. Complete by April 30, 2008.
- Support and encourage professional certification and continuing education for both regional and headquarters staff. Ongoing.
- The WSDOT Purchasing Manual 72-80, Para 1-23.3.d already contains specific guidance about contract price adjustments. Completed. We will continue to review for additional guidance on price adjustments that will be helpful for the Purchasing Manual. Ongoing.
- WSDOT will track the cost of those items purchased under “Q” contract authority in order to address the question of changing prices for such commodities as sand, gravel, asphalt, etc. An annual assessment of cost changes will be provided to the Office of Financial Management when the agency request budget is submitted.



Procurement Strategy for Hot Mix Asphalt



PROCUREMENT STRATEGY FOR HOT-MIX ASPHALT

APPROACH

Hot mix asphalt (HMA) is a flexible surface used on roads with high traffic volumes. With approximately 1.5 million tons purchased annually, HMA is the major paving material used by WSDOT.

To determine if WSDOT's procurement process for hot-mix asphalt is effective and to identify and assess "innovative ways" to better control, predict, or reduce the cost of provided asphalt to WSDOT and other governmental entities, the following primary activities occurred:

- Review of literature. Although limited, information concerning how states, localities, and foreign governments procure hot-mix asphalt was obtained and reviewed.
- Discussions with WSDOT personnel regarding current practices.
- Interviews with asphalt and construction industry representatives within Washington and elsewhere.
- Questionnaire-based review of state DOT practices regarding various aspects of asphalt and asphalt product procurement and use.
- Review of international practices, to the extent they were available.

The latter two items above are focused on "best practices" where available.

RESULTS

With minor variations, HMA purchasing practices vary little among state transportation departments and other public sector entities. WSDOT practices for procuring HMA generally follow standard practice and Agency efforts to encourage competition and minimize vendor risk premiums essentially mirror those of most states.

Although no substantial recommendations for change regarding the procurement of hot mix asphalt in the state of Washington are offered, specific opportunities to improve current practices have been identified:

- Potential reduction in vendor risk through the use and application of price adjustment clauses for all HMA contracts.
- Encourage Washington cities and counties to allow use of recycled asphalt pavement (RAP), which is consistent with WSDOT practice.
- Explore increasing allowable RAP levels in non-critical mixes.
- Continue to monitor developments in Warm Mix Asphalt Technology as a possible option for increasing competition and/or conserving natural resources.
- Continue to monitor HMA competition and service levels.

Each of these issues is explained in greater detail in the following sections. Also included is a discussion of current practices with respect to public ownership of HMA plants.

Procurement Practices

The HMA “marketplace” is relatively local and effectively constrained by the physical properties (components, temperature requirements, etc.) that limit haul length and/or make it difficult for vendors to compete beyond their local areas - especially for the “on demand” contracts typically used by transportation departments and local governments for maintenance paving. Conversely, for HMA contracts that identify specific needs and offer sufficient volume (typically construction contracts performed by vendors on behalf of WSDOT), portable asphalt plants help ensure a competitive marketplace. Both scenarios suggest that little economic benefit is possible from attempting to purchase HMA through a single, statewide contract.

Currently, WSDOT has a minimum of 16 HMA providers. In total, these providers operate 64 plants across the state. However, the concentration of HMA plant locations in Washington generally mirrors population centers, with a significantly higher proportion in Western Washington than in Central and Eastern Washington. However, portable asphalt plants and the availability of WSDOT-owned pits and quarries provide alternative HMA sources and supplement competition.

WSDOT’s approach for securing optimal vendor pricing is to encourage a competitive bidding environment with a goal of attracting as many responsible bidders as possible. This approach is based on the three strategies: 1) fairness

and efficiency; 2) communications with the contracting industry; and 3) bid advertisement scheduling.

With respect to HMA, the level of competition on a given procurement tends to be influenced by several factors. The following discussion focuses on three of the more important vendor considerations:

1. Proximity to the projected work
2. Viability of portable plant operations
3. Available capacity

Proximity to Projected Work

With the exception of natural disasters and/or emergency repairs, most WSDOT work involving significant amounts of HMA is planned in advance, is identified in publicly available information, and is routinely communicated to the WSDOT vendor community as part of its overall planning process. Where a significant number of HMA providers are within viable proximity to given WSDOT projects, vendors will tend to adjust prices with respect to the perceived competition, constrained by the direct cost of the product. Conversely, when an HMA provider is in the position where logistics limit competition and/or work volumes are inadequate to support options such as the use of portable asphalt plants, vendors face less competitive pressure.

Viability of Portable Plant Operations

The viability of this option is typically a function of the volume and duration of HMA needs, the proximity of raw

material sources, and the availability and the cost of HMA from other vendors.

To encourage competition and control costs, WSDOT owns a significant number of pits and quarries in many of the more remote areas of the state and will allow HMA contractors to set up a portable plant, mine the WSDOT-provided aggregate, process it, and produce the HMA. This allows HMA contractors with portable plants to bid on an equal footing with those fixed plants that do not have nearby competition.

Available Capacity

As a vendor approaches the capacity of the supply plant location, the more likely the vendor is to increase prices offered. Because weather conditions affect the ability of contractors to install asphalt, demand also fluctuates by season with appropriate impacts on short-term pricing.

WSDOT's current procurement practices for hot-mix asphalt do not vary appreciably from methods (and results) used throughout the United States or internationally. By effectively following a "free market" approach to HMA purchasing, WSDOT allows the marketplace to establish prices while prompting business practices that are designed to encourage competition. This is generally considered a best practice approach to public sector procurement. According to WSDOT vendors, the state DOTs asphalt

standards and specifications are appropriate and bidding practices encourage full competition.

WSDOT Does Not Use Price Adjustment Clauses for All HMA Resulting in Increased Vendor Risk

Vendor options for bidding on HMA contracts that contain no provision for increasing prices include the following:

- Bid product pricing that includes a “risk premium” (additional price margin) sufficient to allow for most price fluctuations.
- Provide the product at a loss. The approach is untenable over time as it can result in the provider going out of business.
- Attempt to renegotiate the price with the buyer.
- Reduce product quality – not tenable over time
- Refuse to bid on such contracts – this option reduces competition, which tends to increase costs.

Because none of the above represents positive, long-term outcomes, the best option for most transportation departments is to minimize vendor risk by including a defined process for systematically adjusting costs based on objective measures of component materials costs. Typical processes for such price adjustments include contract language that allows for proportional adjustments in HMA prices based on changes in a relevant benchmark. One such example is in use at the Texas Department of Transportation (TxDOT), which allows vendors to request price adjustments quarterly, based on changes in the Producer Price Index (PPI)⁸. Other transportation departments - California, Ohio, Oregon, and New Jersey - use similar processes with various benchmarks.

⁸ The US Bureau of Labor Statistics calculates the “Producer Price Index” for a variety of industries.

Regardless of the actual price adjustment benchmark, it is important that the process be clearly defined, be included in the procurement document, and the vendor community be educated on the adjustment process in order to achieve the desired goals of increased competition and/or improved product pricing. This typically involves conducting vendor outreach meetings in conjunction with providing supporting documentation, ideally posting this information on the DOT Web site.

In August 2006, WSDOT established an “Asphalt Binder Monthly Cost Index” for the purposes of calculating asphalt cost price adjustments for contracts, with separate price adjustment calculations for Eastern and Western Washington. Currently, WSDOT has only included this price adjustment clause for contracts of one year or longer in duration. The Agency perceives that the administration burden and associated costs for maintaining price adjustment clauses during single-season contracts to exceed its potential savings. In addition, because this price process could result in falling HMA prices during periods of asphalt cement price decline (as in recent periods), Washington’s asphalt industry has not historically supported price adjustment clauses.

In contrast with WSDOT, the New York State Department of Transportation (NYSDOT) applies price adjustment clauses to all HMA-related contracts, regardless of duration. Additionally, the NYSDOT has contractors

submit HMA-related invoices that simply identify the quantity of HMA material used, the vendor's bid price per ton and the price index amount at the time of the bid. From that invoice, NYSDOT directly calculates and applies its price adjustment index to all vendor HMA invoices - for both direct purchases and for payments provided as bid items to contractors (based on the average posted price for Performance Graded Binder). This approach represents a logical extension of the base concept of mitigating vendor risk and provides clear administrative advantages to both the vendor and the DOT. Accordingly, we perceive this to be a "best practice" for using such indexes.

Recommendation #6: **We recommend WSDOT pursue the use of price adjustment clauses for HMA to include all future HMA-related contracts.**

WSDOT Response: WSDOT agrees that the use of a price adjustment for HMA to shift cost escalation risk to the owner is an effective and appropriate means to mitigate payment of a "risk premium" on some HMA projects. Designers are directed to include the Hot Mix Asphalt Price Adjustment Clause in our multi-year HMA-related projects. We will continue to implement this clause in our multi-year projects.

WSDOT disagrees that it is in the owner's best interest to assume this risk on all contracts. Based on results to date and our communications with industry, we do not agree that using the price adjustment clause in projects of short duration is cost effective due to administrative costs and low risk. Contractors have the ability to negotiate with suppliers and better manage HMA cost for the short term.

OFM Response: We agree with WSDOT that a price adjustment clause is not needed for contracts of less than one year. There is no clear demand from suppliers that this needs to be done.

WSDOT Can Educate and Encourage Local Agencies on the Use of Reclaimed Asphalt Pavement Potentially Resulting in Cost Saving OpportunitiesAction Steps and Timeframe:

- WSDOT will continue to monitor the effectiveness and application of the HMA price adjustment provision by reviewing the data annually in November and communicating with industry, making adjustments to our policies and provisions as needed.

Reclaimed asphalt pavement (RAP) is defined as salvaged, milled, pulverized, broken, or crushed asphalt pavement. It is removed or reprocessed from pavements undergoing reconstruction or resurfacing. The components of this material - primarily stone, sand, and asphalt - are essentially identical to new HMA and can replace equal amounts of corresponding materials with the potential for reducing the cost of the HMA. Up to 20 percent RAP can be included in HMA with no change in mixture or process.

In the 1970s, WSDOT built several roads using 100 percent RAP as a demonstration effort. WSDOT was successful in this initiative and the roads have proved durable. However, to successfully pave with 100 percent RAP, WSDOT had to engineer both the asphalt mix design and the chemical binders. Conversely, WSDOT has found that use of RAP at or below 20 percent requires no additional engineering.

WSDOT's general approach to the use of RAP in HMA is based on using market economics to determine the most efficient mix of materials. Accordingly, WSDOT has chosen to allow (but not require) contractors to use up to 20 percent RAP in its HMA without any additional processing

DOT has \$5 m to spend on HMA**Assume:**

- \$400.00 Liquid Asphalt (64-22)
- \$450.00 Liquid when using Recycle
- 5.5% Liquid
- Processing Recycle Cost – \$3.00/ton
- Haul Cost – \$3.00/ton
- Aggregate Cost – \$10.00/ton
- Plant Processing Cost – \$6.00/ton
- Overhead and Profit – \$4.00/ton

If State D.O.T. purchases - All Virgin Mix

Tons of Virgin Mix = 120,627 tons

If State D.O.T. purchases 50% RAP Mix - 2" Inlay - Contactor gets RAP

Tons of RAP Mix = 166,113 tons

Lane miles paved with All Virgin Mix

162 miles

Lane miles paved with 50% RAP Mix

223 miles

Additional miles paved with Recycle

61 miles

Source: *Recycling Asphalt*, 1/22/07

or engineering. However, a number of Washington cities and counties do not allow the use of RAP in local roadway paving.

The Illinois DOT allows the use of up to 30 percent RAP on low-volume roads and up to 50 percent RAP for non-critical mixes, such as shoulder, base, and sub-base. In such instances, RAP usage clearly reduces the virgin material required, providing environmental benefits (through reduced consumption of natural resources and recycling of previously used resources) while reducing the amount, and therefore the cost, of the HMA used. Similarly, a task force formed by the Texas DOT to recommend practices for controlling construction and maintenance cost increases identified the use of RAP and crushed concrete at up to 50 percent of HMA volume for use in driveways, crossovers, shoulders and other miscellaneous areas. This practice was estimated to potentially save up to \$1.5 million per year in a large, urban district (equivalent to a WSDOT region) but implementation was left to the region to evaluate and use as appropriate.

WSDOT should use its position as the primary transportation agency in the state to continue to educate and encourage Washington cities and counties to *allow* (but not require) contractors to use up to 20 percent RAP to benefit the state in the form of lower overall costs and/or more roads paved for the same amount of money.

WSDOT should also evaluate the experiences of the Illinois and Texas DOTs in using a higher level of RAP and crushed concrete in non-critical HMA applications. If WSDOT analysis supports this practice, considerable savings could be possible.

Recommendation #7:**We recommend WSDOT:**

- **encourage local governments to allow the use of RAP consistent with WSDOT practices.**
 - **explore increasing allowable RAP levels in non-critical mixes.**
-

WSDOT Response:

We agree that continuing our education effort with local agencies may allow those same local governments to save money through the use of Recycled Asphalt Pavement (RAP). WSDOT has continued to educate local governments, through conferences, research reports, presentations and face-to-face meetings, on the value of allowing the use of RAP up to 20% in new hot mix asphalt pavement (HMA).

We also agree that WSDOT should continue to research and explore using higher levels of RAP in HMA. WSDOT has been a national leader in researching higher levels of RAP in HMA since the late 1970s. We analyze our pavement performance carefully through a world class pavement management system. The Illinois and Texas proposals are not without risk: we expect our “non-critical mixes” on shoulders to last much longer than pavements under traffic. Decreasing pavement life, even on shoulders, would adversely impact the Preservation Program and result in higher lifecycle costs. Highway shoulders and driveways are not exposed to large traffic loads, but they are exposed to the environment. High RAP mixes tend to be more oxidized and can be more susceptible to cracking caused by environmental stresses, particularly those brought about by high and low temperatures. We are working on engineering all of our pavements for the lowest life cycle cost.

OFM Response:

WSDOT is a national leader in researching and implementing environmentally friendly transportation projects. Enhancing the use of Recycled Asphalt Pavement will also help to curtail the diminishment of the scarce mineral resources used to make asphalt.

Action Steps and Timeframe:

- Continue to monitor research on using higher levels of RAP, through the State Pavement Technology Consortium (includes WSDOT, Texas DOT, Caltrans and Minnesota DOT).

**Potential Opportunities
Exist to Use WMA
Technology to Reduce the
Cost of Installed Asphalt**

As described previously, the ability to transport HMA to a jobsite is constrained by the need to keep the asphalt above a minimum specified temperature. However, European countries are employing various technologies that both reduce the heat needed to produce asphalt and/or allow asphalt to be satisfactorily installed at lower temperatures. Collectively, “Warm Mix Asphalt” (WMA) is the label used to describe these efforts. These technologies have significant potential to reduce the cost of installed asphalt for the following reasons:

- Reduced energy requirements and emissions (lower costs and reduced environmental impact).
- Increased haul times (encouraging greater competition).
- Increased product working time.
- Potential to allow increased RAP levels (through improved asphalt binder viscosity).

WSDOT should continue to monitor the WMA research and current U.S. evaluations. As these developments warrant, WSDOT should consider applying WMA

technology to encourage increased competition and/or the potential for using WMA technology to increase allowable RAP requirements.

Recommendation #8: **We recommend WSDOT continue to monitor WMA research and current U.S. evaluations**

WSDOT Response: We agree. WSDOT continues to monitor Warm Mix Asphalt (WMA) and participates in national level work, including the Director of our State Materials Lab participating in both a national-level State Pavement Technology Consortium team studying WMA and as one of three state representatives in the FHWA managed, national-level Technical Working Group on WMA.

OFM Response: We agree and encourage WSDOT to evaluate and research WMA technology.

Action Steps and Timeframe:

- Continue to monitor research on Warm Mix Asphalt and continue to participate in national efforts to investigate Warm Mix Asphalt.

Although WSDOT Does Not Own HMA Plants WSDOT, Direct Ownership May be Appropriate Given Specific Conditions

Direct ownership of HMA plants is rare for any public sector entity and extremely rare for state transportation departments - currently only North Carolina and Georgia own plants. Ownership of plants by local governments throughout the United States is more widespread but still relatively rare. This appears to be due to geo-physical considerations, historic practices, and availability and/or cost/performance of private providers. Ten state

transportation departments⁹ were aware of local governments within their jurisdiction that owned and/or operated asphalt plants for their own use.

Public entities that own such plants tend to lack documentation of the decision-making process. They usually report favorable cost and/or service outcomes. Such reporting is largely anecdotal and tends to ignore the risks associated with direct HMA plant ownership. Such risks include a lack of external recourse for premature pavement failures; the costs associated with remanufacturing HMA that is out-of-specification; and/or the costs of reprocessing HMA that is unable to be used because of weather or other factors. However, public entities can benefit from retaining the option of owning HMA plants should market conditions and/or a lack of vendor support warrant. In one documented example, McPherson County, Kansas, indicates that a \$420,000 investment in a new plant provides asphalt at a lower cost and on a readily available basis. This county also provides HMA to local contractors as well as performing all of its own design and engineering, project inspection, and construction management with in-house staff.

While public ownership of asphalt plants is rare, such ownership may make sense when conditions do not provide adequate market interest and/or support by the private sector. Accordingly, while we neither encourage nor

⁹ of our domestic sample of 35

discourage WSDOT (and/or local public entities) from owning and operating public asphalt plants, having the *option* of public ownership provides a means of encouraging vendor responsiveness and competitive pricing. However, any entities considering this option should consider the risks associated with this practice.

In the event that the state or localities consider owning and operating asphalt plants, they should first review current experiences in North Carolina and Georgia, as well as other countries (specifically France and Sweden), where local governments follow the practice today. Additionally, the North Carolina DOT has recently decided to open a plant to provide HMA in an area where the private sector has chosen not to do so. This will provide a current example that can help WSDOT and/or other entities make an informed decision.

Recommendation #9: We recommend WSDOT and other public entities monitor HMA competition and service levels to determine whether direct ownership is appropriate.

WSDOT Response: WSDOT agrees and notes that monitoring HMA competition is current agency practice. Results of its monitoring both of prices and level of competition have been shared widely with the industry itself, with the public through the *Gray Notebook*, and also through Governor Gregoire's Government Management Accountability and Performance (GMAP) program.

OFM Response: Although the audit report neither encourages nor discourages public ownership of asphalt plants, we urge caution as this work has historically been performed by the

private sector in Washington State. WSDOT has taken the right approach by purchasing asphalt materials that the private sector can access for production in remote areas, but should not become a producer itself. Nevertheless, WSDOT must remain vigilant and closely monitor competition and the availability of supplies.

Action Steps and Timeframe:

- Continue to monitor HMA competition as documented by the low bid system.



Maintenance Operations/Revenue Opportunities



Construction Management/Highway Maintenance Performance Audit

MAINTENANCE OPERATIONS/REVENUE OPPORTUNITIES

APPROACH

Public organizations are charged with exercising responsible stewardship of infrastructure. WSDOT views its facilities, equipment, and other assets as key components to the successful performance of its mission. As such, this audit focused on reviewing the Agency's practices for assuring its assets are properly and effectively maintained.

Our approach considered the adequacy of resources to accomplish maintenance and operations activities, how those resources are employed, and the results of that employment. Within this general approach, our research was directed towards the identification of issues, barriers, and opportunities to:

- Enhance the economy and efficiency of maintenance and operations activities.
- Improve utilization of limited resources.
- Preserve the significant public investment in the state roadways and related facilities and assets.

Six aspects of the Maintenance Operations/Revenue Opportunities area were reviewed - two areas involving the policies, support, operation, and service profile of safety rest areas (SRAs); two areas addressing the issues, policies, support, operation, and management of area-wide subjects; and two areas, while specific to the Maintenance and Operations (M&O) Program, integral to department-wide initiatives and practices. Each of these areas is summarized below:

Safety Rest Areas

This area examined the following safety rest area program elements:

Mission

- Program mission and related strategic planning activities and products.
- Scope of potential current public service mission requirements that have surfaced and/or changed since the program was established including public safety, disaster preparedness, refuge, and redefined commercial economic and safety services.
- Integration of technological capabilities with the potential for improving traveler safety, comfort and travel-related information into the current SRA mission and planning process.
- Risks to the SRA Program asset base and the ability to continue the delivery of reliable, quality and safe public service.
- Roles and responsibilities, including program leadership, among parties involved in the evaluation, planning, design, operation and preservation of SRA facilities and services.

Organization, Revenues, Costs, and Requirements

- Reviewing the suitability of the organization's structure to best support program activities.
- Examining opportunities to increase revenue from safety rest area enterprise activities.
- Assessing operational costs and safety rest area facilities maintenance backlog.
- Determining barriers to directing revenues and revenue increase to unmet facility needs.
- Establishing the need to enhance program support for preserving public investment and sustaining service levels.

Maintenance and Operations/Safety Rest Area Purchasing

The focus of purchasing activities of the M&O and SRA programs included:

- Determining the level and relevance of safety rest area related purchases.
- Determining the level and relevance of other M&O purchases.
- Identifying potential settings and conditions regarding future purchase activity.

Maintenance and Operations Program Barriers and Opportunities

Principal barriers and opportunities affecting the maintenance and operations program were identified and reviewed.

Best Practices

The focus of this area was to accomplish the following:

- Assess the major Maintenance and Operations planning, work processes, and practices.
- Identify potential improvements.
- Highlight noteworthy practices.

Regulatory Mandates

- Identification of relevant regulatory mandates.

Emergency and Disaster Response Preparedness

- Assess the current coordination and preparedness for emergencies and disasters.

Safety

WSDOT's focus on and implementation of applicable safety measures were assessed.

Performance Measurement

WSDOT's selection and use of Maintenance and Operations performance measures were assessed to determine:

- Whether all necessary performance measures were in use.
- The usefulness of adopted performance measures.
- Identification of potential improvements in the performance measurement process or the use of individual performance measures.

Methodology

To achieve our audit objectives, we reviewed various documents including:

- Relevant program and department policies and practices.
- Data collection and reporting mechanisms.
- Financial management activities.
- Headquarters, field planning, and management.
- Prior studies.

In addition, we observed management, supervisory, and operations staff activities and practices and solicited their experiences, opinions, and suggestions regarding the barriers, opportunities, practices and accomplishments of the Agency in general and the Maintenance and Operations Program in particular.

Approximately 80 people were interviewed in individual or group settings. These included department managers; program, financial, information systems, technical, and operational employees. Headquarters and regional staff of all six geographic regions were involved in meetings with the audit team and ranged from the WSDOT Secretary to

local safety rest area attendants. These interviews were supplemented by visits to numerous facilities and sites statewide. Interviews were also conducted with people outside WSDOT to acquire available information.

**“Best Practices”/Other
Information Sources**

Best practices and other information sources used during the course of the audit were varied and numerous. The following is a summary of specific categories and examples:

Plans and Applicable Goals, Objectives, and Strategies

All identified WSDOT plans as well as relevant plans of other state, federal, and agency plans.

Budgets and Related Performance and Service Delivery Commitments

Relevant materials used include budgets, cost reports and attendant service delivery and performance information for the last six biennia and the fiscal years 2007-2009 budget submittal.

Relevant Studies and Reports

A large number and variety of studies and reports were assessed and integrated into the audit when applicable. Examples include the Truck Smart Park Study, FHWA Parking Study, WSDOT Truck Study and Strategic Freight Transportation Analysis. Relevant items from other organizations included disaster preparedness documentation of the Washington State Emergency Management Division and of the federal government,

prior audits and relevant studies of WSDOT and of similar organizations and programs elsewhere.

Financial, Activity, and Services Reports and Analyses

Relevant materials included a broad range of subjects such as safety rest area expenditures; SRA and Maintenance and Operations vendor and services purchases; travel, accident, and related data; third-party claims and financial impact analysis; and materials of other state agencies.

Program Study, Activity, and Service Delivery Information, Proposals, Contracts, Reports and Communications

Significant materials included items regarding subjects such as WSDOT outsourcing, highway maintenance outsourcing, citizen and staff safety rest area study group minutes, findings, and recommendations; SRA contracting correspondence, vending contracts and payment records, SRA wireless Internet and advertising proposals and contracts, SRA program roles and responsibilities, and SRA reorganization and staff assignment responsibilities.

Manuals, Guides, Standards, and Related Materials

Manuals, guides, handbooks, and similar references were reviewed and employed as appropriate.

Performance Standards, Service Delivery, Condition and Maintenance Backlog Information and Reports

WSDOT Maintenance Accountability Process (MAP) targets, performance reports, user committee agenda, work papers, and change and enhancement recommendations; selected analysis and summaries of work load items; and facilities backlog levels.

The Department is focused on its MAP highway maintenance targets. These targets are established through the receipt of periodic satisfaction surveys¹⁰. The targets also factor in available maintenance funding and become accepted standards of performance. Actual achievements against the targets are compiled and published annually and the data used periodically for evaluating manager performance. Achievements are reviewed by the Office of Financial Management, the Governor's Office and legislative staff.

Relevant State, Federal, and Professional Agencies and Organizations

Key statutory, administrative, and funding-related materials including the Code of Federal Regulations, the Revised Code of Washington (RCW), Washington Administrative Code (WAC), and Federal Highway Administration information provide specific guidelines.

¹⁰ Input received from traveling public concerning their satisfaction with the state highway system.

Performance Measures

Policy goals form the framework of the agency's performance management system. These goals, which are included within the provisions of RCW 47.01.012, are described as "the basis for establishing detailed and measurable performance benchmarks." The nine goals refer to highway safety, highway condition, structural condition of bridges, traffic congestion, delays per driver, per capita miles driven, commuter trip reduction, administrative costs, and transit cost per vehicle revenue hour.

Innovations and Best Practices

Some WSDOT practices have been recognized as "best practices" by other state transportation departments and federal organizations. Some significant innovations include:

- Bridge Suspender Cable Painting (Patented)
- Winged Snow Plow
- Living Snow Fence
- Retro-reflectivity-Based Highway Striping
- Global Positioning for Snow and Ice Control
- Energy Services Contract (ESC)
- Guidepost Driver

RESULTS

WSDOT currently maintains and manages safety rest areas, maintenance facilities, and roads throughout the state. Its maintenance and operations practices have been designed to assure that each functions at a level of service defined by the Department's overall goals. Although WSDOT is considered by some transportation departments as an

industry leader, a number of opportunities exist to increase overall efficiency and effectiveness.

WSDOT has an opportunity to improve the design and management of the Safety Rest Area program. Significant changes have occurred during the 40 years since the program was envisioned. Traveler needs, both private and commercial, have evolved and additional public requirements have surfaced that are beyond the original scope of the program. Technology and the aging program infrastructure should be revisited and appropriate modification considered. As part of a comprehensive review of the program design, a similar reassessment of the SRA program organization and management concepts appears to be appropriate.

The Maintenance and Operations processes and practices within headquarters and in the field appear to be well planned and improvements are regularly sought by workers and management. Employees routinely engage in continuous improvement of the processes they work with and examples of “best practices” were found. This can likely be attributed to the high experience levels and the commitment of the current employees. However, WSDOT faces a challenge to continue this level of achievement as employee retirements reduce experience levels throughout the state.

One element of observed best practices within the Department is the liberal use and publication of performance measures. One set of performance measures, those of the Maintenance Accountability Process (MAP), are visible starting at the level of WSDOT front-line employee up to the Office of the Governor and the Legislature. Performance measures regarding the backlog of essential maintenance and repair however, are not documented and periodically reported.

While it appears from objective indicators such as MAP performance measures and observed best practices that maintenance and operations activities are being carried out in an innovative and effective manner, it is equally clear that the highway system public investment is at risk for two principal reasons. First, WSDOT, because of highway financial capacity limitations, has pursued a practice of de-emphasizing maintenance relative to construction activities and is embarking on a significant expansion program. Without a comparable commitment to effectively maintain, at the lowest life cycle cost, the existing asset base and additions, their functionality will gradually decline, ultimately resulting in extensive future investment. Second, the ability of WSDOT to maintain the existing system is heavily reliant on the experience and dedication of current staff, a group that is going to be retiring in great numbers during the next few years. The following sections detail our analysis.

SAFETY REST AREAS

Federal highway policy provides that the public roadside shall provide safety rest areas (SRAs)¹¹ and encourages development of information centers and systems. The Washington Safety Rest Area program was established in 1967 when the Rest Area Master Plan was adopted by the State Highway Commission. The Rest Area Master Plan was part of the Commission’s “Policy on Roadside Development and Highway Beautification” and, being partially funded through federal dollars, was developed to be consistent with the federal requirements.

The state’s safety rest area program is governed by extensive federal and state codes and regulations (See Appendix A-1 for specific requirements). While more than half of the state’s safety rest areas are located on the interstate system, all facilities received federal funds for one or more of the following:

- Land or access control purchase,
- Building construction,
- Rehabilitation.

Current Program Funding and Revenues Generated

The SRA program is associated with three revenue flows:

Program budget funded by the Motor Vehicle Fund

SRA operations and maintenance activities are supported by maintenance funds appropriated by the Legislature. This places SRA needs in competition

¹¹ A roadside facility that is removed from the roadway with parking and other facilities for rest, relaxation, comfort, and information needs.

with state roadway maintenance and operations activities such as roadway related maintenance, snow and ice removal, signage, etc. Capital activities are funded from WSDOT's preservation budget and must compete with all other highway system preservation needs for limited funds.

RV Sanitary Disposal Program budget funded by the RV Fund

A dedicated fund was established in 1979 to construct, improve, and replace RV dump station facilities. The RV Fund is funded by an annual RV fee (presently \$3). Being restricted, these funds cannot be used for either operations or improvement of SRA infrastructure beyond that dedicated to RV use.

Revenues generated by SRA contracted services

Revenues have been historically generated at SRAs by two service contracts - one allowing for advertising and the second allowing vending machines. A third service contract, signed in August 2006 and from which no revenues have yet been realized, provides wireless Internet services at selected SRAs.

**SRA System
Characteristics**

Washington's safety rest areas provide travelers the opportunity to rest and take breaks to promote alertness and safety during long trips. Access to safety parking areas is especially important for commercial truck drivers who rely on rest areas to provide a place to park and sleep.

The current SRA system consists of 27 interstate and 15 non-interstate sites. These 42 rest areas contain over 555 acres. At these sites, WSDOT manages 83 buildings, 29 drinking water systems, 36 on-site sewage treatment and pre-treatment operations, and 19 RV dump stations. These sites and facilities are estimated to have served 21.3 million travelers during 2005, nearly 90 percent on the Interstate system.

The cost of operating and preserving the system during the 2003-2005 biennium (actual) and the 2005-2007 biennium (projected) averages \$6.5 million per year. The average cost per visit is approximately 31 cents.

Relevant Events and Actions

Two primary events and actions have impacted the SRA program in recent years - Initiative 695 and WSDOT's resulting Safety Rest Area Study. An overview of each is presented below.

Initiative 695

The passage of Initiative 695 in November 1999 significantly reduced Washington's vehicle registration fees. The result was a severe cut in the state's transportation infrastructure funding. To manage this funding loss, WSDOT suggested the temporary closure of almost one-half of the state's SRAs. This idea was not well-received by the public and led the Legislature to attach a provision in the 2000 Supplemental Transportation Budget (2SSB6499) that included, in part, the following:

“The Department shall not close any highway rest area but shall continue to operate and maintain all existing rest areas. The Department shall convene a panel of stakeholders to evaluate innovative financing options and partnership opportunities at the safety rest areas on state highways.”

The Federal Highway Administration also notified WSDOT of its concerns regarding closing SRAs and focused on the fact that SRAs were built with federal dollars.

As a result, WSDOT assumed responsibility to manage, operate, and maintain the SRA system with reduced funding. The Safety Rest Area Study of December 2001 was commissioned to determine how this was to occur.

Safety Rest Area Study

The Safety Rest Area Study was released in December 2001. Recommendations from the Study included:

- Explore partnerships
- Assess an automobile fee
- Privatize
- Continuous improvement
- Brainstorm ideas

WSDOT has continued its commitment to continuous improvement as recommended in the report. This commitment is a principal factor in sustaining a MAP level of service given restricted funding and a growing backlog of essential maintenance and repair.

