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### 301.01 Introduction

Maintenance plays an important role in the Washington State Department of Transportation's (WSDOT's) asset management program by meeting the daily requirements of maintaining and operating over 18,000 lane miles, approximately 2,000 miles of ramps and special-use lanes, and over 3,700 bridge and culvert structures, as well as hundreds of other special-use sites vital to the state's transportation system. Activities in the highway maintenance program protect the public infrastructure as well as provide services necessary for daily operation of the highway system. Typical maintenance activities include patching potholes, cleaning ditches, painting stripes on the roadway, repairing damage to guardrail, and controlling noxious weeds. In addition to maintaining assets, operational services are also provided. They include plowing snow, cleaning rest areas, responding to incidents, operating structures like draw bridges, and operating traffic signals, lighting, and Intelligent Transportation Systems (ITS). This limited list of maintenance and operational activities highlights the significant undertaking of maintaining and operating the State Highway System as designed.

Highway maintenance and operations staff are unique stakeholders, because they utilize, maintain, and operate the facilities' engineering designs and constructs. Given the nature and cost of maintenance work, as well as the exposure inherent in maintenance and operational activities, it is important for designers to consider maintenance and operations staff as major stakeholders in every project. It is also important for maintenance and operations staff to understand the purpose of the project and to participate in determining the best method(s) to keep it functioning as designed while maintaining their responsibilities outside of the specific project limits.

This chapter provides multiple options to help improve coordination with maintenance and operations staff during project design. These "best practices" are a culmination of responses from Design Manual user surveys, interviews with maintenance and operations superintendents, and various regional practices that have demonstrated potential improvement related to the coordination of design and maintenance efforts and personnel.

Note: The concepts and methods presented herein do not replace any approved communication or documentation processes that may be currently required by a WSDOT region during the project development process.

### 301.02 Communication

Communication is the most fundamental component of coordination. Executing communication is often oversimplified by the phrase "communicate early and often." In reality, effective communication is significantly more complex. For example: *Who are you communicating with, what methods of communication are being used, what is being communicated, how are you responding to communication, where is the communication taking place, and when does the communication need to occur to maximize effectiveness?*

The following sections highlight areas that may increase the necessary communication between design and maintenance staff.

### 301.02(1) Maintenance Organizational Roles

The most important component of communication is knowing who you are communicating with and what their role is within the organization. Just as engineering has multiple disciplines that cover specific areas within engineering, WSDOT's maintenance organization is also divided into multiple discipline areas, each with focused expertise and specific needs that may be relevant to a particular project.



*Access to maintain luminaire is provided through use of full shoulder*

When asking for maintenance input, it is not sufficient to contact just the Area Maintenance Office that covers that physical geographic area. Depending on the scope of the project, engineering must consult with the appropriate maintenance discipline area. It is a project management responsibility to properly identify and communicate with the appropriate project stakeholders (see [EO 1032 – Project Management](#)). It should not be assumed that the Area Maintenance Office will coordinate with all other maintenance disciplines, unless agreed to organizationally or identified within a particular Project Management Plan (PMP). The PMP is the documentation mechanism for identifying the various contacts and their roles within the project. Each region maintenance organization is different, but in general, the following discipline areas are present:

- Area Maintenance
  - Pavement
  - Roadside vegetation control
  - Rest area management
  - Seasonal and emergent maintenance needs
- Signal, Illumination, and ITS Maintenance
- Bridge
- Traffic Operational Maintenance
  - Pavement markings
  - Sign management
  - Incident response



To access a list of superintendents, go to: [Statewide Maintenance Offices\\_Contact\\_List.xlsx \(sharepoint.com\)](#)  
(Consultants: Please contact your WSDOT Project Manager for Maintenance Contact information.)

To access a list of maintenance performance measures, go to:  
<https://wsdot.wa.gov/about/accountability/maintenance-accountability-process>

### **301.02(2) Communicating Expectations**

Project design is heavily influenced by the subprogram and scope of a particular project. While this becomes a learned experience within engineering design, maintenance staff does not routinely work within these types of funding and project constraints. It is important to identify the type of project and elements that can be addressed under the particular subprogram, in order to effectively manage expectations for maintenance stakeholders participating in the project. It is also important to redirect issues presented by maintenance staff that may not be appropriate for your project but may meet a future need. The project team should work together with maintenance to redirect identified issues to region Program Management to evaluate their relevance for other subprograms or future identified projects or determine if there are funding mechanisms to include the requested feature(s) on the project in question.



### **301.02(3) Communication Timing**

There are multiple constraints to consider when establishing the timing of maintenance stakeholder input. What is the project timeline, when will maintenance involvement be most effective, and which work season(s) are maintenance and operations staff involved with when you need to communicate with them? Each one of these questions needs to be understood to yield the most effective communication result.