**WSDOT Has Not
Strategically Considered
SRA Use and Operations
nor Maintained Historical
Records Regarding the
Number of Travelers
Served Annually**

Although consistent with original federal requirements, WSDOT's scope and interpretation has remained basically unchanged for nearly 40 years. However, conditions and needs are now different. The scope of potential public service mission capabilities including public safety, disaster preparedness, refuge, and commercial economic and safety value has increased since the program was established.

These factors are typically focused upon strategically and defined in a formalized strategic plan. However, the SRA Program does not have a strategic plan. This absence is particularly noteworthy given the comprehensive manner in which other areas of Department activities and programs demonstrate a substantive planning commitment that appears well maintained and suitably current.

The condition of the SRA Program asset base may be at risk and may not be able to continue its delivery of reliable, quality, and safe public service or provide a suitable base for addressing new and growing needs. A comprehensive strategic and operational review of the program and its setting and document could provide results to assist in the updating of its mission, organizational structure, roles and responsibilities, enhanced decision criteria, enhanced funding strategy and financial plan, and management and communication mechanisms as appropriate. Specific strategic and operational review scope items should include, but not necessarily be limited to, issues and subjects including:

Possible New Service Capabilities

Significant and relevant trends and factors that can affect future role, nature, and activities of the SRA System and its mission should be reviewed and assessed.

A variety of items current affect the SRA System that were not broadly envisioned or considered when the program was conceived and put in place. Among these items are:

- Commercial traffic growth and congestion
- Demand growth and traveler safety
- Technology development and application
- Revenue enhancements

Each has had a major effect on SRA use and operations. However, they have not been evaluated and considered strategically in the context of total impact on the state's highway system.

Commercial Traffic Growth and Congestion

The demand for commercial truck parking at SRAs has exceeded available capacity. Currently, the state provides 392 truck/RV spaces at SRAs statewide.

Most SRAs were constructed between 1966 and 1978 and were intended to meet a projected 20-year demand. In 2002, the Federal Highway Administration (FHWA) determined that Washington was one of 12 states with a shortage of available truck parking, having had a 14 percent shortage of parking capacity. FHWA recommendations included:

- Expand or improve public rest area
- Expand or improve commercial truck stops and travel plazas
- Encourage the formation of public-private partnerships
- Educate or inform drivers about available spaces
- Change parking enforcement rules
- Conduct additional studies

In response to these recommendations, the Department began a study to identify locations on the interstate system with inadequate truck parking, future freight trends, and means to manage the shortage. The study identified corridors with truck parking shortages, safety rest areas that have truck parking demands that consistently exceed their capacity, and commercial truck stops that are at capacity. Furthermore, due to changes in federal regulations regarding commercial truck driving hours and rest requirements, parking demand at commercial truck stops and safety rest areas is expected to increase.

In response to the growing commercial vehicle parking problem, the WSDOT has committed to an initial expansion of parking capacity of 15 to 25 additional parking spaces at one SRA. However, this commitment was decided independently of other SRA needs.

Demand Growth and Traveler Safety

The SRA Program has not maintained historical records regarding the number of travelers served

annually. Rather, estimates of annual visitors had been made until 2005 using ADT and "pull rate" - an estimate of the number of persons pulling off the highway into a SRA. Also, no historical records have been identified that quantified estimates for the 20 Year Service Level that was to have been targeted when the SRA Program was implemented and the rest area sites and facilities were originally constructed.

In 2005, the Department attempted to accurately estimate SRA visitors. Water use, measured annually, has been correlated with persons visiting the rest area. This method is determined to be more accurate than the "pull rate" estimate. The results of that research and analysis indicated 21.3 million people stopped at SRAS that year. The development of past period estimates for SRA visitors requires the use of available data that is believed to have a logical relationship with SRA use - proxy indicators or guides. Using the number of driver licenses and vehicle mileage traveled annually, estimates of SRA visitors during selected times since the program was established were developed. Since variations exist between the rate of changes during interim time periods for the two indicators, an estimate that averages the changes in the historical data is also presented.

Based on the analysis in Exhibit 4, the estimated level of traveler use has increased about 2.5 times since the

system was established. This growth has occurred without an increase in the number of sites or in the general size and capacity of facilities within the SRA system.

Estimated Safety Rest Area Visitors

Fiscal Years 1970 - 2005

Fiscal Year	Driver License Indicator Estimate			Vehicle Mileage Indicator Estimate			Average of Visitor Estimates
	Driver Licenses	% of 2005 Level	Estimated Visitors	Vehicle Mileage	% of 2005 Level	Estimated Visitors	
1970	1,920,000	44%	9,384,121	20,371,000	36%	7,627,710	8,505,916
1975	2,177,000	50%	10,640,225	23,106,000	41%	8,651,803	9,646,014
1980	2,663,000	61%	13,015,581	26,686,000	47%	9,992,297	11,503,939
1985	2,981,000	68%	14,569,826	34,260,000	60%	12,828,303	13,699,064
1990	3,377,000	77%	16,505,301	43,934,000	77%	16,450,632	16,477,966
1995	3,765,000	86%	18,401,675	48,430,000	85%	18,134,113	18,267,894
2000	4,190,000	96%	20,478,889	53,248,000	94%	19,938,163	20,208,526
2005	4,358,000	100%	21,300,000	56,885,000	100%	21,300,000	21,300,000

- Sources:
1. Analysis based on data in WSDOT Forecast of Fuel, Vehicles, and Related Data Through 2013
 2. Gray Book #21 of March 31, 2006: Fiscal Year 2005 estimate of SRA visitors

Technological Capabilities

Technological capabilities have the potential for improving traveler safety, comfort and travel related information, but are not presently integrated into the SRA mission and planning mechanism.

Title VI, Part B of the Inter-modal Surface Transportation Efficiency Act of 1991 established the national Intelligent Vehicle-Highway Systems (IVHS) program. This program is now known as the Intelligent Transportation Systems (ITS) and is designed to

promote the use of advanced technologies - sensor, computer, electronics and communications and management strategies - in an integrated manner to increase the safety and efficiency of the surface transportation system.

Key ITS elements in Washington include:

- **Communications Backbone**
WSDOT operates a communication system of radio, microwave and fiber optics that touches all sections of the road network.
- **Traffic Cameras (CCTV)**
WSDOT operates an extensive network of closed-circuit television across the state to help detect congestion and accidents and to be constantly aware of traffic and road conditions.
- **Variable Message Signs (VMS)**
An electronic traffic sign used on roadways to provide motorists with important information about traffic congestion, incidents, roadwork zones, travel times, special events, or speed limits on a specific highway segment.
- **Highway Advisory Radios (HAR)**
Licensed low-power AM radio stations installed along the roadway to provide alerts and general information regarding traffic and travel.
- **Road/Weather Information Systems (RWIS)**
Instruments and equipment installed along the roadway that provide weather and road surface condition observations.
- **Ramp Meters**
Traffic signals on freeway on-ramps that alternate between red and green to control the flow of vehicles entering the freeway mainline.
- **Traffic Data Collectors**

Tools used to keep track of what is happening on the roadways including induction loops, infrared, radar, sound, and video imaging.

- **Traffic Management Centers**

Seven centers that collect real-time information 24 hours a day, seven days a week.

Revenue Enhancements

Current program management initiatives and enhanced program management performance should increase SRA-related revenue flows. Likely revenue flow for the next year and five-year periods includes:

<u>Service/Action</u>	<u>1st year estimate</u>	<u>5-year Total</u>
WiFi contract	\$10,000	\$50,000
New advertising contract	\$ 36,000	\$180,000
Vending contract	\$ 30,000	\$150,000
Vending payments due ¹²	\$150,000	\$150,000
New tech-based opportunities	TBD	TBD
Estimated total	\$226,000	\$530,000

Additional potential sources of SRA system enhancements may include federal grants and inter-agency funding for commercial vehicle parking, piloting/installation of Intelligent Transportation System concepts, and disaster/emergency preparedness capacity and capabilities funding. These potential opportunities should be strategically assessed and focused upon as appropriate.

WSDOT has demonstrated a commitment to the preparation and maintenance of relevant strategic plans, other attendant documents and manuals, and operational and management criteria. This commitment should be

¹² Vending payments of \$150,000 for 2002-06 not billed

extended to the SRA Program through the undertaking of a comprehensive strategic and operational review of the program and its setting. The results should be documented and implemented in an updated mission statement, strategic plan, revitalized organizational structure, updated roles and responsibilities, updated and enhanced decision criteria, enhanced funding strategy and financial plan, and management and communication mechanisms as appropriate. Specific strategic and operational review scope items should include, but not necessarily be limited to, issues and subjects discussed above such as:

- Mission
- Commercial parking
- Information technology systems use
- Disasters and emergencies
- Growth in demands
- Organizational structure
- Decision-making criteria and mechanisms
- System operation, maintenance and development
- Priorities
- Funding strategy

Recommendation #10:**We recommend WSDOT:**

- **undertake a comprehensive strategic and operational review of the SRA Program.**
 - **maintain historical records and develop a trending log to assist in determining budgetary requirements.**
-

WSDOT Response:

We agree, and have developed a SRA stakeholder advisory team to develop a comprehensive strategic plan to capture what we believe our rest areas will need to look like in the future. This team includes numerous interested parties, including members of Washington Trucking Association; Department of Community, Trade, and Economic

Development; Washington State Patrol; Federal Highway Administration; various HQ programs and representatives from the WSDOT regions. The team is charged with the following:

- Clearly identified roles and responsibilities – SRA Program Organization
- Recommendations and strategy on funding opportunities to enhance maintenance and preservation
- Recommendations and strategy on traveler and tourism information
- Recommendations and strategy on other amenities of safety rest areas
- Strategy on public-private partnerships
- Program vision and priorities
- Program measurements
- 10-year plan to operate, manage, maintain and possibly develop new facilities

Additionally, WSDOT currently tracks the numbers of SRA visitors and reports this information in WSDOT's *Gray Notebook*. We will continue to track and report this information. This information will be used to develop and maintain historical records and trending logs to support budget analysis in the future.

OFM Response:

We appreciate the acknowledgment in the audit report that the maintenance and operations division at WSDOT is exemplary and the acknowledgment that maintenance employees regularly improve their work through the use of best practices. As noted in the audit report, the maintenance division is a leader in planning, budgeting, and evaluating their work through the use of performance measures. We share the auditor's concerns about the aging workforce and the lack of investment in maintenance.

Budget justifications could include information about the type of traffic and the traffic trends at rest areas over time. The strategic planning effort currently underway will help shape a vision of SRA for the future, including the use of technology at these facilities, the kinds of amenities that should be offered, the improvements needed, staff resource requirements and training required, etc. We would support

WSDOT developing a backlog of unmet maintenance needs for the 2009-11 budget.

Action Steps and Timeframe:

- A final strategic plan is expected to be completed by March 2008.
- Track and report SRA visitor numbers. Current and ongoing.

**ORGANIZATION,
REVENUES, COSTS,
AND REQUIREMENTS**

Our review of Safety Rest Area organization, revenues, costs, and program requirements focused on the following items:

- Reviewing the organizational structure to determine if it supports program activities.
- Current and potential Safety Rest Area-generated revenues.
- Costs to operate safety rest areas and to maintain system assets.
- Condition and needs to preserve system assets.

The assessment of each of these areas identified two major issues:

1. The responsibility for the SRA Program has been divided, with operational responsibilities principally located with the Environmental and Operations function and planning and facilities-related activities with Facilities. This arrangement has adversely affected the efficient and effective operation of the program.
2. The unmet requirement for SRA operation and capital funding is greater than what can be generated from increased SRA revenues alone. To meet system operation and preservation needs, alternative funding sources and/or enhanced real budget support is needed to supplement moneys generated by SRA initiatives.

**Unclear WSDOT SRA
Roles and Responsibilities
and No Single Program
Level Leader With Full
Accountability Have
Resulted in Non-Collection
of Contract Amounts,
Capacity Issues, and
Limited Planning.**

A number of actions and issues affecting the organization and operation of the SRA program have occurred in recent years to address the efficiency of SRAs. Prior to December 2002, the SRA Program was operated from WSDOT headquarters with little input from regional personnel. A subsequent reorganization occurred to more closely align the SRA functional areas with the program operators. The program was shifted from the Highway and Local Program to Maintenance and Operations (M&O). The ensuing result was a division of responsibilities where Environmental and Operations undertook operational responsibility working through the regional maintenance function and Facilities assumed responsibility for SRA infrastructure and preventive maintenance systems.

Although intended to more closely align the functional areas with program operators and users, this has not occurred. The roles and responsibilities among parties involved in the evaluation, planning, design, operation and preservation of SRA are sometimes unclear and are allocated among numerous individuals. There is presently no single program level leader with full accountability.

In 2004, a Safety Rest Area Committee was established to:
“Determine the alternatives for managing the operational component of SRA’s and recommend a management structure that exemplifies the vision of the department: accountability, transparency and program delivery.”

The results of the Committee's work were published in "Review of the Operations and Maintenance of the Washington State Safety Rest Area" in 2004. The results included the following:

- Sixty-seven significant issues organized into nine categories were identified and documented.
- No helpful information was identified from a large selection of information regarding other state SRAs.
- Five alternative SRA operational plans were developed and assessed with a recommended option for development of policy.

Limited action has been taken regarding report findings and recommendations. As a result, various ineffective and inefficient actions have occurred including:

- Inter-agency contract management
- M&O/SRA roles and responsibilities
- Commercial vehicle parking
- Establishment of new SRA sites.

Contract Management

Vending Machines

Under state law, state agencies that allow vending machines must use the Department of Services for the Blind to install them and collect a certain percentage of receipts. The Services for the Blind vending machine agreement was signed in January 1995. Although the agreement allows the Department to install machines at all SRAs, only 20 were selected. The contract provides for a payment of to WSDOT of \$125 per location per month, paid on a quarterly basis. The annual payment amounts to \$30,000. The contract calls for an annual

review of the agreement and adjustment of the fee to ensure all WSDOT costs are covered.

Management practices associated with the vending contract have been inadequate. Annual reviews have not been performed and no bills have been sent to the Department of Services for the Blind for five years. Subsequent to identification of this condition, WSDOT has reviewed and clarified contract management practices, and staff roles and responsibilities. A financial reconciliation was accomplished, a \$150,000 bill was delivered to the Department of Services for the Blind for collection of fees due, and payment was received.

Advertising

WSDOT's current advertising agreement has been in place since November 1999. It has been extended twice, most recently on October 31, 2006. The extension was granted to provide uninterrupted service until a competitive selection is made regarding a new vendor.

Net payments to WSDOT during the life of the contract total \$270,850 - yielding an average of about \$1,963 per month or an annual average of \$23,550. Under the provisions of RCW 47.12.125, neither the SRAs nor the Maintenance and Operations Program whose staff solicit, negotiate, and administer the agreement benefit

from these payments. All money goes to the Right-of-Way Fund. This requirement was recently reviewed and confirmed by the Attorney General.

The advertising and vending machine agreements would collectively generate an average revenue flow of about \$53,550, if administered as written.

M&O/SRA Program Roles and Responsibilities

M&O roles and responsibilities regarding the SRA Program were developed in 2002. Although changes have occurred since then, they have not been formalized or otherwise documented in an update of the original statement of roles and responsibilities.

Commercial Vehicle Parking

The state has a growing commercial vehicle parking problem. Specific needs were identified in WSDOT's 2005 Truck Parking Study. Five sites were identified as places where average truck parking demands consistently exceed capacity and a commitment to expand the parking capacity of one site occurred. However, no detailed analysis occurred to evaluate the five sites to determine which would be the most important or appropriate one to invest public resources.

Establishment of new SRAs

WSDOT is planning or otherwise considering an expansion of the SRA System. Four sites and attendant facilities are in various stages of planning, design, and

funding. The WSDOT Roadside Manual provides a comprehensive presentation of relevant policy, service objectives and goals, location and site procedures, and conditions for infrastructure, buildings and operations for Safety Rest Areas and Traveler Services. However, WSDOT has no criteria regarding how to determine where limited capital and operational resources should be deployed for the public benefit.

While it appears that WSDOT management recognize the need for improvements in the organization structure, policy foundation, and identification and assignment of roles and responsibilities, this recognition has not necessarily translated into specific changes. A review of the SRA Program organizational structure and personnel roles and responsibilities will provide WSDOT with a thorough understanding of the particular makeup, communication, and operations requirements to assure the efficient and effective delivery of service. Key performance indicators and benchmarks should be developed to assure WSDOT can measure efficiency and effectiveness.

The result of the review should be clearly documented and disseminated among all affected parties, both internal and external to the Program. Position descriptions for affected staff should be updated to reflect assignment of roles and responsibilities

Recommendation #11:**We recommend WSDOT:**

- **conduct a comprehensive organizational review**

of its SRA Program.

- **establish milestones and key performance indicators.**
-

WSDOT Response:

While we agree that current efforts in this area could be improved, the organizational arrangement has not adversely impacted the overall operation of this program. The only problem created by “unclear roles” was failure to invoice Services for the Blind which was done immediately upon notification. Other issues were results of competing priorities and lack of staffing. Implementation of the elements of the strategic plan will also result in more clearly defined SRA program roles and responsibilities.

OFM Response:

We agree with the audit finding that there is no single authority with full accountability for state rest areas. It would have been helpful if the audit report had recommended an approach for resolving this. Rest area facilities cross multiple program areas including the facilities, maintenance, environmental, freight, and economic-partnerships programs. Although safety rest area functions are diverse, the problems identified in the audit seem to be principally around vending and advertisement contract management. We support WSDOT’s contract experts providing more assistance and oversight on rest area-related contracts.

Action Steps and Timeframe:

- This issue will be addressed in the organization review referenced earlier that will be completed in March 2008.
- WSDOT’s contract experts will provide ongoing assistance and oversight of state rest area contracts.

**MAINTENANCE
BACKLOG**

The State of Washington is facing a growing backlog of SRA deferred maintenance and general operations needs. Current proposed expenditures are not sufficient to adequately support these requirements.

Although certain SRA activities provide revenue, this money is directed to the Right of Way Fund. However, even with a redirection of these funds, the unmet requirement for SRA operation and capital funding is greater than what can be generated from current SRA revenues alone. To meet system operation and preservation needs, alternative funding sources and/or enhanced real budget support is needed for the SRA program.

Operations

The following presents a summary of operational expenditures for the last six biennia. This summary includes “current level” and “real level” dollar levels, an important distinction in assessing the effective commitment and capacity of more recent budget levels.

SRA Program Planned Operational Expenditures

Period	SRA Expenditures	Biennium Change		Cumulative Inflation	Change In Budget Value	Effective Budget Value
		Expenditure	%			
FY 1996	\$3,472,628			0	\$0	\$3,472,628
FY 1997	\$3,483,646			0.035	\$121,928	\$3,361,718
95-97 Biennium	\$6,956,274			0.0175	\$121,928	\$6,834,346
FY 1998	\$3,589,102			0.0640	\$229,703	\$3,359,399
FY 1999	\$3,647,345			0.0940	\$342,850	\$3,304,495
97-99 Biennium	\$7,236,447	\$280,173	4.03%	0.0791	\$572,553	\$6,663,894
FY 2000	\$3,675,749			0.1310	\$481,523	\$3,194,226
FY 2001	\$4,126,095			0.1670	\$689,058	\$3,437,037
99-01 Biennium	\$7,801,844	\$565,397	7.81%	0.1500	\$1,170,581	\$6,631,263
FY 2002	\$4,141,522			0.1870	\$774,465	\$3,367,057
FY 2003	\$4,393,929			0.2030	\$891,968	\$3,501,961
01-03 Biennium	\$8,535,451	\$733,607	9.40%	0.1952	\$1,66,432	\$6,869,019
FY 2004	\$4,590,533			0.2150	\$986,965	\$3,603,568
FY 2005	\$5,253,570			0.2430	\$1,276,618	\$3,976,952
03-05 Biennium	\$9,844,103	\$1,308,652	15.33%	0.2299	\$2,263,582	\$7,580,521
FY 2006	\$4,995,058			0.2760	\$1,378,636	\$3,616,422
FY 2007	\$5,116,582			0.3000	\$1,534,975	\$3,581,607
05-07 Biennium	\$10,111,640	\$267,537	2.72%	0.2881	\$2,913,611	\$7,198,029
Totals Current Dollars	\$50,485,759					
Lost Value Effective Dollars					\$8,708,686	
						\$41,777,073

Sources: Financial Information (FIRS) WSDOT Financial Information Retrieval System - 10/27/06
 Inflation Factor: Washington Economic and Revenue Forecast - September 2006, Volume XXIX, No. 3, Table A4.1 (Seattle CPI)

Note: FY 2006 and FY2007 inflation factors are forecasts

During our audit timeframe, operational expenditures totaled nearly \$50.5 million in “current year dollars.” Due to inflation, the effective purchasing power of this \$50.5 million was about \$41.8 million in terms of fiscal year 1996 value. The real value of funding commitments remained basically stable from fiscal year 1995 through fiscal year 2001. Starting in fiscal year 2002, the real level of funding committed to operations has increased. This increase has been important in mitigating the deterioration of the SRA

system, but has been inadequate to stabilize system's condition.

The current MAP condition rating for the rest area system is "B," on a scale from high to low of A, B, C, D, and F. The system's rating has been at "B" for a number of years, but maintenance pressures are mounting and the difficulty of maintaining this level is increasing due to age and the resulting state of system infrastructure and increasing costs.

The "B" rating is consistent with observations made by the audit team members. Five auditors made 33 visits to 19 different sites. Although observations and findings were positive, the age of facilities was specifically identified and noted.

Capital Expenditures

The following is a summary of SRA capital expenditures for the last six biennia. As with operations costs, capital costs are presented in both "current level" and "real level" dollar level formats.

SRA Program Capital Expenditures

Period	SRA Expenditures	Biennium Change		Cumulative Inflation	Change In Budget Value	Effective Budget Value
		Expenditure	%			
FY 1996	\$396,168			0.009	\$3,566	\$392,602
FY 1997	\$1,818,914			0.056	\$101,859	\$1,717,055
95-97 Biennium	\$2,215,082			0.0476	\$105,425	\$2,109,657
FY 1998	\$3,007,790			0.0640	\$192,499	\$2,815,291
FY 1999	\$1,861,031			0.1020	\$189,825	\$1,671,206
97-99 Biennium	\$4,868,821	\$2,653,739	119.80	0.0785	\$382,324	\$4,486,497
FY 2000	\$1,409,465			0.1720	\$242,428	\$1,167,037
FY 2001	\$1,487,116			0.1910	\$284,039	\$1,203,077
99-01 Biennium	\$2,896,581	(\$1,972,240)	(40.51)	0.1818	\$526,467	\$2,370,114
FY 2002	\$1,955,322			0.2050	\$400,841	\$1,554,481
FY 2003	\$105,842			0.2230	\$23,603	\$82,239
01-03 Biennium	\$2,061,164	(\$835,417)	(28.84)	0.2059	\$424,444	\$1,636,720
FY 2004	\$2,466,913			0.2510	\$619,195	\$1,847,718
FY 2005	\$1,595,614			0.4080	\$651,011	\$944,603
03-05 Biennium	\$4,062,527	\$2,001,363	97.10	0.3127	\$1,270,206	\$2,792,321
FY 2006	\$908,658			0.5720	\$519,752	\$388,906
FY 2007	\$1,009,467			0.6620	\$668,267	\$341,200
05-07 Biennium	\$1,918,125	(\$2,144,402)	(52.78)	0.6194	\$1,188,020	\$730,105
Totals Current Dollars	\$18,022,300					
Lost Value Effective Dollars					\$3,896,885	
						\$14,125,415

Sources: Compiled by TKW from TRAINS, CPMS, and WSDOT Construction Cost Index.

During the audit period, capital expenditures totaled approximately \$18 million in “current year dollars.” Due to inflation, the effective purchasing power of this amount was \$14.1 million in terms of fiscal year value. A significant change in the level and value of capital commitments has occurred in recent years. During the first

half of the audit period (fiscal years 1995-2001), current dollar capital expenditures were almost \$10 million with a 1995 value of approximately \$9 million. During the second half (fiscal years 2002-2007), current dollar capital expenditures fell to approximately \$8 million, a 20 percent reduction in commitment. In terms of expenditure effectiveness or real value of expenditures, capital expenditures fell to \$5.2 million, a reduction in real capital commitment of about 42 percent. This reduction appears to be contributing to both the slippage in SRA MAP rating and the growth in SRA backlog.

**Essential WSDOT
Maintenance and Repair
of SRAs is not Consistently
Prioritized or Adequately
Funded Resulting in a
Deteriorating
Infrastructure**

Aging Facilities

As discussed earlier, the current SRA system consists of 27 interstate and 15 non-interstate sites. These 42 rest areas contain a total of 555.45 acres, 83 buildings, 29 public drinking water systems, 36 on-site sewage treatment and pre-treatment operations, and 19 RV dump stations. The replacement value of these sites and improvements exceeds \$41.4 million. The age of the 83 buildings is presented below. The age of the buildings is contributing to the growing costs and difficulty of maintaining them.

- Oldest building 68 years
- Average age 27 years
- Median age 33 years
- Mode age 39 years

Deficiency Backlog and Trend

The M&O Facilities unit operates a Condition Assessment Program that evaluates the condition of every WSDOT facility every two years. Based on the assessment, facility

deficiencies are identified and categorized. Based on August 2006 information, the SRA Systems facilities deficiencies backlog is estimated at \$14.1 million.

In 2004, WSDOT internally recognized the growing backlog:

“The 2004 Condition Assessment identified an estimated backlog of \$11.5 million in building and site renovations. Each biennium, approximately \$2.5 million is allocated to address site and building renovation needs. The renovation backlog is expected to grow, because of the age of the safety rest area facilities and increasing traveler demand.”

The 2004 recognition of a growing backlog, even in the face of a continuing capital improvements program, has been realized. Specifically, SRA System aging and increasing use has caused the backlog to grow \$2.6 million or 22.6 percent in two years. This pattern can be expected to continue with a growing need for financial resources to sustain the current system. WSDOT prioritization and funding is required to stem the growth in the SRA facility maintenance backlog.

For the SRA Program to benefit from management’s initiative to identify and develop new revenue sources and to increase revenue flows through enhanced management of existing sources, changes are required in rules that were established four decades ago. When the SRA Program and its facilities were new, the state was actively acquiring property to expand the roadway and SRA systems. The

need for SRA facility rehabilitation, maintenance, and repair was neither a high priority nor an urgent need.

Conditions however, have changed. The SRA system is aging and the infrastructure is deteriorating. To preserve the SRA system at a reasonable MAP service level, additional resources will be required. Although limited, the redirection of money generated by the SRA Program to facility maintenance can help. To achieve this end, a dedication of SRA initiative revenues must result in a net increase in program resources. Additional potential sources of SRA system enhancements may include federal grants and interagency funding for commercial vehicle parking, piloting/installation of Intelligent Transportation System concepts, and disaster/emergency preparedness capacity and capabilities funding.

Recommendation #12:**We recommend WSDOT:**

- **pursue statutory changes to allow SRA revenues to be dedicated to SRA maintenance activities.**
 - **prioritize preservation of the SRA System and fund appropriately.**
-

WSDOT Response:

WSDOT defers to the Legislature on this recommendation. Statutory changes allowing SRA revenues to be dedicated to the SRA program would have to be completed at both state and federal levels. Regarding priorities, WSDOT's Facilities Computer Maintenance Management Systems (CMMS) is the primary tool used to prioritize SRA preservation needs. WSDOT is working towards full implementation of the CMMS so this information can be used in budget requests.

OFM Response:

As noted in the audit, sufficient inflationary increases have not been provided to meet current safety rest area activities and the persistence of underfunding may result in the further decline of these aging facilities. Yet overall, the rest areas currently sustain a level of service rating of B, which is to the credit of those who manage and operate the safety rest areas within scarce resources. Rest areas will always compete with ferries, highways, rail, and other transportation needs. Much of the transportation system is aging and in need of additional resources. It is incumbent upon the department to establish lowest lifecycle cost methodologies are in place to help ensure preservation, maintenance, and replacement of safety rest area needs occur at the right time and price. We are curious why the audit did not recommend further exploration of public-private partnerships at rest areas. There may be state and federal barriers to this, but public-private partnerships at rest areas would seem to provide opportunities for generating additional revenues and help meet the changing needs and expectations of the traveling public, truckers, safety officers, and others.

Action Steps and Timeframe:

- Full implementation of CMMS is projected to be complete by December 2009.
- Funding requests for preservation funding will be made on an as-needed basis within the biennial WSDOT budget process.

MAINTENANCE AND OPERATIONS

Safety Rest Areas and Maintenance and Operations purchase diverse products and labor to help accomplish various activities. Although WSDOT considers the most appropriate method to deliver services, a review of purchasing activities of the M&O and SRA programs should continuously identify potential settings and conditions for increasing future purchases. Current relevant areas include:

SRA Purchasing Activity

Safety Rest Area Expenditures and FTEs by Functional Categories

(2003 - 2005 Biennium)

Work Category	Total Expenditures	% of Total
Weed Control	\$82,294	0.79%
Winter Activities	\$30,377	0.29%
Cutting/Thinning/ Pruning	\$185,578	1.79%
Seed/Plant/etc.	\$63,803	0.62%
Mowing Lawns	\$525,752	5.07%
Irrigation Systems Ops & Maint.	\$232,833	2.25%
Litter Pick-up Garbage Collection & Disposal	\$995,253	9.61%
Gen'l Building Maintenance	\$397,136	3.83%
Janitorial Services	\$1,693,673	16.35%
Electrical Maintenance	\$3,065,059	29.58%
Water System Maintenance	\$274,001	2.64%
Sewage System Maintenance	\$347,921	3.36%
RV Dump Maintenance	\$292,160	2.82%
Utilities	\$314,242	3.03%
Other Rest Area Maintenance	\$1,012,175	9.77%
Total Expenditures	\$848,510	8.19%
	\$10,360,767	100.00%

Source: WSDOT Financial Information &
Retrieval System

The SRA Program purchases a variety of goods and services including cutting, thinning, and pruning; mowing; litter pick-up; garbage collection; general building maintenance; and janitorial services. Expenditures for these purchases are more than \$5.11 million and account for 49.33 percent or nearly one-half of all program expenditures. The remaining \$5.25 million in program expenditures is for labor-related costs that include full-time and part-time SRA attendants, selected M&O skilled staff, selected facilities staff, and overtime required to maintain sites and facilities.

The largest program expense categories - janitorial services, general building maintenance, utilities, litter pick-up, and garbage collection and disposal - account for over 67 percent of vendor purchases and 71 percent of program labor costs. On average, the remaining program categories generally require a higher level of skill, experience, training or licensure than the categories itemized above.

Contracted services, a sub-set of vendor purchases, totaled \$507,978 or 9.9 percent of all vendor purchases and 4.9 percent of total program expenditures. Contracted services included janitorial services, garbage and waste disposal, and selected cleaning and maintenance services.

SRA Attendant Duties

SRA locations are widely distributed across WSDOT's six regions and few share common characteristics such as traveler volume, natural settings, weather patterns, sewer

and water systems, structure conditions and needs, landscaping, and related items. The most common characteristic of the SRA system is its diversity, which affects the needs and duties of attendants and requirements for other personnel and material resources.

SRAs have approximately 40 full-time and 10 part-time staff that is generally committed principally to operations and secondarily to maintenance. Janitorial services are provided at two sites through a service contract. Janitorial services for the other 40 sites and the full range of other work categories presented above are provided for all 42 sites by an array of attendants, regional operations, and special skill personnel and local vendors. Approximately 15 full- and part-time employees are required to accomplish the remaining operational and maintenance activities

The roles and responsibilities for a SRA attendant are extensive and require appropriate experience, training, skills and/or licensure. Specific activities include:

- “Ambassador”
- Security
- Site maintenance/landscaping
- Machines operation
- Janitorial services
- Trash and litter management
- Vegetation control/management
- Snow and ice treatments
- Snow and ice removal
- Water/sewer systems maintenance
- Preventive maintenance
- RV dump maintenance
- Emergency repairs
- Medical emergencies

- Traffic control
- Visitor auto repair
- Visitor communications services
- Maintaining maintenance equipment
- Small engine repair
- Snake control

Each of these items is relevant to one or more SRAs and each is performed by one or more attendants, though no one attendant is performing all of the above. A few attendants provide only limited services such as janitorial, litter control, and garbage while most provide these and a selection of additional routine buildings and grounds maintenance and operational services. A limited group of more experienced and skilled attendants participate in preventive maintenance activities and maintain and repair sanitary systems and maintenance equipment.

Diversity in traveler demand, physical setting, infrastructure condition and composition, geographical location, and other needs of SRA sites is extensive. The resulting demand for skills and capabilities required for operations and maintenance is broad in scope and reasonably requires a team rather than an individual to satisfy requirements. The SRA attendant is the most visible participant and makes the biggest single contribution to SRA operations and maintenance but the attendant contribution is neither uniform throughout the system nor adequate to properly protect public investment in site and infrastructure and to ensure a continuing flow of service.

This diversity, coupled with the demand for suitable and available labor and skills, shows a potential for cost-savings through purchasing of additional services to be approached on a site by site basis. Any potential saving is limited to the labor component of the SRA Program. As a result, only one-half of total program funding (approximately \$5.24 million) is available as a source of possible savings. Given that WSDOT is increasingly unable to attract personnel in urban areas, in general, and skilled staff in selected rural areas at current pay scales, it appears increasingly unlikely that a private firm could provide a suitable quality and skilled workforce capable of sustaining the current level of services, operations, and maintenance.

M&O Purchasing Activity Expenditures for purchases from vendors is nearly \$116 million and accounts for 39.57 percent of all program expenditures. The remaining \$176.65 million in program expenditures is principally for labor-related costs. These labor costs and associated indirect charges are estimated at about \$170 million or over 96 percent of non-vendor expenditures and include M&O operation and support staff, full-time and part-time SRA attendants, and selected facilities and other staff required to accomplish M&O activities and maintain sites and facilities.

The largest program vendor expense categories - equipment charges and fees; winter snow and ice removal; vegetation control materials; utilities; maintenance supplies; building and equipment rentals; and road patching materials and

**M&O: Materials and Services
Purchased from Vendors**

2003-2005 Biennium

Category of Materials and Services	Vendor Purchases
M2 Maintenance	
Equipment: Trucks, Loaders, Plows,	\$38,607,552
Winter & Vegetation Control Materials	\$26,239,919
Utilities: Electricity	\$9,120,917
Maintenance Supplies: Shovels, Pencils, Hard Hats	\$8,056,554
Rental: Equipment and Buildings	\$3,683,154
Road Patching Materials: Asphalt, Concrete	\$3,586,569
Services: Printing, Hazardous Disposal, Moving	\$3,280,083
Highway Improvements and Enhancements	\$2,316,326
Utilities: Water, Sewer, Garbage, Natural Gas	\$2,180,675
Equipment Repairs: Vehicles, Office Equipment	\$1,887,817
Office Furnishing and Equipment	\$1,163,388
Travel: Motels, Hotels, Meals	\$842,666
Utilities: Data Lines	\$689,139
Technology: Palm Pilots, Telephones, Copiers	\$667,843
Small Projects: Construction, Maintenance, Repair	\$614,405
Utilities: Telephone	\$584,710
Small Expenditures: (< .5%)	\$5,625,673
Total M2 Maintenance	\$109,147,390
Total M1 Maintenance: Vendor Purchases	\$1,839,102
Total M5 Maintenance: Vendor Purchases	\$781,111
Total Private Sector Vendors	\$111,767,603
Public Sector Purchases	\$3,929,132
Total M&S Purchases	\$115,696,735
Total M&O Expenditures	\$292,349,962

Source: WSDOT Work Outsourced and Direct Purchases, 2003-2005 Biennium.

WSDOT is Facing an Engineer and Project Manger Labor Shortage Potentially Resulting in Increased costs and the Loss of Institutional Knowledge

services account for \$92,574,748 of vendor purchases or approximately 83 percent of all vendor purchases and 32 percent of total M&O program costs.

Contracted services, a sub-set of vendor purchases, totaled over \$10.1 million or 8.75 percent of all vendor purchases and 3.46 percent of total M&O program expenditures.

Contracted services include items such as:

<u>Private Contracted Services</u>	<u>Public Contracted Services</u>
Winter Operations	Traffic Signal Maintenance
Traffic Control Maintenance	Litter Pickup
Third Party Damage & Disasters	Road Sweeping
Bridge and Tunnel Maintenance	Landscape Maintenance
Employee Training & Testing	Noxious Weed Control
Rest Area Maintenance	Bridge/Structure Maintenance
Roadside & Landscape Maintenance	Sidewalks/Curbs/Gutter Maint.
Pavement and Shoulder Maintenance	Transient Cleanup
Drainage and Slope Repair	Pigeons and Animal Control

Contracted services and other vendor purchase decisions are generally made on a case-by-case basis at the regional level. A project or activity will generally be contracted or purchased when WSDOT staff is not available, a desired or more appropriate skill and experience level is found outside the Department, or the provider offers a better cost and service capability.

Approximately 50 percent of the M&O budget is labor. To realize a savings in the labor component of the M&O program through purchase of services, potential providers must be inherently more productive or cost less than program staff while providing acceptable levels of service.

Over the next 16 years, WSDOT will face circumstances that will significantly affect its workloads, required staffing, and potentially its effectiveness. The effect on maintenance and operational activities includes:

- An expanded highway construction program,
- Departmental workload increase,
- Under-funding of maintenance activities,
- A maturing workforce,
- A reduction in the number of mid-level managers,
- An increase in disaster response preparedness,
- Competitive contracting opportunities and difficulties.

Over the last decade M&O funding declined approximately 8.5 percent. Workloads, including new infrastructure and unfunded mandates, have steadily increased. These have cut substantially into the effectiveness of programs, despite the introduction of innovative practices by WSDOT.

Current industry trends indicate WSDOT will become more and more affected by skill shortages over the next few years. The steady retirement of the “baby boomers” will cause an increasing difficulty in hiring qualified replacements. In addition, the Department will need to hire up to 450 engineers and project managers for a substantially enlarged capital program¹³. Furthermore, in response to the Governor’s request, WSDOT and other agencies are reducing the numbers of its mid-management positions.

¹³ Per WSDOT management

All regions of the Department are experiencing, to some degree, staff shortages and the inability to recruit skilled and trained personnel. While this situation is generally most pronounced in major urban areas, it is present throughout the state. WSDOT is training staff to fill jobs that have historically been directly recruited. Given the Department's often weak competitive position, it is likely that these trainees will be the target of private sector recruiting when fully skilled. Increasingly, the Department is finding itself the low-salary employer with unfilled positions, hiring trainees in lieu of journey-level employees. Protracted recruitments are becoming common.

WSDOT has begun to experience recruiting difficulties that are consistent with national and international forecasts regarding shortages of qualified personnel. Recent independent research¹⁴ forecasts a major loss by 2010 of critical U.S. institutional knowledge among both private and public sector organizations caused by retirement of the "baby boomers." The research concludes that by 2010 worldwide demographic and economic trends will greatly reduce the numbers of persons in the hiring pool who are capable of accomplishing work requiring any level of technical or mathematical knowledge, skills, and abilities.

One indication of the risk that WSDOT faces of losing its institutional knowledge and experience is the number of employees who are eligible for or are nearing retirement.

¹⁴ Edward E. Gordon, *The 2010 Meltdown: Solving the Impending Jobs Crisis*. Westport Connecticut: Praeger, 2005, pp. 12-18.

Of the 405 M&O Division staff eligible for retirement from 2006 through 2016, more than 56 percent of those individuals could retire now¹⁵.

Most of WSDOT's M&O supervisors and superintendents report difficulty hiring staff with desired qualifications in both urban areas and rural areas, despite intense recruiting efforts. Supervisors report that lengthy searches for new hires often result in a pool of under qualified candidates who would not be hired under better circumstances. In addition, the salaries of many M&O staff are significantly lower than equivalent private sector jobs.

This recruitment and retention trend will be affected by the impending retirement of large numbers of highly skilled and experienced staff. The loss of those individuals will have an effect on the possible future ability to contract M&O activities now performed by department staff. If WSDOT's competitive position continues to deteriorate, recruitment and retention difficulties continue, and large numbers of skilled and experienced staff retire, WSDOT will not have the means to assure required M&O program duties and activities occur.

The M&O program will need to hire contractors to accomplish work that staff no longer will be available to do. Contractors, because of higher labor costs and market conditions, will likely provide services at a higher cost to

¹⁵ Source: WSDOT HR

the Department. The anticipated result will be necessary maintenance not being accomplished, a faster-growing backlog of maintenance needs and the general deterioration of the public's transportation system investment.

The WSDOT Human Resources office and some of its regional managers have taken aggressive steps to enhance recruitment. One region, for example, has begun talking to college students who could be job candidates one full year earlier than in the past. Recognizing that job candidates and new employees need vocational and remedial training, one region has convinced a local community college to establish a vocational training program tailored to topics directly relevant to WSDOT jobs.

Although the Human Resources office has undertaken innovative recruiting and training initiatives, there is no indication that the Department or the state, through training offered by the Department of Personnel, has the capacity to cope with these changes.

WSDOT is aware that reductions of staff, voluntary and otherwise, may well require increasing contractual efforts for M&O. The state's competitive contracting statute provides opportunities for outsourcing many activities that previously were reserved for state employees.

In 2002, the Washington State Legislature passed into law *The Personnel System Reform Act*, an Act that allows agencies to:

“ . . . purchase services, including services that have been customarily and historically provided by employees in the classified services...”

Classified employees can opt to compete against contractors for their jobs should an agency choose to outsource the work those employees perform.

Although WSDOT engages in a great deal of contracting for services, it has not used the competitive contracting law for outsourcing services. Informal discussions on this subject with WSDOT managers indicate the reasons for not having used the process are generally identical with those reported by the Joint Legislative Audit Review Committee performance audit of competitive contracting, referred to earlier:

- A concern that labor strife and litigation would ensue if competitive contracting were pursued.
- A hesitancy to proceed without first observing the outcomes of another agency’s experience with competitive contracting.
- Lack of familiarity with the statute and the rules.
- A perception that the Employee Business Unit concept is untested.
- A perception that the competitive contracting process is too complex.

The competitive contracting process provides WSDOT with an additional measure to improve efficiency and effectiveness. The process can assist in streamlining work processes before soliciting bids and could result in

competition among vendors and between employees and vendors for specific work.

WSDOT should immediately identify potential retirees by timeframe and the types of skills and experience needed to replace each. Consideration should be given to flexible work schedules - project, part-time, job-sharing, job rotation - available to individuals considering retiring. Although WSDOT has regularly sought contractors to help provide needed services, certain job classifications, by law, could not be contracted. The state's competitive contracting law now provides the opportunity for outsourcing difficult-to-fill positions and those activities for which long-term career advancement within the agency is not feasible. Moreover, the analytical process required for competitive contracting, if applied on a regular basis throughout WSDOT, can identify work activities that would more efficiently or effectively be accomplished by contract.

WSDOT also purchases a substantial amount of goods and services from private vendors - over 49 percent for SRAs and almost 40 percent for M&O. Although the Department considers outsourcing a viable option for service delivery, it does not appear to use it extensively. However, any decision to increase the scope or level of contracted services should be based on a methodologically sound evaluation that is consistent with relevant state law and rules; considers all appropriate costs; and is applied on a

local “case-by-case basis.” It appears that current rules and guidance in the form of the Washington State Competitive Contracting Manual are consistent with and supportive of these conditions.

Within the above context, WSDOT, when contemplating a competitive contracting evaluation, should be guided by the following elements:

- Provide an evaluation setting that is fair and equitable to employees and potential contractors.
- Provide for employee assistance to re-engineer and/or revise current methods and processes.
- Properly define the functional, and perhaps geographic, scope of the evaluation with a single function per evaluation being preferred.
- Provide adequate funding to insure a competent and reliable evaluation is accomplished.
- Plan ahead and ensure adequate time is available to accomplish the evaluation.

Recommendation #13:

We recommend WSDOT:

- **determine the types of skills by timeframe that the M&O program will need to replace as experienced personnel retire.**
 - **determine what types of work schedules - project, part-time, job-sharing, job rotation - could be offered in order to retain persons eligible to retire or nearing retirement eligibility.**
 - **adopt statewide successful recruiting and educational initiatives being used within the regions.**
 - **regularly schedule and conduct competitive contracting analyses, including the process improvement steps for improving the efficiency and effectiveness of current operations**
-

WSDOT Response:

We agree on the importance of continuity of leadership in management positions in the Maintenance organization. As the report acknowledges, WSDOT has been aggressive and innovative in its recruiting. We will continue to work with our Human Resource personnel to use innovative ways to retain experienced personnel and recruit new talent, such as early recruitment of college and vocation school students.

WSDOT will continue to contract for certain maintenance activities where it is cost-effective to do so. New opportunities will be evaluated, based on cost-effectiveness, as they arise. Evaluations of highway maintenance contracting implemented in other states have not shown advantages in cost-effectiveness. References supporting this include:

- *The Massachusetts State Auditor's Report on the Privatization of the Maintenance of State Roads in Essex County, October 7, 1992 to October 6, 1993, issue on July 19, 1995.*
- *The Operational, Human Resource, and Financial Implications of the Privatized Highway Maintenance Program of the Province of British Columbia, June 1994, generally referred to as the "Burton Report."*
- *Elliot D. Sklar, You Don't Always Get What You Pay For: The Economics of Privatization*

Therefore, we will proceed carefully in this area to ensure we use both the most efficient and effective methods to address staffing needs and provide our maintenance services. Any consideration of outsourcing must respect the Department's collective bargaining agreements and applicable state law, including the competitive contracting requirements of the Personnel System Reform Act.

OFM Response:

We are concerned about the adverse recruitment and retention trends the department is experiencing. Not only are aging baby boomers retiring, it is difficult to attract new recruits with the right training and skill sets. It may be beneficial for WSDOT to evaluate the job classifications that support the rest area functions and identify career track opportunities for individuals within these different classifications. Training would also need to be thoughtfully evaluated to support such career opportunities. It is

possible that individuals could have a fulfilling career with ample advancement opportunities as they trained for different facets of maintenance and operations. For example, a focus on rest area management could include training and work experience in contracting, facility design, environmental mitigation, etc.

Action Steps and Timeframe:

- WSDOT's human resource department, in conjunction with DOP and the different program areas that have maintenance and operation responsibilities, will evaluate career development opportunities to identify career paths and training opportunities within this field. Evaluation to begin by July 1, 2008 and conclude by August 31, 2009.

MAINTENANCE AND OPERATIONS PROGRAM BARRIERS AND OPPORTUNITIES

Capital Improvement and Preservation Program Funding

The M&O program faces a number of challenges over the near-term. Over the past six biennia, capital expenditures totaled over \$10.76 billion in "then-year" dollars. Because of inflation, the effective purchasing power of this \$10.76 billion was about \$7.433 billion, a loss of \$3.327 billion in purchasing power. Current dollar expenditures have increased markedly as a result of an extensive construction inflationary rate. There was an 18-fold increase in inflation from the 1995-1997 to the 2005-2007 biennia. Because of this increase, the level of effective construction activity has fallen. Specifically, current dollar capital expenditures more than doubled during this period, while the real value of construction activity declined just under 1 percent.

The public and the Legislature have supported funding for major highway rehabilitation work and further expansion of capacity through two improvement and preservation packages funded by increases in the state gasoline tax and other revenue-generating packages:

- The 2003 five-cent-per-gallon tax increase (“nickel tax”) will expire in the 2013-2015 biennium.
- The 2005 Transportation Partnership Account is a 9.5-cent-per-gallon tax increase. It is in effect through the 2019-2021 biennia.

These funding sources will result in a substantial increase in the level of highway construction through the 2019-2021 biennia. The work will include major rehabilitation of the highway system and an increase in capacity. The significance of this construction work to the M&O program is two-fold: First, the work will require hiring up to 450 new engineers and technicians to manage the design and construction oversight of the projects. Those requirements undoubtedly have the most immediate and highest priority for the funding of new hires, no matter how urgent the needs of the M&O program. Secondly, those projects that involve the expansion of highway capacity will create additional workloads for the M&O program. In addition to its daily operational requirements, the M&O program responsibilities include a substantial and growing amount of other required work such as compliance with environmental regulations and the documentation of that compliance; response to an increasing number of motor vehicle accidents; and complaints or damage claims from owners of property adjacent to the highway system. The

new highway component must also be incorporated into a recurring inspection process to ensure its continuing safety for the driving public.

WSDOT Does Not Compile Essential Facility Maintenance and Repair for all Activities Limiting the Ability to Estimate the Degree of Risk Concerning the Condition of the Infrastructure.

Increases in the funding of the capital construction program have resulted in additional infrastructure responsibilities for Maintenance and Operations. Although those amounts do not match the funding levels to be experienced over the next 16 years, cumulatively they represent a considerable increase in M&O workloads.

WSDOT regional employees indicate increases in workload levels have gradually forced them to discontinue or scale back work that had been traditionally performed. Regional maintenance managers, superintendents, supervisors, and lead workers expressed concern that a maintenance crisis has been building for several years.

A successful measure of how well a maintenance program is achieving its goals is the degree to which a comprehensive maintenance management system is being used. Such a system can provide the percentage of maintenance actions or the dollar amounts that could not be accomplished because of resource limitations. An additional result - a backlog of essential maintenance and repair listings - is one of the best measures of the effectiveness of the maintenance program.

WDOT has several distinct maintenance management systems, among them facilities (primarily buildings and their components), lighting, intelligent highway system components, tunnels, and moving bridges. M&O personnel are operating maintenance management systems when they have found that level of data to be useful. However, because some M&O maintenance management systems are not sufficiently mature to allow the compilation of a comprehensive backlogged essential maintenance and repair, it was not possible to objectively assess to what extent backlogs may be growing.

Our review found it difficult to ascertain detailed information regarding how actual workloads affect the ability of WSDOT to meet its M&O mission. Although it appears that M&O staffing levels have not kept pace with system deterioration, workload increases resulting from past network expansions, and increased regulatory requirements, definitive data was not available to confirm that.

Information concerning workloads that can no longer be accomplished effectively or have become backlogged needs to be carefully documented for budgetary reasons and for tracking the effects of discontinuing or deferring work.

The projected growth of the highway system will place extreme demands on the M&O program. Because objective information is not yet available concerning the extent of the

backlog of essential maintenance and repair, it is not possible to estimate the degree of risk that this represents concerning the condition of the infrastructure. The condition of safety rest area utilities systems was noted earlier within this report as one example of failing systems. A good estimate of the total backlog is needed annually for budgetary purposes and to gain a better understanding of the condition of the infrastructure at a finer level of detail than MAP provides.

Recommendation #14:**We recommend WSDOT:**

- **determine from the respective maintenance management systems the current backlogs of essential maintenance and repair.**
 - **prepare a comprehensive listing of the backlogs of essential maintenance and repair and assess the risk that the backlogs may pose, if any.**
 - **include the backlogs of essential maintenance and repair as one element of the M&O budget justification.**
-

WSDOT Response:

We agree that defining a measurable backlog of essential maintenance is an important element for program budget justifications. While some operational activities (i.e., Snow and Ice Control) cannot be put in terms of a “maintenance backlog,” many other activities can be measured as such. In 2006, WSDOT began determining current backlogs of essential maintenance for those highway features that are managed with the help of computerized maintenance management systems. A team of maintenance personnel is currently developing strategies to expand our abilities to document the extent and costs of essential maintenance backlogs.

OFM Response:

There is a pressing need for the department to identify the maintenance and operation costs associated with the major

highway expansions underway as a result of the 2003 and 2005 revenue packages.

Action Steps and Timeframe:

- Strategy development projected to be complete in spring 2008. Implementation is dependent on the strategy that is developed.
- We will estimate operations and maintenance costs needed to support the highway expansions underway as a result of the 2003 and 2005 revenue packages and submit this information with the 2009-11 budget request.

WSDOT's Maintenance Management System Does Not Measure the Backlog of Essential Maintenance Limiting the Ability to Determine Effectiveness of Effort

From 1997-1999 to 2005-2007, maintenance and operational commitments totaled nearly \$1.7 billion in "current" or "then year" dollars. Because of inflation, the effective purchasing power of this \$1.7 billion was about \$1.415 billion. The real value of funding commitments fell about 13 percent from the 1995-1997 to the 1997-1999 biennium, and fell on average approximately another one percent from the 1997-1999 through the 2005-2007 biennium.

Our analysis indicated that current program funding is approximately 82.6 percent of that during the 1995-1997 biennium. Over the last decade, M&O funding has declined in real terms at a rate six times that of the drop of capital program funding. Due to inflation, unexpected budget reductions have had a greater effect than the steady erosion of real dollars. For example, during the 1999-2001 biennium, the M&O program experienced an \$18.5 million (15 percent) reduction. The M&O program funding, and

that of the Department as a whole, were cut following approval of Initiative 695, a measure rescinding the authority of the state to impose vehicle licensing fees exceeding \$30.

Many experienced superintendents and supervisors within the regions expressed concern with the condition of the state's highway system. They perceive maintenance work not being accomplished because of M&O program funding limitations. Both MAP scores and the scope of the approved preservation projects in the capital improvement program also indicate that the level of maintenance activities is not adequate. Based on MAP priorities, lower-priority work is deliberately left untouched or only selected parts are completed. However, we found little objective evidence indicating the severity of the problem. The backlog of essential maintenance and repair could provide a measure of how effective the efforts of WSDOT are. Most organizations maintain this information in a single maintenance management system. However, the M&O program has several independent systems in various stages of implementation.

Because a comprehensive maintenance management system is not yet fully functional, it is not possible at this point in time to estimate the extent of the backlog of essential maintenance and repair.

The National Research Council (NRC) has published research findings indicating that a reasonable rule-of-thumb for annual maintenance funding would be 2-4 percent of the current infrastructure replacement cost, or 4-8 percent per biennium. The current replacement value of the WSDOT infrastructure is not known. The infrastructure value stated in the state's comprehensive annual financial report, \$14.2 billion, is the sum of original costs. Applying the formula from the NRC report to this amount, the result is \$355 million per year. M&O funding is roughly one-half this amount.

Knowledge of the infrastructure replacement cost would permit program management to test the NRC target or to set some other benchmark of funding adequacy. WSDOT should establish a maintenance funding minimum that is sufficient for preserving the state's large financial investment in the highway system infrastructure. This minimum should establish the level below which the Department acknowledges that significant deterioration or other specified undesirable outcomes would likely occur. Annually, an estimate of the current replacement cost of the infrastructure should be calculated so that the ratio of the M&O budget to this statistic can be monitored and reported during the budget preparation process.

Recommendation #15:**We recommend WSDOT:**

- **prioritize the development of a centralized maintenance management system.**
 - **annually calculate an estimate of the current replacement cost of the infrastructure.**
 - **establish an M&O minimum.**
 - **include each measurement in its performance measures program.**
-

WSDOT Response:

WSDOT has implemented many databases that could be considered components of such a system. We currently have activity-specific maintenance management systems used to help maintain traffic signals, highway lighting, intelligent transportation systems, movable bridges, urban tunnels, and traffic signs. We also have databases that document work accomplishments for various other activities and a feature inventory is currently under development. We are evaluating options for a centralized maintenance management system and other comparable options.

The establishment of an M&O minimum budget and the viability of basing this on a percentage of the replacement cost of existing infrastructure will be included in the evaluation of a centralized maintenance management system.

Starting in 2008, measures of the amounts of essential work not being completed will be incorporated into the budget process, where this information is available. We agree that a centralized maintenance management system is one of several types of tools that can help a maintenance organization meet an objective of measuring a backlog of essential maintenance. At this point, we are not ready to prioritize and fund the development of such a system. This issue is being considered as we determine which tool will be best for us to use to measure a maintenance backlog. An option that might be preferred is the expansion of the current, de-centralized maintenance management system. Additionally, we currently have no funding to pursue any types of maintenance management system development and

implementation so a budget element would also need to be included in the strategy for moving forward.

OFM Response:

The National Research Council uses a rule of thumb of 2 percent to 4 percent of the current infrastructure replacement cost as an indicator for how much should be spent on maintenance and operations. The value of the infrastructure in Washington's comprehensive annual financial report is \$14.2 billion, the sum of original costs. According to the audit report, maintenance and operation budgets should total about \$355 million per year when, in fact, they are about half of this amount. The 2007-09 budget allocates \$347 million for the biennium. The audit report recommends prioritizing the development of a centralized maintenance management system, but we believe an even higher priority is identification of short, medium and long-term risks to our infrastructure as a result of not fully funding maintenance work. We need to identify and address the risks to determine where the most cost-effective maintenance investments should be made.

Action Steps and Timeframe:

- Develop strategy to address how to measure a maintenance backlog. Complete in spring 2008. Implementation is dependent on the strategy that is developed.
- Rail, highways, and ferry program managers will document consequences of not funding their most critical maintenance and operation activities and submit that information with each biennial budget request. This information should be submitted with the 2009-11 agency request budget.

**WSDOT Does Not
Maintain Summary
Information Concerning
Past and Future
Unfunded Mandates
Reducing the Ability to
Determine Budget
Requirements**

M&O is less able to meet maintenance requirements now than it was 10 years ago. This can be attributed to a variety of causes, many regulatory in nature.

A recent example of a major unfunded regulatory impact on M&O is the National Pollutant Discharge Elimination

System (NPDES), a new federal program for reducing damage caused by pollution. This program, managed on behalf of the federal government by the state Department of Ecology, contains substantial financial penalties for state government for noncompliance with its provisions. The M&O program managers estimated that 40 employees would be needed to satisfy the requirements of this mandate. No staffing increases have been approved.

Another earlier mandate of the Federal Clean Water Act, also imposed requirements that were not funded. Mission changes such as these, while incremental over time, have had an effect on the funding and workload of the M&O Division. Although the magnitude of this over many years is not known with certainty, it is anticipated that current deficiencies will only be compounded. While WSDOT personnel accept these changes as environmentally desirable, the result over time has been a gradual shift in some of the Division's focus from maintenance to compliance with these and similar laws.

WSDOT should begin collecting and analyzing pertinent information for two reasons. The first is to assure M&O has the capability to meet maintenance requirements. The second is so M&O staff understand the cumulative effects are and be able to communicate those effects during each budget cycle,

- Recommendation #16:** **We recommend WSDOT:**
- **research, document, and maintain summary information concerning past and future unfunded mandates.**
 - **record budget ramifications.**
-

WSDOT Response: WSDOT agrees that summary information may be helpful in clearly communicating budget needs and is planning on implementing these recommendations. Summary information regarding budgetary impacts of unfunded mandates are typically generated during the budget development process of each biennium. A formal, continuous record of this information has not been traditionally compiled and maintained in a single document.

OFM Response: It seems prudent to identify new requirements and related estimated costs on an annual basis in order to keep the executive and legislative branches apprised of emerging issues and potential budget shortfalls.

Action Steps and Timeframe:

- Identify budget impacts from new unfunded mandates and compile this information into a single document that can be updated and maintained into the future. Complete by June 30, 2008.

WSDOT is Favorably Organized to Respond Regionally or Statewide to Emergencies or Disasters

WSDOT is responsible for state assets that could play a vital role in responding to natural or man-made disasters. The potential risks in this region are many, including earthquakes, volcanic eruptions, tsunamis, and floods. The state coordinates contingency planning for these risks through the Emergency Management Division of the Military Department. Other state agencies, including WSDOT, assist in this planning and help staff the state's emergency operations centers during exercises and

emergencies. As noted below, other jurisdictions have significant emergency planning and operations responsibilities.

WSDOT is favorably organized to respond regionally or statewide to emergencies or disasters. Agency personnel are assigned to six regions throughout the state. Within each region, employees are distributed geographically by work requirements and work under section supervisors who are responsible to another supervisor or lead worker. This distribution makes the mobilization for emergencies or disasters easier.

The decentralization and regionalization of many Department employees is advantageous from a disaster command-and-control perspective. WSDOT executive management is situated in the Olympia headquarters. Program management and headquarters staff participate in disaster response planning or in simulated or actual emergencies. Should the Department's leaders not be available other senior headquarters management staff would likely be available to assume responsibility for disaster recovery operations. Moreover, the management team of a given region would have the ability to assume responsibility for disaster response within another region or for the headquarters should a major disaster disrupt or prevent operations there. With respect to emergency and disaster response actions, these decentralized personnel are a resource at least as important as the physical assets for

which the Department is custodian. They represent available reserves capable of mobilizing for a variety of potential risks.

Emergency planning is a collaborative process among the state, counties, and other local jurisdictions. WSDOT plays a major role given that its physical assets are spread geographically throughout the state. The Department operates seven traffic management centers (TMCs) that monitor road conditions and dispatch personnel. Each TMC has radio and land-line communications capabilities and video feeds from the highway cameras (located primarily in urban areas and mountain passes that are open during the winter). They also receive other highway data from the Intelligent Transportation System.

Other system components would likely be heavily relied on by the public and by emergency response teams during disasters or major emergencies. Safety Rest Areas provide an extensive level of potential use during disasters. However, specific limitations exist.

The SRAs have drinking water, restroom facilities, and other limited amenities. Because of their direct link to a highway, a major emergency or disaster in which a voluntary or directed evacuation of an urban area occurs would likely place unsupportable demands on SRAs. Most safety rest areas lack the required size, motor vehicle parking, water supply and distribution capacity, emergency

power, and the means for disposing of sewage during the surge conditions of a major emergency. Some SRAs near urban areas and on heavily traveled sections of highway are marginally capable of satisfying driver requirements during normal driving conditions.

By establishing a strong correlation to disaster response capabilities, federal funding of SRA projects for increasing capacity or restoring failing infrastructure may be available. This potential needs to be aggressively explored with the federal government.

Recommendation #17:**We recommend WSDOT:**

- **identify SRA deficiencies in acreage, motor vehicle parking capacity, water supply and distribution, emergency power, and the means for disposing of sewage during the surge conditions of a major emergency.**
 - **seek federal funding to support safety rest area disaster preparedness upgrades and the construction of additional sites for the most likely risk scenarios.**
-

WSDOT Response:

We agree that direct communication links between TMCs and EOCs are important. As such, direct communication links including telephone, e-mail, and satellite telephones are maintained. These are used on a regular basis during times of EOC activation. In addition to this, video feeds have been established between TMCs and EOCs so personnel in EOCs can now view real-time road conditions via traffic cameras through the TMCs.

A specific program to ready SRAs for disaster roles by, for example, large and costly expansion of water supply and sanitary systems, may not be appropriate. The capabilities of SRAs to fit into the larger disaster readiness picture

should be linked to disaster response planning now generally being conducted by the counties.

OFM Response:

We defer to the Military Department to guide us on how best to use safety rest areas during emergencies.

Action Steps and Timeframe:

- The alternative uses for SRAs referenced in these findings will be considered during the SRA strategic plan development to be completed by March 2008.

**WSDOT Can Improve
SRA Safety to Help
Deter Illegal Activities**

As highway traffic density has increased and urban boundaries have expanded within the state, additional demands have been placed on the highway system and on SRAs. These demands have been accompanied by increases in criminal activities near some urban population concentrations. Consequently, unlawful behavior and the physical security of SRAs are of increasing concern to the public, WSDOT and law enforcement officials. Although the Washington State Patrol does occasionally check security at rest areas, other law enforcement demands cause these visits to be cursory and infrequent.

A recent safety rest area technological investment by WSDOT has provided an opportunity for deterring illegal activities and for monitoring circumstances in the vicinity of rest areas during major emergencies. Wireless Internet, or Wi-Fi, gives travelers with appropriately equipped devices the ability to connect to the Internet. Wi-Fi systems are installed at several rest areas. This capability makes it feasible, with a modest investment in additional equipment,

to monitor SRA conditions from WSDOT traffic management centers and Washington State Patrol communication centers. For example, the density of truck parking at a specific rest area could be checked and communicated automatically to truck drivers approaching that location who may be nearing their maximum driving time. During major emergencies, camera images could be monitored by state emergency operations centers. This would permit visual checks on the status of urban evacuations at sequential locations and on potential safety risks to people who have exited to a rest area.