*This procession of snow plows clearing the roadway demonstrates the urgency of labor and equipment necessary to maintain operations on the highway during certain seasons*

Maintenance staff has identified scoping through the 30% design phase as a critical period for their input. The scoping phase presents opportunities to identify maintenance concerns and adequately address them within the project scope and budget. The period between scoping and 30% design presents opportunities to evaluate and refine options, as well as gain more understanding of project constraints that may impact a previously identified or requested maintenance feature. As the constraints and design trade-offs become evident, it is necessary to review the impacts to maintenance needs and requests that were originally captured in the project scope and ensure they are not impacted by constraints or the options under evaluation.

Maintenance staff are obligated to respond to immediate incidents and weather conditions. They are not often able to delay their work functions and activities to make time for a design project review. It is essential that designers understand this issue and plan for reviews through scheduling techniques (see Section [301.03\(1\)\(a\)](#)). In general, the best time to involve maintenance staff is during their slower work seasons.



*Maintenance responds to emergencies, which are more likely to occur during certain seasons*

### 301.02(4) Communication Methods

Maintenance has identified field reviews as the primary and most effective method of communication for their staff. Designers are strongly encouraged to perform multiple field reviews with the appropriate maintenance disciplines. Depending on the size, scope, and location of the project, it may be appropriate to first meet in the office and review the project scope and plans, confirm and endorse the Pre-Activity Safety Plan, then proceed with the field review. Field reviews are recommended at the following periods:

- Scoping phase
- Prior to the 30% design milestone (may need multiple meetings to evaluate design options)
- Each time a previously agreed-to maintenance feature is impacted through design iterations, as appropriate
- Prior to other major design review milestones



*Maintenance clearing highway from rockfall overburdening catchment area*

A primary purpose for performing field reviews with maintenance is to assist with visualizing the project and to understand existing conditions. When performing the field review, it is important to emphasize the following:

- Reiterate the purpose of the project and subprogram and discuss maintenance expectations.
- Determine the deficiency being corrected and the understood contributing factors. It is important to gain an understanding from maintenance staff on any other contributing factors or physical conditions that engineers may not be aware of.
- Visualize the project with maintenance:
  - What will be new?
  - What will be removed?
  - What will be replaced, and what is the replacement?
  - Where will new features be located?
  - How will project changes affect neighbors?
- Determine whether the project can be operated and maintained with existing equipment.

- It is necessary for design and maintenance staff to fully understand the impacts to both the maintenance and project budgets to analyze and balance the obligations for the investments as assets are identified on a project. For example, new lighting means maintenance will be billed for the utility costs. Generally, this increased cost has not resulted in increased funding.
- Will proprietary item requests be needed so maintenance can maintain the project items with the tools and equipment they currently have?
- Will new equipment be needed, and who will fund that equipment acquisition?
- What is the maintenance frequency for affected assets? Will this change?
- What are the environmental and permit restrictions related to the asset or feature?
- How might maintenance physically maintain features to understand safety and access needs for the asset or feature?
- Identify explicit action items for design and maintenance staff to follow up on as design iterations continue.
- Document the outcomes of the field meeting, and follow up to ensure maintenance needs are addressed, or provide specific explanations.

In order for maintenance to assist in brainstorming alternative options, engineering design must explain the reasons and constraints behind the previous design options considered and abandoned through the design iteration process.

- Provide maintenance stakeholders the reasons and justification behind design decisions.
- Allow for the time and discussions necessary to brainstorm other options to provide the desired accommodations and features, given the constraints and conflicting performance outcomes identified.
- Before removing any previously discussed maintenance features, always discuss and work on the issue with maintenance staff first.



*Cleaning bridge drains requires special equipment and traffic control*

While independent reviews of plan sheets are meaningful for engineers, it may be an inappropriate expectation that maintenance staff will see the same value. The repeated familiarity of reviewing plan sheets is not necessarily present within the maintenance staff, and plan review training may or may not be feasible for a given regional maintenance organization based on staffing, workloads, and skill retention.

In some larger regional maintenance organizations, a liaison position has been designated for designers to coordinate plan reviews. This approach has seen some success. However, this liaison cannot possibly be aware of all comments/concerns for every maintenance discipline. Don't assume that coordinating plan reviews through the liaison meets the expectation for maintenance stakeholder input. Always check with the various maintenance disciplines for their preferred contacts and include those contacts within the PMP.

### **301.03 Incorporating Maintenance Considerations in Design**

The intent of this section is to provide some project management options and potential strategies or products to help manage the incorporation of maintenance considerations into a design project.

#### **301.03(1) Project Management and Review Strategies**

Design iterations are necessary as information is gained throughout the design process. Designers are constantly forced to balance competing stakeholder needs, regulatory requirements, design criteria, performance outcomes, and physical and political constraints. The following subsections include some recommended strategies for designers throughout the course of a design project.