Recommendation #18: **We recommend WSDOT consider adding cameras and monitoring equipment to the broadband capabilities of current and future SRA installations.**

WSDOT Response: We agree. However, funding for such actions depends on legislative appropriation.

OFM Response: We agree, but the cost for providing the necessary technology needs to be evaluated.

Action Steps and Timeframe:

- The Military Department, Washington State Patrol, WSDOT, and local safety officers will collaboratively evaluate potential solutions related to illegal activities. Cost-sharing between these entities will be part of this analysis. Meetings will occur in the spring and summer of 2008 with a budget request submitted for the 2009-11 biennial budget.

PERFORMANCE MEASUREMENT

WSDOT uses the Maintenance Accountability Process as its primary means to measure performance. The MAP scoring system incorporates into one system stated transportation system goals and legislative and public expectations. The condition of the highway system is assessed twice yearly and those results are reported to program management, executive management, and elected officials. The condition assessments provide an objective, verifiable set of priorities for consideration during the budgeting process. The assessments and the maintenance priorities assigned to specific highway components provide clear guidance regarding where maintenance effort needs to be directed. Actual achievements against MAP targets are compiled and published annually and the data is used periodically for evaluating performance of work units and managers. Achievements are reviewed by M&O supervision and management at all levels as well as the Office of Financial Management, the Governor's Office, and by legislative staff.

In reviewing MAP, we found that although it provides valuable information about the condition of the highway system, it does not reflect the degree to which essential maintenance work has not been accomplished. Without this information, including an assessment of how serious this backlog may be, it is difficult to identify resources required to reduce/eliminate the backlog.

The Framework

Legislatively prescribed policy goals form the framework of WSDOT's performance management system. These goals, which are included within the provisions of Revised Code of Washington, establish the basis for detailed and measurable performance benchmarks.

Nine policy goals refer to highway safety, highway condition, the structural condition of bridges, traffic congestion, delays per driver, per capita miles driven, commuter trip reduction, administrative costs, and transit cost per vehicle revenue hour. Each of these goals has assigned to it either a minimum condition (e.g., poor) or a benchmark that WSDOT shall achieve. For example, for "delays per driver," the benchmark is "*delay per driver shall be significantly reduced and be no worse than the national mean.*"

State law requires the Transportation Commission to establish performance measures. The Commission worked with WSDOT staff and others and in August 2003 adopted benchmarks for measuring the performance of the state's transportation system. These are published in the "*Transportation Benchmarks Implementation Report.*"

The Governor's Office also has incorporated transportation system performance requirements into the state's Priorities of Government (POG) described as "*a strategic framework for investment decisions.*" The POG process begins with 10 key results citizens expect from government.

State transportation system results are also linked to another Governor's Office initiative, the Government Management Accountability and Performance (GMAP) approach. GMAP requires state agencies under direction of the Governor to regularly measure and report the effectiveness of the services they provide. The GMAP transportation system key result area focuses on delivering highway construction projects on time and within budget, maintain transportation assets to maximize benefit-to-cost, and design the transportation system of the future. A GMAP Operations Committee consisting of the deputies of all agencies meets monthly to discuss results achieved and issues that need to be resolved. Quarterly, the Governor holds a public meeting during which agency directors present performance results on a rotating basis.

Department Systems

WSDOT's strategic plan for 2007 through 2011, "*Business Directions*," is the primary planning document for the Department. The plan is a summary of WSDOT's work plan based on the programs and budgets authorized by the state Legislature and the policies adopted by the Governor. The plan describes the strategic directions and initiatives that are part of the Department's program and service delivery mandates.

Although the strategic plan does not address every activity, project, program or function, it does focus on specific strategies seen as key for the next two to six years. Six Strategic Initiative areas support policy directions and

address key external and internal driving forces that affect impact delivery mandates.

The Department's main performance assessment, reporting, and communication tool is a comprehensive quarterly publication, "*Measures, Markers, and Mileposts*" - the "Gray Notebook." This publication contains a broad range of data and information concerning performance. The narrative and quantitative materials in the write-ups are easily followed. Each gray notebook is available on the WSDOT Web site. Topics within each edition are thoroughly indexed and cross-referenced to similar topics in previous issues.

The Maintenance Accountability Process

The Department is focused on its Maintenance Accountability Process highway maintenance targets. These 33 targets are established taking into consideration periodic surveys of the traveling public concerning their level of satisfaction with the state highway system. These targets become the accepted standards of performance stated as levels of service (LOS). The allocated funding for each activity is shown on the MAP score card with the LOS targets ranging from "A" through "F".

The LOS target, in effect, reports the condition code of the highway segment or system. Priorities are set for each activity using a weighting scale driven by the importance of results or outcomes (policy objectives) that the Department wishes to achieve. For example, the safety of the traveling

LEVELS OF SERVICE

LOS is reported on a scale of “A” through “F”. The general definition of each LOS is as follows:

LOS “A” – This is a very high service level in which the roadway and associated features are in excellent condition. All systems are operational and users experience no delays.

LOS “B” – This is a high maintenance service level in which the roadway and associated features are in good condition. All systems are operational. Users may experience occasional delays.

LOS “C” – This is a medium maintenance service level in which the roadway and associated features are in fair condition. Systems may occasionally be inoperable and not available to users. Short term delays may be experienced when repairs are being made, but would not be excessive.

LOS “D” – This is a low maintenance service level in which the roadway and associated features are kept in generally poor condition. Systems failures occur because it is impossible to react in a timely manner to all problems. Occasionally delays may be significant.

LOS “F” – This is a very low service level in which the roadway and associated features are kept in poor and failing condition. A backlog of systems failures would occur because it is impossible to react in a timely manner to all problems. Significant delays occur on a regular basis.

public and employees has the highest weighting, 10. At the low end of the scale, with a weighting of 2, is comfort, aesthetics or convenience. A total priority score is calculated from these weightings and other factors.

The condition codes are determined through a random sampling by maintenance employees of highway segments or systems in the spring and fall of each year. Validation by others also occurs as a safeguard against errors. For the 2005-2007 biennium no activity has an assigned target less than “D;” none received a score lower than “D” for fiscal year 2005.

The MAP information is collected and reported at work areas within a region and at the level of each region and is summarized at the Department level. All of the subsidiary data for regions and areas can be quickly accessed.

LOS targets for the 2005-2007 biennium, LOS delivered during fiscal year 2005, dollars allocated (in millions) for 2005-2007, weightings, total priority, and the identification of each activity can be found in Appendix A-2.

A considerable amount of effort has gone into the design of the MAP system. It contains extensive information that is useful to M&O program management, Department management, the Governor’s Office, and the Legislature.

**WSDOT Sampling Plans
Can Potentially be Reduced
to Help Decrease Costs**

The twice-yearly inspections for the MAP scoring process provide valuable information about the condition of the highway system. Despite automation, the complete process requires more inspections and a higher number of worker hours than necessary for making informed decisions about maintenance needs and accomplishments. It may be feasible to reduce the number of required samples and to redirect these hours to maintenance work. The sampling plan design specifies a sufficient number of samples to achieve a 95 percent confidence level for each of 33 activities. The resulting sample size is larger than needed for the intended purpose.

One use of the MAP scores is performance evaluation and the scores therefore need to be accurate. Specifying a relatively high confidence level or confidence interval, such as 95 percent, does not achieve accuracy but ensures precision. For a specified sample size, accuracy is improved by ensuring that the sampling design provides a sufficiently representative selection from the range of all possible circumstances. Based on that, the Department should determine whether the potential decrease in the number of M&O employee hours required to sample is justified by using a confidence level of 90 percent and reducing the size of the samples.

Recommendation #19:

We recommend WSDOT determine if information needs will permit the reduction of the size of the required random samples for the Maintenance Accountability Process.

WSDOT Response:

We agree, and are already taking steps to streamline the sampling/field survey process to provide valid performance data at minimized costs. Recent reductions in MAP survey efforts include use of Pavement Management System data (instead of conducting our own MAP survey) to determine pavement maintenance Levels of Service (LOS). We also use Region Traffic Survey data (instead of conducting our own MAP survey) to determine sign LOS. Not only does this reduce survey costs to the maintenance program, these are examples of larger and more accurate data sets that improve the accuracy of the MAP LOS ratings.

OFM Response:

We support the reduction of sampling efforts in order to control costs, but also urge caution. The maintenance division is a leader in providing data driven decision-making. There is a cost associated with collecting and using such data. We need to be vigilant to ensure the same quality decision making is possible using smaller or less frequent sample sizes.

Action Steps and Timeframe:

- MAP field surveys will be conducted annually instead of twice per year, significantly reducing the effort and costs to obtain LOS data while still maintaining adequate confidence levels. This will begin in the 2008 survey. We also will evaluate the effect of changing from biennial to annual data collection.

**WSDOT MAP
Organizational Review
Level Achievements Do
Not Provide Detailed
Indication of
Accomplishments**

MAP targets and achievements are expressed as a single letter a plus or minus signifying better or worse. Each measure is an average of the random samples taken for that activity. This is standard practice for reporting performance measurement metrics. However, it is not possible from this single measure to gain a complete picture of actual performance, because no indication of the variability of the measurements is provided. For example, within a given region an achievement of “C” for “Maintain

Culverts” could result from half of the sections in that region achieving a relatively high score and half receiving a lower score. Awareness of the range of the achievements among the sections provides a better understanding of the condition of the culverts rather than just that the average was “C.” A suitable indication of the variability of each achievement should be reported for each organizational review level.

Recommendation #20: **We recommend WSDOT increase the detail of MAP organizational review level achievements to provide additional indication of accomplishments.**

WSDOT Response: We agree that MAP information should be reviewed at all levels of the maintenance organization. In addition to the statewide reporting and review level, this should include regions and areas as well. MAP reports are currently developed and reviewed at area, region, and statewide levels. In addition to this, the method of compiling area and region LOS reports into a single statewide report has been revised to more clearly communicate how the lower-level organizational ratings comprise the statewide ratings. This was an improvement recently identified through the Governor’s GMAP process.

OFM Response: The department deserves the national recognition it has received for its maintenance accountability process which includes level of service standards for 33 different maintenance activities. We agree that the “score” assigned to an activity does not capture the range of the achievement. The scores should be accompanied by text to capture more detail about the accomplishments.

Action Steps and Timeframe:

- MAP reporting will include narrative summaries as well as numeric or alpha summaries as appropriate.
Ongoing.



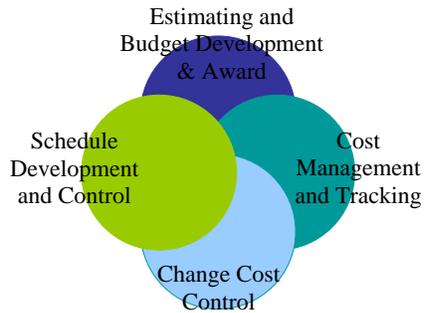
Project Delivery and Capital Project Management



Construction Management/Highway Maintenance Performance Audit

PROJECT DELIVERY AND CAPITAL PROJECT MANAGEMENT

APPROACH



Successful project delivery is a result of many activities and events that integrate with and complement each other. To gain a representative understanding of how WSDOT approaches project planning and design, a sample of 18 capital projects throughout WSDOT regions was initially selected for review. These projects, designed in the 1990s or earlier, were either still in the construction phase or had recently been completed.

The review of selected projects included attention to specific areas of cost management and project controls:

- Project management planning
- Estimating, budget development, and award
- Cost management and tracking
- Change cost control
- Schedule development and control
- Performance measures and indicators

Other Studies

WSDOT has done or has had done a number of studies and reviews to assist it in identifying opportunities to improve operations and efficiencies that result in cost savings. Many of the recommendations made have been accepted and acted upon by WSDOT. To determine the extent to which WSDOT has implemented those recommendations, six additional projects were selected for review.

As part of this audit, the State of Washington's Joint Legislative Audit and Review Committee (JLARC) Report 05-03 "*Overview of Washington State Department of*

*Transportation Capital Project Management*¹⁶” was reviewed. The report contained a number of recommendations, including some that were relevant to the scope of this audit. We examined topics that would provide specifics as to how WSDOT can maximize opportunities to manage costs, achieve dollar savings, and reduce surprises during project delivery.

“Best Practices”

To achieve our audit objectives, we reviewed the WSDOT projects summarized below. Based on analysis of the data gathered and interviews with WSDOT personnel, recommendations were formulated that identify solutions centered on “best practices.” These practices are those techniques in cost and schedule management that are considered the best known methods to achieve the most efficient and effective results for delivery of large capital construction projects. Examples applicable to WSDOT may be prevalent in sectors outside transportation and/or be recognized nationally and globally.

Applicable sources of “best practices” include:

- AASHTO – American Association of State Highway and Transportation Officials
- AACE - Association for the Advancement of Cost Engineering
- ASPE - American Society of Professional Estimators
- RICS - Royal Institution of Chartered Surveyors
- State and federal transportation organizations (including WSDOT)
- Other Governmental Entities (including the FHWA – Federal Highway Administration)

¹⁶ January 21, 2005

- Private Industry
- Other Associations

Many United States transportation sources and publications (FHWA, AASHTO, etc.) reference WSDOT practices, reports, and cost data and are considered by some agencies as best practices.

SAMPLE SELECTION

The following projects were selected to provide a representative sample of WSDOT project types. Projects were selected to represent a cross-section of project scope, capital value and geographical location. In addition, to ensure all aspects of project delivery relating to cost and schedule could be adequately reviewed, 40 percent of projects selected were either completed or in the process of completion.

At the request of the State Auditor’s Office, the State Route 522 Paradise Lake Road to Snohomish River Bridge project was included. Additionally, because of previous reviews conducted on the Hood Canal Project, only the latter portion of the project was included for review.

#	Project Title/Description	Contract	Region	Status	Funding
1	SR 240, I-182 to Columbia Center I/C	6895	South Central	Under construction	\$59.5m
2	US 12, SR 124 to McNary Pool – additional lanes	6860	South Central	Under construction	\$104.1m
3	SR 24, I-82 to Keys Road - additional lanes	6933	South Central	Under construction	\$50.2m
4	US 2, Cashmere East Paving	7059	North Central	Completion 7/06	\$3.25m
5	I-90, Moses Lake Area – Bridge Clearance	7071	North Central	Under construction	\$3.25m
6	I-90, I-90 Sunset I/C Modifications Stage 2	6010	Northwest	Physically complete 5/05	\$42.2m
7	SR522, Paradise Lake Rd. to Snohomish River	6726	Northwest	Under construction	\$36.9m

8	SR161, Jovita Blvd to S360th St - widen	6858	Northwest	Under construction	\$30.1m
9	I-5, 2nd Street Bridge Replacement	6793	Northwest	Completion 10/05	\$14.3m
10	SR 18 Maple Valley to Issaquah Hobart Road	6611	Northwest	Under construction	\$108.2m
11	SR 5, Burnt Creek to NE 78th Ave	5661	Southwest	Completion 7/03	\$37.9m
12	I-5, Widen I-5 each direction from Salmon Creek to I-205	6610	Southwest	Completion 10/06	\$35.4m
13	SR500, 112 th Ave/Gher Rd Interchange	6625	Southwest	Completion 4/05	\$21.3m
14	I-90, Argonne to Sullivan, 2 additional lanes	6620	Eastern	Completion 11/05	\$36.3m
15	SR270, Pullman to Idaho St Line - additional lanes	7120	Eastern	Under construction	\$30.6m
16	I-5, HOV Improvements - South 48th Street to Pacific Avenue	6958	Olympic	Under construction	\$103.7m
17	SR16, New Tacoma Narrows Bridge	6441	Olympic	Under construction	\$771m
18	SR104, Hood Canal Bridge E. half replacement and W. half retrofit	6525	Olympic	Under construction	\$470.9m

Source: Compiled by TKW

Seven of these projects have been completed or were forecasted to be completed by end of 2006.

Six additional projects were selected to gain an understanding of how WSDOT approaches project planning and design:

#	Project Title/Description	Contract	Region	Status	Funding
A	Project 9 – Westbound Nalley Valley I/C Reconstruction	OL3460	Olympic	Design	\$181.6m
B	SR 14, 2.2 & 2.3 Miles East of Bergen - Rockfall	XL2395, XL2397	South West	Design	\$644k
C	SR 9, 176 th Street SE to Marsh Road Intersection Vicinity	XL2262	North West	Design	\$35m
D	US 12, Attalia Vicinity – additional lanes	7082	South Central	Construction	\$17m
E	SR 518, Sea-Tac Airport to I-5/I-405 Interchange	MS5185	North West	Design	\$30.8m
F	I90, Sullivan Road Interchange PCCP Rehabilitation	XL2799	Eastern	Design	\$3m

Source: Compiled by TKW

Methodology

To evaluate project delivery and effectiveness of project controls, we extensively reviewed capital project files. Because our sample provided a range of project value, type, and complexity, the level of application of project control techniques required and/or expected was different for each.

The review of project files allowed the determination of the integrated nature of project planning, execution, and delivery. To make this determination, many aspects of project management and delivery required consideration.

The following identifies topics reviewed:

1. Project budget and estimate files
 - Have estimating best practices been used?
 - How have escalation, inflation, and market conditions been addressed?
 - How have contingencies and “soft costs” (non-contractor payments such as permitting, licenses, taxes, etc.) been applied to the project estimate (including relationships with the estimated project cost of work and other benchmarks)?
 - What is the magnitude of allowances or costs for undefined scope?
2. Project management plan
 - Land acquisition process. How has this had an effect on costs and scheduling?
 - Permitting. How has this had an effect on cost and scheduling?
 - Engineering and design. What controls have been used to manage change, use of Requests for Information (RFI’s), etc?
 - Procurement plan. Is it integrated with all stages of project development and execution?
3. Contractor and supplier proposals and agreements
 - How sound are commercial provisions within contracts?
 - What are the incentives for performance/delivery?

- Bid evaluation procedures and practices. Do evaluations include cost modeling to understand the potential effect of proposed change rates on the potential contract award?
 - Have all bidder clarifications and exclusions been addressed during the evaluation phase?
 - Benchmark award costs to final contract values.
 - Have the contract terms and conditions been adhered to during the course of the project?
4. Review of approved and proposed change orders
- Have the terms of the base contract been applied?
 - Are there potential conflicts with the basis of remuneration? Not sure what this means
 - Have quantities been verified?
 - Do costs and prices reflect fair market value? For example, how do labor costs compare with other industries in the state and how do labor costs compare across WSDOT projects?
 - Has supporting documentation such as supplier quotes, timecards, etc., been provided to support costs such as supplier quotes, timecards?
 - Have change orders been identified as having an effect on scheduling?
 - Is the change order a valid change to the base scope?
5. Schedule development and performance tracking
- Was the master schedule baselined at the start of the project, and periodically throughout after achieving major milestones?
 - Did the schedule include extensive resources? If so, how does that compare to actual field labor loading on a daily/weekly/monthly basis? Was the resource loading evaluated and adjusted to compensate for change orders?
 - Was earned value or some other type of project forecasting tool used throughout the project? If so, how does that compare to what actually took place? How accurate was the forecasting?
 - How has the critical path been managed?
 - How often is the schedule updated?
 - What has been the basis of schedule updates?
 - Any evidence of schedule compression/acceleration to mitigate delays?

- Are cost impacts identified to unplanned changes in schedule?
- 6. Project cost management
 - Project cost reports and cost forecasting techniques.
 - Budget performance. Have reconciliations been carried out to assess performance of the cost estimate versus actual scope?
 - How have contingencies and allowances been tracked and managed?
- 7. WSDOT capital project procedures
 - Have established procedures been followed on the selected projects?
 - Do existing procedures present any constraints to maximize value and manage risk?
- 8. Project close-out files, if applicable
 - Have there been any issues which have hindered the timely close-out of projects?
 - Claims. If applicable, why have they occurred and what could have been done to avoid them?

An important component of this audit was to undertake interviews with WSDOT project management staff responsible for project delivery. These interviews provided important insight to individual project characteristics.

We also conducted a review of project correspondence to determine whether any contractual or project issues arose that may have affected project costs, scheduling, and risk.

RESULTS

WSDOT has taken significant steps to improve project delivery and implement best practices. It has made a significant investment in the development of practices and procedures to strive for continuous improvement. In 2005 WSDOT recognized the need to ensure delivery of a \$15 billion construction program and established a statewide

group to develop a strategic plan. Communication and transparency have been a major emphasis and the agency's Web site, reports and other publications have helped accomplish this goal. Many state transportation organizations as well as AASHTO have identified WSDOT practices as being innovative.

A wide range of tools and formats are used to manage projects. However, some projects have had more success with controlling costs and schedule than others. While project teams should be commended for their efforts, inconsistencies in practices have resulted in variances in cost tracking and change order management. Regional differences continue to occur. Document layouts, content, and nomenclature – specifically in relation to project scheduling – were noted. Reports and data are often meaningful only at the project level and are not easily communicable to senior management and comparable with others.

These issues should be considered in context of the increasing challenges that WSDOT faces in staffing its capital program, either directly or indirectly. The 10-year program occurs during a time of increasing competition in the marketplace for experienced, skilled craft and construction professionals - made more acute by retiring "baby boomers" who are leaving industry; global mega-projects; and the Chinese construction boom.

WSDOT has opportunities to continue to improve project delivery and management. The following provides our detailed analysis of each of the areas of cost management and project control.

PROJECT MANAGEMENT PLANNING

WSDOT Implementation of SPMG Recommendations Will Eliminate Many Management and Reporting Inconsistencies

WSDOT has taken significant steps to improve project delivery and implement best practices. In 2005, the Agency created the Statewide Program Management Group (SPMG), a consortium of leading consulting firms in the transportation industry to assist in delivering over \$15 billion in capital construction.

The SPMG was charged with assisting the development of WSDOT's strategic plan. Specific planning objectives included:

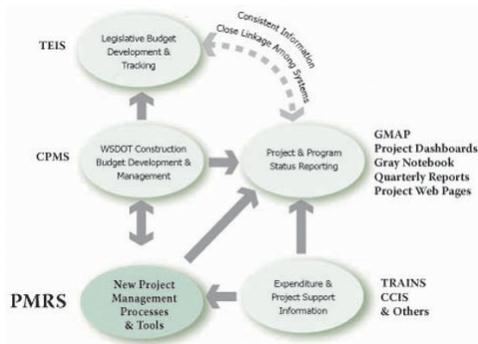
- Identification of actions that promote successful delivery of projects
- Report on projects and programs.

“A Strategic Delivery Plan for the Washington State Department of Transportation’s Capital Construction Program – Phase 1 Final Report¹⁷”, produced by the SPMG, proposes solutions for program management, workforce improvements and project management processes, including control and reporting systems.

In addition, in September 2006, WSDOT announced its latest change to management of capital projects in the form

¹⁷ June 30, 2006

of the Project Management Reporting System (PMRS). PMRS is a “collection of integrated tools”, created to address the current inconsistencies in application of management practices and data across WSDOT.



Source: PMRS

The SPMG Strategic Plan, released shortly before this audit began, contains many key topics that integrate with the audit scope. While it is premature to expect SPMG’s recommendations to be fully applied to all the projects selected for review, we remain aware of solutions proposed in the report. We expect that full integration of PMRS will eliminate many of the management and reporting inconsistencies this audit found.

Additionally, during the course of this audit, SPMG commenced Phase 2 of its study, which includes 90 targeted projects to be reviewed for budget, scope, and schedule. The SPMG “Baseline Assessment Checklist” asks specific questions that are similar to those posed during this audit. For example:

- Has a project management plan been approved?
- Is the project estimated to be completed within budget?
- Is the project estimated to be completed within schedule?
- Has the project completed the Cost Estimate Validation Process[®] (CEVP[®])/ Cost Risk Assessment (CRA) process?

- Recommendation #21:** **We recommend WSDOT:**
- **ensure SPMG recommendations are followed and published management practices are implemented.**
 - **follow up with activities to assure expected outcomes are realized.**
-

WSDOT Response: We agree and have recently taken significant steps to improve project delivery and implement best practices. Two examples are the Program Management On-Line Guide and Project Management Reporting System (PMRS.) The Statewide Program Management Group is currently working to develop these tools as well as other project management tools and training.

OFM Response: We agree and also want to emphasize the need for ongoing, sustained and rigorous project management training.

Action Steps and Timeframe:

- Develop and implement policy statements to coordinate consistent and timely application of the PMRS system and provide direction on the various processes involved. Policies and procedures are scheduled to be developed by January 2008.
- Update existing Executive Order 1032.00 for project management (originally issued in 2005) by February 2008.
- Implement the SPMG recommendations statewide and the following activities underway:
 - Development of standard processes for:
 - Cost Control and Earned Value
 - Project Estimate Creation, Review and Approval
 - Project Change Management
 - Development of a training program for project control staff regarding use of these new business processes
 - While the fully integrated PMRS system is scheduled to be completed in January 2010, the cost control/earned value software has currently been implemented to manage some of WSDOT's larger projects and will be configured and available for use

in a stand alone mode for all WSDOT projects in May 2008.

- Continue to refine the Cost Estimate Validation Process (CEVP[®]) and Cost Risk Assessment (CRA) estimating procedures and apply these to formulate realistic estimates during the project development process. Ongoing.
- Provide additional emphasis of tools and expectations at the Project Management Training Academy, Statewide Meetings, and Quarterly Reporting. Ongoing.

Review of Project Management Plans

Project management is the application of tools and techniques to successfully deliver projects. These tools address aspects such as safety, quality, communication, cost, and schedule in such a manner that projects can be effectively controlled and delivered to the customer according to plan. These applications are documented in a formal project management plan.

Our review of project management plans indicated WSDOT has demonstrated a proactive approach to exploring appropriate planning strategies with the goal of increasing efficiencies and effectiveness across all regions and projects. WSDOT continues to modify its approach in an effort to continuously improve its operations.

WSDOT's *Project Management On-Line Guide* is an important source of information and a reference point for best practices. This guide "*provides guidance and tools for performing project management functions on WSDOT projects*" including the following areas:

- Project objectives and goals
- Roles and responsibilities

- Design schedules (conceptual to detailed)
- Development of a project contracting strategy
- Right-of-way and land acquisition activities
- Permitting
- Environmental studies
- Geotechnical surveys
- Major construction milestones
- Change management plan
- Communication plan
- Quality plan
- Completion milestones,
- Project close out
- Lessons learned

In conjunction with developing a project plan, an appropriate procurement strategy should be formulated to optimize cost and schedule while meeting the needs of the project, eventual users, and customers.

**Many Sampled Projects
Contained Planning
Inconsistencies and
Deficiencies Resulting in
Project Inconsistencies**

While WSDOT's intent is to plan projects in a manner that optimizes cost and schedule, our review of sample projects identified a number of inconsistencies and plan deficiencies. Our review compared project planning and performance tracking against established plan components in addition to identifying any plan deficiencies that resulted in potential lost opportunities in terms of cost. Any deficiencies in the plan or lack of adherence to the plan that had any other cost or schedule impacts were also noted.

Our review found many projects without a readily accessible project management plan and (with certain exceptions) many that did not meet the expectations of WSDOT's *Project Management On-Line Guide*. This guide is intended to provide guidance and tools for

performing project management functions on WSDOT projects. Responses to questionnaires issued during this audit illustrated the range of regional offices' understanding of how and when project management plans are compiled. Although the majority of construction offices stated that they received training for and were familiar with the *On-Line Guide*, clear and concise documentation in accordance with the guide was not evident when initially requested on-site for 10 of the 18 projects reviewed.

Although WSDOT offers training, we found a gap in its application. Without proper outreach to all regions with a mandated, formal, continuous, and comprehensive training program for project engineers, project inconsistencies will continue. The responses to questionnaires stated that training on the *Project Management On-Line Guide* was being received. However our review indicated that specific components (e.g.: lessons learned) of the guide were not consistently applied to all projects. WSDOT's *Project Management On-Line Guide* indicates "Lessons Learned" as a key component of project "*transition and closure.*" Established guidelines explain that "*Lessons learned is a continuous improvement process that occurs during each step of every project. The process to document Lessons Learned is developed during the Plan the Work step; implemented during the Work the Plan step; and completed at the close of the project or phase.*"

To address this issue and to ensure the consistent collection of lessons learned, WSDOT has developed an online,

centralized database to facilitate dialogue, mitigate risks and capitalize on opportunities. Regular, well documented lessons learned are an invaluable resource to prevent recurring mistakes and encourage innovation and industry best practices – in real time. Additionally, regular documentation further supports accountability to taxpayers.

Of particular concern are those projects that have encountered challenges that significantly impacted budget and schedule and still have no lessons learned plan and/or still maintain ad-hoc risk assessment plans. This is particularly demonstrated on the Maple Valley Project¹⁸.

Recommendation #22:**We recommend WSDOT:**

- **ensure all aspects of the *Project Management On-Line Guide* are applied consistently to each project.**
 - **require consistent entry of “lessons learned” into the agency’s centralized database.**
-

WSDOT Response:

We agree that the principles and tools detailed in the Project Management On-Line Guide are useful. In addition, the tools provided and training performed through the SPMG’s efforts, as listed previously, will help to initiate and support a more coordinated and sophisticated project management approach.

We also agree that “lessons learned” is a valuable tool and are assigning additional resources to improve both the database and the procedures.

OFM Response:

The audit recognized that WSDOT has acted upon a number of studies and reviews conducted in the recent past to help it identify ways to improve operations and efficiencies that result in cost savings. As a result,

¹⁸ SR18 Maple Valley to Issaquah/Hobart Road

WSDOT is considered a national leader in project management. Nevertheless, there is room to improve. Providing more consistent budgeting, reporting, and handling of change orders across regions and modes is very important. Consistent document layouts, contents and nomenclature are key elements of providing a transparent and accountable rendering of every project.

Action Steps and Timeframe:

- In addition to the actions and timelines for Finding #21, WSDOT will evaluate and assess projects annually to gather lessons learned. WSDOT plans to share lessons learned through the annual Construction conferences, beginning in February 2008.
- Progress of this lessons learned effort and the schedule for developing improvements will be available on the website. Complete by February 2009.

WSDOT's Primary Procurement Strategy of Low Bid Can Limit its Ability to Receive Best Value.

A key component to successful project management planning is the development of a contracting strategy. Such a strategy involves identifying the method of procurement and project delivery that will be used on the project. The goal is to select an approach that will deliver core project objectives and provide the best value to the taxpayer.

Projects reviewed identified the following featured arrangements which, while not new in the global construction market, differed from WSDOT's traditional low-bid arrangements for construction and are contributing to successful project delivery.

- Tacoma Narrows Bridge: *Lump Sum Design-Build*.¹⁹ This project is based upon a negotiated state-financed contract that was previously intended as a Public-Private Initiative. Further information on how legislation and state Supreme Court rulings

¹⁹ WSDOT is also currently utilizing the Design-Build approach on other projects.

have affected this project can be found in WSDOT's report to the Legislative Oversight Committee titled "*Overview of the Public-Private Initiatives Program.*"

- Hood Canal Bridge: *Target Price* with shared risk and savings for both WSDOT and the contractor. Three components make up the target price: target cost, the fee and the shared savings/ incentives.

Typically, an organization's contracting strategy focuses on maximizing value while reducing areas of risk. For example, a poorly detailed or undeveloped scope inevitably leads to increased cost to the owner through the use of change orders during construction. It becomes very important to choose a strategy that will reduce the risk to the owner of increased costs.

During our audit, we assessed WSDOT's strategies with regard to procurement and contracting. WSDOT has various published "delivery" options including:

- Low bid
- Design-build
- A + B bidding
- Lane rentals
- Interim completion dates
- Flexible start date
- Lump sum traffic control

Appendix B-1 identifies in more detail the contracting strategies available.