##### **301.03(1)(a) Project Management and Schedules**

Include maintenance discipline representatives within the PMP and identify their specific roles and responsibilities within the design project. This is important for team members, to ensure their inclusion on interdisciplinary decision making and brainstorming options for specific features that may affect only a single or all maintenance disciplines.

Schedule the appropriate duration and timing within the project schedule to complete the necessary field reviews with maintenance staff. There are multiple scheduling techniques that may assist you, ensuring this will be well planned based on maintenance staff availability and changing work priorities. Contingency activities, providing more activities detailing the effort, or expanding the duration for single activities may all be appropriate. If uncertain how to best represent the needed time within the schedule, consult the Region Project Management and Reporting System (PMRS) Coordinator for options.

As the project works toward constructability reviews, be sure to include appropriate durations for procuring materials. There have been reported instances where maintenance and operations staff has been contacted to temporarily provide equipment while awaiting procurement and acceptance. This creates additional work efforts for maintenance staff to install and remove their equipment to keep a project operational, because inadequate procurement timelines were identified during the design phase.

Note: Some regions have an internal policy that prohibits use of maintenance equipment on a temporary basis due to poor execution and management of procurement timelines. Designers should verify what options exist if procurement timelines appear problematic in construction staging exercises.



Whenever possible, design should avoid creating environments that might be desirable to the homeless, both for their safety and the safety of maintenance staff.

### 301.03(1)(b) Project Reviews

The skill sets of individuals throughout the department vary with experience and training. Strictly utilizing independent plan reviews to gain maintenance stakeholder input may be inappropriate. While field reviews are an optimal means of communicating and visualizing the project with maintenance, it is not prudent to meet in the field for every change or design iteration of a specific feature. However, design engineers frequently engage multiple stakeholders on a project, and those stakeholders are generally provided visual aids and descriptions in addition to a set of plans.



The same effort can be applied to the maintenance stakeholders. Use pictures of completed products, or generate 3D PDFs and/or working drawings, to better illustrate and visualize the features under discussion. Take the time to understand what matters regarding a particular feature and how it will be maintained, and ensure the illustrations provided depict the worst case for their concerns, not the average. For example, if the steepness of side slopes matters regarding how the feature will be accessed or maintained, be sure to depict how the slope will vary, including the steepest portion, not the typical slope.

Every effort should be made to ensure stakeholders understand the balancing act design is working through and how it affects the various maintenance features or assets.

Maintenance staff should never be in a position to review project details from a plan sheet without a meeting/discussion, examples, or other means of communicating what feature or issues they are reviewing on the plan sheet. This effort will help ensure there are “no surprises” for maintenance and operations staff when the planned project enters construction.

### **301.03(2) Maintenance Design Considerations – Tips, Tools, and End Products**

There are multiple potential products that design teams should consider to effectively document maintenance considerations. Note that some options presented in the following subsections may be more effective if implemented on a regionwide basis; however, all options can be described as project procedures and should be identified and explained within the PMP.

#### **301.03(2)(a) Establish Maintenance Performance Measures**

For a given corridor or project location, it may be advantageous to identify desired performance measures and their established goal(s). Providing a performance-based outcome provides something tangible for designers to evaluate when exploring options. These performance objectives should be specific and state the actual needed outcome, not necessarily a proposed solution (see annotated example in [Exhibit 301-1](#)).

Exhibit 301-1 General Input Form with Listed Performance Objectives

<b>MAINTENANCE CONCERNS AND INPUT</b>				
<b>WIN</b>	<b>SR</b>	<b>REGION</b>	<b>COUNTY</b>	<b>DATE</b>
D00521I	005	Southwest	Clark	5/21/2014
<b>PROJECT:</b> I-5/Widen and Construct Interchange				
<b>TYPE OF WORK:</b> Widening for a additional lane and construct two overcrossings, one overcrossing will be a half diamond interchange.				
<b>BEGIN MP:</b>	30.0	<b>END MP:</b>	50.0	<b>LENGTH OF PROJECT:</b> 20 miles
<b>FUNCTIONAL CLASS:</b> Interstate – Principal Arterial				
<b>NHS STATUS:</b> NHS				
<b>ROADWAY IS:</b> (check one)		2 lane	multi-lane <input checked="" type="checkbox"/>	other
<b>NEW/RECONSTRUCTION:</b> (check one)		YES <input checked="" type="checkbox"/>	NO	
<b>STATEMENT OF PURPOSE:</b> (brief description of work to be completed by the Design Engineer) This section of Interstate 5 needs additional capacity and improved auto mobility. Capacity will be provided in three ways; improving local circulation by constructing a new overcrossing at Y Street which will remove local auto trips from the Interstate, providing for a additional half interchange at Z Street to improve existing X Street Interchange, as well as providing an additional lane on the interstate.				
<b>STATEMENT OF CONCERNS:</b> (known maintenance issues within the scope of the proposed project) It is unclear at this time what assets will remain and what new assets will be installed along this urbanizing location. Since this facility is high speed and high ADT, maintenance offices' primary concern is locating protected access to assets placed and maintaining or improving access to assets planned to remain. Maintenance anticipates significant collaboration needs consisting of multiple site visits with all maintenance disciplines (not just this area office). We have prioritized a list of maintenance performance outcomes to consider when weighing specific asset design options as follows:				
<ul style="list-style-type: none"> <li>• Reduction in Maintenance Exposure to Traffic</li> <li>• Reduction in Maintenance Frequency to Maintain and Operate</li> <li>• Lowest Maintenance Life Cycle Cost</li> </ul>				
<b>Area Superintendent:</b>		<b>Date:</b>		
John Doe		5/21/2014		
<b>Area Supervisor:</b>		<b>Date:</b>		
Jonny Smith		5/15/2014		
<b>Lead Tech:</b>		<b>Date:</b>		
Jane Smith		5/1/2014		

### 301.03(2)(b) Evaluate Maintenance Lifecycle Cost

Designers should work with maintenance to understand the full life cycle cost for maintaining a certain feature. Maintenance will need to provide and explain to design:

- The frequency of maintaining the asset
- Labor costs
- Material costs
- Traffic control costs
- Utility costs
- Additional equipment costs (cost to repair if equipment owned, rental costs, or purchase cost of new equipment needed)
- Cost of procuring replacement parts for the asset

Additionally, maintenance and operations staff should identify some qualitative risks and opportunities associated with certain assets. Some opportunities, like the one presented in [Exhibit 301-2](#), may not be possible depending on material availability or funding restrictions.

It is important for designers to understand that some products may have a short shelf-life. Procuring new replacement parts in the future may not be possible, which may result in a search for used parts or the total replacement of the particular asset. These are future risks that need to be identified so design engineers will understand what options or special provisions may be required to help address the potential risks. Maintenance staff can help design understand the history of different assets and determine options that have been successful for a given maintenance location. Design engineers also need to communicate the requirements and disadvantages of proprietary items specifically requested by maintenance. While it may be the desired product that maintenance is familiar with, it may not be the best product for what is being designed.



It is necessary to both determine the life span for a particular asset and utilize discounted cash flow techniques to understand the present worth of the future expenditures. The discounting process can be complex; however, for the purposes of evaluating maintenance life cycle cost, it is acceptable to use a flat discount rate applied to the sum of all future maintenance expenditures. In [Exhibit 301-2](#), the asset life span is 20 years, and the discount rate is approximately 80% (based on a 4% interest rate per year). If the asset life span is different, then the discount rate will also change.

To determine the life span of a particular asset type and the approximate discount rate for that life span, contact the Asset Management Group within the Capital Program Development and Management Office.

After analyzing the life cycle cost to maintain a particular asset, and demonstrating an understanding of the associated risks, design and maintenance staff can justify the best return on the construction investment. While the primary intent of this process is to document justification for an asset decision, it is important that region Maintenance is supplied with the information as well. Providing this information during the design process can inform maintenance budgetary scenarios. Allow sufficient time for maintenance to capture budget impacts and apply for the necessary funding in the bi-annual maintenance budgeting process.

**Exhibit 301-2 Design Option Worksheet Showing Example of Life Cycle Cost Assessment**

**Design Options Worksheet**  
 Engineer: Jane Smith  
 Maintenance Representative: John Doe

**Project Information:**  
 Title: SR Rural Highway/BST and Guardrail Repair  
 Design Speed: 60 mph  
 2 lane rural arterial highway  
 P1 – Paving and P3 – Guardrail Replacement  
 Project Deficiencies: Pavement degradation due to normal wear; non-standard guardrail height at various locations  
 Proposed Scope: pavement repair, BST travelled way from MP 15 to MP 32, and replace identified guardrail priorities from MP16.5 to 17; 20.2 to 20.3; 30.6 to 31.1

**Segment Problem Statement:**  
 Maintenance has identified this segment of highway as a high frequency repair location. Maintenance records for the past 3 years has indicated location requires guardrail repair on average twice a year. Collision data does not show any run off the road collision reporting. The lack of shoulder and work area behind the guardrail requires one way traffic control operations, and exposes maintenance staff to traffic. Maintenance staff has requested additional analysis of design options at this location.