WSDOT's current contract strategy of low bid limits its ability to receive best value. In contrast, performance contracting seeks to obtain "best value" and brings benefits that include, among other elements, gaining continuous

improvement among competitive contractors; transferring risk of non-performance to contractors; fostering innovation; promoting proactive safety and quality related solutions to issues that occur at field level; and encouraging partnering. Using a “performance contracting strategy” will allow WSDOT to gain more value for its money in the long term by encouraging continuous improvement among contractors. For example, Utah used performance contracting for six large construction jobs totaling \$80 million. Prior to this method of contracting, Utah’s construction projects resulted in very few being delivered on time, a change order rate of 5.7 percent (1.2 percent over the contingency funding of 4.5 percent), and not meeting quality expectations. The first five projects were completed on time, with no contractor-generated change orders, and very high performance ratings by the facility owners.

Recommendation #23:

We recommend WSDOT pursue legislative authority to use a performance contracting strategy for applicable projects.

We recommend the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.

WSDOT Response:

We believe that the Legislature has provided the latitude necessary to use the appropriate contracting strategies for projects. WSDOT supports and uses best value selection and performance based contracting within our Design Build contracting approach. On our more complex projects, WSDOT does an in-depth risk profile, cost assessment and contracting analysis to select the appropriate contracting strategies as part of managing the risks. WSDOT’s delivery results, as reported in GMAP, show that our current procurement and delivery practices support on-time,

on-budget delivery. Our approach is consistent with the way most other states have approached highway-related contracting.

OFM Response:

There are circumstances when low bid is not the optimal approach, but best value, design-build, or some other contracting arrangement is. We believe the department has the statutory authority to use these different contracting approaches as particular circumstances warrant.

Action Steps and Timeframe:

- We will continue the current practice of using performance contracting and best value selection as appropriate and consider the recommendation if/when it is necessary to do so.

Auditor Response:

Although WSDOT currently has a variety of contracting strategies available (see Appendix B-1), performance contracting is not specifically identified nor was there any evidence of its use on reviewed projects.

SCHEDULE DEVELOPMENT and CONTROL**WSDOT Has Minimal Consistency in Procedures and Schedules Limiting the Ability to Effectively Manage Projects**

The ability to analyze and organize a project or program with respect to time and its effect on cost and resources is critical to achieving desired objectives. Using discrete activities, techniques such as critical path method (CPM) are used to prepare schedules and monitor performance.

Effective project management begins at the planning phase. A schedule is developed using logic-based activities that identify required resources where appropriate. During the project, the schedule is the basis for:

- Measuring and controlling progress
- Forecasting end dates
- Highlighting critical areas
- Assessing schedule risk
- Leveling resources for economic use
- Developing mitigating strategies.

The purpose of planning and scheduling is to develop an independent and objective viewpoint assuring that any plan or schedule and its subsequent updates are generated with a full understanding of the project scope and constraints. This “master schedule” should include an appropriate level of detail, identify schedule risks, include risk mitigation strategies, and comply with project objectives. Specific benefits include:

- The ability to harness the latest technology and available experience.
- More effective management of schedule issues.
- Better understanding and control of contractors and progress.
- Increased focus on critical and near critical issues.
- Added confidence in meeting project goals in general and schedule goals in particular.
- Superior management of scope changes with the potential to impact schedule.
- More economic use of resources.
- The ability to coordinate capital and maintenance programs effectively.

Many project aspects reside in a master schedule that drives the success of a project - links that provide a critical path; resources that help determine loading and, to a lesser extent, scheduling of activities and activity codes that provide insight into how things are organized. A master schedule that is appropriately detailed and maintained during the life of the project is a valuable tool that facilitates management of key activities, and, when integrated with other documents, can be used to understand required resources and control costs. It is essential that the master schedule remain as a “real-time” document providing the project management team with an indication

of project performance and thus a basis upon which to make informed decisions.

During our audit, we requested electronic copies of project schedules. Because schedules are dynamic creations based on complicated software, printouts typically provide only a minimal level of information. Essentially, most of what drives a schedule is provided behind the scenes in the resident database and is not always represented on a printout. An electronic version provides access to all data that make up a schedule and will allow for certain analyses.

Specific items were reviewed to determine the effectiveness of each. Our review found little consistency in procedures from project to project or according to projects of various sizes. Some projects had marginal schedules while others had fully developed and resource-loaded project plans.

The software used was dependent on which software contractors were using. Our analysis of electronic versions was hampered by the numerous formats and programs in which the schedules were developed. In five of 18 projects, we were unable to determine the actual software used and could not open applicable files. These different formats make it difficult to compare, contrast, and understand what is causing project delays.

The practice of delegating schedule development for construction to the contractor is also placing projects at risk. For projects such as Interstate 5 (Salmon Creek to I-

205), State Route 500 (112th Avenue/Gher Road Interchange), and State Route 270 (Pullman to Idaho State Line), it has taken contractors an inordinate amount of time to submit acceptable schedules. As a result, projects can go for months without updates to progress schedules.

Various software applications that do scheduling are available. WSDOT needs to define its specific needs, choose the appropriate software and specifically require the use in its standard specifications.

This standardization will allow for accumulation of data and ease of transfer of templates and standardized items. This will also allow for program-level reporting across all WSDOT's projects, supplying enterprise-level reporting and control of program and project schedules across the state. Part of this process should include enforcing the contractual responsibility of schedule creation and maintenance by contractors, working with contractors to resolve issues in a timely manner, and holding them accountable, when merited, for performance deficiencies. This will help maintain integrity of schedule during the entire project lifecycle.

Recommendation #24:**We recommend WSDOT:**

- **identify required scheduling software.**
 - **stipulate in its standard specifications, the required scheduling software program to be used by contractors.**
-

WSDOT Response: We agree and are in the process of implementing this recommendation. Examples that support this statement include implementing scheduling requirements in the 2008 standard specifications to better define schedule requirements. Our new specifications provide scalable project scheduling requirements that are useful and practical for the various types of projects. On our more complicated projects, WSDOT specifies the specific scheduling program (Primavera 6) to be used by contractors. The new scheduling requirements have been discussed with the contracting industry (AGC) and are expected to improve contractor performance in submitting approved schedules, as well as help our managers better manage workforce and on time delivery.

OFM Response: We have supported the purchase, implementation, and training of Primavera software to enhance project management, including scheduling. Ongoing training on the use of the software is, however, the key to success.

Action Steps and Timeframe:

- We will continue to monitor the effectiveness of our contract provisions (“*general special provisions*”) on an annual basis (end of the construction season in November). This includes communicating and working with industry to make adjustments to our policies and provisions as needed. Increased focus on training in this area will also occur over the next year through the SPMG effort.

ESTIMATING, BUDGET DEVELOPMENT, and AWARD

During all phases of the planning and procurement process, organizations require cost estimates, which are used in:

- Preparing feasibility studies and project budgets
- Predicting the probable bid amount during design
- Providing cost comparisons between alternate design solutions
- Providing estimates of project cost changes during construction

Available scoping documents supplemented by interviews with the designer or the owner establish the quantity, quality, procurement strategy, and schedule regarding various costs. Experience, internal data, and project-specific research guide the evaluation of the required resources, methods, and management that form the basis for cost. A determination of risks and uncertainties is inherent in the process, although formal risk management is not included in standard cost-estimating services.

Decision-makers require a cost estimate to properly evaluate alternatives. The objective of the cost estimator is to work seamlessly in an expert role within the project team to provide accurate, timely, cost-effective estimates that are vital to the smooth management of any project.

**WSDOT Has Had
Difficulty in Identifying
Trends in High-Risk
Quantity Growth Items
Resulting in Unnecessary
Costs**

Estimating and budget development are processes that must be integrated in a timely manner with the development of design and must also include risk assessment and value management practices. An effective estimating and budget development process will provide:

- Independent, objective, professional estimates and validation.
- Improved cost effectiveness.
- Informal review of project documents for conflicts and constructability.

WSDOT has recognized the need to address issues that can lead to inadequate cost estimates and resulting budget overruns. The agency has processes that fully integrate cost estimating and cost risk assessments to determine the best known range of probable cost - Cost Estimate

Validation Process (CEVP[®]) and Cost Risk Assessments (CRA). The CEVP[®] process is used for projects over \$100 million and the CRA process for projects over \$25 million.

Although this audit did not specifically review the CEVP[®]/CRA processes, it did assess the techniques and practices used to compile the original baseline estimates and to determine how widely the CEVP[®]/CRA technique has been applied to various projects.

Our audit focused on assessing approaches used to identify and understand “soft costs,” market conditions (including volatility of commodity prices for significant materials and consumables), labor cost inflation, contingencies, and other allowances. We also reviewed cost benchmarking practices and data compilation and their subsequent uses in the baseline estimating process.

Our assessment of estimating and budget development focused on the results of WSDOT’s efforts as they related to the 18 projects reviewed. Contract award values and engineer’s estimates were compared to determine whether acceptable accuracy parameters were achieved. Using the Association for Advancement of Cost Engineering (AACE) “best practices” as a guide (expected accuracy range: -3 percent to -10 percent - low end/+3 percent to +15 percent - high end), each of the sampled project engineer’s estimates fell within acceptable percentages.

WSDOT has experienced success among the 18 projects in producing engineer's estimates (bid check estimates) within best practices accuracy parameters. However, difficulty exists in identifying trends in high-risk quantity growth items. Historical cost databases include only bid history items. Databases are not updated to include quantity variances and unit price increases during construction. WSDOT is therefore unable to identify trends in high-risk, quantity growth items.

For example, of the 18 projects reviewed, traffic control and street sweeping scope were found to be relatively common areas of growth in overall quantity and cost. WSDOT's initial estimating, captured in EBASE, provides a good baseline. However, cost changes need to be identified to be properly managed. Regular updates to EBASE will provide a clearer picture of what is transpiring, including the spotting of trends in pricing and where cost overruns occur. Accurate updates of the estimates will reduce the magnitude of contract overruns on estimated hours on the traffic control and street sweeping. On certain projects, WSDOT has paid increases of over 50 percent hourly rates for hours that exceed 125 percent of contract amounts (see Appendix B-2.)

Further study is required to understand the magnitude of occurrence and whether correlations exist that can be used to devise more accurate prediction models.

Recommendation #25: **We recommend WSDOT continuously review cost changes and manage as appropriate.**

WSDOT Response: We agree that an improved understanding of trend data improves estimating and risk mitigation and allows us to establish policies and practices to support better results.

While we recognize that WSDOT does not have a formal, systematic tracking tool, we monitor this area carefully. Efforts include regularly monitoring industry cost trends, change order roundtables, and HQ change order review and stewardship reviews. In addition, the design team and the construction team communicate through the lessons learned data base and policy and specification changes to improve estimating practices.

A better understanding of trend data generally improves estimating and risk mitigation results, though several of the overruns mentioned in the report were related to weather conditions driving environmental protection activities. These are generally not avoidable or predictable.

OFM Response: A broader understanding of the construction cost index across WSDOT programs would be helpful. For example, the planning, research, environmental, and budgeting departments could all benefit from a deeper understanding of and tracking of these kind of cost indices. Further, trends in the availability of scarce mineral resources, fossil fuels, and metals like copper and steel should be thoughtfully monitored.

Action Steps and Timeframe:

- Create a cross functional team to evaluate existing informal processes and procedures that support trend analysis. Next, develop strategies to support a systematic approach to track, report, review and improve estimating practices by monitoring quantity growth. This is scheduled to be in place by July 2008.

**WSDOT’s Bid Evaluation
and Award Approach
Does Not Incorporate
Actual Costs and
Quantities Potentially
Increasing Costs**

WSDOT’s current system of analyzing bid rates to determine anomalies (and the potential effect should variances in actual quantities occur on higher risk items) is through preparation of a bid check created in WSDOT’s *Estimating and Bid Analysis System (EBASE)*²⁰. This data is manually analyzed by project and contract staff prior to a decision to award or reject bids. The traditional approach is to award to the lowest bidder.

WSDOT analyzes all bid prices and quantities that appear to be “unbalanced” or anomalistic which may be potentially detrimental to the state. However, our review of contracts identified instances in which contractors have bid \$0.01 per unit for some items, an irregularity that WSDOT has elaborated on by indicating that, although the bid item does not cover the cost of the work, the bidder commonly claims that the way he or she structures bids is to include the costs in associated items of work or general overhead. However, this practice does create anomalies when unit rate contracting is used. These anomalies can include:

- Distortion of earned value progress measurements.
- Progress payments may not reflect the value of work completed to date.
- No financial basis for pro rata should quantities vary significantly against planned.
- The rate cannot be considered for cost databases. Lack of data for particular items may hamper estimating efforts for future projects and/or use of the database for check pricing by other projects trying to validate their own change orders.

²⁰ Standardized estimate templates and estimating software used to calculate the cost for each project phase.

To assure that any potential detriment to the state is identified and minimized, WSDOT should incorporate actual costs and quantities into EBASE. Increasing the precision of estimated quantities can mitigate premium costs associated through adding units to the contract via change order as opposed to being included in the original bid documents.

Recommendation #26:

We recommend WSDOT incorporate actual costs and quantities into EBASE to develop cost benchmarks and cost metrics that can be used for estimating future projects and determining cost overrun trends.

WSDOT Response:

We disagree with the suggestion that an inadequate bid evaluation potentially increases costs. WSDOT reviews all bid items for material unbalancing of bid item prices that may be a potential detriment to the state as provided by state law. The evaluation includes a review of the submitted bid prices, estimated quantities, engineer's estimate, and other bidders' submitted prices. If a potential detriment is discovered, the bid is rejected. The contracting agency is required by law to demonstrate a detriment to the state to reject unbalanced bids. While contractors' bid estimates do not always reflect actual cost on every item, our records show that WSDOT's engineering estimate are consistently within 10% of final completion costs.

OFM Response:

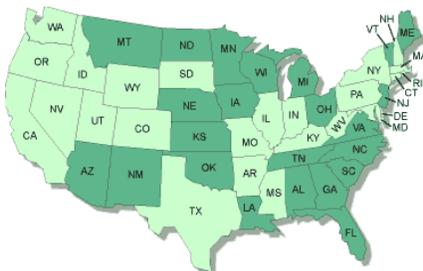
At a minimum, an evaluation of engineer estimates, contractor estimates, and actual costs could be sampled and reported to the Legislature and the Governor as part of the annual budget submittal process in order to address concerns about unpredictable and escalating commodity cost increases.

Action Steps and Timeframe:

- We will review our process for opportunities for improvement as the aforementioned SPMG efforts advance.

- We will evaluate a sample of engineer estimates, contractor estimates, and actual costs and report to the Legislature and the Governor with the annual budget submittal.

WSDOT's Does Not Participate in an Electronic Bid Evaluation and Award Forum Potentially Limiting Perspective Vendors



■ Production States
Source: BIDX

The Request for Proposal bid award process, with particular emphasis on cost analysis of bids, can potentially be streamlined through use of technology. For example, some departments of transportation offer contractors the choice of submitting bids electronically for projects. The open projects are posted on a Web page known as “BIDX.” The Web page, maintained by a third-party vendor, requires a “BIDX” account to participate in on-line bidding.

Although WSDOT does not participate in this particular forum, the agency is looking at online software options. WSDOT offers contractors the option of bidding via diskette with its in-house developed EBIDs software. Contractors’ electronically submitted information can be loaded into WSDOT software for more efficient and thorough analysis of the bids. This is particularly important when, and if, other contracting strategies are used.

Electronic bidding platforms may attract participants from other states that, particularly for large projects, can increase competitiveness and ultimately optimize bid prices. WSDOT’s “*Gray Notebook - Measures, Markers and Mileposts*”²¹ states that 50 percent of projects have two or fewer bidders. The percentage of projects with three or

²¹ June 30th 2006

more bidders decreased from 69 percent in 2005 to 50 percent in the first two quarters of 2006. The reduction in competition will tend to produce higher prices for WSDOT.

Recommendation #27: **We recommend WSDOT continue investigating electronic bidding systems to streamline the process, increase competition among vendors and reduce paper use.**

WSDOT Response: We agree that electronic bidding is a good business strategy and are actively investigating electronic bidding options and the performance of Electronic Bidding via Transport's EXPEDITE and BID EXPRESS software.

OFM Response: We defer to the department on this finding.

Action Steps and Timeframe:

- Investigate electronic bidding options by March 2008.
- Develop an implementation plan that includes strategies to address best practices, financial impacts, industry input, awareness, and training. Complete by August 2008.

COST MANAGEMENT and TRACKING

Sampled WSDOT Projects Found No Consistency of Total Project Cost Forecasting Decreasing the Ability to Determine the Volume of Change Orders and Other Categories of Cost Growth

Cost management is one of the primary means to achieve project success. Sound financial control of planned and on-going expenditures maximizes return value.

Cost management includes more than cost reporting. It is forward-looking and proactive and requires analysis, forecasting, motivating remedial action, and documenting results. The process is cyclical: creating a plan, monitoring against it, identifying and reporting deviations, initiating corrective action, and controlling against a

revised plan. The goal is to maintain effective proactive project accounting to identify potential future problems and take corrective actions in a timely manner. Cost management gives decision-makers unambiguous, concise cost information anchored in clear understanding of the project definition, as it exists at any given time during the life of an asset. Proper cost management helps avoid surprises. It is the responsibility of a cost engineer or business manager to provide senior management with confidence of the project's financial outcome. The role of a sound cost management strategy is to:

- Provide the owner with timely, reliable project cost information on which to base their project and capital management decisions.
- Assure full recognition of the cost impact for anything that varies from the project budget baseline.
- Recognize and address cost issues as early as possible before they become cost problems.

An effective cost management process applies procedures and techniques to maintain a balance and alignment of scope, user and owner expectations, and budget from project inception. It is a continuous process that:

- Establishes realistic elemental budgets.
- Monitors and analyzes cost through design and construction.
- Ensures use of an accurate and timely reporting process against each element.
- Forecasts future cash flows and costs from an understanding of any potential changes.

It is important for any project that cost forecasting provide an accurate and real-time indication of potential final project cost. The constant availability of such information

provides the project management team with a tool that can be used to make informed decisions regarding project scope, cost, and schedule. The absence of time-sensitive quality data increases project risk.

For each sampled project, we reviewed cost forecasting techniques within the project cost report and examined whether the reports provided sufficient data or standardization of format to support effective cost tracking. In addition, how often the forecast was updated and the accuracy of forecasts were reviewed. We also assessed the composition of available project cost reports and determined whether levels of the cost report provided sufficient data with which to manage and track costs.

Active real-time cost forecasting of total project scope was found to be rare among the projects reviewed - despite this being a component of the Executive Order E 1032.00²².

Some initiatives were evident at the project level to forecast and track costs. We found cost reports on four projects, each with varied formats and approaches to forecasting the cost to complete. Issues that can arise from poor cost forecasting can be seen on one of the aforementioned four projects.

The State Route 18 Maple Valley to Issaquah Hobart Road report document was not set up at the start of construction. The first report provided (dated March 10, 2005) states the

²² issued in July 2005.

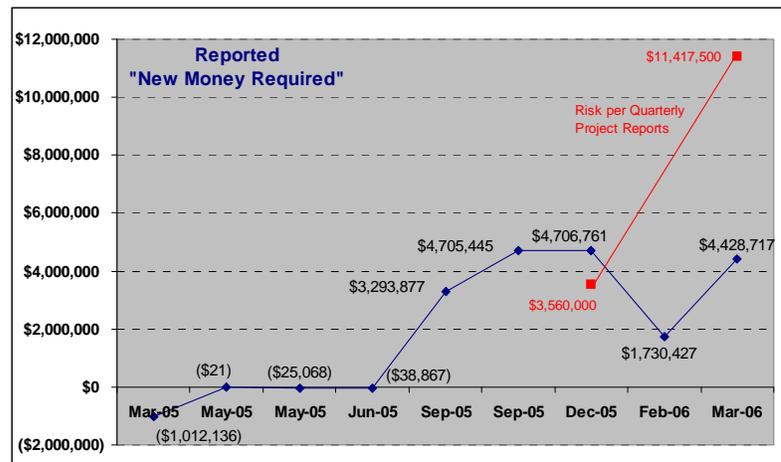
“existing items” are \$65,930,329. This means \$10,025,392 in changes or additional items had incurred before this “Cost to Complete” document was initiated. The Contract was awarded on August 15, 2003.

The report is poorly laid out and is cumbersome for the reviewer to determine the volume of change orders and other categories of cost growth on this project. When asked to clarify how particular figures had been derived, the WSDOT project team found an error that resulted in under-reporting the forecasted overrun by \$252,445.

Forecasting of new funds required to complete has been erratic over the reported period. On March 10, 2005 an under-run of \$1,012,136 was forecast. On September 7, 2005, this increased to an overrun of \$3,293,877 (an increase of \$4,306,013). On February 24, 2006 the forecast decreased from \$4,706,761 to \$1,730,427 then increased again to \$4,428,717 for the following period.

The estimated “potential risk” increased from \$3,560,000 on December 5, 2005 to \$11,417,500 on March 7, 2006. As shown by the chart below, the reported “new money required” decreased from \$4,706,761 to \$1,730,427 then increased to \$4,428,717 over the same period. Some of these items have been, or are in the process of being, incorporated into change orders. The \$11,417,500 included an “*estimated additional exposure of \$7,000,000 for delay damages if the proposed schedule recovery effort was not adopted. The schedule recovery strategy was adopted and*

has been successfully executed, so the additional \$7,000,000 of exposure did not occur.”



Source: Compiled by TKW from WSDOT project files

The continuing escalation of costs and the erratic fluctuation in reported figures of “costs to complete” raise concerns regarding accuracy of current cost forecasts.

For each sampled project, cost forecasting techniques within the project cost report, how often the forecast was updated, and accuracy of forecasts were reviewed. It should be noted that a finding of the JLARC Report 05-03 “Overview of Washington State Department of Transportation Capital Project Management” stated “There should be more emphasis on assessing forecasted costs at both program and project level.” In addition, WSDOT’s Executive Order E 1032.00 states “All project status reports shall include at a minimum the status of the “total” project budget, cost and forecasted cost-to-complete.”

Our review also found no WSDOT standard template providing guidance on the level of total project cost forecasting required. WSDOT's *Gray Notebook* includes "current estimated cost to complete" for projects completed at the end of the report period. However, because cost forecasting is not a standard activity at the project level, no definitive approach could be found to determine how the figures were derived.

An example cost report is found in Appendix B-3. An integrated software solution that suits WSDOT should be developed.

Accurate and consistent cost reporting is the pinnacle of project controls. It provides decision-makers with the necessary facts on which to properly execute a project within budget, which can be translated into "best practices" as witnessed on the most recent components of the Hood Canal Bridge project. Having cost engineers or business managers trained to focus on identifying and tracking project-specific cost trends and forecasts will provide better key performance indicators. Cost engineers or business managers can serve as champions of consistency in reporting across multiple projects statewide.

Recommendation #28:**We recommend WSDOT:**

- **standardize cost reporting practices for all project phases.**
 - **utilize cost engineers or business managers who are responsible for projects on a collective or regional basis.**
-

WSDOT Response:

We agree with the recommendation recognizing the importance of cost forecasting and change management tools. Cost reporting is being standardized and better tools are being provided as part of the PMRS system. In advance of statewide implementation, we have hired business managers and adopted industry-standard cost management, estimating and tracking processes for our larger, high-risk projects. We have developed a modern project management and reporting system to address the type of cost management and tracking issues identified in this audit finding.

OFM Response:

This finding relates to a number of others regarding the need for full implementation of PMRS, and training of project managers. We support WSDOT formalizing its timeline for implementation of the PMRS system and training.

Action Steps and Timeframe:

- See actions and timelines for Recommendation #21.
- WSDOT will submit a work plan and timeline for full implementation of PMRS and project management training to the 2008 Legislature.

**WSDOT Change Order
Logs Varied Extensively in
Format and Level of Detail
Potentially Increasing Risk
of Higher Project Cost**

Although most projects had basic documentation such as a “Change Order Log” or “Change Order Summary,” the documents varied extensively in format and level of detail provided. For example, the Hood Canal Bridge project maintains a performance indicator reflecting the change order management activities (see Appendix B-4). However, other projects do not detail their activities. Change Order Logs are initiated at the site level and vary in format. WSDOT has no standard template for tracking project change orders. Logs are based on individual project initiatives, delivering varied information and formats.

A good change order management system tracks elements such as processing time, open change orders, change orders submitted and approved costs, cumulative costs to date, and forecasted potential changes. Timely processing and agreement of valid requests for changes in costs mitigates the likelihood of claims later in the project. The maintenance of such a document should integrate into the Project Cost Report.

WSDOT should standardize Change Order Logs and incorporate the logs into its suite of required project deliverables. This will increase the effectiveness of change order management and reporting and ensure that cost forecasts are kept current with the latest data.

Change Order Logs could include the following:

- Project number
- Change order number
- Brief change order description
- Date proposal received from contractor
- Date approved/executed by WSDOT
- Value of initial contractor proposal
- Value of approved change order
- Schedule Impact (Y/N). If yes, number of days.
- Change code (see “Categorization of Change Costs” below)
- Remarks, e.g. indicate status of submissions pending approval

Recommendation #29: **We recommend WSDOT standardize Change Order Logs and integrate each into Project Cost Reports.**

WSDOT Response: We agree with the benefit of providing a consistent tool. This will be undertaken as part of the PMRS commitment.

WSDOT's experience does not support the suggestion that this inconsistency potentially increases claims, and has successfully managed disputes. We have not had a formal claim in the recent past.

OFM Response:

PMRS should help formalize change order log change order processes.

Action Steps and Timeframe:

- See actions and timelines for Recommendation #21.

CHANGE COST CONTROL

Change orders can cause disruption to the contractor, reduce productivity, and increase contract costs. To mitigate the effect change orders may have on the construction phase of a capital project, the project planning phase should include all available and practical measures.

The National Electrical Contractors Association (NECA) warns its members: *“do not be deceived by the illusion that all change orders make money²³”* and specifically cites 22 reasons that can *“cause the contractor to experience detrimental conditions and increased costs.”* These include additional management time, redirecting workforce, compressed job schedule, updating ‘as-built’ drawings, and revising and/or updating CPM and other schedules.

Aggressive change order controls assure the owner pays only fair and reasonable prices for changes and that unsubstantiated change orders are rejected. This can include

²³ NECA Manual of Labor Units, Appendix C

maintaining exacting requirements for detailed change order documentation and enforcement of strict approval techniques.

A process with adequate controls allows an organization to determine:

- **Justification:** Are the modifications legitimate changes to the scope of the work that could not have been anticipated in construction or are a legitimate “means and methods” of the work?
- **Appropriateness:** What is the substantiation for the proposed cost? Are market factors adequate? Are productivity issues overstated?
- **Effect:** What is the potential effect on project completion, substantial completion, or out-of-sequence work? What is the potential impact to project quality or required change to specification?
- **Assessment:** Includes performing an overall assessment of the adequacy of documentation and sub-contractor costs and an analysis of delay claims.
- **Independent estimate:** Includes performance of a detailed independent estimate (as appropriate) of the proposed change or bulletin.

Change Order Management

Our audit focused on determining the means by which WSDOT managed change orders and tracked performance of those projects selected for review. Specifically, the types of change orders, the degree of due diligence exercised in the review and approval of change costs, and whether costs represented fair value were assessed. To accomplish a review of this nature, we selected representative documents from each project. The following are key observations from that review:

- No standard template for tracking project change orders. Current logs are based on individual project initiatives. Formats and information provided vary by project.

- Current interpretation of the JLARC categorization of change orders is producing misrepresentative data of WSDOT projects.
- “Independent engineer’s estimates” do not optimize values paid by WSDOT for contractor-proposed change costs. Greater transparency of contractor pricing is required. As required by the Tacoma Narrows Bridge Design-Build Agreement, proposals should be “*supported by sufficient substantiating data to permit evaluation.*” This should not result in any significant added overhead cost to the contractor since the requirement is for the detail behind the submission, not necessarily a change in approach.
- “Independent engineer’s estimates” are not always “independent.” Estimates performed may be prejudiced by the prior submittal of the contractor’s proposal - before WSDOT commences preparation of its “check estimate.” The responses to questionnaires indicate the range of timing and application of “Independent Engineer’s Estimates” and shows that the current process does not validate that WSDOT always receives value-for-money. Furthermore, since WSDOT is a party to the contract, they are technically not “independent.”
- “Force account” pricing methods are producing large adjustments to unit rates.

A summary of change costs against the contract award value is shown in the table below. The “Change $\pm\%$ to Award” provides an indicator as to whether the total value of change costs is within acceptable parameters (for example the Arizona DOT has a target of 10 percent). Bold text is used to indicate those projects that have been completed and have closed construction contracts. “Approved Change” costs are current per the date of the fieldwork for this audit and subsequently may not reflect final actual costs. This table indicates the magnitude of change growth which may be attributable to many factors

or events including design errors, field conditions, contractor-generated changes, third-party requests and others.

<i>Project Title/Description</i>	<i>Engineer's Estimate</i>	<i>Contract Award</i>	<i>Award ±% to Estimate</i>	<i>Approved Change</i>	<i>Change ±% to Award</i>
<i>SR 240, I-182 to Columbia Center I/C</i>	32,815,309	30,473,331	-7.14%	15,000	0.00%
<i>US 12, SR 124 to McNary Pool – additional lanes</i>	5,339,425	5,576,283	4.44%	75,990	1.36%
<i>SR 24, I-82 to Keys Road - additional lanes</i>	31,605,043	33,963,845	7.46%	372,788	1.10%
<i>US 2, Cashmere East Paving</i>	2,675,507	2,587,144	-3.30%	45,122	1.74%
<i>I-90, Moses Lake Area – Bridge Clearance</i>	2,618,093	2,701,190	3.17%	none found	n/a
<i>I-90, I-90 Sunset I/C Modifications Stage 2</i>	42,245,682	39,100,844	-7.44%	26,896,541	68.79%
<i>SR522, Paradise Lake Rd. to Snohomish River</i>	20,962,038	22,180,188	5.81%	3,902,298	17.60%
<i>SR161, Jovita Blvd to S360th St - widen</i>	18,093,644	16,299,956	-9.91%	538,815	3.30%
<i>I-5, 2nd Street Bridge Replacement</i>	9,177,391	9,362,049	2.01%	226,153	2.42%
<i>SR 18 Maple Valley to Issaquah Hobart Road</i>	54,895,831	55,904,937	1.84%	15,414,351	27.57%
<i>SR 5, Burnt Creek to NE 78th Ave</i>	37,968,579	41,107,091	8.27%	5,559,608	13.52%
<i>I-5, Widen I-5 each direction from Salmon Creek to I-205</i>	26,846,012	25,920,957	-3.45%	4,505,110	17.40%
<i>SR500, 112th Ave/Gher Rd Interchange</i>	17,768,796	18,162,105	2.21%	685,252	3.80%
<i>I-90, Argonne to Sullivan,</i>	26,385,260	23,915,738	-9.36%	697,775	2.90%
<i>SR270, Pullman to Idaho St Line - additional lanes</i>	17,221,552	18,090,192	5.04%	17,125	0.10%
<i>I-5, HOV Improvements - South 48th Street to Pacific Avenue</i>	76,470,517	72,869,000	-4.71%	2,998,467	4.10%
<i>SR16, New Tacoma Narrows Bridge</i>	n/a	615,000,000	n/a	13,986,174	2.27%
<i>SR104, Hood Canal Bridge E. half replacement and W. half retrofit</i>	n/a	n/a	n/a	n/a	n/a

Source: Compiled by TKW from WSDOT project files

Costs for the Hood Canal Bridge Project were not included in the previous summary. Due to the unique structure and

history of this project, data from that project would not be comparable to others.

Although change growth has occurred, it does not necessarily equate to WSDOT receiving poor value or inadequate quality. However it does indicate that a premium may have been paid to receive specific services and does highlight an opportunity to WSDOT to understand trends and incorporate each into lessons learned.

**WSDOT Does Not Use
Rate Adjustments Based
Upon a Pro-Rata of Bid
Contract Unit Rates
Resulting in Increased
Costs**

WSDOT uses various methods to validate proposed change costs to assure “value for money.” The following techniques were identified in our review of sample change orders:

- “Independent engineer’s estimates” to validate contractor proposals.
- Reimbursed costs based upon timesheets for actual hours worked and invoices for materials: “Force Accounts.”
- Validation of costs using “Unit Bid History” or “Pay Item” reports. These reports provide a good source to check pricing, but should be used with caution where geographical variances in costs occur.

WSDOT may benefit by introducing standard pricing substantiation that ensures change orders are reconciled to actual costs. The “Force Account” method allows the processing of a change order without the contractor’s consent to cost, however it is not entirely clear how the actual costs are validated and reconciled afterwards.

The goal of contract pricing is to keep as close as possible to the original financial basis. This measurement should

always be used for additions in preference to time and materials where the result is susceptible to pricing. The primary criteria are whether the items are similar in character, conditions of execution, and if total quantity of any item has not been significantly changed to the original bid. If these characteristics apply, the original rates will also apply. If one or more doesn't hold, it should be feasible to determine prices on a pro-rata basis.

WSDOT has used the force account method of calculating lump sum change costs in its projects. Force account methods have also been used to calculate new unit rates where quantities have exceeded 125 percent. Strict and thorough management of change orders and compliance with force accounts have the potential to be a source of cost savings for WSDOT. For example, among the sample reviewed, analysis of three change orders found \$394,361 in opportunity lost had the pro-rata technique been applied instead of the force account approach.

Recommendation #30: **We recommend WSDOT use, where appropriate, rate adjustments based upon a pro-rata of the bid contract unit rates to assure the optimization of the value of changes.**

WSDOT Response: We agree that an extension or pro rata of unit bid pricing is one of the strategies that can and should be used when appropriate. WSDOT supports several different methods for estimating change costs depending on the nature of the work, the risk, the urgency and the nature of the change. Extending unit bid prices, negotiated rates, lump sum costs, or force account rates are all appropriate pricing strategies depending upon the risks and timing of the change. Our

philosophy is to maximize competition and manage the risk appropriately by paying fairly and equitably for the work performed and as well as when changes occur.

We also agree that it is important to clearly understand the contract, the contractor's price and the state's position when negotiating, and that additional training in this area is appropriate. WSDOT's construction office has developed a change order training course and will incorporate methods of pricing and negotiating into the training discussions. WSDOT will continue to emphasize aggressive cost management and change strategies.

OFM Response:

We agree with WSDOT. We suggest WSDOT use a sampling approach on various-sized projects located in different regions to evaluate change orders.

Action Steps and Timeframe:

- WSDOT's project management-related efforts include placing business managers in the project offices and providing cost tracking and estimating software, which will address this recommendation. We are in the preliminary stages of this process, and will review progress after the next construction season (November 2008).
- Based on the results of project samples, WSDOT will take actions as appropriate to improve the cost estimation. Ongoing.

**WSDOT Does Not
Aggressively Manage
Change Orders Resulting
in Increased Project
Costs**

Aggressive change order management is considered a "best practice" in various private sector industries including high tech and petroleum. This is a component of total cost management (TCM) for which private sector owners typically engage suitably qualified and experienced cost engineering practitioner. WSDOT currently does not take a consistent, aggressive approach to change order management and typically uses Professional Engineers (PE's) whose focus is on broad and multiple tasks of

construction management rather than a specialist cost engineer whose is responsible for cost management. The result of not using a specialist is variable levels of cost effectiveness.

The Association for Advancement of Cost Engineering (AACE) defines TCM as *the effective application of professional and technical expertise to plan and control resources, costs, profitability and risk. Simply stated, it is a systematic approach to managing cost throughout the life cycle of any enterprise, program, facility, project, product or service. This is accomplished through the application of cost engineering and cost management principles, proven methodologies and the latest technology in support of the management process.....*

Cost engineering practitioners tend to be:

- specialized in function (e.g., cost estimating, planning and scheduling, etc.);
- focused on either the asset management or project control side of the TCM process; and c) focused on a particular industry (e.g., engineering and construction, manufacturing, information technology, etc) or asset type (e.g., chemical process, buildings, software, etc.).

They may have titles such as cost estimator, quantity surveyor, parametric analyst, strategic planner, planner/scheduler, value engineer, cost/schedule engineer, claims consultant, project manager, or project control lead.

The Royal Institute of Chartered Surveyors (RICS) states *Quantity surveyors are the cost managers of construction.*

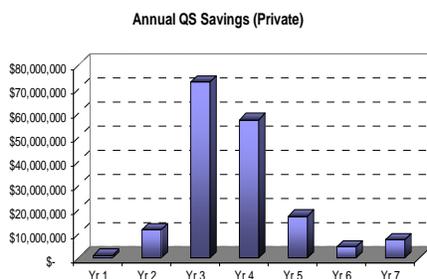
They are initially involved with the capital expenditure phase of a building or facility, which is the feasibility, design and construction phases, but they can also be involved with the extension, refurbishment, maintenance and demolition of a facility. The construction industry is global and extends across all real estate and infrastructure markets. Quantity surveyors work in all sectors of the construction industry worldwide. In real estate this covers residential, commercial, industrial, leisure, agricultural and retail facilities. In infrastructure it covers roads, railways, waterways, airports, sea ports, coastal defences, power generation and utilities. Quantity surveyors may also work in process engineering, such as chemical engineering plants or oil rigs. They must understand all aspects of construction over the whole life of a building or facility. They must have the ability to manage cost effectively, equating quality and value with individual client needs.

The International Cost Engineering Council describes Cost Engineering (CE) and Quantity Surveying (QS) function as *to provide independent, objective, accurate, and reliable capital and operating cost assessments usable for investment funding and project control; and to analyze investment and development for the guidance of owners, financiers and contractors.*

CE and QS include:

1. estimates of capital or asset costs including development costs;

2. estimates of operating and manufacturing costs through an asset's life cycle;
3. risk assessment and analysis;
4. trending of scope and cost changes;
5. decision analysis;
6. financial analysis (e.g. net present value, rate of return, etc);
7. project cost control;
8. appraisals of existing assets;
9. project analyses, databases, and benchmarking;
10. planning and scheduling;
11. siting studies, etc.;
12. productive and investment needs assessment;
13. facility management needs assessment;
14. project feasibility and budget assessment;
15. cost management;
16. procurement management;
17. contract administration;
18. whole-life appraisals;
19. quality audits;
20. value management; and
21. dispute resolution



The CE or QS provides information by:

1. estimating costs and analyzing risk;
2. trending and controlling costs and assessing design; and
3. documenting costs

These are interdependent and feed back to each other and include:

1. analyzing cost;
2. assessing design;
3. assessing risks;
4. trending costs;
5. advising clients;
6. managing cash flows;
7. preparing feasibility analyses; and
8. assessing life-cycle costs

Experience in the private sector has shown savings on individual projects of up to 10 times the cost of deploying a

cost engineer or quantity surveyor. One private sector owner achieved \$172 million in cost savings over multiple projects at a cost of \$36 million during a seven year period. The cost included estimating and procurement duties as well as construction cost management. The utilization of specialist cost engineering practitioners or quantity surveyors as members of the construction management team has a number of benefits to owners;

- hard dollar savings in negotiated change costs
- cost avoidance (soft dollar savings)
- management or support of project cost report, including forecasting
- accumulation of field generated cost and quantity data to support budget estimating of future projects
- sharing of lessons learned; can lead to cost avoidance measures being implemented on future projects

WSDOT has recognized the value of cost engineering and, for selected projects, retained CE's. This approach on the Tacoma Narrows Bridge resulted in a change order rate of approximately 2% - less than one-third that of the average rate for other WSDOT projects.

The use of cost engineers to aggressively manage change costs on applicable projects (>\$10 million) can have a major impact on the final cost of those projects. The audit team used four approaches to approximate potential savings. Using the most conservative approach, over a fifteen year, \$15 billion capital program and a 7.35% rate of change, 4.72% (\$36 million) in potential savings may be achievable.

The value of cost engineering has been demonstrated by private sector best practices as well as by the use of WSDOT on selected projects. WSDOT should extend this practice to all applicable projects.

Recommendation #31: **We recommend WSDOT use, where appropriate, cost engineers or quantity surveyors to aggressively manage all change costs during construction, and maximize the cost-benefit of deployment through integrating activities such as cost report management and budget estimating.**

WSDOT Response:

We believe that we aggressively manage change orders, although we do agree with the recommendation that we can improve our process. WSDOT has demonstrated that managing construction costs and determining work items with a higher risk of cost increase is a priority.

The auditors propose achieving savings by using an extension of unit bid prices for all work done through change orders. This approach focuses on achieving savings once the project has already begun. We believe we currently achieve greater savings by focusing on reducing the total cost of the project at the beginning. With our current approach, we not only aggressively manage change orders, but also let our contractors know upfront that we will pay fairly and equitably for work performed, including change orders. We believe this philosophy results in lower project bid prices, as opposed to mandating one method to price change orders, which would likely result in much higher initial bids from contractors to cover potential risks of project changes.

We will implement new project management systems as observed by the auditors on our larger projects including the Tacoma Narrows Bridge, Hood Canal Bridge, and Alaskan Way Viaduct projects. These projects currently have project controllers and business managers to help manage cost issues and provide the reporting/forward forecasting as suggested. We have invested significant time and energy into providing training and tools to address this issue. Our Project Engineers are trained to be

aggressive in their active management of construction cost changes. The regions and headquarters play a role in oversight of every change order.

Tools that are currently being used include the Cost Estimate Validation Process (CEVP), Cost Risk Assessment (CRA), Risk Matrices, Project Management Plans, Schedule Management, and Value Engineering.

OFM Response:

With appropriate training, tools, and staffing on higher risk projects, WSDOT engineers and project managers can provide the same quality assurance and oversight as cost engineers or quantity surveyors.

Action Steps and Timeframe:

- We have recently begun integrating business managers in our project offices and will continue to do so. Refer to SPMG Timelines under Recommendation #21. WSDOT is in the preliminary stages of this process, and will review progress after the next construction season (November 2008).

Auditor Response:

We agree that WSDOT has demonstrated effective controls on mega projects such as the Hood Canal Bridge and Tacoma Narrows Bridge. However, results on mid-sized projects remain a cause for concern. We found no evidence during the audit (and no evidence was presented by WSDOT) to support its view that its change order management strategy leads to lower bid prices. When contract quantities exceed 125%, it is accepted by WSDOT that the renegotiated bid price should also increase. This is without cognizance to efficiencies and economies of scale that greater quantities often bring. This results in an inequitable price adjustment for the taxpayer. Given the volume of WSDOT projects, this category should not be overlooked for improvement.

Project Engineer expertise and experience differ from those skills associated with Cost Engineers and Quantity Surveyors. We do not believe that current WSDOT engineers and project managers can provide the same quality assurance and oversight as Cost Engineers or Quantity Surveyors as was evidenced by the hiring of those skill sets for the Hood Canal Bridge and Tacoma Narrows Bridge projects.

**WSDOT's
Categorization of
Change Costs Limits
the Ability to
Effectively Track and
Manage**

The categorization of change orders under JLARC recommendations was found to be misleading. Our review included the “Avoidable” or “Value Added” categorization of change orders that was initially recommended in the 1998 JLARC Audit Report. Based on the samples we reviewed, this categorization requires modification or elimination to provide WSDOT with more representative project performance indicators. Without further explanation, statements such as “38 percent (of change orders) were of the “avoidable/no-value added” nature” arguably creates the perception that WSDOT is unnecessarily issuing this proportion of change orders to contractors. On further analysis, we found that this conclusion was confusing. In addition, in many of the samples reviewed, we found “avoidable” interpreted as being symptomatic of an imperfect design.

For example, a change order for State Route 500 Northeast 112th Avenue/Gher Road Interchange was identified as a credit of approximately \$89,000 but was not recognized by the project as being “value added.” The credit was for a cost-effective solution that, while maintaining expected project performance, improved value to the taxpayer. What was it?

WSDOT should enhance its system of identifying change order sources. Improved tracking of sources of specific changes will generate data WSDOT management can use to determine whether occurrences are within acceptable limits; possible areas for improvement in project delivery;

whether corrective actions may be needed; and at project completion, lessons learned. Data should be available for detailed review at project and state-wide levels and increase the effectiveness of executive management oversight.

The table below contains examples of source categories currently in place on the Hood Canal Bridge Project and are featured on change order checklists seen on other projects. This categorization is an example of best practices and can be modified, if necessary, to develop a standard template for WSDOT statewide projects.

<i>Code</i>	<i>Code Title</i>	<i>Description</i>
<i>AP</i>	Administrative Problem	There is a problem with administrative functions that does not relate to physical work
<i>BC</i>	Budget Constraints	Deletion or modification was initiated because the cost of the project was exceeding authorized funding limits
<i>CC</i>	Changed Condition	Site condition differed from design expectations and Section 1-04.7 applies
<i>CE</i>	Contractor Error	Contractor made a mistake in performing the work or caused some damage that needs repair
<i>CS</i>	Claim Settlement	Entitlement was found for the Contractor in a claim situation
<i>DR</i>	DRB Decision	A Disputes Board finding created a need for a Change Order
<i>EE</i>	Const. Engineer Error	A State employee made a mistake that created a need for repair, modification, or costs adjustment
<i>EJ</i>	Engineer's Judgment	A change, usually minor, that is a good idea. Makes the project work better. May be a Contractor suggestion
<i>HZ</i>	Hazardous Material	Encountered during the project. Not covered by contract
<i>IP</i>	CRIP	Contractor's Cost Reduction Incentive Proposal
<i>MP</i>	Interim Main. Problem	Temporary Maintenance is needed during the project
<i>PI</i>	Plan Error – Info.	Plans contain a mistake that resulted from the designer working with insufficient information
<i>PM</i>	Plan Error – Mistake	Plans contain a mistake that, given the information available to the designer, should not have been made
<i>SC</i>	Spec. Conflict/ Ambiguity	There is a conflict or ambiguity between specifications or among specifications and plans
<i>TP</i>	Third Party Request	Initiated by any party other than WSDOT or the Contractor. For example: Local or Regulatory agencies, Private parties
<i>UC</i>	Unanticipated Condition	A situation, different from that assumed during design, but not qualifying under Section 1-04.7

Source: Hood Canal Bridge Project Files

Recommendation #32: We recommend WSDOT use change source categories to provide a basis for understanding changes on all projects.

WSDOT Response: We agree. We are currently pursuing several efforts in this area. We are developing changes to our source codes and the process we use to collect the information on changes. These efforts, along with the search capabilities from our new Data Mart tool, will allow the department to better identify systematic problems. Our evolving lessons learned data base is also a convenient tool for sharing this information with project designers. In addition, SPMG efforts will provide better access to change-related data.

OFM Response: We agree and reiterate that training is critical to success.

Action Steps and Timeframe:

- The new and improved system for categorizing change orders is scheduled to be in place by the end of February 2008. Headquarters construction staff will be introducing the system to the regions at the regional construction conferences in February. A follow up will be performed as part of an annual review in November 2008.

WSDOT’s Independent Engineer’s Estimates Do Not Optimize Value of Change Orders Limiting the Ability to Determine Fairness and Reasonableness of Prices

“Independent Engineer’s Estimates” do not optimize values paid by WSDOT for contractor-proposed change costs. Greater transparency of contractor pricing is required. Contractors’ proposals should be “*supported by sufficient substantiating data to permit evaluation,*” as specified by the Tacoma Narrows Bridge design-build agreement. This should not result in any significant added overhead cost to the Contractor since the requirement is for the detail behind the submission, not necessarily a change in approach. WSDOT needs to understand the components that make up the price it is paying to determine whether the price is fair

and reasonable and whether the contractor has captured all aspects of the scope WSDOT expects to be performed.

Recommendation #33: **We recommend WSDOT require greater price transparency from contractors for proposed change costs.**

WSDOT Response: We agree with the recommendation and apply it to proposed change orders when it is appropriate. WSDOT's philosophy is to give the contractor the incentive to incorporate and manage the changed work in a timely and efficient manner. Depending upon the cost, nature and urgency of the change, it may be appropriate to require the contractor to provide detailed documentation with regard to their costs. Exercising this practice for every change would not be cost effective. WSDOT believes that the engineer's estimate is a good and appropriate tool to use for estimating the type and value of changed work. We also support the need to gather information and discuss it with contractors when the impacts and approach to new work is difficult to determine.

OFM Response: The proposed approach of sampling contracts in the action steps for Finding #30 could also be used to gather value of change order information.

Action Steps and Timeframe:

- We have the ability to ask for this information under our current contract structure and do so when it is appropriate. Training on this subject is currently being provided as part of the Headquarters change order training. Ongoing.

PERFORMANCE MEASURES and INDICATORS

**WSDOT's Current
Performance Measures
Could be Enhanced to
Provided Additional
Indicators of Performance**

Performance measures provide an owner with data that can be used in the project planning and decision-making process and identifying areas for corrective actions and improvements while measuring progress against targets.



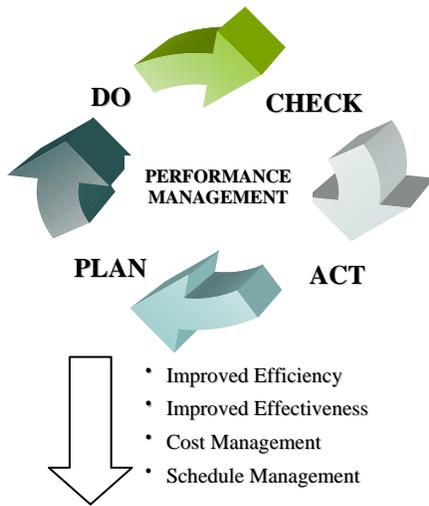
Performance measurement is a valuable tool to help owner's achieve goals and maintain standards.

Performance measurement is widely used across the United States by various transportation agencies and is recognized by the U.S. Department of Transportation, the Federal Highway Administration and the federal government. Transportation mobility, safety, and training are among the many topics that agencies currently measure. Public opinion surveys are used to measure performance where applicable.

In measuring performance, WSDOT states that “*what gets measured gets managed.*” The Association for Advancement of Cost Engineering (AACE) through its Total Cost Management (TCM) framework recognizes “*you can't manage what you can't measure*” and “*whatever you measure tends to improve.*”

WSDOT has evaluation criteria that measures construction highlights in terms of cost growth for design, contract administration, schedule, and cost. In addition, WSDOT provides excellent public reporting through its “*Measures, Markers and Milestones*” (Gray Notebook) which is aimed at “*supporting WSDOT's “no surprises” reporting focus.*”

The continuous cycle of “Plan, Do, Check, Act” is a familiar process for quality management. This process is an essential component of performance management that strives for continuous improvement. WSDOT's ‘*Project Management On-Line Guide*’ also recognizes the value of performance measurement and strives to achieve



continuous improvement - not only to maintain, but to be, “best in class.”

The identification of key performance indicators (KPI) at the project delivery level will help WSDOT achieve strong project controls and provide management with indicators that can identify trends before they affect the project. In addition, accumulation of performance data can help set targets for new projects and contribute to development of project controls procedures. Performance data will create internal benchmarks and can be reported at project, regional, and state levels and can result in the identification of areas for improvement. This continuous cycle (Plan, Do, Check, Act), at left, is at the core of the AACE’s TCM framework.

Examples of performance indicators at project level can be found on the Hood Canal Project. For each category identified in the Project Management Plan, (including safety, quality, environmental compliance, change management, office health and communication), goals are set and performance measure data, standards, tools, and procedures and corrective actions are outlined. This detailed plan is an example of best practice and is an important tool to control project direction thus avoiding surprises and subsequent crisis management.

The following are examples of key performance indicators that should be considered by WSDOT. Any reported variances (or negative trending) against pre-determined

acceptable limits for occurrence and agency targets require assessment for corrective actions.

- Change order processing.
- Change order source categories.
- RFI and RFC status.
- Ratio of current contract value to award value i.e. extent of change.
- Duration of contract extensions.
- Source of contract extensions.

These indicators should integrate with continuous improvement practices. Performance indicators indicate potential areas for improvement, and if monitored during the project cycle, are tools to mitigate crisis management. Executive management needs consistent reporting to enable effective interpretation, appropriate decision-making and critical follow up. Consistent reporting can reveal trends that management needs to address or provide assurances that performance targets are being met.

Recommendation #34: **We recommend WSDOT continue to develop and maintain project performance indicators that can be monitored at state and project levels.**

WSDOT Response: We agree. In addition to current efforts as noted in the report, SPMG will move us ahead in this area.

OFM Response: OFM has statutory responsibility for producing an attainment report that reflects the progress we are making in preservation, safety, mobility, environment, and stewardship. This report will document system performance and be provided to the Legislature on a biennial basis.

Action Steps and Timeframe:

- Continue to track and evaluate performance measures as reported in the *Gray Notebook* and GMAP.
Ongoing.



Appendix



**Washington State
Department of Transportation**

Construction Management/Highway Maintenance Performance Audit

A. Maintenance Operations/Revenue Opportunities

A-1 Relevant Statutes and Regulations

23CFR752 - Safety Rest Area Policy and Definitions

- 20USC107a (a) 5 and 23USC111(b) – Randolph-Sheppard Act
Vending Services and Vending Machines including vending services and machines in public buildings, property purchased and safety rest areas using federal funds. Specifically, the Act requires that priority must be given to licensed blind people (Department of Services for the Blind).
- 23USC111(a) – Use of Airspace Leases and Access Allowed from the Interstate.
The U.S. Secretary of Transportation (Federal Highway Administration –FHWA) prohibits SRAs on the Interstate System from providing additional access to or from SRAs without prior approval and further requires that states do not permit automobile service station or commercial establishments for serving motor vehicles to be constructed or located in an Interstate Highway right-of-way. A state may lease space within the right-of-way as long as vehicle access is not required or allowed.

The operations and management of SRAs, as well as the distribution of any revenues generated, are regulated by the state of Washington. Relevant state laws and rules include: (4)

RCW 47

- RCW 47.18.220 – Little Randolph-Sheppard Act
The state shall give priority to licensed blind persons to operate vending facilities and machines in public buildings.
- RCW 47.12.120 – Lease of Highway Land or Air Space
The department is authorized to rent or lease lands (including improvements or air space) used or to be used for limited access and conventional highways, but not presently needed.
- RCW 47.12.125 – Disposition of Land or Air Space Lease Proceeds
All proceeds to the state of Washington under provisions of RCW 47.12.120 shall be deposited in the department’s Right of Way Revolving Fund.
- WAC 468-30-110 (2) – Non-highway use of airspace on state highways
All airspace leases are subject to approval by the Federal Highway Administration.
- RCW 47.52 and WAC 468-58 – Highway Access
These rules define the state’s limited access highway route and relevant restrictions.

**2006 Maintenance Activities
Priority and Level of Service Matrix**

STATEWIDE MAP PRIORITIES					Policy Objectives										Total Priority		
					05-07 Plan Dollars (Millions) (Aug. 2006)	2005 LOS Delivered	05-07 LOS Target	Safety of Traveling Public and Employees	Operate the Highway System and Keep the Road Open	Meet Environmental Responsibilities	Maintaining the Infrastructure	Address Legal Mandates Other than Environmental (Including Torts)	Contribute to Comfort, Aesthetics or Convenience				
Num.	MAP Activity				10	9	7	7	7	7	2						
4B1	Movable & Floating Bridge Operations	\$6.6	B+	B+	6	60	9	81	6	42	9	63	9	63	6	12	321
9B2	Disaster Operations	\$1.5			9	90	9	81	9	63	9	63	3	21	0	0	318
6B1	Traffic Signal System Operations	\$9.7	C	C	9	90	9	81	3	21	6	42	9	63	3	6	303
5B1	Snow & Ice Control Operations	\$58.4	A-	C+	9	90	9	81	6	42	0	0	9	63	9	18	294
4B2	Keller Ferry Operations	\$1.1	B	B	3	30	9	81	3	21	9	63	9	63	6	12	270
4B3	Urban Tunnel Systems Operations	\$3.4	B	B	3	30	6	54	3	21	9	63	9	63	6	12	243
4A2	Structural Bridge Repair	\$8.7	C	C	6	60	3	27	6	42	9	63	6	42	3	6	240
6A4	Regulatory/Warning Sign Maintenance	\$2.5	C-	C+	9	90	6	54	0	0	3	21	9	63	6	12	240
2A5	Slope Repairs	\$4.4	A	B	6	60	6	54	6	42	6	42	3	21	3	6	225
6B3	Intelligent Transportation Systems(ITS)	\$4.8	B-	B-	6	60	9	81	3	21	6	42	0	0	9	18	222
2A3	Maintain Catch Basins & Inlets	\$3.8	B+	B	6	60	6	54	6	42	6	42	3	21	0	0	219
1A1	Pavement Patching & Repair	\$21.0	A-	B+	6	60	3	27	3	21	9	63	6	42	3	6	219
4A1	Bridge Deck Repair	\$1.5	B+	B-	6	60	3	27	3	21	9	63	6	42	3	6	219
6A7	Guardrail Maintenance*	\$1.3	A	A	9	90	3	27	0	0	6	42	6	42	3	6	207
6A1	Pavement Striping Maintenance	\$8.8	A-	A-	9	90	6	54	0	0	0	0	6	42	9	18	204
6A2	Raised/Depressed Pavement Markers	\$1.9	B	B	9	90	6	54	0	0	0	0	6	42	9	18	204
3A4	Control of Vegetation Obstructions	\$7.3	A-	B-	9	90	3	27	0	0	3	21	6	42	6	12	192
7B1	Rest Area Operations	\$10.1	B	B	3	30	3	27	6	42	6	42	3	21	9	18	180
1A4	Sweeping and Cleaning	\$7.0	A-	B+	3	30	3	27	9	63	3	21	3	21	9	18	180
2A1	Maintain Ditches	\$10.1	B+	B	3	30	3	27	6	42	6	42	3	21	3	6	168
6B2	Highway Lighting Systems	\$10.2	A	B+	6	60	3	27	0	0	6	42	3	21	9	18	168
6A6	Guidepost Maintenance	\$2.4	C	C-	6	60	3	27	3	21	3	21	3	21	9	18	168
1B1	Safety Patrol	\$6.1	B-	C+	9	90	3	27	0	0	3	21	3	21	3	6	165
2A2	Maintain Culverts	\$5.2	C+	C	3	30	3	27	6	42	6	42	3	21	0	0	162
6B4	Permits/Franchises	\$2.7			3	30	3	27	3	21	3	21	9	63	0	0	162
6A3	Pavement Marking maintenance	\$2.5	B-	C-	6	60	3	27	0	0	0	0	9	63	6	12	162
3A2	Noxious Weed Control	\$5.0	A	B	0	0	0	0	9	63	3	21	9	63	3	6	153
1A3	Shoulder Maintenance	\$3.1	B	C+	3	30	3	27	3	21	6	42	3	21	3	6	147
6A5	Guide Sign Maintenance	\$4.0	B	B-	3	30	6	54	0	0	3	21	3	21	9	18	144
2A4	Maintain Detention/Retention Basins	\$0.5	C	C	0	0	0	0	9	63	3	21	6	42	0	0	126
4A3	Bridge Cleaning & painting	\$1.9	B+	C	0	0	0	0	9	63	6	42	0	0	6	12	117
3A3	Nuisance Vegetation Control	\$8.8	A	B-	0	0	0	0	6	42	3	21	3	21	9	18	102
3A5	Landscape Maintenance	\$4.3	C	C-	0	0	0	0	3	21	3	21	3	21	9	18	81
1A2	Crack Sealing	\$1.0	C	C-	0	0	0	0	3	21	6	42	0	0	0	0	63
3A1	Litter Pickup	\$6.3	D	D	0	0	0	0	3	21	0	0	3	21	9	18	60

B. Project Delivery and Capital Project Management

Low Bid	Award of contract to the lowest responsible bidder. The successful contractor typically prepares its bid based on a complete set of plans and specifications that precisely defines the project to be built. This is the most common strategy used by public agencies.
Design-Build	Design-Build projects overlap design and construction activities, thereby saving time. This strategy is currently being employed by WSDOT and has also been successfully used in both Colorado and Utah.
A + B Bidding	A + B Bidding and incentives reduce construction time traffic delays. This approach has been used by both Oregon and North Carolina. WSDOT states that this method of awarding a contract has been used on a limited basis - "Application is limited to projects that lend themselves to innovation and provide a demonstrated time savings benefit. It has been used on five contracts between 2001 and 2003. Overall individuals involved considered the application of A + B a success."
Lane Rentals	Lane Rentals minimize traffic impacts during construction. This technique has been used on the Indiana I-70 Corridor improvements and has been utilized in the UK to encourage schedule performance. WSDOT has not used Lane Rentals in the recent past.
Interim Completion Dates	Interim Completion Dates allows duration concerns of local agencies, businesses, and public to be addressed. Interim completions are use on contracts that have an intermediate milestone date that is important to WSDOT. They are commonly associated with bridge or road closures. This has been a good method of describing the owner's intent to the bidder and they schedule the work accordingly.
Flexible Start Date	Flexible Start Date allows the contractor some discretion when working days start. WSDOT clarifies that "this technique has been successfully used on many WSDOT contracts. Generally this provision is used to accommodate delivery of materials or fabricated items with a long lead time but it can be used for other reasons as well. The flexibility is appreciated by the project office and the contractor".
Lump Sum Traffic Control	Lump Sum Traffic Control is used to streamline all traffic control unit bid items into a single item. WSDOT records indicate that lump sum traffic control has been used in 138 contracts. WSDOT's guidance for application of lump sum traffic control states: "This type of payment should only be used on the simpler jobs, typically

single-season, for which the entire project duration and sequence of activities can be readily visualized. The bidder must have a reasonable opportunity to predict the necessary temporary traffic control measures and prepare a responsible estimate. The designer should be able to do the same." WSDOT claim "anecdotal evidence indicates that it is working well as applied. Traffic control is predictable on these types of contracts and therefore is biddable. The contractor has the incentive to be efficient and feedback has indicated that they have done so".