**Segment Location Information:**  
 300 ft Guardrail section on outside of horizontal curve  
 Natural Land use  
 Lane widths are 12 ft  
 Shoulder widths vary from 0.5 to 1 ft  
 ADT is 5000 with 11% trucks

**Typical Section:**

On May 20, 2014, the project team, materials engineer and area maintenance staff performed a second scoping visit to develop pavement repair quantities and methods. We also discussed the maintenance concern for the guardrail repair location at MP 20.2 to 20.3, together we brainstormed and vetted potential contributing factors and design options for this location.

**Potential Contributing Factors:**

- Geometric cross section: Lack of shoulder and sight distance around the curve, outside orientation of the curve may be a factor for drivers negotiating this area. There may be a tendency for driver concern about opposing direction of travel, and to position the vehicle on the outside of the curve. This could result in the minor unreported collisions with the close proximity of guardrail to the travelled way.

**Potential Solutions:**

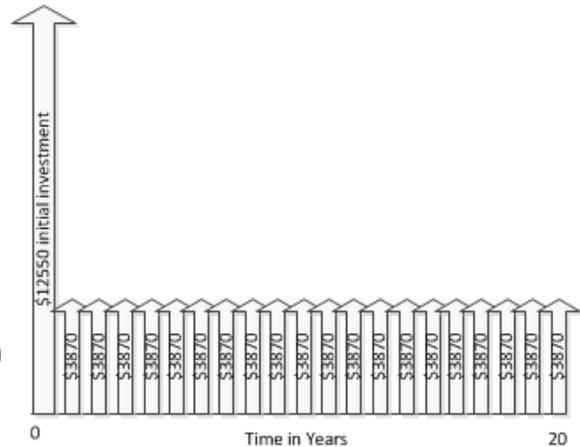
- Replace guardrail at same location
- Replace with pinned pre-cast concrete barrier
- Widen for 2' shoulder, install shoulder rumble strip and install long post guardrail run
- Widen for an 8' shoulder, install rumble strips and install long post guardrail
- Cut into slope and widen pavement section (will require realignment and/or superelevation change)

**Design Option Evaluation:**

Option 1 – Replace guardrail in kind

Contract Investment Calc:

Materials and Labor from UBA  
 6757 @ 27.5 LF for 300 ft = \$8250  
 Traffic Control Costs  
 Flaggers @ \$50/hr x 4 hr x 2 persons = \$400  
 TCS @ \$100/hr x 4 hr = \$400  
 Portable Attenuator = \$3500  
 Total Traffic Control = \$3500 + \$400 + \$400 = \$4300  
 Total Contract Investment = \$8250 + \$4300 = **\$12550**



Maintenance Costs Calc (per repair):

Maintenance records show repairs consist of two sections of guardrail and two posts or post blocks need replacement each repair. Records average repairs 2x each year.

Materials and Labor from Area Maintenance:

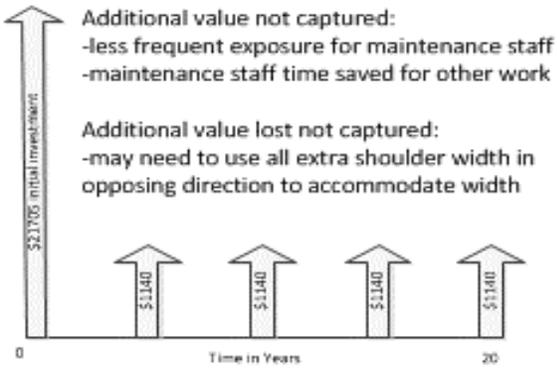
26' beam @ \$27.5/LF = \$715  
 2 posts or blocks @ \$80/ea = \$160  
 3 persons @ \$35/hr x 4 hr (includes PASP and travel) = \$420  
 Traffic Control Labor  
 2 persons @ \$35/hr x 4 hr (includes PASP and travel) = \$280  
 All equipment necessary for repair @ \$90/hr X 4 hr = \$360  
 Total Maintenance per repair = \$360 + \$715 + \$160 + \$420 + \$280 = \$1935 x 2/yr = \$3870  
 Total Maintenance Net Present Worth = (\$3870 X 19)(0.8) = **\$58824**

Total Life Cycle Cost = \$12550 + \$58824 = **\$71374**

**Option 2 – Install pinned pre-cast concrete barrier**

**Contract Investment Calc:**

Materials and Labor from UBA  
 6776 @ \$39/LF for 300 ft = \$11700  
 5767 @\$85/ton for 33tons = \$2805  
 5100 @\$50/ton for 30 tons =\$1500  
 Other costs = \$1000  
 Traffic Control Costs (TC for HMA placement assumed incidental to BST)  
 Flaggers @\$50/hr x 6 hr x 2persons = \$600  
 TCS @\$100/hr x 6 hr = \$600  
 Portable Attenuator = \$3500  
 Total Traffic Control = \$3500+\$600+\$600 = \$4700  
 Total Contract Investment = \$11700+\$2805+\$1500+\$1000+\$4700 = **\$21705**