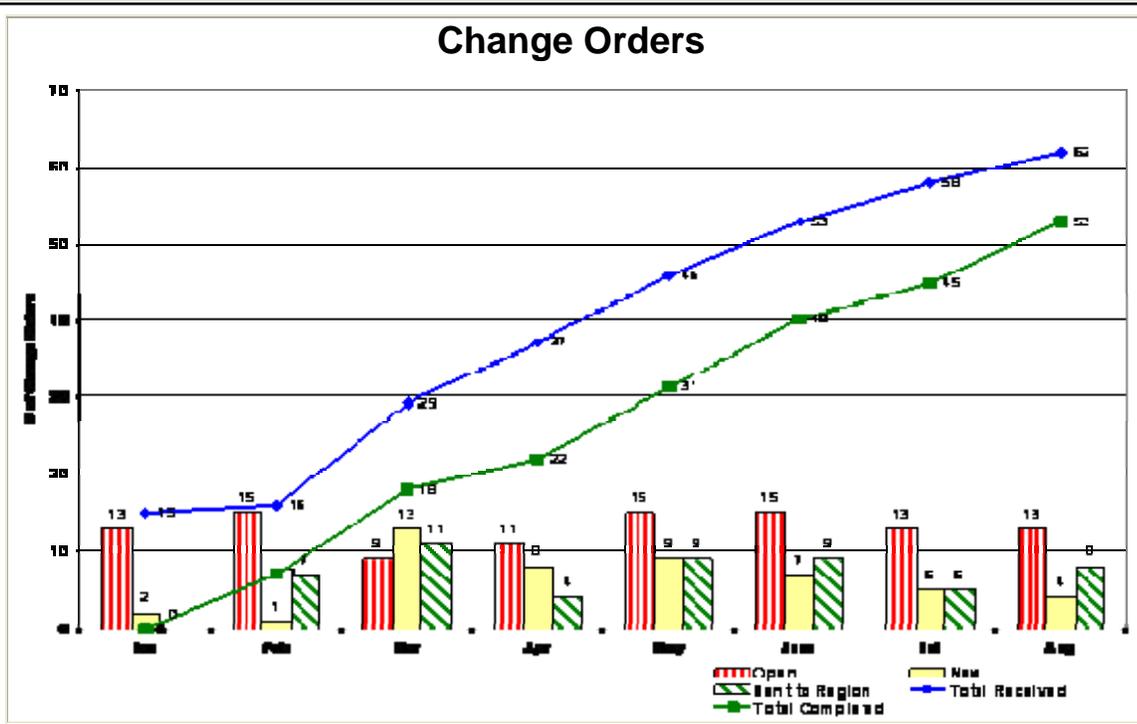
<i>Traffic Control</i>		<i>SR500, 112th Ave/Gher</i>	<i>SR18, Maple Valley</i>	<i>SR161, Jovita Blvd</i>	<i>I-90 Sunset I/C</i>
<i>Change Order</i>	Reference #	#069	#102	#017	#087
	Value	\$189,282	\$780,331	\$504,000	\$1,089,254
<i>Planned Quantity</i>	Labor Hrs	4,000	18,000	400	2,380
	Supervisor Hrs	1,500	4,812	n/a	945
<i>Total Quantity</i>	Labor Hrs	2,881	16,182	14,000	16,764
<i>Increase</i>	Supervisor Hrs	1,388	3,188	n/a	5,335
<i>Total % increase on Planned Hours</i>	Labor	72.0%	89.9%	3,500%	704.4%
	Supervisor	92.5%	66.3%	n/a	564.6%
<i>Contract Rate</i>	Labor/Hr	\$37.00	\$40.00	\$39.00	\$40.00
	Supervisor/Hr	\$37.00	\$42.00	Lump Sum	\$40.00
<i>Adjusted Rate</i>	Labor/Hr	\$43.10	\$55.45	\$36.00	\$47.32
	Supervisor/Hr	\$46.91	\$66.28	n/a	\$51.33
<i>Total % increase on Contract Rate</i>	Labor	16.5%	36.8%	(7.7%)	18.3%
	Supervisor	26.8%	57.8%	n/a	28.3%
	<i>Average increase in hours</i>	86.5%			
	<i>Average increase in Unit Rate</i>	20.6%			

Source: Compiled by TKW from WSDOT Files

WSDOT		Detailed Project Cost Report							F+G Epoch
Code / Description	Original Budget A	Revised Budget B	Forecast C	Variance D (B - C)	Future Commit E (C - F)	Committed F	Accrual G	Expended H	
XL9999 - Road Widening Project									
CN - Construction Costs									
3935 - PVC Pipe for Water Main 8in. Diameter	97,270	97,270	108,933	-11,663	11,663	97,270	95,824	95,824	
4115 - Traffic Barrier	13,200	13,200	26,400	-13,200	13,200	13,200	26,400	26,400	
4117 - Pedestrian Barrier	66,000	66,000	16,500	49,500	-49,500	66,000	33,000	33,000	
4139 - Conc. Class 4000 for Retaining Wall	270,000	270,000	270,000			270,000	250,000	250,000	
4141 - Epoxy-Coated St. Reinf. Bar for Retaining Wall	291,384	291,384	503,110	-211,726	211,726	291,384	503,110	503,110	
4150 - St. Reinf. Bar for Retaining Wall	135,000	135,000	175,550	-40,550	40,550	135,000	165,000	165,000	
4472 - Noise Barrier Wall	622,000	622,000	622,000			622,000			
5761 - Asphalt Conc. Pavement CL. Superpave 1/2 In.	4,642,020	4,642,020	4,404,420	237,600	-237,600	4,642,020	2,187,911	2,187,911	
6442 - Compost Type 1	56,100	56,100	56,210	-110	110	56,100	32,546	32,546	
6489 - Temporary Water Pollution/Erosion Control	78,000	78,000	78,000			78,000	39,540	39,540	
6791 - Perm. Geosynthetic Wall Single Slope Barrier	495,040	495,040	495,040			495,040	144,464	144,464	
PE - Project Management	550,000	550,000	538,885	11,115	63,219	475,666	289,044	289,044	
Subtotal for CN - Construction Costs	7,316,014	7,316,014	7,295,048	20,966	53,368	7,241,680	3,766,839	3,766,839	
PC - Project Costs									
01 - Preliminary Estimates & Schedules	125,000	125,000	113,999	11,001		113,999	113,999	113,999	
08.04 - Consultant Management	230,000	230,000	229,595	405	40,942	188,653	178,803	178,803	
19 - Environmental Permits	75,000	75,000	78,000	-3,000		78,000	78,000	78,000	
23 - Structure Design	250,000	250,000	234,489	15,511		234,489	234,489	234,489	
24 - Roadway Design	350,000	350,000	284,999	65,001		284,999	284,999	284,999	
29 - Right of Way Acquisition	1,500,000	1,500,000	1,697,979	-197,979		1,697,979	1,697,979	1,697,979	
31 - Traffic Design	150,000	150,000	132,299	17,701		132,299	132,299	132,299	
An F+G Information Solution									
								Page 1 of 2	

WSDOT		Detailed Project Cost Report							F+G Epoch
Code / Description	Original Budget A	Revised Budget B	Forecast C	Variance D (B - C)	Future Commit E (C - F)	Committed F	Accrual G	Expended H	
39 - Construction Permits	25,000	25,000	23,997	1,003		23,997	23,997	23,997	
Subtotal for PC - Project Costs	2,705,000	2,705,000	2,795,357	-90,357	40,942	2,754,415	2,744,585	2,744,585	
Subtotal for XL9999 - Road Widening Project	10,021,014	10,021,014	10,090,405	-69,391	94,310	9,996,095	6,511,404	6,511,404	
Grand Total	10,021,014	10,021,014	10,090,405	-69,391	94,310		6,511,404	6,511,404	
An F+G Information Solution									
								Page 2 of 2	

Hood Canal Bridge Performance Indicators



WSDOT Monthly Change Order Status through August 31, 2006

Definition:

1. Open – Change orders carried forward from the previous month.
2. Received – New change orders initiated during a given month.
3. Completed – Change orders sent to Region for processing and final execution.

Status

There are a total of sixty-two (62) Change Orders, with fifty-three (53) submitted to Region from January through August 2006.

Successes

With the addition of staff to the HCB Business Group, we continue to improve our processes and turn around times with the setting of monthly goals through prioritizing outstanding change issues and the needs of the project.

Issues/Concerns

Of the current nine open change orders, three are on hold awaiting proposals, but are not pressing as they relate to work in future cycles. Change Order 164 Materials Escalation is pending submittal of additional documentation by K-G. Delays in submittal of this information could result in additional costs.

In addition to the open change orders illustrated above there are twenty-one (21) change management issues that are being evaluated as possible changes to the contract.

WSDOT Construction Management/Highway Maintenance Performance Audit

I-900 Element	Consumable Inventory					Hot Mix Asphalt					Maintenance Operations/Revenue Opportunities									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Identification of cost savings.	X						X				X									
2. Identification of services that can be reduced or eliminated.				X																
3. Identification of programs or services that can be transferred to the private sector.													X							
4. Analysis of gaps or overlaps in programs or services and recommendations to correct them.	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	
5. Feasibility of pooling the entity's information technology systems.	X														X					
6. Analysis of the roles and functions of the entity and recommendations to change or eliminate roles or functions.		X		X																
7. Recommendations for statutory or regulatory changes that may be necessary for the entity to properly carry out its functions.												X								
8. Analysis of the entity's performance data, performance measures and self-assessment systems.	X	X	X	X	X	X	X			X	X	X	X	X	X		X		X	X
9. Identification of best practices.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
I-900 Element	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

	Project Delivery													
I-900 Element	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1. Identification of cost savings.											X	X		
2. Identification of services that can be reduced or eliminated.														
3. Identification of programs or services that can be transferred to the private sector.														
4. Analysis of gaps or overlaps in programs or services and recommendations to correct them.		X	X	X	X	X	X	X	X	X	X	X	X	X
5. Feasibility of pooling the entity's information technology systems.						X								
6. Analysis of the roles and functions of the entity and recommendations to change or eliminate roles or functions.											X			
7. Recommendations for statutory or regulatory changes that may be necessary for the entity to properly carry out its functions.			X											
8. Analysis of the entity's performance data, performance measures and self-assessment systems.	X	X		X	X	X								X
9. Identification of best practices.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
I-900 Element	21	22	23	24	25	26	27	28	29	30	31	32	33	34

D. Legislative Actions

The following recommendation provided in this report requires legislative action in support of implementation.

Legislative Action

LOW BID RESTRICTIONS

Recommendation #23: We recommend WSDOT pursue legislative authority to use a performance contracting strategy for applicable projects.

We recommend the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.



STATE OF WASHINGTON

January 4, 2008

The Honorable Brian Sonntag
Washington State Auditor
P.O. Box 40021
Olympia, WA 98504-0021

Dear Auditor Sonntag:

Thank you for the opportunity to respond to the *Construction Management/Highway Maintenance Performance Audit*. We reviewed the report and have provided our formal response in the attached document.

Like Governor Gregoire, we are committed to performance accountability. Since 2001, the Department of Transportation (WSDOT) has reported quarterly on agency and transportation system performance. We use these performance results to take action and make improvements within existing resources.

We appreciate the acknowledgment of our maintenance employees' commitment to continuous improvement and our program's status as a national leader. We also thank you for acknowledging the successful groundwork established through the agency's Strategic Program Management Group in improving construction project management.

The audit's recognition of the need for additional investment in highway maintenance is helpful, and consistent with our response to the performance audit on congestion issued in October 2007. Our response highlighted the importance and priority of maintaining and preserving our state transportation infrastructure.

We have developed an action plan that addresses the audit issues and recommendations. Progress on our action plan will be tracked at the Governor's Government Management Accountability and Performance (GMAP) forums and through various reports to the Legislature. We look forward to working with the Governor and members of the Legislature as they further evaluate the audit recommendations.

Sincerely,

Paula J. Hammond, P.E.
Secretary of Transportation

Victor A. Moore, Director
Office of Financial Management

Enclosure

cc: Cindy Zehnder, Chief of Staff, Office of the Governor
Joyce Turner, Deputy Chief of Staff, Office of the Governor
Larisa Benson, Director, Government Management Accountability and Performance

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

This document was prepared in response to the audit report delivered to the Washington State Department of Transportation (WSDOT). We have provided a coordinated response from both WSDOT and the Office of Financial Management (OFM) for each issue. Action steps are by WSDOT unless otherwise noted. Our intent is that this organization will make it easier to copy and paste our response after the appropriate issue and recommendation section in the report.

Finding #1: *WSDOT's Consumable Inventory Management System does not Support the use of Automated Business Processes Relying on Non-Automated, Burdensome Business Processes to Perform Routine Tasks*

Recommendation #1: We recommend WSDOT:

- **pursue the development of an integrated purchasing-inventory management system linked to the Department's accounting system.**
- **consider the use of M4 as a short-term solution.**

WSDOT Response: We agree. This recommendation supports a course of action recommended to WSDOT in the *Consumable Inventory Feasibility Study (Dye Management Group, Inc.)*, a report we commissioned in September 2004.²⁴ The study estimated the cost of a new consumable inventory system to be \$4.5 million.

WSDOT's consumable inventory system is over 30 years old. It is very labor intensive and uses dated technology to account for \$80 to \$100 million in annual transactions. WSDOT has taken a lead role with other state agencies to develop solid business requirements for a replacement system that will meet statewide needs. WSDOT will continue to work with the Office of Financial Management (OFM), Department of Information Services (DIS), and others to implement a modern inventory accountability system within the "Roadmap" framework that has been established to integrate policies, processes, information tools and data for state agencies. In the meantime, we have assigned more staff to train inventory system users and managers to more consistently use the full capabilities of the existing system. We also are using new data mart technology to provide better and timelier access to consumable inventory information.

OFM Response: Many of the department's systems are out-of-date and need to be replaced. In a recent study, *Critical Applications Modernization and Integration Strategy, December 30, 2005*, eleven core systems were identified. The consumable inventory system was not one of these. Given the competing demands for scarce funds, the consumable inventory systems needs to be evaluated against the eleven core projects identified in the study.

Action Steps and Timeframe:

- Provide user training in both the consumable inventory system and data mart. Ongoing.
- Participate in the OFM Roadmap process to position consumable inventory as an early implementation module. Ongoing.
- Evaluate the fleet management system (M4) for possible short-term application to meet consumable inventory needs. Complete by June 30, 2008.
- Evaluate options for financing a new system. Complete by June 30, 2008.

²⁴ <http://wwwi.wsdot.wa.gov/fasc/adminservices/PandMM/feasibilitydye.pdf>

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Finding #2: *Current Practices in Some WSDOT Regions have Prevented the Processing of Inventory and Accounting Transactions to Leverage its Inventory Management System*

Recommendation #2: We recommend WSDOT assure inventory is managed only by appropriately trained personnel.

WSDOT Response: We agree, and have been working to establish more functional oversight of regional inventory management procedures. We have a professional certification and training program in place for regional supply officers that has resulted in eight regional staff earning their Certified Professional Public Buyer (CPPB) credential. Training for over 200 system users is provided jointly by regional and headquarters staff. The department is constantly analyzing information to identify more ways to eliminate regional variations in supply processes.

OFM Response: OFM supports the training and certification program WSDOT is deploying and encourages the idea of having at least two individuals in each region with such certification.

Action Steps and Timeframe:

- Support and encourage professional certification and continuing education for both regional and headquarters staff. Ongoing.
- Conduct a detailed analysis of the different procedures used in each region to determine which practices achieve the best results. Complete by March 15, 2008.
- Provide on-site training and technical assistance to inventory system users. Ongoing.
- Develop a professional certification and training registrar at headquarters in order to track progress towards the goal of at least two professionally trained and certified supply officers per region. Complete by July 2008.

Finding #3: *WSDOT Inventory Records are Not Consistently Adjusted, Creating Inaccuracies in the Consumable Inventory System and Impeding Efforts to More Effectively Manage Inventory*

Recommendation #3: We recommend WSDOT:

- **adopt the inventory level recommendations from the Cisco Systems report.**
- **direct all field operations to maintain accurate information in the consumable inventory system.**
- **redistribute high-value and/or critical-need materials among regions.**

WSDOT Response: WSDOT suggested this recommendation for strengthening our program to the audit team, and supports its implementation.

OFM Response: We agree with the recommendations and all of the action steps.

Action Steps and Timeframe:

- Implement the action steps associated with recommendations 1 and 2.
- Require appropriate orders, receipts, and issues of inventory to be entered into the consumable inventory system in a timely manner. Complete an implementation plan to balance recording of inventory transactions with business requirements for the use of inventory materials. Complete by September 2008.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

- Encourage used material that is in serviceable condition (e.g. guardrail, light poles) to be added to inventory so it is visible for redistribution and reuse between regions. Complete in FY09.

Finding #4: *Timeliness of WSDOT Procurements Through the Department of General Administration Was Unable to Be Determined, Inhibiting the Ability to Assess Purchasing Power and Future Economics*

Recommendation #4: We recommend WSDOT work directly with GA to:

- obtain detailed information identifying timeliness of service.
- establish reasonable benchmarks.
- monitor service levels.

WSDOT/OFM/GA Response: We agree with the recommendation to review and improve appropriate performance measures and benchmarks and to monitor performance against them. The three agencies are committed to working together to ensure efficient procurement and supply chain management. The agencies will improve documentation of when purchase requests are made, orders are placed, and goods are delivered. However, it is important to recognize that WSDOT and GA already regularly monitor service and meet together quarterly to address performance questions and current topics. Further, the purchasing services agreement between both WSDOT and GA also identifies service level expectations and protocols for both agencies. A quality and timely procurement process is the goal for all of the parties. Receiving ordered supplies that meet quality service and delivery standards is a shared responsibility of WSDOT and GA.

Action Steps and Timeframe:

- WSDOT will continue to monitor critical contract matters and work with GA to continually improve service and resolve issues. Ongoing.
- To enhance current monitoring of service quality and timeliness, GA and WSDOT will ensure appropriate performance measures are in place to assess actual performance against these measures. This work will commence immediately and be ongoing.

Finding #5: *WSDOT Regional Purchasing Practices for Quantity “Q” Contracts May be Inconsistent, Potentially Reducing Public Visibility, Requiring Additional Work for Bidders, Restricting Price Adjustment Provisions, and Inappropriately Using Liquidated Damage Clauses*

Recommendation #5: We recommend WSDOT:

- increase department-level oversight of regional “Q” contract practices to promote more efficient bidding and contract administration.
- continue and expand its training and certification program for procurement and inventory management personnel.
- revise the WSDOT Purchasing Manual to provide specific guidance price adjustments during the term of a contract and at the time of contract renewal.

WSDOT Response: WSDOT agrees, and will work to implement consistent “Q” contract practices across the state. WSDOT supply managers apply competitive contracting tools and techniques that they believe provide the best value to the department under specific market

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

conditions. There may be some unique circumstances that result in some unique contract provisions.

OFM Response: Extraordinary cost increases in steel, copper, asphalt, and other resources has created a need to reconsider how risks are shared between the state and contractors. Contract price adjustments should be closely tracked in order to inform future contracting, project cost estimating, and budget development.

Action Steps and Timeframe:

- WSDOT will evaluate additional oversight measures that can be implemented at the department-level. Complete by April 30, 2008.
- Support and encourage professional certification and continuing education for both regional and headquarters staff. Ongoing.
- The WSDOT Purchasing Manual 72-80, Para 1-23.3.d already contains specific guidance about contract price adjustments. Completed. We will continue to review for additional guidance on price adjustments that will be helpful for the Purchasing Manual. Ongoing.
- WSDOT will track the cost of those items purchased under “Q” contract authority in order to address the question of changing prices for such commodities as sand, gravel, asphalt, etc. An annual assessment of cost changes will be provided to the Office of Financial Management when the agency request budget is submitted.

Finding #6: *WSDOT Does Not Use Price Adjustment Clauses for All HMA Resulting in Increased Vendor Risk*

Recommendation #6: We recommend WSDOT pursue the use of price adjustment clauses for HMA to include all future HMA-related contracts.

WSDOT Response: WSDOT agrees that the use of a price adjustment for HMA to shift cost escalation risk to the owner is an effective and appropriate means to mitigate payment of a “risk premium” on some HMA projects. Designers are directed to include the Hot Mix Asphalt Price Adjustment Clause in our multi-year HMA-related projects. We will continue to implement this clause in our multi-year projects.

WSDOT disagrees that it is in the owner’s best interest to assume this risk on all contracts. Based on results to date and our communications with industry, we do not agree that using the price adjustment clause in projects of short duration is cost effective due to administrative costs and low risk. Contractors have the ability to negotiate with suppliers and better manage HMA cost for the short term.

OFM Response: We agree with WSDOT that a price adjustment clause is not needed for contracts of less than one year. There is no clear demand from suppliers that this needs to be done.

Action Steps and Timeframe:

- WSDOT will continue to monitor the effectiveness and application of the HMA price adjustment provision by reviewing the data annually in November and communicating with industry, making adjustments to our policies and provisions as needed.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Finding #7: *WSDOT Can Educate and Encourage the Use of Reclaimed Asphalt Pavement, Potentially Resulting in Cost Saving Opportunities*

Recommendation #7: We recommend WSDOT:

- encourage local governments to allow the use of RAP consistent with WSDOT practices.
- explore increasing allowable RAP levels in non-critical mixes.

WSDOT Response: We agree that continuing our education effort with local agencies may allow those same local governments to save money through the use of Recycled Asphalt Pavement (RAP). WSDOT has continued to educate local governments, through conferences, research reports, presentations and face-to-face meetings, on the value of allowing the use of RAP up to 20% in new hot mix asphalt pavement (HMA).

We also agree that WSDOT should continue to research and explore using higher levels of RAP in HMA. WSDOT has been a national leader in researching higher levels of RAP in HMA since the late 1970s. We analyze our pavement performance carefully through a world class pavement management system. The Illinois and Texas proposals are not without risk: we expect our “non-critical mixes” on shoulders to last much longer than pavements under traffic. Decreasing pavement life, even on shoulders, would adversely impact the Preservation Program and result in higher lifecycle costs. Highway shoulders and driveways are not exposed to large traffic loads, but they are exposed to the environment. High RAP mixes tend to be more oxidized and can be more susceptible to cracking caused by environmental stresses, particularly those brought about by high and low temperatures. We are working on engineering all of our pavements for the lowest life cycle cost.

OFM Response: WSDOT is a national leader in researching and implementing environmentally friendly transportation projects. Enhancing the use of Recycled Asphalt Pavement will also help to curtail the diminishment of the scarce mineral resources used to make asphalt.

Action Steps and Timeframe:

- Continue to monitor research on using higher levels of RAP, through the State Pavement Technology Consortium (includes WSDOT, Texas DOT, Caltrans and Minnesota DOT).

Finding #8: *Potential Opportunities Exist to Use WMA Technology to Reduce the Cost of Installed Asphalt*

Recommendation #8: We recommend WSDOT continue to monitor WMA research and current U.S. evaluations.

WSDOT Response: We agree. WSDOT continues to monitor Warm Mix Asphalt (WMA) and participates in national level work, including the Director of our State Materials Lab participating in both a national-level State Pavement Technology Consortium team studying WMA and as one of three state representatives in the FHWA managed, national-level Technical Working Group on WMA.

OFM Response: We agree and encourage WSDOT to evaluate and research WMA technology.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Action Steps and Timeframe:

- Continue to monitor research on Warm Mix Asphalt and continue to participate in national efforts to investigate Warm Mix Asphalt.

Finding #9: *Although WSDOT Does Not Own HMA Plants WSDOT, Direct Ownership May be Appropriate Given Specific Conditions*

Recommendation #9: We recommend WSDOT and other public entities monitor HMA competition and service levels.

WSDOT Response: WSDOT agrees and notes that monitoring HMA competition is current agency practice. Results of its monitoring both of prices and level of competition have been shared widely with the industry itself, with the public through the *Gray Notebook*, and also through Governor Gregoire's Government Management Accountability and Performance (GMAP) program.

OFM Response: Although the audit report neither encourages nor discourages public ownership of asphalt plants, we urge caution as this work has historically been performed by the private sector in Washington State. WSDOT has taken the right approach by purchasing asphalt materials that the private sector can access for production in remote areas, but should not become a producer itself. Nevertheless, WSDOT must remain vigilant and closely monitor competition and the availability of supplies.

Action Steps and Timeframe:

- Continue to monitor HMA competition as documented by the low bid system.

Finding #10: *WSDOT Has Not Strategically Considered SRA Use and Operations nor Maintained Historical Records Regarding the Number of Travelers Served Annually*

Recommendation #10: We recommend WSDOT:

- undertake a comprehensive strategic and operational review of the SRA Program.
- maintain historical records and develop a trending log to assist in determining budgetary requirements.

WSDOT Response: We agree, and have developed a SRA stakeholder advisory team to develop a comprehensive strategic plan to capture what we believe our rest areas will need to look like in the future. This team includes numerous interested parties, including members of Washington Trucking Association; Department of Community, Trade, and Economic Development; Washington State Patrol; Federal Highway Administration; various HQ programs and representatives from the WSDOT regions. The team is charged with the following:

- Clearly identified roles and responsibilities – SRA Program Organization
- Recommendations and strategy on funding opportunities to enhance maintenance and preservation
- Recommendations and strategy on traveler and tourism information

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

- Recommendations and strategy on other amenities of safety rest areas
- Strategy on public-private partnerships
- Program vision and priorities
- Program measurements
- 10-year plan to operate, manage, maintain and possibly develop new facilities

Additionally, WSDOT currently tracks the numbers of SRA visitors and reports this information in WSDOT's *Gray Notebook*. We will continue to track and report this information. This information will be used to develop and maintain historical records and trending logs to support budget analysis in the future.

OFM Response: We appreciate the acknowledgment in the audit report that the maintenance and operations division at WSDOT is exemplary and the acknowledgment that maintenance employees regularly improve their work through the use of best practices. As noted in the audit report, the maintenance division is a leader in planning, budgeting, and evaluating their work through the use of performance measures. We share the auditor's concerns about the aging workforce and the lack of investment in maintenance.

Budget justifications could include information about the type of traffic and the traffic trends at rest areas over time. The strategic planning effort currently underway will help shape a vision of SRA for the future, including the use of technology at these facilities, the kinds of amenities that should be offered, the improvements needed, staff resource requirements and training required, etc. We would support WSDOT developing a backlog of unmet maintenance needs for the 2009-11 budget.

Action Steps and Timeframe:

- A final strategic plan is expected to be completed by March 2008.
- Track and report SRA visitor numbers. Current and ongoing.

Finding #11: *Unclear WSDOT SRA Roles and Responsibilities and No Single Program Level Leader With Full Accountability Have Resulted in Non-Collection of Contract Amounts, Capacity Issues, and Limited Planning*

Recommendation #11: We recommend WSDOT:

- **conduct a comprehensive organizational review of its SRA Program.**
- **establish milestones and key performance indicators.**

WSDOT Response: While we agree that current efforts in this area could be improved, the organizational arrangement has not adversely impacted the overall operation of this program. The only problem created by "unclear roles" was failure to invoice Services for the Blind which was done immediately upon notification. Other issues were results of competing priorities and lack of staffing. Implementation of the elements of the strategic plan will also result in more clearly defined SRA program roles and responsibilities.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

OFM Response: We agree with the audit finding that there is no single authority with full accountability for state rest areas. It would have been helpful if the audit report had recommended an approach for resolving this. Rest area facilities cross multiple program areas including the facilities, maintenance, environmental, freight, and economic-partnerships programs. Although safety rest area functions are diverse, the problems identified in the audit seem to be principally around vending and advertisement contract management. We support WSDOT's contract experts providing more assistance and oversight on rest area-related contracts.

Action Steps and Timeframe:

- This issue will be addressed in the organization review referenced earlier that will be completed in March 2008.
- WSDOT's contract experts will provide ongoing assistance and oversight of state rest area contracts.

Finding #12: *Revenues: Essential WSDOT Maintenance and Repair of SRAs is not Consistently Prioritized or Adequately Funded Resulting in a Deteriorating Infrastructure*

Recommendation #12: We recommend WSDOT:

- **pursue statutory changes to allow SRA revenues to be dedicated to SRA maintenance activities.**
- **prioritize preservation of the SRA System and fund appropriately.**

WSDOT Response: WSDOT defers to the Legislature on this recommendation. Statutory changes allowing SRA revenues to be dedicated to the SRA program would have to be completed at both state and federal levels. Regarding priorities, WSDOT's Facilities Computer Maintenance Management Systems (CMMS) is the primary tool used to prioritize SRA preservation needs. WSDOT is working towards full implementation of the CMMS so this information can be used in budget requests.

OFM Response: As noted in the audit, sufficient inflationary increases have not been provided to meet current safety rest area activities and the persistence of underfunding may result in the further decline of these aging facilities. Yet overall, the rest areas currently sustain a level of service rating of B, which is to the credit of those who manage and operate the safety rest areas within scarce resources. Rest areas will always compete with ferries, highways, rail, and other transportation needs. Much of the transportation system is aging and in need of additional resources. It is incumbent upon the department to establish lowest lifecycle cost methodologies are in place to help ensure preservation, maintenance, and replacement of safety rest area needs occur at the right time and price. We are curious why the audit did not recommend further exploration of public-private partnerships at rest areas. There may be state and federal barriers to this, but public-private partnerships at rest areas would seem to provide opportunities for generating additional revenues and help meet the changing needs and expectations of the traveling public, truckers, safety officers, and others.

Action Steps and Timeframe:

- Full implementation of CMMS is projected to be complete by December 2009.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

- Funding requests for preservation funding will be made on an as-needed basis within the biennial WSDOT budget process.

Finding #13: WSDOT is Facing an Engineer and Project Manager Labor Shortage Potentially Resulting in Increased costs and the Loss of Institutional Knowledge

Recommendation #13: We recommend WSDOT:

- **determine the types of skills by timeframe that the M&O program will need to replace as experienced personnel retire.**
- **determine what types of work schedules - project, part-time, job-sharing, job rotation -could be offered in order to retain persons eligible to retire or nearing retirement eligibility.**
- **adopt statewide successful recruiting and educational initiatives being used within the regions.**
- **regularly schedule and conduct competitive contracting analyses, including the process improvement steps for improving the efficiency and effectiveness of current operations.**

WSDOT Response: We agree on the importance of continuity of leadership in management positions in the Maintenance organization. As the report acknowledges, WSDOT has been aggressive and innovative in its recruiting. We will continue to work with our Human Resource personnel to use innovative ways to retain experienced personnel and recruit new talent, such as early recruitment of college and vocation school students.

WSDOT will continue to contract for certain maintenance activities where it is cost-effective to do so. New opportunities will be evaluated, based on cost-effectiveness, as they arise. Evaluations of highway maintenance contracting implemented in other states have not shown advantages in cost-effectiveness. References supporting this include:

- *The Massachusetts State Auditor's Report on the Privatization of the Maintenance of State Roads in Essex County, October 7, 1992 to October 6, 1993, issue on July 19, 1995.*
- *The Operational, Human Resource, and Financial Implications of the Privatized Highway Maintenance Program of the Province of British Columbia, June 1994, generally referred to as the "Burton Report."*
- *Elliot D. Sklar, You Don't Always Get What You Pay For: The Economics of Privatization*

Therefore, we will proceed carefully in this area to ensure we use both the most efficient and effective methods to address staffing needs and provide our maintenance services. Any consideration of outsourcing must respect the Department's collective bargaining agreements and applicable state law, including the competitive contracting requirements of the Personnel System Reform Act.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

OFM Response: We are concerned about the adverse recruitment and retention trends the department is experiencing. Not only are aging baby boomers retiring, it is difficult to attract new recruits with the right training and skill sets. It may be beneficial for WSDOT to evaluate the job classifications that support the rest area functions and identify career track opportunities for individuals within these different classifications. Training would also need to be thoughtfully evaluated to support such career opportunities. It is possible that individuals could have a fulfilling career with ample advancement opportunities as they trained for different facets of maintenance and operations. For example, a focus on rest area management could include training and work experience in contracting, facility design, environmental mitigation, etc.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Action Steps and Timeframe:

- WSDOT's human resource department, in conjunction with DOP and the different program areas that have maintenance and operation responsibilities, will evaluate career development opportunities to identify career paths and training opportunities within this field. Evaluation to begin by July 1, 2008 and conclude by August 31, 2009.

Finding #14: *WSDOT Does Not Compile Essential Facility Maintenance and Repair for all Activities Limiting the Ability to Estimate the Degree of Risk Concerning the Condition of the Infrastructure*

Recommendation #14: We recommend WSDOT:

- determine from the respective maintenance management systems the current backlogs of essential maintenance and repair.
- prepare a comprehensive listing of the backlogs of essential maintenance and repair and assess the risk that the backlogs may pose, if any.
- include the backlogs of essential maintenance and repair as one element of the M&O budget justification.

WSDOT Response: We agree that defining a measurable backlog of essential maintenance is an important element for program budget justifications. While some operational activities (i.e., Snow and Ice Control) cannot be put in terms of a "maintenance backlog," many other activities can be measured as such. In 2006, WSDOT began determining current backlogs of essential maintenance for those highway features that are managed with the help of computerized maintenance management systems. A team of maintenance personnel is currently developing strategies to expand our abilities to document the extent and costs of essential maintenance backlogs.

OFM Response: There is a pressing need for the department to identify the maintenance and operation costs associated with the major highway expansions underway as a result of the 2003 and 2005 revenue packages.

Action Steps and Timeframe:

- Strategy development projected to be complete in spring 2008. Implementation is dependent on the strategy that is developed.
- We will estimate operations and maintenance costs needed to support the highway expansions underway as a result of the 2003 and 2005 revenue packages and submit this information with the 2009-11 budget request.