Additional value not captured:  
 -less frequent exposure for maintenance staff  
 -maintenance staff time saved for other work

Additional value lost not captured:  
 -may need to use all extra shoulder width in opposing direction to accommodate width

**Maintenance Costs Calc (per repair):**

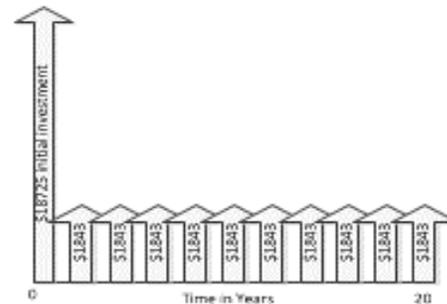
Maintenance records for a similar location and context show repairs consist of resetting a barrier section once every 5 years.  
 Materials and Labor from Area Maintenance:  
 3 persons @ \$35/hr x 4 hr (includes PASP and travel) = \$420  
 Traffic Control Labor  
 2 persons @ \$35/hr x 4 hr (includes PASP and trave) = \$280  
 All equipment necessary for repair @ \$110/hr X 4 hr = \$440  
 Total Maintenance per repair = \$440+\$420+\$280 = \$1140 every 5 yrs  
 Total Maintenance Net Present Worth = (\$1140 X 4)(0.8) = **\$3648**

Total Life Cycle Cost = \$21705 + \$3648 = **\$25353**

**Option 3 – Widen shoulder, install rumble shoulder rumble strips and long post guardrail**

**Contract Investment Calc:**

Materials and Labor from UBA  
 6711 @ \$34/LF for 300 ft = \$10200  
 5767 @\$85/ton for 25tons = \$2125  
 5100 @\$50/ton for 22 tons =\$1100  
 Other costs = \$1000  
 Traffic Control Costs (TC for HMA placement assumed incidental to BST)  
 Flaggers @\$50/hr x 4 hr x 2persons = \$400  
 TCS @\$100/hr x 4 hr = \$400  
 Portable Attenuator = \$3500  
 Total Traffic Control = \$3500+\$400+\$400 = \$4300  
 Total Contract Investment = \$10200+\$2125+\$1100+\$1000+\$4300 = **\$18725**



**Maintenance Costs Calc (per repair):**

Maintenance records for a similar location and context (but higher ADT) show repairs consist of two sections of guardrail and two posts or post blocks need replacement each repair. Records average repairs 1 every other year.  
 Materials and Labor from Area Maintenance:  
 26' beam @ \$27.5/LF = \$715  
 2 long posts or blocks @ \$100/ea = \$200  
 3 persons @ \$35/hr x 3.5 hr (includes PASP and travel) = \$368  
 Traffic Control Labor  
 2 persons @ \$35/hr x 3.5 hr (includes PASP and travel) = \$245  
 All equipment necessary for repair @ \$90/hr X 3.5 hr = \$315  
 Total Maintenance per repair = \$715+\$200+\$368+\$245+\$315 = \$1843 every other year  
 Total Maintenance Net Present Worth = (\$1843 X 10)(0.8) = **\$14744**

Total Life Cycle Cost = \$18725 + \$14744 = **\$33469**

Options 4 & 5 - Widen for an 8' shoulder, install rumble strips and install long post guardrail & Cut into slope and widen pavement section (will require realignment and/or superelevation change). Field visit participants determined these options would be significantly out of scope for the project. Additionally all parties agreed that initial costs are significantly more than the three previous options. Other concerns were permitting, specialty design needs, and potential need to add a ROW phase makes these design options fatally flawed.

**SUMMARY:**

Field participants agreed that Design Option 2 presents the best maintenance performance outcome; with potential to reduce the maintenance frequency, and thereby reducing the exposure of maintenance staff to the inherent risks of working on the roadway. The option also presents the lowest long term costs associated with maintaining the asset. However, the option does create an potential project funding issue at approximately \$10,000 higher costs than option 1.

**Next steps:**

This project is currently within the scoping stage and the final project budget is yet to be determined. The design team will seek endorsement for Option 2 with the project PE, responsible maintenance superintendent and region program manager. Following this endorsement the design office will facilitate a project funding meeting with region program management, region project development, maintenance, and CPDM to confirm budget endorsement for Option 2. Assuming confirmation of budgeting, this option will be identified on the project summary and carried into the design scope for the project.

**CONCLUSION:**

On June 23, 2014, the endorsed Option 2 was discussed for budgeting. The P3 program was determined to have minimal flexibility to fund the additional cost without impacting other projects or other locations on the same project. Maintenance identified a surplus stockpile of the appropriate type of pre-cast concrete barrier, that could be utilized for state supplied materials on the contract, reducing the initial investment by \$5000-6000. Parties agreed to move forward with Option 2 with state supplied material from the area maintenance stockpile.

### 301.03(2)(c) CAE Design Tools

Projects create assets that need to be maintained. The various CADD and modeling programs used for engineering design allow for significant flexibility to show maintenance considerations related to the project. This is true even if a feature won't be physically built by the project, but we want to ensure its visibility throughout the design. Indicate maintenance work zones and access routes within the working files. Refer to the [Electronic Engineering Data Standards Manual](#) for symbology requirements and standards.



### 301.03(2)(d) Maintenance Review and Quality Control Products

There are a number of different ways to support design reviews and quality control for maintenance features associated with a project. Some regions use maintenance review checklists to remind designers and reviewers of common maintenance needs on projects (see example in [Exhibit 301-3](#)).



Worksheets for each asset are another means to document the discussion, options considered, and the decided outcome for a particular asset placed or retained within the project limits (see example in [Exhibit 301-2](#)).

Even if these review and documentation options are not specifically required by region documentation and approval processes, a decision to utilize these tools can be made at the project level.

The established quality control and quality assurance (QA/QC) procedure within each region provides an additional process for ensuring maintenance comments and concerns have been addressed and the agreed-on features are in place.

This procedure becomes increasingly important at the 60%, 90%, and constructability review milestones, where design iterations may have neglected to account for impacts to previously agreed-on features or treatments specific to maintenance and operational needs. Discuss increasing the visibility of maintenance-related quality control within the project or region QA/QC plan and identify the assigned staff responsible for quality control and quality assurance.

Exhibit 301-3 Excerpts from Olympic Region Review Checklist

Maintenance Preferred Outcomes			
Maintenance Preferred Outcomes	Reason	General Outcome Notes	Discussed(Y/N) & Comments
<b>Shoulders</b>			
<ul style="list-style-type: none"> <li>12-foot shoulders at locations where electrical equipment (HAR stations, VMS signs, light poles, CCTV cameras, data stations and RWIS are installed)</li> </ul>	This allows man-lift and other service equipment to park and safely work, may be gravel area in combination with standard paved shoulder.	Could be in the form of widened gravel area.	12 foot shoulders provided for maintenance of multiple assets (ie closed system drainage, walls, illumination, etc.
<ul style="list-style-type: none"> <li>Parking area (access areas) for maintenance to load and unload</li> </ul>	Safety, negates need to take lanes for maintenance work.	Could be in the form of widened gravel area.	Yes – agreed that this project will not be able to create parking areas for some assets given the right of way constraints. Foot access and 12' shoulders provided for project
<ul style="list-style-type: none"> <li>Full depth shoulders</li> </ul>	This would allow the use of the shoulder when detouring traffic		Yes – Provided for multiple reasons including hard running shoulder use.
<ul style="list-style-type: none"> <li>Tapered shoulder edge (safety) edge</li> </ul>	Improved water runoff. Keeps sod and debris from blocking shoulder drainage.	Reduced maintenance practices and herbicide use. <a href="#">Attachment A</a>	Not discussed yet, revisit at 60% design
<b>Electrical</b>			
<ul style="list-style-type: none"> <li>Junction boxes</li> </ul>	It is best to place J-boxes out of the traveled area (4-foot off pavement edge). Use traffic bearing J-boxes as a last resort.		Yes – box type TBD. Attempting to widen within existing ROW, creating need for retaining walls and J-boxes for illumination will need to be relocated. See design options worksheet for initial options discussed, but this and other roadside needs have resulted in a terraced wall design allowing for J boxes and other equipment to be accessed by foot on the terrace. Fall protection system will be needed.
<ul style="list-style-type: none"> <li>Lighting on outside of multi-lane highways</li> </ul>	Median lights are not being constructed in 2010. Keep in mind access (a safe area) for repairing and re-lamping.		Yes – <u>Luminar</u> foundations will be placed behind the first terraced retaining wall. Full shoulder provided for bucket truck to access luminar head. However, project plans on using Hard Running Shoulders for transit priority and maintenance work requiring the shoulder will likely result in night work and/or coordination with transit authority. Night work is acceptable and typical for interstate work on this segment of the corridor
Maintenance considerations for Scoping, Design and Construction Olympic Region Maintenance and Operations Office		5/21/14 1	

**Endorsement**

This checklist has been reviewed, and issues have been discussed as noted. This checklist should be filed within the Design Documentation Package.