Finding #15: *WSDOT's Maintenance Management System Does Not Measure the Backlog of Essential Maintenance Limiting the Ability to Determine Effectiveness of Effort*

Recommendation #15: We recommend WSDOT:

- prioritize the development of a centralized maintenance management system.
- annually calculate an estimate of the current replacement cost of the infrastructure.
- establish an M&O minimum.
- include each measurement in its performance measures program.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

WSDOT Response: WSDOT has implemented many databases that could be considered components of such a system. We currently have activity-specific maintenance management systems used to help maintain traffic signals, highway lighting, intelligent transportation systems, movable bridges, urban tunnels, and traffic signs. We also have databases that document work accomplishments for various other activities and a feature inventory is currently under development. We are evaluating options for a centralized maintenance management system and other comparable options.

The establishment of an M&O minimum budget and the viability of basing this on a percentage of the replacement cost of existing infrastructure will be included in the evaluation of a centralized maintenance management system.

Starting in 2008, measures of the amounts of essential work not being completed will be incorporated into the budget process, where this information is available. We agree that a centralized maintenance management system is one of several types of tools that can help a maintenance organization meet an objective of measuring a backlog of essential maintenance. At this point, we are not ready to prioritize and fund the development of such a system. This issue is being considered as we determine which tool will be best for us to use to measure a maintenance backlog. An option that might be preferred is the expansion of the current, decentralized maintenance management system. Additionally, we currently have no funding to pursue any types of maintenance management system development and implementation so a budget element would also need to be included in the strategy for moving forward.

OFM Response: The National Research Council uses a rule of thumb of 2 percent to 4 percent of the current infrastructure replacement cost as an indicator for how much should be spent on maintenance and operations. The value of the infrastructure in Washington's comprehensive annual financial report is \$14.2 billion, the sum of original costs. According to the audit report, maintenance and operation budgets should total about \$355 million per year when, in fact, they are about half of this amount. The 2007-09 budget allocates \$347 million for the biennium. The audit report recommends prioritizing the development of a centralized maintenance management system, but we believe an even higher priority is identification of short, medium and long-term risks to our infrastructure as a result of not fully funding maintenance work. We need to identify and address the risks to determine where the most cost-effective maintenance investments should be made.

Action Steps and Timeframe:

- Develop strategy to address how to measure a maintenance backlog. Complete in spring 2008. Implementation is dependent on the strategy that is developed.
- Rail, highways, and ferry program managers will document consequences of not funding their most critical maintenance and operation activities and submit that information with each biennial budget request. This information should be submitted with the 2009-11 agency request budget.

Finding #16: *WSDOT Does Not Maintain Summary Information Concerning Past and Future Unfunded Mandates Reducing the Ability to Determine Budget Requirements*

Recommendation #16: We recommend WSDOT:

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

- **research, document, and maintain summary information concerning past and future unfunded mandates.**
- **record budget ramifications.**

WSDOT Response: WSDOT agrees that summary information may be helpful in clearly communicating budget needs and is planning on implementing these recommendations. Summary information regarding budgetary impacts of unfunded mandates are typically generated during the budget development process of each biennium. A formal, continuous record of this information has not been traditionally compiled and maintained in a single document.

OFM Response: It seems prudent to identify new requirements and related estimated costs on an annual basis in order to keep the executive and legislative branches apprised of emerging issues and potential budget shortfalls.

Action Steps and Timeframe:

- Identify budget impacts from new unfunded mandates and compile this information into a single document that can be updated and maintained into the future. Complete by June 30, 2008.

Finding #17: *WSDOT is Favorably Organized to Respond Regionally or Statewide to Emergencies or Disasters*

Recommendation #17: We recommend WSDOT:

- **consider creating direct communication links between the Traffic Management Centers and the state's Emergency Operation Centers.**
- **identify SRA deficiencies in acreage, motor vehicle parking capacity, water supply and distribution, emergency power, and the means for disposing of sewage during the surge conditions of a major emergency.**
- **seek federal funding to support safety rest area disaster preparedness upgrades and the construction of additional sites for the most likely risk scenarios.**

WSDOT Response: We agree that direct communication links between TMCs and EOCs are important. As such, direct communication links including telephone, e-mail, and satellite telephones are maintained. These are used on a regular basis during times of EOC activation. In addition to this, video feeds have been established between TMCs and EOCs so personnel in EOCs can now view real-time road conditions via traffic cameras through the TMCs.

A specific program to ready SRAs for disaster roles by, for example, large and costly expansion of water supply and sanitary systems, may not be appropriate. The capabilities of SRAs to fit into the larger disaster readiness picture should be linked to disaster response planning now generally being conducted by the counties.

OFM Response: We defer to the Military Department to guide us on how best to use safety rest areas during emergencies.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Action Steps and Timeframe:

- The alternative uses for SRAs referenced in these findings will be considered during the SRA strategic plan development to be completed by March 2008.

Finding #18: *WSDOT Can Improve SRA Safety to Help Deter Illegal Activities*

Recommendation #18: We recommend WSDOT consider adding cameras and monitoring equipment to the broadband capabilities of current and future SRA installations.

WSDOT Response: We agree. However, funding for such actions depends on legislative appropriation.

OFM Response: We agree, but the cost for providing the necessary technology needs to be evaluated.

Action Steps and Timeframe:

- The Military Department, Washington State Patrol, WSDOT, and local safety officers will collaboratively evaluate potential solutions related to illegal activities. Cost-sharing between these entities will be part of this analysis. Meetings will occur in the spring and summer of 2008 with a budget request submitted for the 2009-11 biennial budget.

Finding #19: *WSDOT Sampling Plans Can Potentially be Reduced to Help Decrease Costs*

Recommendation #19: We recommend WSDOT determine if information needs will permit the reduction of the size of the required random samples for the Maintenance Accountability Process.

WSDOT Response: We agree, and are already taking steps to streamline the sampling/field survey process to provide valid performance data at minimized costs. Recent reductions in MAP survey efforts include use of Pavement Management System data (instead of conducting our own MAP survey) to determine pavement maintenance Levels of Service (LOS). We also use Region Traffic Survey data (instead of conducting our own MAP survey) to determine sign LOS. Not only does this reduce survey costs to the maintenance program, these are examples of larger and more accurate data sets that improve the accuracy of the MAP LOS ratings.

OFM Response: We support the reduction of sampling efforts in order to control costs, but also urge caution. The maintenance division is a leader in providing data driven decision-making. There is a cost associated with collecting and using such data. We need to be vigilant to ensure the same quality decision making is possible using smaller or less frequent sample sizes.

Action Steps and Timeframe:

- MAP field surveys will be conducted annually instead of twice per year, significantly reducing the effort and costs to obtain LOS data while still maintaining adequate confidence levels. This will begin in the 2008 survey. We also will evaluate the effect of changing from biennial to annual data collection.

Finding #20: *WSDOT MAP Organizational Review Level Achievements Do Not Provide Detailed Indication of Accomplishments*

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Recommendation #20: We recommend WSDOT increase the detail of MAP organizational review level achievements to provide additional indication of accomplishments.

WSDOT Response: We agree that MAP information should be reviewed at all levels of the maintenance organization. In addition to the statewide reporting and review level, this should include regions and areas as well. MAP reports are currently developed and reviewed at area, region, and statewide levels. In addition to this, the method of compiling area and region LOS reports into a single statewide report has been revised to more clearly communicate how the lower-level organizational ratings comprise the statewide ratings. This was an improvement recently identified through the Governor's GMAP process.

OFM Response: The department deserves the national recognition it has received for its maintenance accountability process which includes level of service standards for 33 different maintenance activities. We agree that the "score" assigned to an activity does not capture the range of the achievement. The scores should be accompanied by text to capture more detail about the accomplishments.

Action Steps and Timeframe:

- MAP reporting will include narrative summaries as well as numeric or alpha summaries as appropriate. Ongoing.

Finding #21: WSDOT Implementation of SPMG Recommendations Will Eliminate Many Management and Reporting Inconsistencies

Recommendation #21: We recommend WSDOT:

- **Ensure SPMG recommendations are followed and published management practices are implemented.**
- **Follow up with activities to assure expected outcomes are realized.**

WSDOT Response: We agree and have recently taken significant steps to improve project delivery and implement best practices. Two examples are the Program Management On-Line Guide and Project Management Reporting System (PMRS.) The Statewide Program Management Group is currently working to develop these tools as well as other project management tools and training.

OFM Response: We agree and also want to emphasize the need for ongoing, sustained and rigorous project management training.

Action Steps and Timeframe:

- Develop and implement policy statements to coordinate consistent and timely application of the PMRS system and provide direction on the various processes involved. Policies and procedures are scheduled to be developed by January 2008.
- Update existing Executive Order 1032.00 for project management (originally issued in 2005) by February 2008.
- Implement the SPMG recommendations statewide and the following activities underway:
 - Development of standard processes for:
 - Cost Control and Earned Value

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

- Project Estimate Creation, Review and Approval
- Project Change Management
- Development of a training program for project control staff regarding use of these new business processes
- While the fully integrated PMRS system is scheduled to be completed in January 2010, the cost control/earned value software has currently been implemented to manage some of WSDOT's larger projects and will be configured and available for use in a stand alone mode for all WSDOT projects in May 2008.
- Continue to refine the Cost Estimate Validation Process (CEVP[®]) and Cost Risk Assessment (CRA) estimating procedures and apply these to formulate realistic estimates during the project development process. Ongoing.
- Provide additional emphasis of tools and expectations at the Project Management Training Academy, Statewide Meetings, and Quarterly Reporting. Ongoing.

Finding #22: Many Sampled Projects Contained Planning Inconsistencies and Deficiencies Resulting in Project Inconsistencies

Recommendation #22: We recommend WSDOT:

- **Ensure all aspects of the Project Management On-Line Guide are applied consistently to each project.**
- **Require consistent entry of "lessons learned" into the agency's centralized database.**

WSDOT Response: We agree that the principles and tools detailed in the Project Management On-Line Guide are useful. In addition, the tools provided and training performed through the SPMG's efforts, as listed previously, will help to initiate and support a more coordinated and sophisticated project management approach.

We also agree that "lessons learned" is a valuable tool and are assigning additional resources to improve both the database and the procedures.

OFM Response: The audit recognized that WSDOT has acted upon a number of studies and reviews conducted in the recent past to help it identify ways to improve operations and efficiencies that result in cost savings. As a result, WSDOT is considered a national leader in project management. Nevertheless, there is room to improve. Providing more consistent budgeting, reporting, and handling of change orders across regions and modes is very important. Consistent document layouts, contents and nomenclature are key elements of providing a transparent and accountable rendering of every project.

Action Steps and Timeframe:

- In addition to the actions and timelines for Finding #21, WSDOT will evaluate and assess projects annually to gather lessons learned. WSDOT plans to share lessons learned through the annual Construction conferences, beginning in February 2008.
- Progress of this lessons learned effort and the schedule for developing improvements will be available on the website. Complete by February 2009.

Finding #23: WSDOT's Primary Procurement Strategy of Low Bid Can Limit its Ability to Receive Best Value

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

Recommendation #23: We recommend WSDOT pursue legislative authority to use a performance contracting strategy for applicable projects. We recommend the Washington State Legislature modify current contracting requirements to allow performance based contracting as appropriate.

WSDOT Response: We believe that the Legislature has provided the latitude necessary to use the appropriate contracting strategies for projects. WSDOT supports and uses best value selection and performance based contracting within our Design Build contracting approach. On our more complex projects, WSDOT does an in-depth risk profile, cost assessment and contracting analysis to select the appropriate contracting strategies as part of managing the risks. WSDOT's delivery results, as reported in GMAP, show that our current procurement and delivery practices support on-time, on-budget delivery. Our approach is consistent with the way most other states have approached highway-related contracting.

OFM Response: There are circumstances when low bid is not the optimal approach, but best value, design-build, or some other contracting arrangement is. We believe the department has the statutory authority to use these different contracting approaches as particular circumstances warrant.

Action Steps and Timeframe:

- We will continue the current practice of using performance contracting and best value selection as appropriate and consider the recommendation if/when it is necessary to do so.

Finding #24: *WSDOT Has Minimal Consistency in Procedures and Schedules Limiting the Ability to Effectively Manage Projects*

Recommendation #24: We recommend WSDOT:

- Identify required scheduling software.
- Stipulate in its standard specifications, the required scheduling software program to be used by contractors.

WSDOT Response: We agree and are in the process of implementing this recommendation. Examples that support this statement include implementing scheduling requirements in the 2008 standard specifications to better define schedule requirements. Our new specifications provide scalable project scheduling requirements that are useful and practical for the various types of projects. On our more complicated projects, WSDOT specifies the specific scheduling program (Primavera 6) to be used by contractors. The new scheduling requirements have been discussed with the contracting industry (AGC) and are expected to improve contractor performance in submitting approved schedules, as well as help our managers better manage workforce and on time delivery.

OFM Response: We have supported the purchase, implementation, and training of Primavera software to enhance project management, including scheduling. Ongoing training on the use of the software is, however, the key to success.

Action Steps and Timeframe:

- We will continue to monitor the effectiveness of our contract provisions (“*general special provisions*”) on an annual basis (end of the construction season in November). This includes

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

communicating and working with industry to make adjustments to our policies and provisions as needed. Increased focus on training in this area will also occur over the next year through the SPMG effort.

Finding #25: *WSDOT Has Had Difficulty in Identifying Trends in High-Risk Quantity Growth Items Resulting in Unnecessary Costs*

Recommendation #25: We recommend WSDOT continuously review cost changes and manage as appropriate.

WSDOT Response: We agree that an improved understanding of trend data improves estimating and risk mitigation and allows us to establish policies and practices to support better results.

While we recognize that WSDOT does not have a formal, systematic tracking tool, we monitor this area carefully. Efforts include regularly monitoring industry cost trends, change order roundtables, and HQ change order review and stewardship reviews. In addition, the design team and the construction team communicate through the lessons learned data base and policy and specification changes to improve estimating practices.

A better understanding of trend data generally improves estimating and risk mitigation results, though several of the overruns mentioned in the report were related to weather conditions driving environmental protection activities. These are generally not avoidable or predictable.

OFM Response: A broader understanding of the construction cost index across WSDOT programs would be helpful. For example, the planning, research, environmental, and budgeting departments could all benefit from a deeper understanding of and tracking of these kind of cost indices. Further, trends in the availability of scarce mineral resources, fossil fuels, and metals like copper and steel should be thoughtfully monitored.

Action Steps and Timeframe:

- Create a cross functional team to evaluate existing informal processes and procedures that support trend analysis. Next, develop strategies to support a systematic approach to track, report, review and improve estimating practices by monitoring quantity growth. This is scheduled to be in place by July 2008.

Finding #26: *WSDOT's Bid Evaluation and Award Approach Does Not Incorporate Actual Costs and Quantities Potentially Increasing Costs*

Recommendation #26: We recommend WSDOT incorporate actual costs and quantities into EBASE to develop cost benchmarks and cost metrics that can be used for estimating future projects and determining cost overrun trends.

WSDOT Response: We disagree with the suggestion that an inadequate bid evaluation potentially increases costs. WSDOT reviews all bid items for material unbalancing of bid item prices that may be a potential detriment to the state as provided by state law. The evaluation includes a review of the submitted bid prices, estimated quantities, engineer's estimate, and other bidders' submitted prices. If a potential detriment is discovered, the bid is rejected. The

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

contracting agency is required by law to demonstrate a detriment to the state to reject unbalanced bids. While contractors' bid estimates do not always reflect actual cost on every item, our records show that WSDOT's engineering estimates are consistently within 10% of final completion costs.

OFM Response: At a minimum, an evaluation of engineer estimates, contractor estimates, and actual costs could be sampled and reported to the Legislature and the Governor as part of the annual budget submittal process in order to address concerns about unpredictable and escalating commodity cost increases.

Action Steps and Timeframe:

- We will review our process for opportunities for improvement as the aforementioned SPMG efforts advance.
- We will evaluate a sample of engineer estimates, contractor estimates, and actual costs and report to the Legislature and the Governor with the annual budget submittal.

Finding #27: WSDOT Does Not Participate in an Electronic Bid Evaluation and Award Forum Potentially Limiting Perspective Vendors

Recommendation #27: We recommend WSDOT continue investigating electronic bidding systems to streamline the process, increase competition among vendors and reduce paper use.

WSDOT Response: We agree that electronic bidding is a good business strategy and are actively investigating electronic bidding options and the performance of Electronic Bidding via Transport's EXPEDITE and BID EXPRESS software.

OFM Response: We defer to the department on this finding.

Action Steps and Timeframe:

- Investigate electronic bidding options by March 2008.
- Develop an implementation plan that includes strategies to address best practices, financial impacts, industry input, awareness, and training. Complete by August 2008.

Finding #28: Sampled WSDOT Projects Found No Consistency of Total Project Cost Forecasting Decreasing the Ability to Determine the Volume of Change Orders and Other Categories of Cost Growth

Recommendation #28: We recommend WSDOT:

- **standardize cost reporting practices for all project phases.**
- **utilize cost engineers or business managers who are responsible for projects on a collective or regional basis.**

WSDOT Response: We agree with the recommendation recognizing the importance of cost forecasting and change management tools. Cost reporting is being standardized and better tools are being provided as part of the PMRS system. In advance of statewide implementation, we have hired business managers and adopted industry-standard cost management, estimating and tracking processes for our larger, high-risk projects. We have developed a modern project

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

management and reporting system to address the type of cost management and tracking issues identified in this audit finding.

OFM Response: This finding relates to a number of others regarding the need for full implementation of PMRS, and training of project managers. We support WSDOT formalizing its timeline for implementation of the PMRS system and training.

Action Steps and Timeframe:

- See actions and timelines for Recommendation #21.
- WSDOT will submit a work plan and timeline for full implementation of PMRS and project management training to the 2008 Legislature.

Finding #29: *WSDOT Change Order Logs Varied Extensively in Format and Level of Detail Potentially Increasing Risk of Higher Project Costs*

Recommendation #29: We recommend WSDOT standardize Change Order Logs and integrate each into Project Cost Reports.

WSDOT Response: We agree with the benefit of providing a consistent tool. This will be undertaken as part of the PMRS commitment. WSDOT's experience does not support the suggestion that this inconsistency potentially increases claims, and has successfully managed disputes. We have not had a formal claim in the recent past.

OFM Response: PMRS should help formalize change order log change order processes.

Action Steps and Timeframe:

- See actions and timelines for Recommendation #21.

Finding #30: *WSDOT Does Not Use Rate Adjustments Based Upon a Pro-Rata of Bid Contract Unit Rates Resulting in Increased Costs*

Recommendation #30: We recommend WSDOT use, where appropriate, rate adjustments based upon a pro-rata of the bid contract unit rates to assure the optimization of the value of changes.

WSDOT Response: We agree that an extension or pro rata of unit bid pricing is one of the strategies that can and should be used when appropriate. WSDOT supports several different methods for estimating change costs depending on the nature of the work, the risk, the urgency and the nature of the change. Extending unit bid prices, negotiated rates, lump sum costs, or force account rates are all appropriate pricing strategies depending upon the risks and timing of the change. Our philosophy is to maximize competition and manage the risk appropriately by paying fairly and equitably for the work performed and as well as when changes occur.

We also agree that it is important to clearly understand the contract, the contractor's price and the state's position when negotiating, and that additional training in this area is appropriate. WSDOT's construction office has developed a change order training course and will incorporate methods of pricing and negotiating into the training discussions. WSDOT will continue to emphasize aggressive cost management and change strategies.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

OFM Response: We agree with WSDOT. We suggest WSDOT use a sampling approach on various-sized projects located in different regions to evaluate change orders.

Action Steps and Timeframe:

- WSDOT's project management-related efforts include placing business managers in the project offices and providing cost tracking and estimating software, which will address this recommendation. We are in the preliminary stages of this process, and will review progress after the next construction season (November 2008).
- Based on the results of project samples, WSDOT will take actions as appropriate to improve the cost estimation. Ongoing.

Finding #31: *WSDOT Does Not Aggressively Manage Change Orders Resulting in Increased Project Costs*

Recommendation #31: We recommend WSDOT use, where appropriate, cost engineers or quantity surveyors to aggressively manage all change costs during construction, and maximize the cost-benefit of deployment through integrating activities such as cost report management and budget estimating.

WSDOT Response: We believe that we aggressively manage change orders, although we do agree with the recommendation that we can improve our process. WSDOT has demonstrated that managing construction costs and determining work items with a higher risk of cost increase is a priority.

The auditors propose achieving savings by using an extension of unit bid prices for all work done through change orders. This approach focuses on achieving savings once the project has already begun. We believe we currently achieve greater savings by focusing on reducing the total cost of the project at the beginning. With our current approach, we not only aggressively manage change orders, but also let our contractors know upfront that we will pay fairly and equitably for work performed, including change orders. We believe this philosophy results in lower project bid prices, as opposed to mandating one method to price change orders, which would likely result in much higher initial bids from contractors to cover potential risks of project changes.

We will implement new project management systems as observed by the auditors on our larger projects including the Tacoma Narrows Bridge, Hood Canal Bridge, and Alaskan Way Viaduct projects. These projects currently have project controllers and business managers to help manage cost issues and provide the reporting/forward forecasting as suggested. We have invested significant time and energy into providing training and tools to address this issue. Our Project Engineers are trained to be aggressive in their active management of construction cost changes. The regions and headquarters play a role in oversight of every change order.

Tools that are currently being used include the Cost Estimate Validation Process (CEVP), Cost Risk Assessment (CRA), Risk Matrices, Project Management Plans, Schedule Management, and Value Engineering.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

OFM Response: With appropriate training, tools, and staffing on higher risk projects, WSDOT engineers and project managers can provide the same quality assurance and oversight as cost engineers or quantity surveyors.

Action Steps and Timeframe:

- We have recently begun integrating business managers in our project offices and will continue to do so. Refer to SPMG Timelines under Recommendation #21. WSDOT is in the preliminary stages of this process, and will review progress after the next construction season (November 2008).

Finding #32: *WSDOT's Categorization of Change Costs Limits the Ability to Effectively Track and Manage*

Recommendation #32: We recommend WSDOT use change source categories to provide a basis for understanding changes on all projects.

WSDOT Response: We agree. We are currently pursuing several efforts in this area. We are developing changes to our source codes and the process we use to collect the information on changes. These efforts, along with the search capabilities from our new Data Mart tool, will allow the department to better identify systematic problems. Our evolving lessons learned data base is also a convenient tool for sharing this information with project designers. In addition, SPMG efforts will provide better access to change-related data.

OFM Response: We agree and reiterate that training is critical to success.

Action Steps and Timeframe:

- The new and improved system for categorizing change orders is scheduled to be in place by the end of February 2008. Headquarters construction staff will be introducing the system to the regions at the regional construction conferences in February. A follow up will be performed as part of an annual review in November 2008.

Finding #33: *WSDOT's Independent Engineer's Estimates Do Not Optimize Value of Change Orders Limiting the Ability to Determine Fairness and Reasonableness of Prices*

Recommendation #33: We recommend WSDOT require greater price transparency from contractors for proposed change costs.

WSDOT Response: We agree with the recommendation and apply it to proposed change orders when it is appropriate. WSDOT's philosophy is to give the contractor the incentive to incorporate and manage the changed work in a timely and efficient manner. Depending upon the cost, nature and urgency of the change, it may be appropriate to require the contractor to provide detailed documentation with regard to their costs. Exercising this practice for every change would not be cost effective. WSDOT believes that the engineer's estimate is a good and appropriate tool to use for estimating the type and value of changed work. We also support the need to gather information and discuss it with contractors when the impacts and approach to new work is difficult to determine.

**Official Response to the
Construction Management/ Highway Maintenance Performance Audit
From Department of Transportation and Office of Financial Management
January 4, 2008**

OFM Response: The proposed approach of sampling contracts in the action steps for Finding #30 could also be used to gather value of change order information.

Action Steps and Timeframe:

- We have the ability to ask for this information under our current contract structure and do so when it is appropriate. Training on this subject is currently being provided as part of the Headquarters change order training. Ongoing.

Finding #34: *WSDOT's Current Performance Measures Could be Enhanced to Provided Additional Indicators of Performance*

Recommendation #34: We recommend WSDOT continue to develop and maintain project performance indicators that can be monitored at state and project levels.

WSDOT Response: We agree. In addition to current efforts as noted in the report, SPMG will move us ahead in this area.

OFM Response: OFM has statutory responsibility for producing an attainment report that reflects the progress we are making in preservation, safety, mobility, environment, and stewardship. This report will document system performance and be provided to the Legislature on a biennial basis.

Action Steps and Timeframe:

- Continue to track and evaluate performance measures as reported in the *Gray Notebook* and GMAP. Ongoing.

This action plan summarizes the action steps listed in the joint response by the Washington State Department of Transportation and the Office of Financial Management. The plan includes the agency responsible for completing the action item, and the scheduled date for its completion.

Finding	Action Step	By Whom	Due Date
1	Provide user training in both the consumable inventory system and data mart.	WSDOT	Ongoing
1	Participate in the OFM Roadmap process to position consumable inventory as an early implementation module.	WSDOT	Ongoing
1	Evaluate the fleet management system (M4) for possible short-term application to meet consumable inventory needs.	WSDOT	June 30, 2008
1	Evaluate options for financing a new consumable inventory management system.	WSDOT	June 30, 2008
2	Support and encourage professional certification and continuing education for both regional and headquarters staff.	WSDOT	Ongoing
2	Conduct a detailed analysis of the different inventory procedures used in each region to determine which practices achieve the best results.	WSDOT	March 15, 2008
2	Provide on-site training and technical assistance to inventory system users.	WSDOT	Ongoing
2	Develop a professional certification and training registrar at headquarters in order to track progress towards the goal of at least two professionally trained and certified supply officers per region.	WSDOT	July 2008
3	Complete implementation plan to require appropriate orders, receipts, and issues of inventory to be entered into the consumable inventory system in a timely manner.	WSDOT	September 2008
3	Encourage used material that is in serviceable condition (e.g. guardrail, light poles) to be added to inventory so it is visible for redistribution and reuse between regions.	WSDOT	FY 2009
4	Monitor critical contract matters and work with GA to continually improve service and resolve issues.	WSDOT and GA	Ongoing
4	Ensure appropriate performance measures are in place that will enable both GA and WSDOT to assess actual performance.	WSDOT and GA	Ongoing
5	Evaluate additional oversight measures that can be implemented at the department-level.	WSDOT	April 30, 2008
5	Support and encourage professional certification and continuing education for both regional and headquarters staff.	WSDOT	Ongoing

Finding	Action Step	By Whom	Due Date
5	Review for additional guidance on price adjustments that will be helpful for the Purchasing Manual.	WSDOT	Ongoing
5	Track the cost of items purchased under "Q" contract authority to address the question of changing prices for such commodities as sand, gravel, asphalt, etc. An annual assessment of cost changes will be provided to the Office of Financial Management when the agency request budget is submitted.	WSDOT	With 2009-11 Budget Request
6	Continue to monitor the effectiveness and application of the HMA price adjustment provision by reviewing the data annually in November and communicating with industry making adjustments to our policies and provisions as needed.	WSDOT	Ongoing
7	Continue to monitor research on using higher levels of RAP, through the State Pavement Technology Consortium (includes WSDOT, Texas DOT, Caltrans and Minnesota DOT).	WSDOT	Ongoing
8	Continue to monitor research on Warm Mix Asphalt and continue to participate in national efforts to investigate Warm Mix Asphalt.	WSDOT	Ongoing
9	Continue to monitor HMA competition as documented by the low bid system.	WSDOT	Ongoing
10	Complete final SRA Strategic Plan.	WSDOT	March 2008
10	Track and report SRA visitor numbers.	WSDOT	Ongoing
11	WSDOT's contract experts will provide ongoing assistance and oversight of state rest area contracts.	WSDOT	Ongoing
12	Complete implementation of Computer Maintenance Management Systems (CMMS).	WSDOT	December 2009
12	Make funding requests for preservation funding on an as-needed basis within the biennial budget process.	WSDOT	As needed
13	Evaluate career development opportunities to identify career paths and training opportunities within the maintenance and operation field.	WSDOT	Begin by July 1, 2008 and conclude by August 31, 2009
14	Develop strategies to document essential maintenance backlogs.	WSDOT	Spring 2008

Finding	Action Step	By Whom	Due Date
14	Estimate operations and maintenance costs needed to support the highway expansions underway as a result of the 2003 and 2005 revenue packages.	WSDOT	2009-11 Budget Request
15	Develop a strategy to address how to measure a maintenance backlog.	WSDOT	Spring 2008
15	Document consequences of not funding the most critical maintenance and operation activities for rail, highways, and ferry programs and submit that information with each biennial budget request.	WSDOT	2009-11 Budget Request
16	Identify budget impacts from new unfunded mandates and compile this information into a single document that can be updated and maintained into the future.	WSDOT	June 30, 2008
17	Consider alternative uses for SRA's referenced in these findings during the SRA strategic plan development.	WSDOT	March 2008
18	Evaluate potential solutions related to illegal activities.	Military Department, WSDOT, WSP, local jurisdictions, as appropriate	August 2008
19	Conduct MAP surveys annually instead of biennially, and evaluate the effect of changing the frequency.	WSDOT	2008 MAP Survey
20	Include narrative summaries as well as numeric or alpha summaries in MAP reporting as appropriate.	WSDOT	Ongoing
21,22, 28,29	Develop and implement policy statements and procedures to coordinate consistent and timely application of the Project Management Reporting System (PMRS).	WSDOT	January 2008
21,22, 28,29	Update existing Executive Order 1032.00 for project management.	WSDOT	February 2008

Finding	Action Step	By Whom	Due Date
21,22, 28,29	Implement the SPMG recommendations statewide, including activities underway: <ul style="list-style-type: none"> ▪ Standard processes for: <ul style="list-style-type: none"> ○ Cost Control and Earned Value ○ Project Estimate Creation, Review and Approval ○ Project Change Management ▪ Develop training program for project control staff regarding use of these new business processes. ▪ Use cost control/earned value software for all WSDOT projects (by May 2008). 	WSDOT	Ongoing as part of SPMG effort
21,22, 28,29	Refine Cost Estimate Validation Process (CEVP [®]) and Cost Risk Assessment (CRA) estimating procedures and apply these to formulate realistic estimates during the project development process.	WSDOT	Ongoing
21,22, 28,29	Provide additional emphasis of tools and expectations at the Project Management Training Academy, Statewide Meetings, and Quarterly Reporting.	WSDOT	Ongoing
22	Perform annual evaluation and assessment of projects, and share lessons learned through the annual Construction conferences.	WSDOT	February 2008
22	Provide progress of the lessons learned effort and the schedule for developing improvements on the website.	WSDOT	February 2009
23	Continue to use performance contracting and best value selection as appropriate and consider the recommendation if/when it is necessary to do so.	WSDOT	Ongoing
24	Continue to annually monitor the effectiveness of our contract provisions (“ <i>general special provisions</i> ”). Communicate and work with industry to make adjustments to our policies and provisions as needed. Increase focus on training in this area.	WSDOT	Ongoing as part of SPMG effort
25	Create a cross functional team to evaluate existing informal processes and procedures that support trend analysis. Develop strategies to support a systematic approach to track, report, review and improve estimating practices by monitoring quantity growth.	WSDOT	July 2008
26	Review bid evaluation and award process for opportunities for improvement.	WSDOT	Ongoing as part of SPMG effort

Finding	Action Step	By Whom	Due Date
26	Evaluate a sample of engineer estimates, contractor estimates, and actual costs and report to the Legislature and the Governor.	WSDOT	As part of annual budget submittal
27	Investigate electronic bidding options.	WSDOT	March 2008
27	Develop an electronic bidding implementation plan that includes strategies to address best practices, financial impacts, industry input, awareness, and training.	WSDOT	August 2008
28	WSDOT will submit a work plan and timeline for full implementation of PMRS and project management training to the 2008 Legislature.	WSDOT	2008 legislative session
30, 31	Integrate business managers to WSDOT project offices and provide cost tracking and estimating software.	WSDOT	Ongoing, review at end of 2008 construction season (November)
32	Implement new system for categorizing change orders.	WSDOT	February 2008; Follow up review in November 2008 (end of next construction season)
33	Provide enhanced change order training.	WSDOT	Ongoing
34	Continue to track and evaluate performance measures as reported in the <i>Gray Notebook</i> and GMAP.	WSDOT	Ongoing