OR Maintenance: Jonny Appleseed  
name date

Design PEO: Jane Smith, PE  
name date

### 301.03(2)(e) Asset Management and Maintenance Owner's Manual

Maintenance and operations staff will need to maintain the assets placed or retained within a project location. It is important to be aware of the various asset management systems:

- Highway Activity Tracking System (HATS)
- Roadside Features Inventory Program (RFIP)
- Signal Maintenance Management System (SIMMS)
- Maintenance Productivity Enhancement Tool (MPET)
- Traffic Sign Management System (TSMS)

The asset management system reviews are necessary to confirm the assets present on a project, as well as any identification numbers associated with the assets to track and list those that will be removed, replaced, or remain. Work with the appropriate maintenance staff and confirm the assets identified during field reviews with maintenance staff. Post-construction, any new assets placed will need to be logged into the appropriate asset management system(s) by maintenance or construction staff, depending on region procedures.



Maintenance and operations personnel have experience maintaining a variety of products and features on state highways. However, not every asset is strictly typical for the maintenance discipline or area responsible for maintaining or operating it. Review the assets planned for placement within a project and understand what information maintenance crews may need to adequately maintain the asset or feature. This should include the following:

- Recommended equipment
- Frequency of maintenance activities
- Limits or boundaries (particularly for stormwater BMPs)
- Access location and route
- Any other relevant information discussed with maintenance or supplied by the product provider, including information on brand, make, and model of the asset

Information about these assets should be compiled into an *Owner's Manual* for maintenance to reference.

- The Owner's Manual will be provided in hard copy, an editable electronic copy, and static electronic versions.
- Electronic versions of the Owner's Manual must be titled in the following format: [YYYYMMDD]\_Owner's Manual\_[route]\_[MP Limits]\_[Contract Number].
- Hard copies will be bound in a binder and labeled on the cover and binding with the same information provided in the required PDF title.

The *Owner's Manual* versions will be supplied to both maintenance and the construction office, upon contract advertisement.

Note: This may not be necessary if needed content is captured within the area's Integrated Vegetation Management (IVM) Plan.

If changes occur during post advertisement for a particular asset or feature listed in the *Owner's Manual*, it is the responsibility of the construction office and maintenance to coordinate an update of the *Owner's Manual*, as appropriate. As the construction phase ends, after punch list items are resolved, Maintenance staff should undergo a final review to ensure the *Owner's Manual* is complete and accurate.

### **301.03(2)(f) Maintenance Agreements**

Some project locations may have multiple maintenance jurisdictions, at both the state and local levels. In these circumstances, involve all maintenance jurisdictions throughout the planning and design process. They can help you understand their capabilities and the reasonable accommodations necessary for frequent maintenance operations. To understand the likely split between local and state jurisdictions, refer to [Chapter 1230](#) and the Conformed Agreement... for the Construction, Operations and Maintenance Responsibilities...

[www.wsdot.wa.gov/localprograms/lag/construction.htm](http://www.wsdot.wa.gov/localprograms/lag/construction.htm)

Some maintenance and operations agreements between state and local agencies exist for streets that are also state highways, and are important to the success of these projects. These agreements may need to be created, updated, or replaced due to the nature of the project. The potential agreements need to identify the maintenance, operational, and jurisdictional boundaries, roles, and responsibilities of the parties entering into the agreement, including liability, indemnification, and insurance. The Conformed Agreement (above) lists the likely split of jurisdictional responsibilities. However, maintenance jurisdiction(s) may want to create an operational plan or agreement for the infrequent maintenance functions that designs may not be able to accommodate. It is also possible that one maintenance jurisdiction will be better equipped to handle certain maintenance elements than another. It will be necessary to document the split of maintenance responsibilities even if responsibilities remain the same as those listed within the Conformed Agreement.

Agreements require a level of detail that will not be known early in project development, so it is important to document trade-offs, benefits, and impacts with the affected maintenance jurisdictions while early decisions are being made.



*Maintenance patching pavement at an intersection requires significant planning, night work, and traffic control*

## 301.04 References

### 301.04(1) Federal/State Laws, Codes and Agreements

*City Streets as Part of State Highways Guidelines Reached by the Washington State Department of Transportation and the Association of Washington Cities on Interpretation of Selected Topics of RCW 47.24 and Figures of WAC 468-18-050 for the Construction, Operations and Maintenance Responsibilities of WSDOT and Cities for such Streets, 4-30-1997, amended 4-2-2013*

[www.wsdot.wa.gov/localprograms/lag/construction.htm](http://www.wsdot.wa.gov/localprograms/lag/construction.htm)

### 301.04(2) Design Guidance and Supporting Information

*A Policy on Geometric Design of Highways and Streets, AASHTO, current edition*

*Cost Estimating Manual for WSDOT Projects, M 3034, WSDOT*

*Electronic Engineering Data Standards, M 3028, WSDOT*

*Highway Runoff Manual, M 31-16, WSDOT*

*Maintenance Manual, M 51-01, WSDOT*

*Roadside Design Guide, AASHTO, current edition*

*Roadside Policy Manual, M 3110, WSDOT*

Secretary's [Executive Order 1032](#), Project Management